



Towards Priority Actions for Market Development for African Farmers

Proceedings of an
International Conference
13-15 May 2009, Nairobi, Kenya

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International Livestock Research Institute

P O Box 30709, Nairobi 00100, Kenya

Phone + 254 20 422 3000

Email: ILRI-Kenya@cgiar.org

www.ilri.org

Alliance for a Green Revolution in Africa

P O Box 66773, Westlands

Nairobi 00800, Kenya

Phone + 254 20 367 5000

Email: AGRA@agra-alliance.org

CSIR Office Complex

#6 Agostino Neto Road

Airport Residential Area,

PMB KIA 114 Accra, Ghana

Phone +233 21 740 660 / 768

www.agra-alliance.org



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Anne Mbaabu,
Director, Market Access, AGRA

Steve Staal,
Director, Market Opportunities, ILRI



Synthesis of Outcomes

Priority actions for developing African agricultural markets: A synthesis of conference outcomes

Agricultural markets in developing countries, including sub-Saharan Africa (SSA), are undergoing rapid changes in response to strong economic growth, improved infrastructure and communication systems, and growing demand among consumers for higher quality products. Associated with and facilitating these changes are a range of new interventions and investments, from creative ways to finance value chains, to ICT solutions for the quick and reliable delivery of market information for farmers, to new organizational approaches to linking small farmers to markets. AGRA took the initiative to invest in a gathering to learn from the experiences of those involved in these initiatives, and in May 2009, 150 of the world's leading market experts gathered in Nairobi, Kenya.

The objective of the conference was to document the practices, policies and investments that can drive agricultural market development in SSA, reveal the gaps and shortcomings that continue to create barriers, and identify priority actions that should be taken by governments, the private sector, donors and other stakeholders. The outcomes from the conference are even more relevant given the recent surges in food prices and the significant burden this is inflicting on millions of poor people.

This book is a collection of practitioner research and evidence presented at the conference. It addresses a wide range of topics regarding what is working and what is not working to leverage the untapped capacity of agricultural markets in Africa to increase food security and incomes. The broad array of issues discussed is especially timely given current food price volatility that underscores the urgent need for action. This synthesis highlights the major ideas and themes emerging from the conference and that are now being explored by market experts across Africa and to identify priorities for action.

Introduction: Focusing on markets in a food challenged world

The sudden escalation in food costs that began in late 2010 and persist into 2011 mark the second time in only three years that developing countries have been rocked by a rapid rise in food prices. The forces causing the 2011 spikes differ in some respects from the problems responsible for the 2008 increases. But both episodes are rooted in the same fundamental problem: a combination of production shortfalls and market failures that quickly generated a dramatic gap between supply and demand.

These interrelated issues are resistant to a rapid remedy. In fact there are many observers who note that the price instabilities of 2008 and 2011 are not an aberration but potentially the new norm in a world where the capacity of existing agricultural systems and markets to meet basic nutritional needs has emerged as one of the biggest challenges of our time. In December 2010, Food and Agriculture Organization of the United Nations (FAO) food price index surpassed its 2008 peak, and Oxfam has recently projected that food prices will double by 2030.

In fact, in the absence of successful interventions that address both production and market shortcomings, the gap between food availability and food demand is expected to widen. The human population is likely to grow from roughly 7 billion today to 9 billion by 2050, and all those involved in the food supply chain – including farmers, agro-dealers, wholesalers, financial institutions, processors, seed companies, input distributors, extension agents, agriculture ministries, and agriculture researchers – will be challenged to stay abreast of this increase.

Much of this population growth is predicted to occur in Africa, where for decades chronic food insecurity has been a key reason economies in the region have consistently underperformed. The long-term struggle with food security also makes Africa and its economies and people especially vulnerable to any sudden rise in food prices.

Even before the price shocks of 2008 and 2011, a consensus was emerging among national, regional and international actors regarding the centrality of agriculture in addressing Africa's widespread hunger, poverty and economic issues. Much of the discussion regarding agriculture in Africa has focused on increasing productivity through improved crop varieties and animal breeds, along with increased access to inputs and

veterinary services to greatly boost farm yields. Indeed with crop production per hectare and unit livestock productivity on African farms often a small fraction of what farmers in other regions have achieved, there are clearly opportunities for new breadbaskets and milk sheds to emerge across the continent.

But there also is a new appreciation of the fact that it will not be enough to simply produce more food from the fields and grazing lands of Africa. Market experts point out that most Africans – including most smallholder farmers – are net purchasers of food (Barrett, 2011). Even subsistence farmers are likely to depend on the food available through local produce markets to satisfy basic nutritional needs. Also, the reliance on markets to meet food needs is increasing across Africa as more and more people migrate from rural to urban areas. In addition, millions of rural and urban Africans spend a significant proportion of their income on food, so it does not take a large increase in food prices to tip millions into poverty.

Conversely, it does not take a big swing in the other direction to achieve major improvements in food security and incomes. Therefore, poor Africans can quickly realize the benefits of policies, infrastructure improvements, and other market-enhancing actions that can increase food availability and help stabilize and lower food prices.

Ultimately, better and more accessible markets are as important to poverty reduction in Africa as new farm technologies and macroeconomic policy. They are key determinants of farm productivity, food prices, and food availability, and must be a major component of any effort to bring a sustainable Green Revolution to Africa.

It is also clear that markets must be on the forefront because other forces cannot generate the investments required to achieve necessary improvements. For example, in 2009, overseas development assistance for Africa totaled US\$ 28.2 billion. It would require more than ten times that amount to begin to close the poverty gap in Africa.¹ However, development assistance – along with national governments and private aid groups – can play an important role in supporting the institutions and infrastructure that bring stability to markets and give investors confidence to place their bets on African agricultural endeavors.²

For example, the evidence from recent research indicates that governments, donors and NGOs can best help build better markets by focusing on efforts to relieve bureaucratic delays, improve access to capital, and resolve transportation issues.

Putting markets to work for an African green revolution

Research into African agricultural markets seeks to reveal practical strategies for leveraging their capacity to provide income and food security. Investigators are exploring approaches that confront the substantial inefficiencies that now exist in African markets. Impediments to improving agriculture markets in Africa include a lack of processing, pricing information, credit, storage and transport. These inefficiencies consistently generate higher prices for consumers and prevent farmers in one region who produce a surplus from selling their harvests to hungry people in other regions who are experiencing shortages. For example, transaction costs alone for crop sales in rural Kenya and milk sales in rural Ethiopia act like a 15-20% ad valorem tax on transactions.³ These shortcomings hurt both farmers and consumers, with the problem compounded by the fact that they are often one and the same.

For example, a farmer who grows cassava may be unable to sell her excess harvest to earn income to purchase milk for her family. Similarly, a dairy producer who cannot get her milk to market lacks income to buy other staples. The inability of either to more widely distribute their farm products leads to persistent shortages that in turn drive up prices and affect all consumers.

Harvesting the best ideas for better markets

The research in this book identifies specific interventions, initiatives and innovations that can improve agriculture markets in Africa to the mutual benefit of both producers and consumers. These actions include:

- Lowering the high transaction costs associated with marketing and trading agriculture products in Africa;
- Determining appropriate, equitable and safe food standards and grades;
- Helping small-scale entrepreneurs obtain good market information; and

¹ "Challenges to Pro-Poor Market Development for African Agriculture," Barrett, C. 2011. (This volume.)

² Ibid.

³ Ibid.

- Adding value to farm production through upgrading value chains and processing.

The various analyses presented herein document past efforts that have improved African markets, while also reflecting on actions and policies that have undermined them. A common theme that emerges is that no single institution or stakeholder group can resolve the array of problems afflicting Africa's agricultural markets.

The wide range of actors involved in the Nairobi conference and the variety of topics explored in the related research and presentations are indicative of the mosaic of interests that must act in concert to improve African agriculture markets. They include governments, international aid organizations, NGOs, bankers, agro/veterinary-dealers, seed and livestock genetics companies, grain councils and livestock product boards, national commodity exchanges, research organizations, universities, and farmer associations.

While different stakeholders can address specific challenges, there is agreement on the need for a comprehensive, collaborative and coordinated effort to improve agriculture markets in Africa. The goal is to move quickly to scale-up proven interventions while testing new ideas and approaches that can unleash the capacity of African agriculture to improve livelihoods and drive economic growth.

Match making: getting farmers a date with a market

Experts agree that despite the mixed success of sustaining effective collective action among producers, there is need for continued innovation to more fully integrate small-scale agro-entrepreneurs, who dominate most markets and services, into marketing processes and so offer the small farmers they serve more opportunities to sell their products. In particular, there is considerable evidence showing that farmer groups are one key way to enable smallholder growers to link with private sector actors and participate in the high-value markets that otherwise would be out of reach.

For example, in Uganda, the Nyabyumba Farmers Group (NFG) has an agreement with a fast-food restaurant in Kampala 450 miles away to provide high-quality potatoes. In Kenya, producer

groups have allowed farmers to tap into opportunities to sell fruits and vegetables to urban supermarkets. Researchers note that in both Kenya and Uganda, producer groups have been critical, not only in negotiating the deals, but also in helping individual farmers meet detailed quality standards that are a typical feature of high-value markets.

There is a large body of evidence that producer groups enable smallholder farmers to obtain better prices for their crops. In Ethiopia, for example, research shows cooperative members receive between 7-9% more for their cereal produce than non-members.⁴

Research also shows that farmer cooperatives can be especially effective at improving market opportunities for smallholders when they view the private sector as a source of partnerships rather than as a collection of competitors. For example, there are partners in the private sector – such as wholesalers, processors, exporters and financial institutions – that can facilitate market access for smallholder farmer organizations. But in many parts of Africa potentially productive relationships between the private sector and farmer organizations remain unexploited due to mistrust and rivalry, which is exacerbated by the views of some investors and decision-makers of private actors as being generally exploitative.⁵

Pay to play: providing smallholder farmers with financing

At the top of conference participants' list of recommended actions were initiatives that could provide desperately needed financial services to small-scale agro-enterprises and smallholder farmers – especially women.

Recent efforts in this area include developing risk-sharing arrangements between selected African commercial banks, national governments and development partners, such as the Millennium Challenge Corporation (MCC), the International Finance Corporation (IFC), and the International Fund for Agricultural Development (IFAD), which are encouraging the flow of private capital into smallholder-based agriculture. Innovations include partial equity financing, loans secured by income potential rather than traditional collateral, and value chain financing aimed at reducing the financial barriers that have so far

⁴"Farmer organizations and collective action institutions for improving market access and technology adoption in sub-Saharan Africa: review of experiences and implications for policy" Shiferaw B. and G. Muricho. 2011. (This volume)

⁵ *ibid.*

limited market development on the continent. Loan guarantees have also helped unlock credit (see Box: “A Major New Source of Credit for African Farmers”).

A model of interest is that provided by African Agriculture Capital (AAC), a venture capital fund established in Uganda to invest in small and medium-sized agriculture businesses. Among its goals

The goal of smart subsidy programs is to avoid the perverse incentives generated by traditional subsidy programs. Traditional subsidy programs can end up being too costly to maintain, particularly for cash-strapped governments in developing countries. They also have been criticized as undermining the establishment of durable, private sector agri-business enterprises that can serve smallholder farmers for the long-term.

A major new source of credit for African farmers

In a bold move to unlock credit for African farmers, in 2009, the Alliance for a Green Revolution in Africa (AGRA) partnered with Standard Bank, Africa’s largest bank, to make US\$ 100 million in loans available to smallholder growers.

The AGRA/Standard Bank program focuses on four countries: Ghana, Tanzania, Mozambique, and Uganda. AGRA and several other partners put US\$ 10 million in a loan guarantee fund to cover losses of up to 20% of the loan portfolio in the first year, 15% in the second year, and 10% in the third. The program is the largest single smallholder lending effort ever undertaken by an African bank.

The program is patterned on an initiative implemented by the Rockefeller Foundation in Uganda that had only a 2% default rate, showing the potential for increased lending to African farmers to be a win-win: farmers can get the money they need to boost harvests and lenders can cultivate a new pool of reliable borrowers.⁶

is to provide affordable and flexible capital that will allow small seed companies in East and Southern Africa to supply more farmers with affordable, improved crop varieties. Increased access to high-yield crop varieties is one way smallholder growers can transition from subsistence to more market-oriented farming.

A more intelligent market via targeted farmer support

There is an ongoing debate about the proper role of direct farmer support, i.e. subsidies, in the development of healthy agricultural markets. Today, there is considerable evidence that one way to make such support compatible with market development is to channel assistance for farmers and small agribusinesses through private sector input suppliers, an approach sometimes referred to as a “smart subsidy” – in short, a form of government support that is intended to encourage rather than act as a substitute for private sector participation in agriculture markets, and also to be targeted to those with the greatest need.

For example, limited access to fertilizers, particularly in a region where many farmers struggle with nutrient-depleted soils, is a major factor behind Africa’s struggle to match agricultural productivity to population growth. Transportation challenges and other impediments have left African farmers paying two to six times the world average price for fertilizer.⁷ Traditional subsidies in some areas have boosted access, but the concern is that their costs are unsustainable over the long-term and discourage the establishment of a more reliable private sector supply.

One alternative is to replace traditional fertilizer subsidies with vouchers, which would be targeted specifically to poor farmers who could redeem them for input purchases from private retailers. Researchers also are exploring projects that seek to build up fertilizer markets by giving private firms, rather than governments, the responsibility for handling imports.⁸ Recent initiatives by Tanzania and Malawi to use vouchers that enable smallholders to purchase inputs from rapidly expanding

⁶http://www.agra-alliance.org/files/911_file_AGRA_SBG_MCA_Fact_Sheet_Approved_March18.pdf (Source: <http://www.agra-alliance.org/content/news/detail/907/>)

⁷<http://bit.ly/kMSDWi>

⁸“Fertilizer Markets in Africa: Challenges and Policy Responses.” Wanzala-Mlobela, M. 2011. (This volume.)

networks of certified agro-dealers illustrate how this approach can help transform agriculture, although questions remain as to sustainability.⁹

New approaches are being developed called “agricultural pull mechanisms” that attempt to focus such targeted public support to facilitate private innovation through price or advance market purchase commitments.

High cost of buying and selling: infrastructure and intermediaries

A major reason many smallholder farmers do not seek to produce or sell excess harvests, even with high food prices, is that it can be very expensive to bring crops from farmers’ fields to regional or national markets. Research points to the need for investments that reduce transaction costs both for smallholder producers and the various market intermediaries that provide critical linkages between farmers and consumers.

Reconsidering infrastructure investments

A major transaction cost is tied to the high price and logistical difficulties involved in transporting often perishable harvests from remote farms to urban markets along poorly developed highways, rail lines and shipping networks. Analysis has made clear for some time now that reducing such costs

requires upgrading transportation systems, as well as power infrastructures.

But market experts agree that policymakers should not automatically assume that any investment in infrastructure is money well spent. They advise officials to subject existing and planned investments to impartial and independent analyses of anticipated returns. These analyses should take into account the comparative advantages of each country or region and the extent to which transport corridors and rural road systems slated for improvements will serve key agricultural supply areas.

High-payoff, low-cost solutions to link farmers to markets

There is an increasing excitement around the potential for so-called high-payoff/low-cost solutions that take advantage of innovative thinking and new technology to help level the playing field for smallholder farmers. Examples include the use of warehouse receipt systems to help farmers obtain both credit and good prices (see Box: “Warehouse Receipt System Offers Safe Storage, New Credit Opportunity”).

African farmers also are benefiting from new communication technologies – chief among them rapidly expanding mobile phone networks – to deliver market information and link buyers and sellers.

Warehouse receipt system offers safe storage, new credit opportunity

In Kenya, the warehouse receipt system operated by the East African Grain Council and ACDI/VOCA’s Kenya Maize Development Program offers smallholder farmers two distinct advantages. First, well-run warehouses provide a place to keep the grain safe from spoilage or infestation. In Africa, post-harvest losses, much of which occur due to lack of proper storage options, can cripple income potential and endanger food security.

Second, it provides a receipt verifying the deposit. Farmers can use this receipt as collateral for obtaining temporary loans. These loans can act as bridge financing in situations in which waiting a few months to sell will bring higher prices.¹⁰

The warehouse receipt program developed through ACDI/VOCA illustrates that success depends on the involvement of multiple partners, particularly from the private sector. Kenya’s Equity Bank stepped up to provide a special financial product to serve the program. There was also active participation by transporters, traders, storage managers, millers, local banks, and input supply companies.

⁹ “Building Sustainable Fertilizer Markets in Africa.” Morris, M., et.al. 2011. (This volume.)

¹⁰ http://www.acdivoca.org/site/ID/news_KenyaWR

Texting their way to market success

Agricultural market transactions can also be greatly facilitated by new applications of information and communications technology systems (ICTS). Using technology to improve incomes for African farmers is an important example of leveraging private sector investment to facilitate rural development.

In Africa, entrepreneurs and NGOs are tapping into the rapid adoption of mobile phones and text messaging to help farmers gain instant access to an array of helpful information.

For example, an agriculture market information system operated by Esoko, an NGO based in Accra, is allowing farmers in several African countries to obtain and transmit up-to-date information via cell phone on such issues as prices, offers, weather, buyers, transportation, and crop diseases. There is already evidence of Esoko helping farmers boost income. In Northern Ghana, farmers are projecting a 68% improvement in revenues after two years of using the service to facilitate sales.¹¹

Another example is a new system that combines cell phone networks with automated weather stations to provide smallholder farmers with drought insurance on purchases of seeds and fertilizer. Launched by the Syngenta Foundation for Sustainable Agriculture, each policy is linked to a weather station near the farmer's fields. If the weather station records insufficient rainfall, farmers automatically receive a payout via a mobile phone money transfer system operated by telecommunications provider Safaricom.¹²

Stop the rot: processing the way to food security

A key ingredient to improving food security in Africa is actually sitting in farmers' fields. Only it sits there too long. Research shows that anywhere from 25-50% of crops produced on smallholder farms simply spoil after harvest. Similarly, a study found that milk losses due to spoilage and waste amounted to some US\$ 90 million in East Africa.¹³ Poor transport infrastructure contributes to these losses, as does a dearth of reliable storage facilities.

Another major factor is a lack of knowledge regarding post-harvest handling and processing.¹⁴ Smallholder farmers could earn considerably more income and provide more food for African and international consumers if they can develop better post-harvest technical skills, especially when it comes to processing commodities in which African producers may have a comparative advantage if they can capture low opportunity costs of labor, and target local demand (see Box: "Cassava Processing in Tanzania").

¹¹ "MIS Models." Davies, M. 2009. Conference PowerPoint presentation. Conference on "Towards Priority Action for Market Development for African Farmers" 13-15 May 2009, Nairobi, Kenya.

¹² <http://www.syngentafoundation.org/index.cfm?pageID=562>

¹³ Milk and dairy products, post-harvest losses and food safety in sub-Saharan Africa and the Near East (PFL), FAO 2004.

¹⁴ "An Assessment of the Potential Efficiency and Profitability of Value-Addition and Marketing Innovations Involving Smallholder Farmers Under a Pilot System in Tanzania," Abass, A.B., et. al., 2011. (This volume.)

Cassava processing in Tanzania

There could be a major opportunity to boost income for African farmers by focusing on post-harvest processing of cassava. Cassava is a relatively abundant commodity produced by many smallholders in Africa, but not one that today is generally thought of as a cash crop, in part because it is highly perishable. However, its value can significantly increase if processed into stable products with a long shelf life, such as cassava flour and chips.

An analysis of cassava processing facilities in Tanzania presented at the conference found that if they are operated at full capacity and located in areas where there is an abundance of fresh cassava, cassava processing could be highly profitable. Even facilities that were operating at around 50% capacity still turned a profit.

But like so many initiatives focused on increasing farmers' incomes, addressing one aspect of the value chain – processing capacity – is not sufficient to realize the full potential of cassava. Profits from processing are closely tied to the steady availability of raw material, which means that efforts to boost processing must be tied to initiatives focused on improving the yield and consistency of cassava harvests and on transport infrastructure needed to get crops from the field to the processing facilities.¹⁵

Milking profits from informal market systems

Increasing access to food produced in Africa does not always require formal market systems. There are a huge number of informal marketing systems throughout Africa managed by small-scale players, which in aggregate often comprise by far the largest market share in some food commodities. Improving technical post-harvest and marketing skills and establishing effective certification systems can significantly upgrade these systems.

Research done so far – especially in East Africa and specifically with Kenya's smallholder dairy producers – shows that such investments can produce considerable pro-poor benefits

(both for producers and consumers). For example, efforts have been underway for several years in Kenya – one of the largest consumers of milk in the developing world – to help informal networks of dairy producers maximize their income and production potential (see Box: “Building the Capacity of Small-Scale Market Actors to Upgrade Markets: The Example of Milk Traders”).

A key lesson learned is that policies need to focus simultaneously on both formal and informal market systems and seek synergies between them, particularly as the line between formal and informal is not always clear. Policy makers also must embrace the idea that relatively small investments in informal market systems can lead to significant payoffs for poor producers and consumers.

¹⁵ Ibid.

Building the capacity of small-scale market actors to upgrade markets:

The example of milk traders

Traditional or informal milk markets dominate dairy industries in many developing countries, including in South Asia, Sub-Saharan Africa and the Near East. They channel raw milk and traditionally processed dairy products to consumers who value the traditional tastes and generally low prices. Consumers nearly always boil raw milk before consumption, so mitigating risks. Informal milk markets generally operate under the policy radar, since they rarely comply with official food safety standards or dairy industry regulations, and so are frequently subjected to attempts to ban or limit their activities, including confiscating products and equipment. However, these efforts are nearly always ineffective due to the strong consumer demand that drives the market, and serve only to raise costs for traders by increasing risks of losses and impeding successful entrepreneurs from scaling up and potentially improving their efficiency.

The Smallholder Dairy Project (www.smallholderdairy.org) piloted an innovative effort to work with small-scale milk traders in Kenya to design practical training approaches that allowed them to increase the levels of milk safety and quality, and to conduct business more effectively. By closely involving the Kenya Dairy Board (KDB) in a participatory process, that regulatory agency was able to endorse the training process and certified third-party agencies to supply training across Kenya. Under this business development service (BDS) approach, traders paid the third-party agencies to undertake the training, and were in turn granted certificates from the KDB. This in effect “formalized” their enterprises and gave them greater scope for market activity and reduced risks and costs related to harassment from regulators.

This led to dairy policy reforms that have helped 40,000 small-scale milk vendors reduce risks and costs, which has led to estimated annual gains to the Kenyan economy of US\$ 33 million, some US\$ 16 million of which accrues to smallholder milk producers due to improved prices.¹⁶ Overcoming this barrier required developing new approaches to improving and certifying quality standards for small-scale producers while simultaneously working with policymakers to incorporate those standards into their regulatory frameworks. The key to the project’s success is that it was a multi-pronged effort. It combined research into public health risks associated with small-scale producers (they were found to be exaggerated) with practical assistance for dairy farmers and new policies from regulators.¹⁷ The lesson is relevant to other food systems in which small-scale traders play an important role, by combining targeted capacity-building tools with regulatory support to upgrade markets.

¹⁶ Kaitibie et al., Kenyan Dairy Policy Change: Influence Pathways and Economic Impacts, World Development, Volume 38, Issue 10, The Future of Small Farms; Including Special Section: Impact Assessment of Policy-Oriented International Agricultural Research (pp. 1453-1526), October 2010, pages 1494-1505.

¹⁷ “Integrating Informal Actors Into the Formal Dairy Industry in Kenya Through Training and Certification.” Omore, A. and D. Baker. 2011. (This volume.)

Agriculture policy: the Achilles' heel to improving agriculture markets?

Recent history has shown that to be successful over the long-term, farmers need more than just improved seeds and fertilizers. Over the last few decades there have been efforts to improve farm production in Africa that succeeded over the short-term yet eventually faltered. One reason sustainable growth in Africa's agricultural sector has been so elusive is that the existing policy environment does not encourage – and in fact often discourages – the pursuit of higher yields and stronger markets that can boost incomes and end the vicious cycle of price spikes and food shortages.

It is widely acknowledged that greater private sector investment in all aspects of African agriculture is central to addressing the poverty endemic among smallholder farmers, who represent the majority of the African population. But in Africa, like elsewhere in the world, individuals in the private sector are reluctant to invest in situations that involve two off-putting qualities: unpredictability and high risk. Yet many African governments – sometimes through neglect and incompetence other times through well-meaning but misguided efforts – routinely introduce both these variables.

Governments generate uncertainty and risk by doing such things as imposing import and export bans with little warning, varying import tariffs, and abruptly selling grain stocks for low prices. Among other things, such actions make banks reluctant to invest in agriculture, choosing instead to seek returns in safer areas.¹⁸

Even if some of policy actions stem from good intentions, the end result can still be bad for farmers and consumers. For example, in times of food shortages and price spikes, it can seem logical to respond with export bans and price controls. But price instability appears to be greatest in African countries that rely heavily on marketing boards and discretionary trade policies to stabilize prices and supplies.¹⁹

The irony here is that government mistrust of the private sector's capacity to deal with food challenges actually makes matters worse by discouraging private sector investment that could increase food availability and reduce food prices.²⁰

Another major policy challenge concerns tariff and non-tariff barriers that impede the flow of agricultural products between African countries. Agricultural entrepreneurs in Africa must navigate a hodge-podge of tariffs on staple foods, in addition to a number of export restrictions. Getting through customs can be a mind-boggling affair as well. For example, permits to import grain into Kenya can be obtained only in Nairobi. Moving products from northern Mozambique to southern Malawi requires getting an export permit in the port city of Quelimane.²¹

Trade is also impeded by cumbersome business registration and licensing requirements, random police road checks, complicated standards and certification requirements, and corruption.²² The many challenges that impede the flow of agricultural products explains why much agricultural trade in Africa goes through informal channels, including up to 95% of livestock trade and 60% of trade in staple grains.²³

But there are ways governments can improve food security by adopting policies that allow the government to play a more supportive rather than intrusive and obstructionist role in the agricultural sector. For example, governments can help provide a more stable foundation for agricultural investments by focusing on policies that improve transportation infrastructure, financial services, commodity exchanges, seasonal storage options, crop research, and farm extension services. They should also pursue policies that provide a strong legal and regulatory framework for developing autonomous producer organizations. Producer organizations can be instrumental in helping smallholder farmers gain access to such things as grain storage facilities, processing plants, and marketing services that enable them to pursue new income-earning opportunities.²⁴

¹⁸ "Improving the Performance of Staple Food Markets to Exploit the Productive Potential of Smallholder Agriculture." Jayne, T.S., et al., 2011. (This volume.)

¹⁹ Ibid.

²⁰ Ibid.

²¹ Ibid.

²² "The Impact of Non-Tariff Barriers on Maize and Beef Trade in East Africa." Karugia, J. 2011. (This volume.) and

"Regional Trade: An Opportunity to Spur Growth in Eastern and Central Africa." Waithaka, M. and M. Kyotalimye. 2011. (This volume.)

²³ Waithaka, page 8.

²⁴ Jayne, 2011.

Governments also have numerous opportunities to improve investment – and hence, production – in Africa’s agricultural sector through policies that reduce barriers to trade in common agricultural commodities. For example, in an effort to address frustrations at the border, 34 countries in Africa have installed compatible excise tax and customs software.²⁵

There is also a growing number of market integration efforts underway, including the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of West African States (ECOWAS), and the East African Community (EAC). These initiatives, which are working within the Comprehensive Africa Agriculture Development Program (CAADP) to open markets and harmonize trade policies, can provide platforms for moving toward broader market integration across Africa.²⁶

A call to create a continent-wide African Common Market for agricultural products is already emerging, which could become a powerful force for stimulating private sector investments across the African agricultural value chain – including in production, processing, transportation, and credit. The endeavor also could become a model for establishing a common market in Africa for all goods and services.²⁷

As one researcher noted, “Private sector investment patterns and the supply of bank financing for private investment are largely outcomes of public sector behavior – policy choices, the integrity of institutions, and the ways funds are spent through the treasury.”²⁸

Conclusion: seeking the right mix of policy and investments

Identifying actions that should be taken, while an essential step, leaves unanswered the all-important question of how to pursue them. Many experts believe there is an urgent need to invest in strengthening African policy expertise – as AGRA and others are now doing – to establish a new generation of local, credible, and independent policy professionals.

These new policy specialists can conduct analyses and advise government policy makers on the most appropriate and effective actions to take. They also can ensure that those actions are consistent with the policy and investment framework that has been put in place under Pillar 2 of the New Partnership for Africa’s Development (NEPAD) Comprehensive Africa Agriculture Development Programme (CAADP). Pillar 2 is focused on improving rural infrastructure and smallholder market access to reduce transaction costs and increase competitiveness.

Conference participants also underscored the point made by many researchers that uncertainty in how markets will be allowed to operate is a significant deterrent to potential investors. The problem is that ad hoc policymaking, without adherence to underlying guiding rules or principles, creates uncertainty that hampers investors of all kinds, and leads to a preference for capturing short-term rather than long-term returns.

As was noted above, in times of crisis, a number of African countries have resorted to such ad hoc policy making – putting in place, for example, short-term import/export bans on agricultural products that impede trade and market expansion. There also is a tendency to blame price increases not on long-term structural problems, such as poor infrastructure and lack of credit and information systems, but on the unethical actions of traders and middlemen. This is yet another unfortunate effect of food crises: reactionary and populist policies that can be counter-productive to finding long-term solutions to market deficiencies.²⁹

Finally, a general consensus was reached that the traditional heavy reliance on policy reform to bring about market improvements should be reduced in favor of pursuing a more diverse array of investments and initiatives, including those initiated by the private sector. This point is grounded in the fact that in a number of SSA countries demonstrating the fastest economic growth, much of the impetus for action – and the investment and innovation – has come from the private sector.

²⁵ Waithaka, 2011.

²⁶ Ibid.

²⁷ “Developing Agricultural Commodity Markets for Improved Regional Trade in Africa.” Olu Ajakaiye, D. and A.S. Olomola. 2011. (This volume.)

²⁸ Jayne, 2011.

²⁹ Barrett, page 11.

Summary of conference outcomes: priority actions

During the final conference session, the experiences shared and the consensus built were summarized into a list of principles and actions for effectively advancing agricultural market development in Africa.

Principles to guide priority actions:

- 1) Actively promote a culture of evidence-based decision making by all development agents, public and private;
- 2) Improve coordination of interventions and their evaluation to achieve generalizable lessons;
- 3) Celebrate and encourage private sector initiative, but also recognize the critical role for government enabling functions;
- 4) Promote and involve farmer organizations in the identification, design and evaluation of interventions;
- 5) Carefully differentiate gross and net benefits, and the opportunity costs of using public or donor funds;
- 6) While exports to OECD are desirable, focus on the far larger domestic and regional markets; and
- 7) Shape modern value chains (supermarkets) where possible, but focus first on the more important traditional channels.

Based on these principles and lessons learned from the conference experience, a set of priority actions were prescribed, and differentiated into policy and investment interventions in recognition of the increased awareness of investment opportunities.

Priority policy actions:

- 1) Reduce international trade barriers, both tariff and non-tariff;
- 2) Harmonize grades and standards within national and regional markets, including for seeds and other inputs;
- 3) Monitor the need for anti-trust action where non-competitive behavior exists;

- 4) Land and labor (education and health) policies should facilitate smallholder productivity growth and market participation; and
- 5) Avoid ad hoc policy processes that generate risk and uncertainty.

Priority investment actions:

- 1) Improve access to financial services for producers and market intermediaries, especially for small-scale producers/intermediaries and for women;
- 2) Extend, upgrade and maintain transport and power infrastructures;
- 3) Build independent African food policy analysis capacity;
- 4) Advance technical skills training in value addition, new products, food standards, etc.;
- 5) Extend, upgrade and maintain town and urban wholesale marketing infrastructures; and
- 6) Facilitate rapid and broad roll-out of advanced ICT tools to help level the playing field.

AGRA President Dr. Namanga Ngongi, stressed the importance of bringing together a similarly diverse group of experts to clarify what needs to be done next, when and by whom in order to develop Africa's local, national and regional markets. He said, "Concrete actions that will promote the ability of these markets to absorb the fruits of smallholder productivity increases are essential. The right actions by key players across the continent will reinforce the growing momentum for a uniquely African Green Revolution, and in so doing help increase food security and reduce poverty for millions."

"Efficient agricultural value chains and markets will help unlock the full potential of smallholder farmers," he stated. "Human capacity and physical infrastructure must be ramped up, and we pledge ourselves to work with key partners to ensure that markets are not a limiting factor in the green revolution."



Section 1

Developing Pro-poor Markets for African Smallholder Farmers

Challenges to pro-poor market development for African agriculture¹

Christopher B. Barrett^{2,3}

Introduction

Markets are as fundamental to African agricultural development and poverty reduction as technologies and macroeconomic policies. All three heavily influence the productivity, and thus the incomes, of rural land owners and workers, as well as the prices of agricultural commodities and the food security of poor populations. Scholars and policymakers have nonetheless paid far less attention to the promotion of improved institutions for exchange than they have to the development of improved production technologies or to the pursuit of more prudent macroeconomic policies. This is perhaps especially true in Africa, an agrarian continent that was largely bypassed by the Green Revolution technological innovations of the 1960s-1970s, and subsequently unresponsive to the macroeconomic reforms enacted during the structural adjustment era of the 1980s-1990s. Recent efforts at sparking a new Green Revolution for Africa are finally awakening observers to the continent's longstanding need to attend to market development.

There are multiple reasons to applaud the increased attention being paid to markets for African agricultural development. Enhanced performance of the institutions that govern the exchange of commodities across form (e.g., processing grain into flour), space (i.e., intra- and inter-national trade), and time (i.e., storage) can generate important benefits for low-income agrarian economies. First, the market defines the economic reach of the state. Markets transmit the policy signals sent by central governments through exchange rate, fiscal, monetary and trade policy. When markets function poorly, those signals are distorted or extinguished before they influence firms, households and workers by changing constraints or incentives. Given how much has been invested in trying to improve agricultural and macroeconomic policymaking in Africa over the past generation, it is essential to reinforce whatever improvements have been achieved by enhancing the market institutions that ultimately support effective states.

Second, well-functioning markets aggregate demand and supply across space and time in a manner that increases the price elasticity of demand and supply faced by individual agents. This enhances the responsiveness of farmers and firms to emergent technologies, helping to stimulate increased uptake of the fruits of modern science and engineering. Improved markets also encourage greater specialization according to comparative advantage, leading to efficiency gains in economies commonly impoverished in part by severe inefficiencies in production patterns. This aggregative function of markets also reduces price volatility, which has become a renewed concern since the 2007-08 global food price crisis. Markets thereby enhance the efficiency of and opportunities facing the poor relative to autarky or small, segmented community-scale exchange.

Third, well-functioning markets also communicate to all economic agents the relative scarcity of different factors of production and thereby help induce desirable institutional and technological innovations to conserve relatively scarce inputs (Hayami and Ruttan, 1985). Having been bypassed by the greatest gains of the Green Revolution, African agriculture depends heavily on private innovation to enhance the productivity of the continent's land, people and water. Those innovations are most generally beneficial when they respond to accurate market price signals.

Fourth, on a somewhat less positive note it is essential to pay greater attention to markets because the "market-based" approach adopted from roughly the mid-1980s until some time last decade was not wholly successful. The private sector has not always stepped up to fill the gaps left where the public sector has retreated, for example, the provision of seasonal credit, input delivery and output evacuation services through parastatal marketing boards. It is equally true that, market-oriented rhetoric notwithstanding, the state has not always stepped away so as to let the private sector emerge from the shadow of a powerful public sector (Kherallah et al., 2000).

Fifth, the global food price crisis of 2008-09 underscored the poor's vulnerability to food and agricultural input price spikes. Market risk remains a major concern as few African farmers enjoy access to effective price risk management tools given

¹Source data for this paper come from the World Bank, World Development Indicators Database (<http://data.worldbank.org/indicator>) using the most recently available poverty gap estimate based on the US\$ 2/day per person international poverty line in purchasing power parity (PPP) terms. The aggregate continental estimate is a population-weighted average of the available country-specific estimates.

²The author is the Stephen B. and Janice G. Ashley Professor of Applied Economics and Management, and International Professor of Agriculture, at Cornell University, Ithaca, NY, USA.

³Corresponding author (cbb2@cornell.edu)

the underdeveloped nature of futures and options as well as insurance markets on the continent. Further state withdrawal from agricultural markets will expose producers and poor consumers to greater vulnerability to market disruptions unless active steps are taken to deepen markets and develop effective institutions for hedging risk.

Although the necessity of increased focus on market development for African agriculture is clear, for the reasons just enumerated the challenges to pro-poor market development in African agriculture are many. Success in this crucial endeavor requires building up and acting upon a growing base of rigorously established evidence. Toward that end, this paper offers one longtime observer's view of what we already know based on rigorous analysis and what we do not yet know with great confidence. Donor agencies, governments, nongovernmental organizations (NGOs), and private firms need to act based on the evidence in which we can already have reasonable confidence, and to invest in developing a firmer understanding of crucial issues on which we lack such evidence before gambling scarce resources. In the past, Africa has suffered gravely from policies based on simplistic ideologies – both statist and libertarian – that lacked solid empirical foundations. We need to identify what works and focus on evidence-based approaches. The remainder of this paper offers a modest contribution in that direction.

What we know

In this section, nine distinct and important points are enumerated on which the empirical evidence is sufficiently dense and rigorous that the development community can proceed with confidence. The details on these bits of evidence are reported in the cited works; in the interests of brevity descriptions of data or methods are omitted in order to focus just on essential take-home findings. This is not intended as a wide-ranging survey of the literature; the examples offered draw heavily on prior work by collaborators, students and the author to illustrate core points briefly advanced in the narrative.

1. The private sector must be the engine of poverty reduction in Africa

Overseas development assistance (ODA) is nowhere near sufficient to close Africa's US\$ 2/day poverty gap. According to the OECD (2010), Africa received US\$ 28.2 billion in net ODA disbursements in 2009, down 19% in inflation-adjusted terms

from the 2006 record high of US\$ 31.5 billion. Aid flows are dwarfed by the continent's US\$230 billion US\$ 2/day per person poverty gap (Table 1).⁴ It would take well in excess of ten times the record ODA inflows into Africa to close the poverty gap, especially as this crude comparison neglects the inevitable, significant leakage of aid as it flows to the poor. Aid is plainly not the solution, although it can be a useful stimulus to the private sector engine that must drive the investment, employment creation and innovation necessary for sustainable poverty reduction in Africa.

While clearly recognizing the importance of the private sector, it is equally important to guard against a naïve belief in the "free" market (Platteau, 2000; Fafchamps, 2004). No such thing exists; market transactions depend on a terribly expensive array of institutional and physical infrastructure necessary to induce private investors to put scarce capital at risk in contracts and investments. The state is a key partner in the essential task of creating an expensive market mechanism to generate the essential new income flows necessary to close Africa's yawning poverty gap.

2. Most poor Africans live in rural areas and pursue farming as a livelihood

In spite of rapid urbanization, more than three-quarters of Africa's poor still live in rural areas, where more than 90% of the population still lives on US\$2/day or less (IFAD 2010). The principal livelihoods are based on agricultural production, for auto-consumption at home and for market sale, and off-farm employment in agriculture and post-harvest processing and distribution. These basic descriptive statistics underscore that poverty reduction in Africa turns fundamentally on increasing the returns to agricultural labor and land, including post-harvest processing.

When policymakers and agricultural researchers think about improving the returns to factors of production, they almost invariably think first about improved production technologies. Technological advances that increase productivity are undeniably important and can be very effective tools for poverty reduction (Minten and Barrett, 2008). But we must begin to think equally about improving productivity via increasing producer prices by reducing the high (search, transaction, enforcement, etc.) costs of commercial exchange. Markets are analytically equivalent

⁴These aggregate estimates are lower bounds because of (i) non-random missing countries (e.g., Eritrea, Somalia, Sudan) that likely have higher-than-average poverty gaps and lack poverty estimates, and (ii) especially outdated estimates that are likely lower than current figures (e.g., Namibia, Zimbabwe).

Table 1: Estimated US\$ 2/day per person poverty gap in Africa, by country

Country	Year	\$2/day PG (PPP) (%)	Population (mn)	\$bn PG/year
Angola	2000	42.4	18	6
Benin	2003	33.5	9	2
Botswana	1994	22.3	2	0
Burkina Faso	2003	39.3	15	4
Burundi	2006	56.1	8	3
Cape Verde	2001	14.9	1	0
Cameroon	2001	23.7	19	3
CAR	2003	45.3	4	1
Chad	2003	43.9	11	3
Comoros	2004	34.2	1	0
Congo, Dem. Rep.	2006	42.4	64	20
Congo, Republic of	2005	38.8	4	1
Cote d'Ivoire	2002	17.6	21	3
Djibouti	2002	14.6	1	0
Ethiopia	2005	28.9	81	17
Gabon	2005	5.0	1	0
Gambia	2003	24.9	2	0
Ghana	2006	22.3	23	4
Guinea	2003	50.3	10	4
Guinea-Bissau	2002	34.8	2	0
Kenya	2005	15.1	39	4
Lesotho	2003	33.1	2	0
Liberia	2007	59.5	4	2
Madagascar	2005	46.9	19	7
Malawi	2004	51.8	15	6
Mali	2006	36.5	13	3
Mauritania	2000	15.9	3	0
Mozambique	2003	53.6	22	9
Namibia	1993	36.5	2	1
Niger	2005	46.7	15	5
Nigeria	2004	46.9	151	52
Rwanda	2000	55.7	10	4
Sao Tome & Principe	2001	21.6	0	0
Senegal	2005	24.7	12	2
Sierra Leone	2003	37.5	6	2
South Africa	2000	18.3	49	7
Swaziland	2001	45.8	1	0
Tanzania	2000	64.4	42	20
Togo	2006	27.9	6	1
Uganda	2005	36.4	32	8
Zambia	2004	48.3	13	4
Zimbabwe	1995-96	48.2	12	4
Sample sub-Total			763	215
Sub-Saharan African Total			820	230

to production technologies and offer similar avenues for productivity and income growth (Barrett, 2008). Moreover, improved productivity within the marketing channel – not just on the farm – enables squeezing marketing costs so as to avoid the “food price dilemma” (Timmer et al., 1983) policymakers routinely face, wherein increasing producer prices to stimulate farmer and farm worker incomes and investment incentives injures poor consumers who must pay higher prices for food. Squeezing marketing margins can both raise producer prices and reduce consumer prices, achieving win-win outcomes for the rural poor who at once depend upon agriculture for a large share of their income and are typically net food buyers vulnerable to price increases (Barrett, 2008).

3. Marketing costs in African agriculture are very high

Squeezing marketing costs is important because the very high costs of commerce in African agriculture sharply reduce producers’ and traders’ returns and induce self-selection out of higher-return crops, especially by the poor. Renkow et al. (2004) and Holloway et al. (2005) find that fixed transactions costs, on average, act like a 15-20% ad valorem tax on crop sales in rural Kenya and milk sales in rural Ethiopia, respectively. Similarly, Freund and Rochas (2009) estimate that a one-day decrease in inland transit time increases exports by roughly 7%. Variable costs are likewise high, often another 10-25% or more of sales value (Barrett, 2008). High marketing costs can distort crop choices by farmers, leading to far greater production of importable staple grains and less of exportable cash crops than would occur if marketing costs were appreciably lower (Jayne, 1994; Omamo, 1998). In more extreme cases, such as more remote areas of Madagascar, Cadot et al. (2006) find massive costs to entering markets: 124-153% of subsistence farmers’ annual production. The costs of bringing surplus commodities to market significantly dampen farmers’ returns from market participation, often to the point of shifting the crops they grow or discouraging them from entering the market at all.

The problem extends well beyond household-level transactions costs. Firms choose areas in which to contract in part based on the costs of collecting product and establishing and enforcing agreements (Minten et al., 2009; Barrett et al., 2010). The market-level costs of reaching international markets also play an important role by segmenting spatially distinct markets and thereby dampening both competition and price transmission (Stifel et al., 2003; Abdulai, 2007; Stifel and Minten, 2008; Moser et al., 2009). During the structural adjustment era,

fiscal retrenchment by governments cut sharply into roads maintenance, police protection and provision of other essential public goods and services, while exchange rate depreciation drove up the cost of tradable inputs (e.g., fuel), increasing the costs of commerce, driving some entire regions back towards subsistence production (Jayne, 1994; Barrett, 1995, 1997, 1999; Reardon et al., 1999). These effects have not been uniform and in many places have been outweighed by the added vigor of newfound competition in markets in which private intermediaries had long been banned from competing against parastatal marketing boards, as well as by the emergence of new information and communications technologies that have substantially reduced costs of coordination across space.

All of these empirical findings underscore the importance of increased focus on improving internal market functioning so as to reduce marketing costs. Balat et al. (2009) estimate the poverty reducing impacts of reduced marketing costs for high-return crops would be equivalent to up to a fourfold increase in world market prices. A big reason for the markedly pro-poor effect of reduced marketing margins is that the gains from public infrastructure investments as a means to increase the net returns to agricultural production accrue disproportionately to relatively remote rural households, who appear worse off by most welfare measures.

4. Focus on marketing costs related to bureaucracy, capital and transport

Marketing margins are large in African agriculture for a variety of reasons. Commodities are typically transacted multiple times, among a variety of agents, on their way from farm to table. The lack of vertical integration adds considerable transactions costs associated with search, quality control, and contract monitoring and enforcement (Platteau, 2000; Fafchamps, 2004). Reduction of these costs is a major driver behind vertical integration and coordination through contract farming arrangements and agribusiness land investments in Africa in recent years. While modern agricultural value chains remain small scale in African agriculture today, and for the foreseeable future, the direction of change is clear, even if the pace and inclusiveness remain highly uncertain (Barrett et al., 2010).

Information is another impediment, especially in traditional markets in remote locations, where private information networks are used extensively and at relatively low marginal cost, but commonly rely heavily on social connections based on ethnicity,

race or religion and thus are commonly quite exclusive and potentially collusive. NGOs and the state can help by promoting auctions, public agricultural market information systems and other institutions and services that level the informational playing field. But, as with vertical coordination and integration problems that add to marketing costs, the private sector appears to be solving these problems on its own. In particular, rapid advances in information and communications technologies – especially mobile telephones – are rapidly changing information flow within agricultural marketing systems, helping to rapidly erase spatial arbitrage opportunities and enabling small producers and traders to fetch higher prices for the commodities they sell (Jensen, 2007; Aker, 2010). There thus seems relatively little value added from donors or governments intervening in information services.

By contrast, the big costs within African agricultural marketing channels – and the places where government and donors and NGOs can make a difference – concern bureaucratic delays, access to and the cost of working capital, and access to and the cost of transport. These are priority areas for attention.

Freund and Rocha (2010) carefully document the significant adverse impact of customs, documentation, port and transit delays on African exports. Many of the bureaucratic problems that were serious impediments during the parastatal marketing era continue, discouraging the private sector from stepping up to fully replace the state in agricultural marketing (Kherallah et al., 2000).

The marketing costs that have attracted most attention are those associated with transport. This is a problem at multiple levels. At the household level, ownership of bicycles or motorized transport commonly exerts a significant positive effect on both market participation and sales volumes conditional on participation (Omamo, 1998; Heltberg and Tarp, 2002; Renkow et al., 2004; Cadot et al., 2006; Boughton et al., 2007). At the community scale, transport costs from local market to the nearest city often consume 25-75% of the destination market price, commonly making spatial arbitrage unprofitable and leaving rural markets isolated (Moser et al., 2009). Recent estimates of the marginal returns to transport improvement range from 16% in rural Ethiopia (Dercon et al., 2008) to nearly 50% in rural Madagascar (Jacoby and Minten, 2009). The costs of moving from local, small volume transport to larger-scale motorized transport commonly create mobility barriers that

impede microenterprise growth in the agricultural sector and protect larger firms against competition (Barrett, 1997).

A major reason for transport bottlenecks is the lumpiness of investment in lorries and limited access to commercial credit within the agricultural sector. Microfinance institutions typically limit lending to volumes far too small to permit investment in expensive equipment such as vehicles. So farmers and traders typically must rely on their own savings or on subsidized lending by state-run banks to finance vehicle purchase. And, for good reason, there is relatively little state-subsidized agricultural lending in Africa today. The result is very high marginal returns to capital in agriculture: greater than 60% in Ghana according to Udry and Anagol (2006). At the household scale, this commonly leads to the “sell low, buy high” phenomenon wherein poor farmers commonly sell agricultural commodities at a low post-harvest price and then buy back the same commodity later, when prices spike during the lean season, using commodity markets to obviate seasonal credit constraints, with de facto interest rates on seasonal quasi-credit (i.e., the seasonal price increases) commonly in the 40-75% range (Stephens and Barrett, 2011).

Bureaucratic, transport and capital costs remain major impediments to firm investment and expansion in African agriculture. Interventions aimed at crowding in private investment within the sector would do well to focus on these bottleneck areas of high cost where the private sector does not seem to be rapidly addressing the problem on its own. Making capital and transport more readily accessible, especially to poorer farmers and traders, can pay very high dividends in terms of productivity growth and poverty reduction in Africa.

5. Asset poverty limits market participation

Historically, when policy analysts have focused on policies for promoting smallholder market participation, they have emphasized primarily macroeconomic (e.g., trade or exchange rate) or meso-scale (e.g., roads, farmer groups) policies. But the growing empirical evidence points strongly to microeconomic factors – especially households’ private asset endowments – as key determinants of market participation, even controlling for public goods and policies (Heltberg and Tarp, 2002; Cadot et al., 2006; Boughton et al., 2008; Barrett, 2008; Bellemare et al., 2010). Net crop sales – both for food crops and cash crops – tend to rise steadily and statistically significantly with farm households’ land holdings and other productive agricultural

assets (e.g., equipment, irrigation, livestock). Analogously, areas blessed with greater agro-ecological and infrastructural assets tend to attract larger-scale buyers and thus producers in those areas are far more likely to receive attractive contract offers from modern value chains than are growers in less favored lands (Reardon et al., 2009; Barrett et al., 2010). These patterns can help reinforce geographic poverty traps, as better endowed regions and households more easily enter higher-return marketing channels, reinforcing their initial advantages, while less well-endowed regions and households commonly cannot generate the surpluses nor access higher-return markets necessary to generate agriculture-led growth.

Even the probability of a household being autarkic – i.e., neither a buyer nor seller – increases steadily with land holdings in the lower half of most land distributions, signaling that the most asset poor households cannot even afford food self-sufficiency; they must work off-farm to earn cash wages with which to purchase food to supplement their own meager output. Autarky is not the domain of the poorest, but rather an option only for those with adequate resources to disengage from the market when transactions costs and the risk associated with commercial exchange prove too great.

A key implication of the ubiquitous, strong relation between household asset holdings and market participation – and its meso-scale analog of community or regional scale endowments and value chain participation – is that macroeconomic policies may prove ineffective in the absence of interventions to equip producers (and traders) with minimum necessary asset holdings to enable them to partake of emerging market opportunities. Market development may require a preparatory focus on promoting asset accumulation so as to endogenously induce market deepening.

6. The overwhelming majority of Africa's poor are net food buyers

Following directly from the previous point, the asset poor are typically unable to generate a marketable surplus of food commodities. Thus the poor are overwhelmingly net food buyers, not net sellers in Africa (Weber et al., 1988; Barrett, 2008). This empirical regularity is commonly forgotten. The fact that the poor overwhelmingly reside in rural areas and work in agriculture (see point 2 above) commonly leads policymakers, the media and non-specialist scholars to infer incorrectly that, because the poor farm, they must therefore be net food

sellers who benefit from higher food crop prices. Not true.

Furthermore, the strong association between poverty and net food buyer status is being reinforced due to urbanization, higher fertility rates among poorer women, and intergenerational farm splitting.

The clear, strong implication is that pro-poor market development interventions should focus first and foremost on achieving efficiencies that sustainably reduce real food prices and that reduce the prospect of price spikes that can be calamitous to the poor. Those who already spend half or more of their income on food cannot withstand a doubling (or worse) of food prices without suffering nutrient deprivation and the associated potential health consequences. By contrast, although a ten percent reduction in food prices due to efficiency gains in value chains has only negligible (<1% of budget share) effect on the best-off decile of the income distribution, it can have a significant (>5% of budget share) effect on the poorest quartile, enabling discretionary investment in children's education and health, or savings to accumulate productive assets to help household escape persistent poverty. Because the poor are net buyers, the consumer side effects of agricultural markets bear special attention, although they rarely receive it. This is perfectly analogous to technological improvements to increase agricultural productivity, the gains from which have historically accrued primarily to poor consumers in the form of lower prices – far more so than to net seller farmers in the form of higher profits – although very few people in the agricultural research or development policy communities recognize and acknowledge this fact (David and Otsuka, 1994; Evenson and Gollin, 2003; Minten and Barrett, 2008).

7. Uninsured risk is a major problem

One reason that capital constraints loom large and the apparent marginal returns to capital investment in agricultural market development in Africa is that investors face considerable uninsured risk. Greater risk drives up the expected returns necessary to induce investment. Agriculture is the riskier sector in any economy, due to the many biophysical shocks that buffet the production process and the long lags between investments in inputs and sale of outputs.

Agricultural price risk looms large, especially for net producers. There are, as yet, relatively few effective means of hedging against price risk. Futures and options markets are woefully underdeveloped on the continent. The primary vehicle growers

are using now is contract farming with agro-exporters or supermarket chains, which indeed appear to stabilize prices and incomes for farmers (Barrett et al., 2010; Bellemare, 2010).

Especially since the 2007-08 global food price crisis, governments are again seriously exploring commodity price stabilization options. While there is clearly demand for commodity price stabilization – for example, Bellemare et al. (2010) estimate Ethiopian farming households' willingness to pay at 6-32% of income, on average – the welfare gains are highly concentrated among net sellers of coffee because that commodity's price is most volatile of the major commodities grown in the country, and because net sellers – the upper 40% of the income distribution – are most exposed to price risk. Thus price stabilization can be a distributionally regressive policy.

The best mechanism for reducing price variability is spatiotemporal market integration to dissipate demand or supply shocks across space and time. When sufficient storage exists to absorb bumper harvests and meet regular demand outside of the harvest season, and intra- or international trade can readily evacuate surpluses or import commodity to meet shortfalls, price variability is sharply reduced (Barrett, 1999). The state of agricultural market integration and price transmission is discussed in the next point.

Asset risk poses an even bigger problem than price risk because, as discussed under point 5 above, asset poverty is perhaps the primary impediment to market participation and development in African agriculture. Quite apart from the risk of collapse into poverty traps posed by asset loss (Barrett et al., 2007), asset risk also impedes credit access for farmers, traders, millers, etc., as lenders become reluctant to lend against collateral that is vulnerable to loss and borrowers become reluctant to put essential productive assets at risk of foreclosure (Boucher et al., 2008). Combined with the problem of correlated default risk that is pervasive in agriculture – a financial institution's borrowers are likely to suffer repayment problems at the same time due to common production or price shocks – asset risk limits trader access to credit to invest in expanding employment and equipment holdings (Fafchamps, 2004).

There is great need to develop improved and more widely accessible mechanisms for risk reduction and risk transfer so as to encourage greater investment in market development and increased access to credit for such investment. But beware a

primary focus on government-led price stabilization schemes as these may not attend to the more important (asset) risk nor are they likely targeted effectively to poorer participants in agricultural value chains.

8. Agricultural spot markets generally work reasonably efficiently

As the preceding point emphasized, reasonably efficient market integration is essential to stabilize prices. Over the past generation, market-oriented reforms and advances in transport infrastructure and, especially, in information and communications technologies have enhanced the speed and extent of price transmission across space (Abdulai, 2007). In most places, markets seem to work reasonably competitively and efficiently, transmitting price shocks across spatially distinct markets quickly, once one accounts properly for changing marketing costs (Badiane and Shively, 1998; Fafchamps et al., 2005; Fafchamps and Vargas Hill, 2008; Aker, 2010; Stephens et al., 2010).

But even though markets transmit prices reasonably effectively across space, the high costs of commerce, especially transport (see points 3 and 4, above), nonetheless frequently lead to market segmentation as an efficient equilibrium (Moser et al., 2009). In these spatial pockets where high marketing costs isolate local markets from global or regional trading patterns, price volatility can be high and competition among traders low. This commonly leads to high average trading profits, especially in capital-intense long-haul transport and inter-seasonal bulk storage, as well as in high-risk areas (Barrett, 1997; Moser et al., 2009).

Private intermediaries respond promptly to emergent profit opportunities in African agricultural markets and by so doing, help stabilize prices for both growers and consumers. But the high costs of commerce continue to impede full market integration within and among countries on the continent. Public investment in improved infrastructure and physical security, as well as reduced bureaucratic impediments to trade, can help enhance market integration in African agriculture.

9. Agricultural marketing systems are changing rapidly

Much attention is being paid to the emergence of supermarkets, restaurant chains and agro-exporters operating under contract, as well as to foreign direct investment in African agricultural lands. While these new ventures in vertical coordination through contracting and integration through direct investment are

beginning to shift market power downstream, traditional spot markets remain dominant in African agriculture and are likely to remain so for many years to come (Reardon and Timmer, 2007). But at the margin, farmers and traders need to adopt to an upgrading and increased harmonization of grades and standards, which now increasingly differentiate value chains offering higher and more stable prices from conventional wet markets offering lesser returns (Reardon and Timmer, 2007; Swinnen, 2007; Reardon et al., 2009; Barrett et al., 2010). The clear implication is a growing need for world-class management skills, which poses serious challenges given the declining state of and rapidly growing demands on higher education systems in Africa. Private universities and non-degree management training institutes have been booming across the continent over the past decade and may yet help to meet much of this need, although most of these efforts are based in major metropolitan areas and targeted at sectors other than agriculture. Initiatives such as the African Economic Research Consortium's collaborative masters program in agricultural and applied economics (<http://www.agricultureconomics.net/home/home.asp?00=1>) need reinforcement and expansion to accommodate rapidly growing demand for and returns to management skills in agricultural markets.

What we need to learn

The preceding section enumerated nine different points on which a sufficient mass of solid empirical evidence has emerged as to provide clear direction to donors, governments, NGOs and firms seeking to advance market development in African agriculture. Although researchers and policymakers long neglected the direct study of markets and marketing arrangements in African agriculture, scholars working on these issues – especially over the past decade – have built up a reasonable stock of knowledge about essential points that can usefully inform policymaking and investment patterns in this area.

These key points of existing knowledge are nonetheless, unfortunately, fairly general. They offer relatively little specific guidance for choice among specific intervention options. That is partly because no one-size-fits-all solutions exist; best bet interventions depend heavily on crucial contextual and design details. But the relative dearth of hard empirical evidence to guide specific market development interventions also speaks to the need to probe more rigorously within the black box of African agricultural markets. Toward this end, this section briefly

raises six key questions on which, the author believes, research on African agricultural market development could mostly usefully focus in the coming few years, so as to better inform development programming in this area.

1. Who gains from new marketing arrangements and how much?

Given the rapid change taking place in African agricultural value chains (see point 9, above), who gains from these changes? How much? Should governments, donors and NGOs promote contract-farming schemes? If so, what designs maximize the poverty reduction effects of such interventions? To this point, we know very little about the distribution of gains from contract farming or foreign direct investment in African agriculture. The handful of empirical studies in the peer-reviewed literature has faced significant methodological difficulties in establishing the causal impacts of modern value chain participation on farmer well being (Reardon et al., 2009; Barrett et al., 2010). So the degree to which participating smallholders benefit remains somewhat uncertain. Further, there are strong reasons to suspect that many of the investments NGOs or governments make in an effort to promote smallholder access to modern value chains wind up benefitting mainly the downstream buyers, rather than small farmers (Barrett et al., 2010). It is important to establish more firmly what sorts of interventions actually deliver benefits to intended beneficiaries. While there is much suggestive evidence in both the grey and peer-reviewed literatures of benefits to farm workers (whose wages or days of employment increase with supplier labor demand), to non-participant producers (who benefit from farmer-to-farmer spillover of private extension advice), or to consumers (who enjoy improved food quality), such findings remain rather casual and scattered and the magnitudes of such changes remain unclear (Reardon et al., 2009). Without knowing more concretely who gains from new agricultural marketing arrangements, how much, and how those benefits depend on the structure of contracting and supporting investments it is difficult to know how much such schemes should be promoted by development practitioners, if at all.

2. How large and widespread are efficiency losses and inequities due to market power?

We know relatively little about the competitive behavior of firms within African agricultural marketing channels (Fafchamps, 2004). Remoteness and working capital constraints often lead to imperfect competition. For example, in rural Madagascar, 6-29%

of farmers face only one buyer and there exist significant profits to long haul, intra-national spatial arbitrage (Barrett, 1997; Moser et al., 2009). More generally, however, very little solid empirical evidence exists on firm entry, exit and competitive behavior in African agricultural markets. This makes it difficult to confront widespread popular demonization of traders as parasitic and exploitative. Moreover, if there really is significant market power within agricultural value chains, there is insufficient information to guide anti-trust policy for African agricultural market development or to establish how big a problem it is, i.e., the extent of inefficiency losses and distributional inequities. Given this informational vacuum, anti-trust efforts have, perhaps appropriately, remained largely off the policy radar to date. These issues will need to be confronted, however, especially if the pace of vertical coordination and integration within African agricultural value chains accelerates.

3. What most effectively and sustainably stimulates access to finance?

Since insufficient access to investible capital and excessive exposure to uninsured risk are serious impediments to market development in African agriculture (see points 4 and 7, above), resolving those problems is obviously a priority. But how can development practitioners best stimulate more broad-based, sustainable access to the credit and insurance needed to expand marketing operations and enhance agricultural productivity throughout the value chain? We simply lack evidence to answer that question with confidence. Lots of good ideas are being piloted in various places: index insurance schemes, some linked to credit and some not; credit guarantees, some of them linked to warehouse receipts, others backed by donors; credit reporting bureaus and identity-based credentialing; etc. But few of these efforts have careful evaluation designs built into the pilot efforts, and none appear to bundle multiple intervention types together so that we might be able to generate hard evidence on the comparative performance of different product designs within a common setting. In order to elicit external private capital to support such ventures, the research community must develop solid evidence on returns to such ventures, both in terms of firm profits and poverty reduction impacts.

4. What are the relative benefit/cost ratios of different direct institutional interventions?

Just as there has been a flurry of recent activity around financial innovations for African agricultural market development, so has there been considerable effort invested in institution

building: farmer organizations, information systems, commodity exchanges, etc. The peer-reviewed literature is remarkably lacking, however, in evidence of significant returns to such interventions. Given the high marginal returns to scarce (private or public) capital in African agricultural markets, it is imperative that the research community begins rigorously establishing the returns to different sorts of institution building efforts. Furthermore, as was just discussed with respect to financial innovations, the most valuable evidence will be explicit comparisons with respect to the performance of different interventions so as to help prioritize resource allocation among intuitively appealing, but largely untested, strategies. Particular attention needs to be paid to rigorously identifying how returns – especially to the poor – vary with other context-specific attributes, as it is likely that the absolute and relative returns to different interventions will vary in predictable ways. We in the research community need to begin identifying those conditional orderings so as to better inform ongoing decision making by public and private sector investors.

5. How do returns to different public and private goods vary across sites?

Many of the context-specific attributes that predictably affect the returns to alternative financial or institutional innovations vary across space. There is no reason to expect that what is most needed or effective in one place will be similarly needed or effective in another. Indeed, there may be striking variation in the returns to alternative interventions across space (Fan and Chan-Kang, 2004; Lang et al., 2010). Donors, governments and NGOs must get in the habit of asking what interventions offer the highest returns in a given site – if they have a menu of options open to them – or where one should expect the highest returns to a given intervention (e.g., a water or livestock NGO). While poverty mapping methods that identify where the poor are most concentrated have become mainstreamed over the past decade, methods for the geographic targeting of alternative interventions remain in their infancy (Lang et al., 2010). Far more research attention needs to be devoted to developing feasible methods for rigorously identifying the optimal geographic targeting or subsector prioritization of agricultural and rural development investments and to testing the external validity of existing findings to establish which empirical results can be generalized and which cannot.

6. How do returns to market development compare to returns to technology development?

Just as it is essential to develop a more spatially disaggregated understanding of where different interventions are most likely to yield substantial returns – in terms of increased economic surplus, reduced poverty, or both – so is it desirable to improve our understanding at coarser scales of the basic entry points for reducing poverty and promoting agricultural development in Africa. In particular, the international agricultural research community has long emphasized biochemical and mechanical technological approaches to stimulating productivity growth and reducing hunger and poverty and the vast majority of agricultural research expenditures flow to those areas of inquiry. How do the returns to innovation in marketing institutions, in market-oriented infrastructure, and to markets (e.g., anti-trust, grades and standards) policies compare to the returns to innovations in animal and plant genetic material? We simply do not know and thus have difficulty making well-informed research resource allocation decisions.

It is conceivable that market development will proceed endogenously – and quickly – as improved production technologies stimulate the emergence of significant marketable surpluses in breadbasket – or even traditionally less productive – regions of Africa. Say's Law in economics holds that supply creates its own demand and that may well prove true. But it is equally conceivable that improved access to higher-return urban and international markets could stimulate more rapid farmer innovation and uptake of on-the-shelf production technologies. We presently lack methods appropriate to convincingly answer the question: which path offers the greatest time-discounted returns on investment, in terms of economic or agricultural productivity growth, poverty reduction or natural resources conservation? Greater attention to ex ante impact assessment for research prioritization within the global, regional and national agricultural research communities is essential. Rates of return in agricultural development investment are well known to be high (World Bank, 2007); but in what specific areas are they highest and for whom?

Conclusions

The significant challenges of pro-poor market development in African agriculture are belatedly attracting significant attention by donors, governments, NGOs and researchers. This is a welcome advance, but much remains to be done. Populist politicians throughout the continent continue to resort unhelpfully to demonization of traders and other market intermediaries when food market function falters. Yet commerce is essential to unlock the potential of African agriculture and to open up opportunities for Africa's poor, especially in rural areas. The breadth and depth of poverty in Africa, its concentration in rural areas, and the continent's continued heavy dependence on agriculture necessitate a focus on agricultural productivity growth and commercial expansion in order to effectively reduce poverty over the coming generation.

Thankfully, a growing body of rigorous empirical evidence has been emerging over the past decade to guide policy, program and project investments at broad scale, if decision makers will internalize these essential points. This paper enumerated nine such essential truths that should influence the design of market development interventions in African agriculture.

But we still know little about crucial issues, especially the comparative returns to alternative interventions and investments, and about how those returns vary across space and time. The development community needs to invest more in ex ante impact assessment to inform prioritization among the wide array of candidate interventions. We need to take more seriously than has been the norm the need for rigor in evaluation design, replacing casual ex post case studies with the use of clever techniques to control for placement and selection effects that presently confound. This renewed commitment to research on market development interventions needs to be led from Africa, underscoring the need to develop and maintain analytical capacity in the continent's universities and independent research institutes for rigorous and independent policy and program analysis. Africa should not have to rely on Northern universities and research institutes to guide its essential investments and policy reforms. Market development is essential for African agricultural development and poverty reduction; we need to continue to deploy the most creative and critical minds to build the necessary evidence base to guide interventions in this domain over the coming generation.

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Markets and dynamic (agricultural) development

Andrew Dorward¹, Colin Poulton² and Ephraim Chirwa³

efficient markets for different agricultural products and supply chains and for different and changing stakeholders in those supply chains.

Abstract

This paper sets out a conceptual framework for viewing and analyzing livelihood development as a dynamic process of “hanging in” (protecting livelihoods), “stepping up” (improving livelihoods) and “stepping out” (changing livelihood activities and structures). This process occurs among different actors and at different scales across different sectors, and it involves changes in the relative stocks and functions of different resources, assets or “capitals” (with these functions being defined in terms of “provisioning”, “supporting” and “regulating”). Changing relationships between and among livelihoods and resources involve a variety of transformations and transformation processes.

A major benefit from this framework’s view of development is recognition of the importance in rapid pro-poor development of coordinated change and exchange across different scales, sectors, actors, dimensions and processes. This involves development both (i) of coordinated exchanges across multiple elements and (ii) of mechanisms for coordination (not just of exchange, but across all processes).

Markets provide one very important mechanism of coordinated exchange. “Gift exchange” (between individuals, groups, organizations and their representatives) and “hierarchies” (formal and informal private, communal and state organizations) provide other mechanisms. There are also multiple hybrids between these three primary forms of exchange. All the three forms of exchange, and different hybrids, are important in both more and less “developed” economies, in different forms and playing different complementary and competitive roles.

The need for coordinated change occurs at different levels and can lead to multiple poverty traps, with micro-, meso- and macro-traps reinforcing each other in constraining agricultural and other development in poor rural areas. Increasing staple food productivity is both particularly important in pro-poor growth and particularly constrained by these traps as they affect the complementary development of input, finance and output markets and supporting services. State, private and civil society organizations need to work together performing complementary roles in the development of accessible and

Introduction

This paper sets out a conceptual framework for viewing and analyzing development as a dynamic, multi-dimensional, multi-scale process and explores the implications of this for agricultural and market development. The paper begins by describing development as a dynamic process of “hanging in” (protecting livelihoods), “stepping up” (improving livelihoods) and “stepping out” (changing livelihood activities and structures). The core message from this is the need for different types and scales of coordination in economic development. Different types of coordination failure and poverty trap are described and the implications of this for state, private and civil society actors considered.

Dynamic development: hanging in, stepping up and stepping out

Dorward et al. (2009a) suggest that people pursue livelihoods with three aspirations – to “hang in” (surviving, maintaining basic living standards), to “step up” (improving what they do), and to “step out” (doing new things). They propose that these are fairly universal aspirations that are expressed in different ways and livelihood strategies and patterns according to people’s individual situations and perceptions and their social, economic, cultural, institutional, technical, agro-ecological and other contexts. This conceptualization puts dynamic aspirations and change (including intergenerational change) at the core of understanding livelihoods and development, and is particularly relevant to understanding structural change in agricultural and rural development as poor rural economies grow, and to understanding interactions between agro-ecological and market constraints and opportunities (Dorward et al., 2009a; Dorward, 2007).

The insights from this are further elaborated and formalized by Dorward (2009a), who suggests that they may be applied not only to individual or household livelihoods but also to

¹Centre for Development, Environment and Policy, School of Oriental and African Studies, University of London. Corresponding author (Andrew.Dorward@soas.ac.uk)

²Centre for Development, Environment and Policy, School of Oriental and African Studies, University of London

³Chancellor College, University of Malawi

Dorward, Poulton and Chirwa are members of the Future Agricultures Consortium (www.futureagricultures.org).

other scales of human activity – from small informal groups to large formal organizations, and from local communities to municipalities, regions and nation states. At the same time the widely recognized links between livelihood aspirations and assets or capitals are explicitly introduced, recognizing five types of capital – human, natural, social, physical and financial⁴ (Conway and Champers, 1992; Carney, 1908). This multi-scale conceptualization of livelihoods and capitals introduces different types of transformation involved in development, linking “livelihood” development to different types of capital and their management at different scales, and consequently brings to the fore the importance of coordinated change across different scales of analysis (for example stepping up and stepping out require markets providing inputs and finance and markets for expanded and new products – as well as access to these markets – and these markets themselves depend on changes in other livelihoods and wider transformations; similarly changes in livelihoods involve and require changes in the nature and

balance of different capitals and their control and management at various scales).

Figure 1 extends the conceptualization of Dorward (2009a) by developing the analysis of capitals, and then following through the implications of this elsewhere in the conceptualization. Drawing on the Millennium Ecosystem Assessment identification of ecosystem services (Millennium Ecosystem Assessment, 2005) and generalizing this across services provided by the four other types of capital, assets or resources, we identify three “capital functions”: “supporting”, “provisioning” and “regulating”⁵. This recognizes the importance of these services or functions as supplied by, for example, physical capital (an important part of the functions provided by infrastructure are often to regulate physical environments and to support communication) or social capital (with a major function of institutions being the regulation of individuals’ and groups’ behaviors – a pertinent point following the 2008 financial crash). Recognition of the general

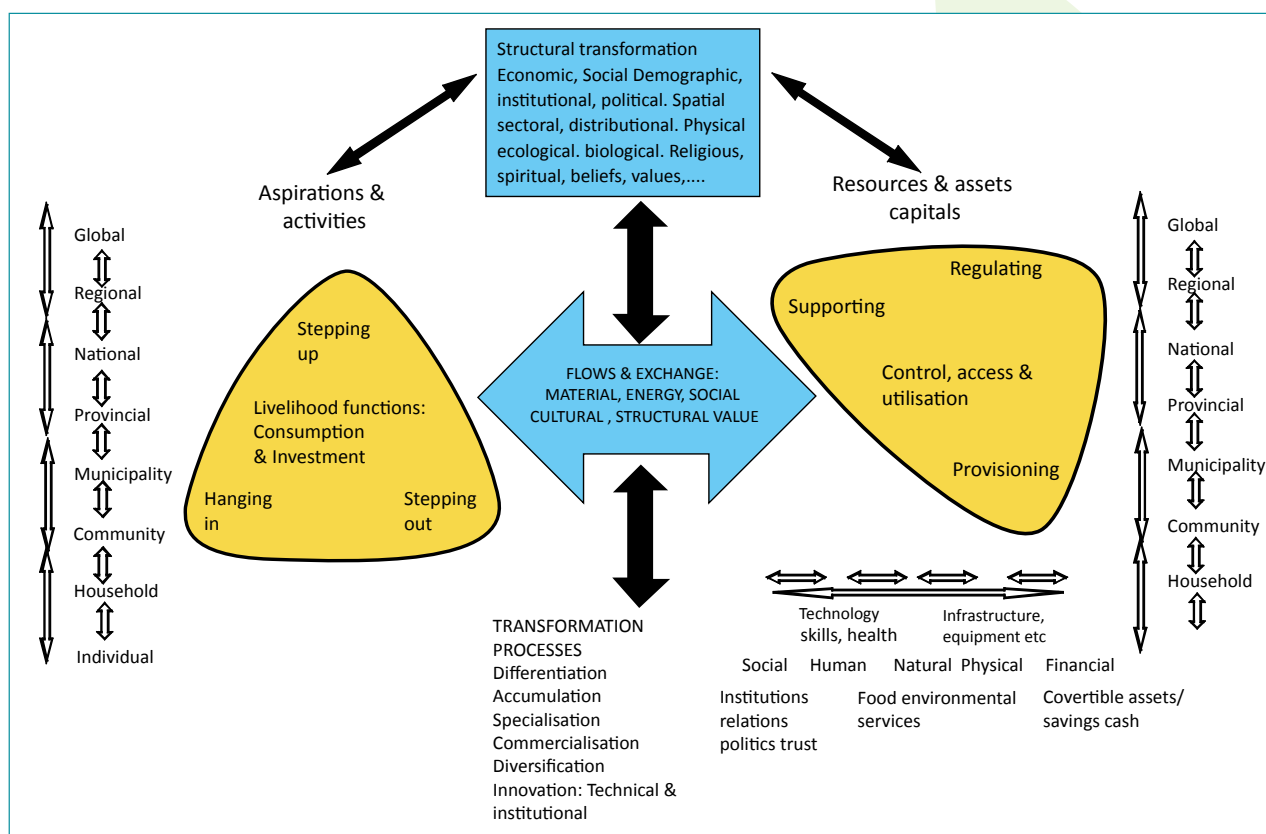


Figure 1. Dynamic development: hanging in, stepping up and stepping out

⁴Financial capital should, strictly speaking, be considered a specific form of social capital as it is entirely created as a result of social interactions and (generally national and global) institutions. However its importance to organizations, groups and individuals means that it is commonly and (at most scales of analysis) usefully considered a distinct fifth type of capital.

⁵The fourth type of service identified in the MEA, “cultural services”, is not explicitly included here. Valuable though it is in the MEA to highlight this separately, it is also possible to see culture as another (important) dimension (of aspiration, with links to social and human capital), where different types of capital provide supporting, regulating and provisioning services – alongside other aspirational dimensions (such as economic welfare, health, education, food security), each with links to other types of capital.

relevance of supporting, provisioning and regulating across all types of capital has value in both highlighting the importance of these functions for other types of capital, apart from natural capital (though of course it is not suggested that all forms of capital always fulfill all three functions), and in applying a common framework for both natural and other forms of capital. This more holistic view of capitals and capital functions adds depth and richness to consideration of different scales of analysis (as the balance between capital functions varies with scales of analysis, with increasing importance of externalities at smaller units of analysis, and hence of complementary regulation at higher units of analysis) and of the nature of transformations and transformation processes involved in and necessary for different types of development.

What are the critical features of this conceptual framework to help us consider “markets and dynamic (agricultural) development”? In addition to the benefits of its emphasis on multi-scale, dynamic and structural change, it is also people centered, focusing on people’s aspirations, but recognizing too that people have multiple aspirations, that these change, and that different people interact within and between different social, economic, political and other groupings. Key processes of change (and stasis) involve changing and multiple balances between hanging in, stepping up, and stepping out, with a variety of transformations, exchanges and flows (some of which involve markets).

As we apply this to agricultural development and markets, it is helpful to also consider the way that agriculture can play two potential roles in wider economic growth, driving growth (increasing basic productivity and earnings) and/or supporting growth processes by multiplying and spreading the benefits of growth drivers through an economy (Dorward et al., 2003; Poulton and Dorward, 2003). The opportunities for and demands from agriculture in driving and supporting growth vary between countries and between different areas within countries, depending upon other growth opportunities and upon agro-ecological, market and other conditions. In most poor rural areas with low agricultural productivity, increasing staple crop

productivity needs to play a critical and dominant role in driving growth (as it raises land and labor productivity of large amounts of land and labor devoted to staple food production and improves food security with greater food availability and lower food prices, thus increasing real incomes with both supply and demand stimuli to diversification into horticultural and livestock production and consumption and into non-farm services and products). Production of agricultural export products can also contribute to these processes, while the most important role for increased productivity in horticulture and livestock will be to meet growth in domestic demand as a result of increasing incomes arising from other growth drivers⁶.

The final major feature of development stressed by the conceptual framework and relevant to agricultural markets and development is the need for coordination. It is clear that, in the interdependency of this multi-scale, multi-actor, multi-dimensional and multi-process, there needs to be some form of coordination between changes across scales, actors, dimensions and processes. This may be directed or evolve (through intrinsic feedback loops). The evolutionary process will often be slow and its outcomes uncertain – it may be inequitable and may lead to unsustainable dead-ends – and unsatisfactory in a wide variety of ways. Directed coordination (“effort or measures designed to make players...act in a common or complementary way or toward a common goal”, Poulton et al., 2004: p. 521), on the other hand, raises other questions regarding the intent of coordination (who directs coordination towards what goals, how are these goals decided, and whose benefits and gains are prioritized?) and the capacity for coordination (what information, knowledge, understanding and power is needed to effectively plan and implement coordination in such complex systems? Where can such information, knowledge, understanding and power be found?)⁷. These questions, of course, interact, as intent and capacity (power) are not unrelated.

⁶Benefits to the poor from intensification of non-staple productivity vary with opportunities to increase land and labor incomes in production (directly and indirectly), in upstream and downstream employment and other multipliers, in consumption multipliers associated with expenditure patterns of different producers, with nutritional benefits (lower prices of horticultural and livestock products may improve diets), and with non-staple production systems’ contributions to improved access to input and financial services, to infrastructure, and to sustained demand and prices for increased production.

⁷There are important parallels between “development coordination” as considered here and debates about evolution. This may also be conceptualized as involving multi-scale, multi-actor, multi-dimensional and multi-process structural transformations with individuals, species and eco-systems “hanging in”, “stepping up” and “stepping out”. Coordination has also been at the heart of questions about the need for a “clock-maker” actively coordinating evolutionary processes – questions that can be resolved by consideration of very long periods of time, with evolutionary blind alleys. Time, blind alleys, and survival of the fittest are not, however, compatible with the urgent moral, humanitarian and political needs for equitable and sustainable pro-poor development.

Coordinated exchange and markets

Markets have been the focus of much attention in economics and development. Fundamentally markets are seen as an efficient mechanism for exchange, coordination and allocation of many resources, goods and services, and thus promote essential processes of specialization and economies of scale in economic activity. DFID (2000) identifies three principle mechanisms by which markets can benefit the poor: by facilitating access to human, financial, social, physical and natural assets; by improving the returns on their assets; and by meeting consumption needs. Markets can also contribute to wider growth (by promoting more efficient resource allocation and use), to empowerment (by stimulating local organization), to equality of opportunity, and to security (for example, in access to food).

Dorward et al. (2003) also argue that the livelihoods of most poor people are directly dependent on their involvement in a range of markets as private agents or as employees (and are indirectly dependent on the wider economy for the demand and supply of goods and services); that major current and historical poverty reduction processes have depended on equitable private sector economic growth (although we also note later the importance of actions by other stakeholders – such as Community Based Organizations and the state – in market development); and that poor people themselves often identify problems with markets as critical to their livelihoods (but these problems may concern both the absence of markets and the effects of markets). However markets also often fail, they can pose threats as well as opportunities, and they may not be the only or always best form of coordinated exchange.

Three principle types of market failure need to be recognized:

- First, for some “public goods and services” it is not possible to restrict use or enjoyment only to particular people who pay for them, as there is then no incentive for users to pay for these goods and services and thus no incentive for their provision. Such market failures are widespread in both developed and less developed economies and can be overcome by some form of collective action, often involving the state.
- Second, where institutions are weak or over-regulated then the transaction costs⁸ and risks from engaging in markets

may be very high – so high as to make it unprofitable – and market failure follows. Overcoming this type of market failure may require more than the conventional promotion of liberalized competitive markets. A more imaginative approach is needed, rooted in a stronger understanding of the importance and nature of institutional development in economic growth, with market development being one part of that institutional development.

- Third, markets may fail for the poor when they are unable to access them, or can only access them on very unfavorable terms, due to lack of resources, active discrimination, or lack of information or power.

Expanded market access can also pose real threats to the livelihoods of poor people. Competition with outside producers, for example, is a two-edged sword that while increasing efficiency and lowering prices for poor consumers, can also expose poor producers to increased competition in the supply of goods and services to local markets, and drive them out of production. Alternatively improved access to outside markets may raise local prices, benefiting local producers but harming poor consumers. Market development may also reflect and reinforce unequal power relations (DFID, 2000) and these may allow elites to capture new market opportunities in activities that were previously undertaken by the poor. Finally, markets can be highly unstable, with sudden changes in supply, demand and prices. Over reliance on markets can lead to increased vulnerability, though this depends upon the relative instability of market alternatives.

Finally, we note that there are alternatives to market mechanisms for coordinated exchange (apart from subsistence or autarchic self reliance), in particular coordinated exchange may occur as gift exchange, within “command and control” hierarchies, and in hybrid forms of contractual arrangements involving elements of gift, hierarchy and market exchange. It is helpful to describe these three main mechanisms in more detail (Dorward and Kydd, 2005a).

Gift exchange involves deliberately imprecise mutual obligations based on shared values stressing reciprocity and the collective good. Although economic development involves a decline in the relative importance of gift exchange, it continues to be

⁸We recognize two broad types of transaction costs: costs incurred to protect parties against risks of opportunism or cheating in a transaction, and costs incurred in meeting licensing and other requirements of regulatory agencies and their officials.

very important (as shown, for example, by recognition of the importance of social capital in determining peoples' ability to participate in and benefit from a wide range of economic and social activities). Gift exchange also continues to be important in more developed market economies in, for example, corporate hospitality and other elements of social interaction in business relationships.

Hierarchies' "command and control" resource allocation is the mechanism by which states, government organizations, parastatal agencies, most NGOs and most private firms operate. In modern economies, hierarchies coexist with markets and indeed use markets to transact with each other and final consumers.

Markets involve transactions that are voluntary (in a narrow sense with both sides having to perceive gains from trade) and precise (as regards quantity, quality, space and time in exchange). Markets can facilitate competition (spurring gains in quality and production efficiency), and normally require money (as a medium for exchange and for savings, loans and investment). Market forms vary enormously in structure, scope and governance, from complex global derivative and futures markets to petty trading.

Gift exchange, hierarchies and market arrangements differ not only in the nature of the arrangements between exchanging parties. As noted above, they also differ in the costs they incur or, in the terminology of the conceptual framework in Figure 1, in the nature of the capital required for their support and regulation. All require incentives and penalties supporting congruent behavior and discouraging free riding, but gift exchange requires strong social interaction and shared values among social groups, hierarchies require specific incentive structures and information systems promoting particular behaviors, while markets require much wider macroeconomic management to maintain the value of money, with legal, contractual and enforcement systems. The fixed costs of market support systems will generally be higher than those of gift exchange and hierarchy systems, but often are much lower per unit because the volume of exchange can be much larger. It is, however, also difficult and unwise to attempt to separate these too much – markets and hierarchies are often strengthened by social interactions and norms, gift exchange and markets can benefit from specific incentive structures and information

systems, and gift exchange and hierarchies also require economic stability and consistent legal and enforcement systems.

Related support and regulatory requirements of gift, hierarchy and market exchange complement the importance of hybrid forms of exchange – which include contract farming, sharecropping and other forms of interlocking where farmers transact with a counter-party in more than one market with instructions concerning the timing and performance of agricultural operations and/or patron-client and other social relationships under which one (more wealthy) party undertakes to provide the other (poorer) party with some form of social security. Long-term contracts between firms or individuals and supplier credit arrangements and franchise systems may also be seen as hybrids between market and hierarchy forms of exchange, and are often strengthened by elements of (limited) gift exchange relationships.

An appreciation of the co-existence and multiple forms and hybrids of gift exchange, hierarchy and markets is important in considering agricultural market systems, as each type of exchange has strengths and weaknesses, and hence advantages and disadvantages under different situations – indeed the term "market system" commonly describes system of coordination and exchange involving combinations of gift, market and hierarchy mechanisms. Promotion of effective, efficient and accessible coordination and exchange in agricultural market systems therefore requires consideration of which types and hybrids of mechanism may be more appropriate in particular situations. We therefore consider now the particular constraints (and opportunities) facing coordination in pro-poor agricultural growth in poor rural areas.

Poverty traps and coordination challenges

We now distinguish between three important and related levels of coordination failure and poverty trap operating at micro-, meso- and macro-scales.

At a micro-level, poor producers suffer from low incomes, limited resources, low productivity and vulnerability. These can be mutually reinforcing – low incomes lead to limited resources which lead to low productivity which leads to low incomes, and all these contribute to vulnerability (high exposure and sensitivity) to climatic, market, health, social and other shocks (see for example Chambers, 1983; Carter and Barrett, 2006).

To escape from such traps, poor producers need simultaneous access to mutually reinforcing services that address each of these problems. For increased productivity, farmers need access to technical production information and market and business information related to new production methods. They also require access to any inputs needed (seasonal inputs, land, and labor), as well as to finance for purchasing such inputs and perhaps for increasing their labor use, and/or to alternative enterprise or employment alternatives (this requires low cost and reliable access to output markets, and information about the behavior of those markets). They also need some form of insurance or social protection against price, weather, health and other adverse shocks. Some technologies may need access to particular production or processing equipment or services. Access to these services may require communications and other infrastructure. Access to the different information, items and services needed for increased productivity needs to be coordinated in that the absence of just one of these may prevent adoption of increased production methods and/or significant reduction of production or economic benefits from adoption.

This micro-level coordinated access to resources and services is needed not just by producers but also by the potential suppliers of such services. These suppliers face major difficulties and risks in providing services in poor rural areas; difficulties associated with diffuse, small producers; poor transport and other communications (though the spread of mobile phones

is leading to dramatic improvements here); highly seasonal activities, prices and risks; high costs of finance; risks of government interventions; and weak institutions for establishing and enforcing contracts. Thus, for example, input suppliers need access to finance, inputs, transport, storage facilities, etc., together with reliable information about prices and probable demand for inputs, if they are to identify investment opportunities in such circumstances. Produce traders have a similar set of information, service and capital demands, while technical and business extension services need financial, human, physical and informational resources. Each set of actors in a supply chain (farmers and service providers) therefore requires access to complementary resources, services and information and must coordinate their own access to and use of these. The more complex a production system, in terms of its different resource, service and information needs, the greater the micro-level coordination and management challenges and risks involved, and the greater the number of other actors with which each actor needs to coordinate.

This leads to a major meso-level coordination challenge, across the different actors: essentially each actor needs to be able to rely on and coordinate with other actors if they are going to overcome their own micro-level coordination challenges. It is helpful here to distinguish between three types of meso-level coordination: vertical coordination along a supply chain, horizontal coordination between competitors performing

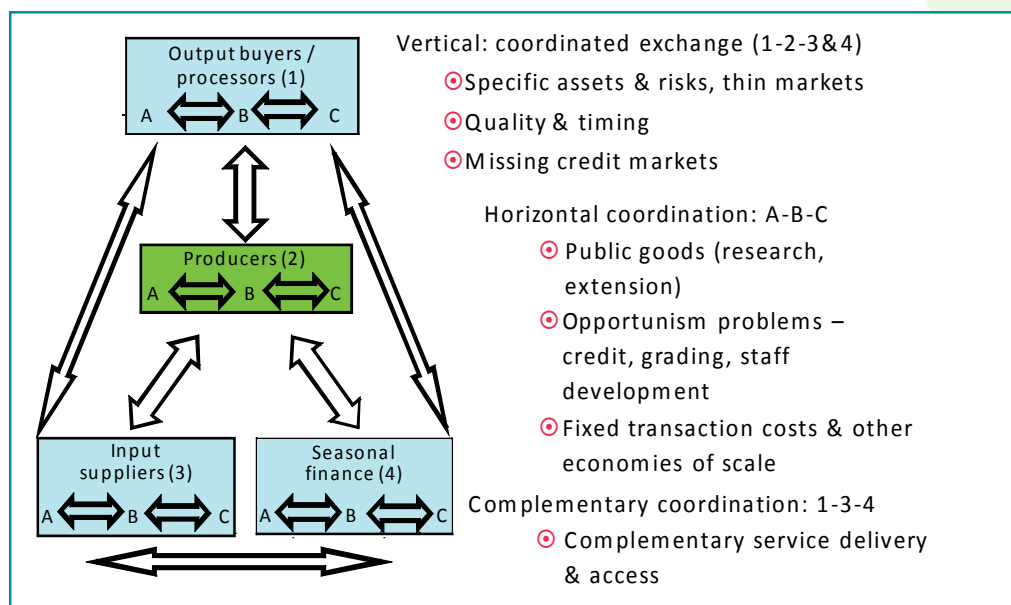


Figure 2. Vertical, horizontal and complementary coordination

the same function in a supply chain, and complementary coordination between providers of complementary services in a supply chain. The nature of and relationship between these different types of coordination are illustrated in Figure 2.

The challenges in meso-level coordination increase with:

- The complexity and number of factors and actors involved in the micro-level challenges facing each actor, and hence along the supply chain as a whole;
- The absence of existing actors and relationships between them in a supply chain or related supply chain;
- The value of new investments at risk for any actor (specific assets) and the potential losses incurred in the event of a coordination failure;
- Lack of trust, of strong institutions or of large potential gains encouraging actors to cooperate and discouraging actors from behaving in opportunistic ways for short term personal gain; and
- Particular informational or production features of goods, services and processes (examples include problems posed by the need for critical timing of delivery of particular goods or services, such as seeds or fertilizers, or information difficulties regarding particular attributes of actors or goods or services, such as seed or fertilizer quality or credit borrowers' repayment intentions).

Thus where flourishing markets exist (with large numbers of players, good information and established norms of behavior) then markets can provide an effective coordination mechanism for goods and services with private good characteristics (where investments in the production or delivery of these goods and services yield major direct benefits to the actors making such investments). Problems arise, however, where such markets do not already exist. Vertical, horizontal and complementary coordination may then be developed within firms – indeed, this is what large firms do. This is not possible with many small farms, although firms can provide vertical and complementary coordination around small farms, particularly if farmer organizations can provide horizontal coordination. Unfortunately the incentives for large firms to provide such coordination are normally weak in dispersed, risky and low value staple food crops markets.

As a result the development of more intensive high productivity staple food crop systems may suffer from a meso-level low equilibrium trap (Barrett, 2008; Dorward and Kydd, 2004; Dorward et al., 2009b).

These difficulties, however, differ between different innovations and different crop types. Thus increasing root crop productivity based initially on improved planting material may not pose as many meso-level coordination challenges as cereal crop intensification involving investments in inorganic and seed input supply systems, knowledge intensive production innovations, and significant seasonal capital investments by input suppliers and farmers. Risks in root crop productivity innovations are also lower not just as a result of their lower seasonal investment requirements, but also because the ability to store the crop in the ground reduces market and price risks for farmers.

Meso-level coordination problems can also be more easily overcome with some non-staple products, where higher potential returns in supply chains and barriers to entry (frequently in processing or in marketing) can provide (i) incentives for commercial companies to invest in complementary coordination mechanisms, and (ii) incentives for farmers to work together in groups in accessing coordinated services. Contract farming and interlocking transactions can be effective meso-level coordination mechanisms where there are limited numbers of produce buyers and/or long-term stable incentives for farmers to work together in groups to access complementary finance, input and output market services. Such arrangements can exist in a wide variety of different production systems (cotton, tea, sugar, milk, tobacco and coffee to name a few) and in a wide variety of forms (for example, in contract farming and in different forms of contracts that interlock land, labor, input, output, insurance and finance markets with each other and with access to other services such as transport, health, food security and extension services). There can also be important spillover and dynamic benefits from such arrangements:

- Such interlocking arrangements often involve direct arrangements for the financing and purchase of inputs for staple food crop production by participating non-staple producers (see for example Chirwa and Kydd, 2005) or, with fungibility, help farmers to afford input purchases for staple crop cultivation (see for example Govereh et al., 1999, Jayne et al., 2004);

- Development of farmer organizations that facilitate coordination of production, input access and marketing services can work for tradable non-staple products, but staples produced alongside may also benefit from these services (see for example Chirwa et al., 2007);
- Local growth driver linkages (as described earlier) can lead to a general growth in economic activity with increased density of economic activity reducing transaction costs and risks;
- Roads and communications infrastructure developed for non-staple markets will also benefit other economic activities, including staple foods markets (see for example Govereh et al., 1999); and
- Similar thickening of input and financial markets and services for non-staple producers may provide sufficient market activity to begin to overcome meso-level coordination problems for staple food crops.

Recent growth in fertilizer use on maize production by smallholder farmers in Kenya appears to be due, in part, to such processes (Ariga et al., 2006; Minde et al., 2008).

Third, macro-level of coordination is concerned with the need for coordination of policies and investment in public goods and services in order to support the meso-level coordination needed for individual entrepreneurs', or the actors' micro-level coordination. This is concerned with targeting and sequencing of provision of wider conditions needed for meso-level coordination between actors, and may involve meso- and micro-level action by the state and state agencies.

Examples of specific macro-level coordination include policies and investments in road infrastructure; in agricultural research and extension service development; and in input subsidy and price stabilization policies. These, however, also have to be coordinated with wider policies regarding macro-economic and fiscal management, private sector development, tax and legal frameworks for businesses and cooperatives, education, and social protection. Macro-level coordination is both particularly important and particularly challenging in situations where markets are poorly developed, governments have restricted human and other resources, and information and governance systems are weak. Indeed, there is both a paradox and a trap here – a paradox that it is in situations where coordination resources are most limited (at all three micro, meso and macro

scales of coordination) that coordination is both most needed and most challenging. Challenges arise from the need for policy (i) to both drive and evolve with a number of structural changes and transitions in developing rural economies (for example from being food deficit to food surplus, from an emphasis on staple foods to high-value crops, from dominance of the farm to non-farm economy, from state to private investment, from non-market to market coordination, and from an unskilled to a skilled labor economy); (ii) to cope with considerable complexity; (iii) to combine the management of transitions with the provision of stability and the development of trust; and (iv) to manage limited financial, human and administrative resources in the context of (often perverse) political, bureaucratic, and donor incentives and interests. These challenges lead to a trap if they prevent macro-coordination and thus lock poor rural economies in long-term underdevelopment.

Particular input market issues with staple food crop intensification

A particular set of coordination issues arises with input markets and staple food crop intensification, to which we now briefly turn.

The price/productivity tightrope

The challenge of the “price/productivity tightrope” relates to a policy dilemma in staple food intensification because:

- 1) Producers need high returns from investment in new technologies in order to provide them with incentives to invest in productivity increasing technologies;
- 2) High returns need high food prices and/or low input prices and/or high output/input ratios; but
- 3) Poor consumers need low prices for food security, for welfare, and to raise real incomes to drive and support growth.

This is a particular problem for cereal intensification, due to the higher investments needed in inputs, as compared with root crop intensification which, initially at any rate, requires a relatively low-cost switch to improved varieties through a one-time adoption of new planting materials. To encourage cereal intensification, therefore, policy needs to tread a fine line between providing attractive incentives to producers to adopt new technologies on the one hand and on the other keeping cereal prices low enough (with prices preferably declining in real

terms over time) such that staple foods are readily accessible to poor consumers. High input prices raise particular problems here.

The logic of the food tightrope problem leads to the identification of the following broad approaches in dealing with it:

- 1) Raising physical productivity of inputs – through adaptation of technologies and farmers learning how to manage them, and when (and when not) to use them;
- 2) Reducing the costs of inputs by increasing efficiencies in (for example) fertilizer or seed production and/or delivery systems;
- 3) Reducing farmers' input costs through input subsidies;
- 4) Reducing the price margin between farm-gate sales and consumer purchase by increasing efficiencies in (for example) grain purchasing, storage and transport;
- 5) Reducing the price margin between farm-gate sales and consumer purchases by subsidizing farm gate sales and/or consumer purchases; and
- 6) Raising the incomes of poor consumers through social protection subsidies (for example safety nets or targeted welfare payments).

In the long run, raising technical and economic efficiency (points 1, 2 and 4 above), should provide the main solution to the food price tightrope problem, together with higher consumer incomes (as a result of economic growth).

In the short run, however, the food price tightrope can be a major constraint to development in poor rural economies. Governments have tried to address this through different combinations of input subsidies, output price subsidies for farmers and for consumers, and social protection to raise the incomes of the poor. Coordination of these policies is a challenging but important example of the macro-level coordination discussed above.

Improved input productivity requires improved research and extension services providing farmers with affordable and profitable recommendations on improved soil fertility management (involving both organic and inorganic fertilizers). It is also important that transport and fertilizer import industries

are encouraged to increase efficiencies in input supply systems. Direct general food price subsidies for consumers have proved to be very expensive and difficult to manage in the past, although targeted consumer subsidies (for example, through food for work and food transfers) and targeted income support are increasingly common. These could be described as part of general moves in subsidies that involve switches from general to “smart” subsidies and from loosely defined narrow objectives to tightly defined broader objectives. A similar pattern may be observed with regard to input subsidies, which we discuss briefly below in the context of wider input market development.

Input markets

Constraints on increased input use can be usefully considered in terms of supply and demand constraints. Fertilizer supply problems, for example, include high transport costs to landlocked countries and within rural areas, long lead times in placing orders, uncertainty regarding government interventions and farmer demand, small markets, limited access to working capital, and exchange rate risk. These problems are exacerbated by recent dramatic but short-lived increases in oil and fertilizer prices, and shortages of fertilizer. Many similar problems are faced in seed supply, though they arise in very different ways.

Fertilizer demand problems include low profitability of high cost inputs, significant output price and weather risks, problems of affordability (given high fertilizer prices relative to the incomes of poor farmers), and ineffective fertilizer use with consequent low physical grain to nutrient responses. The latter are related to poor extension information and application methods and timing, low/variable output prices, lack of financial services, late and unreliable deliveries, inappropriate formulations, low yield potential crop varieties, lack of complementary soil fertility management practices and, at times, poor rainfall. There are many similar demand problems with seeds, though there are probably bigger issues with farmers' concerns about seed characteristics other than yield (for example drought and pest resistance, storage and eating qualities) and about seed quality (in terms of germination and varietal characteristics).

Improving access to input markets may therefore be promoted through investments in improved transport infrastructure and management; in farmer and regional coordination of purchases; in exploitation of linkages and spillovers from non-staple to staple input markets; in coordinated, stable, transparent and consistent government action on technology, public goods

(transport infrastructure, extension), and input and output markets; in improved farm access to seasonal finance (discussed below); in macro-economic stability; in risk management systems (for both suppliers and farmers); in irrigation; and (in specific situations) in smart input subsidies.

Input subsidies can rapidly (but partially) address or help with many, but not all, of the supply and demand problems described above. They most immediately and importantly increase profitability of on-farm use and, if sufficiently large, can bring down the price sufficiently to also address the affordability problem⁹. However there should be long term goals that input subsidies (with building of roads, of research, and of farmers' technical and business skills) should, over time, lead to improved efficiency of input supply systems and of input use, and to economic structural changes. These together should then lead over time to profitable use of unsubsidized inputs at acceptable prices so that subsidies can be reduced and withdrawn.

A major conclusion from successful and unsuccessful experience with input subsidies is that they can make very significant contributions to food security, poverty reduction and economic growth, but alongside their potential benefits are also major potential pitfalls (see, for example, SOAS, 2008; Minde et al., 2008; Dorward, 2009b). Thus their benefits depend upon an effective basic input technology (in terms of its potential to raise yields of marketable produce), good program design and implementation, and indirect subsidy impacts on staple prices, the rural economy and wages. These in turn require prior and complementary investment in public goods (roads, agricultural research and extension, market development infrastructure). complementary policy and service coordination (regarding, for example, policies to encourage stable prices, social protection, private sector involvement and development, good fiscal management and a clear national development strategy), political commitment to the implementation and goals of the program, and the financial and organizational resources for coordinated implementation. Poor design and implementation can lead not only to lack of realized benefits, but very large costs and the undermining of longer-term private sector development.

Critical issues regarding design and implementation concern:

- 1) Program scale (cost, subsidy volume and subsidy rate);
- 2) The basic input supply system (the timing and processes for determining input requirements and for importation);
- 3) Input distribution networks (determination of approved subsidized input selling agents);
- 4) Beneficiary targeting;
- 5) Voucher (or other entitlement) system and distribution to beneficiaries;
- 6) Voucher redemption and input purchase by beneficiaries;
- 7) Voucher redemption by input sellers;
- 8) Financial systems as regards margins and payments for goods and services; and
- 9) Performance monitoring and audit systems (including incentives for good performance and penalties for poor performance or fraud).

Many of these issues are strongly interrelated, so that particular design and implementation features have implications (and pose different advantages and disadvantages) across different issues. There is considerable urgency in the need to improve the effectiveness of input subsidies as there are increasing political pressures for governments to use them and increasing costs that threaten their profitability and affordability.

Where input subsidies can play an important role in improving access to and use of inputs, then governments, farmers, agro-dealers, fertilizer importers and distributors and seed companies need to work together to investigate, develop and implement good practices in input subsidy programs. This should involve a program of innovative action research, evaluation, shared lesson learning, and capacity building, and should work at different levels. The following initiatives are needed:

- Cross country reviews of emerging input subsidy experience;
- Clear identification of situations where particular subsidy approaches can and cannot be beneficial;

⁹Given limited financial market development (for both credit and insurance), cash-constrained poor households may be unable to afford inputs at planting time even if economic analysis shows that use of those inputs would be profitable over the course of the production season.

- Improved integration of input subsidies with complementary policies;
- Guidelines for determining program scale: cost, volume, and subsidy rates; and
- Piloting of system innovations (targeting systems; voucher systems; remoteness incentives; audit systems and penalties; and systems for stakeholder engagement, development of trust and commitment, and performance targets and monitoring).

Seasonal input finance¹⁰

Agricultural intensification, involving adoption of new technology embodied in purchased inputs, requires capital. Small farm households are rarely able to save enough to fund significant intensification, while only a minority (normally among the better off) have access to sufficient non-farm income sources for this purpose. Therefore, credit has long been recognized as a priority to support agricultural intensification (Feder et al., 1985). While there have been and continue to be successful models for delivery of seasonal finance to non-staple producers where complementary coordination problems can be resolved (as discussed earlier), state-supported and subsidized agricultural credit programs in staple crop production are widely perceived to have failed, as they were fiscally unsustainable due to both their subsidy component and repayment problems¹¹. However, despite the subsequent success of hugely innovative microfinance organizations in providing financial services to poor clients (often much poorer than the average recipient of previous agricultural credit programs), the modern microfinance industry in Africa is a predominantly (peri) urban phenomenon and only fairly recently has it begun to address the huge gap in rural financial service provision. Rather than developing a better model for seasonal credit provision to poor agricultural producers than the previous, state-supported and subsidized agricultural credit programs, microfinance has largely abandoned agriculture.

We identify five reasons why, left entirely to market forces, future progress in seasonal credit provision for smallholder agriculture is likely to be slow:

- 1) The price/productivity tightrope – The dilemma was posed earlier that, with high global fertilizer prices, fertilizer use

may only be profitable at maize prices that are damaging for the livelihoods and food security of large numbers of poor people. This problem is intensified if interest charges are also added to the price of fertilizer. Consequently credit for fertilizer application on maize by surplus producers is only likely to be viable with lower fertilizer prices, lower import costs, and more efficient use of fertilizer to gain higher grain returns to fertilizer application.

- 2) High transaction costs – Transaction costs associated with any (financial) service provision in rural Africa are high primarily as a result of (i) high costs in connecting with clients due to low population densities and poor infrastructure and (ii) small transaction sizes where clients are very poor (as many of the costs associated with a financial transaction are fixed, irrespective of transaction value whereas the revenue for the financial institution is the interest payment, which is a function of transaction value). Thus, Johnson et al. (2004) conceptualize a “frontier” of rural service provision, whereby little financial service provision is occurring in areas where both the population density is less than 300 persons per km² and the poverty rate exceeds 40% of the local population¹². This excludes much of rural Africa.
- 3) Seasonal agriculture – This poses problems for conventional microfinance models as borrowers with highly seasonal incomes can only make very small payments at regular intervals, leaving most of their loan (perhaps all the principal and some of the interest) to be repaid at harvest time. Disbursing and collecting all loans at once removes one mechanism for ensuring loan repayment, which is to provide members of a borrower group with staggered access to loans, with some repaying their loans first before others are allowed to take theirs out. (Dorward et al., 1998; Morduch, 1999). Both these features increase lending risks as, in a Grameen-style model, regular repayments signal that all is well with loan servicing while staggered loans and repayments provide group repayment incentives which can be undermined under conditions of covariant risk (Stiglitz, 1990; Besley and Coate, 1995).
- 4) High repayment risks – These arise from (i) the widespread culture of “strategic default” (Poulton et al., 1998) that

¹⁰This section draws heavily on material from Poulton and Dorward (2008) and Dorward, Poulton and Chirwa (2008)

¹¹Furthermore the subsidy component rarely benefited poor households, as the majority of loans were given to well-connected, wealthy borrowers (Adams and Vogel 1986; Yaron 1992)

¹²Their case studies were undertaken in Kenya, which has a relatively strong and innovative microfinance industry.

loans are, after all, really gifts (encouraged by a history of poorly managed government and donor credit programs with, in places, irresponsible political opportunism in newly democratic systems) and (ii) the combination of high climatic variability and low levels of irrigation in Africa, which mean that even many well-intentioned borrowers may struggle to repay loans in bad seasons.

- 5) Subsistence consumption – When farmers are growing staples partly for their own consumption, they will not get cash income for that part of the crop that they consume, and this may limit their ability to repay any production loan unless they have other sources of cash income.

Given the multiple obstacles to seasonal credit provision in African agriculture, it is not surprising that microfinance has made little headway in seasonal finance in agriculture. In these circumstances we should expect most shifts in the lending “frontier” to be incremental, addressing one obstacle at a time. We can, for example, expect a restricted focus on larger, more

commercialized smallholder farmers in more productive and accessible areas, perhaps with significant non-farm incomes, and for production of higher priced crops (not basic staples)¹³. Even so, there will still be significant challenges, with loan sizes still being small by international standards as a result of small farm sizes, even among larger smallholder farms (Poulton et al., 2008).

Such challenges may be addressed by one of the major strengths of the microfinance industry, its international expertise and commercial dynamism and creativity in addressing problems such as those outlined above. Poulton and Dorward (2008) review four innovations in financial service provision and assess their potential to reduce the costs of rural lending: (i) so-called “branchless banking”, involving mobile phone technology in the provision of financial services and the use of agents to deliver basic services to customers at lower costs than banks themselves can do; (ii) cost savings from transferring the current functions of loan agents to (presumably less well trained) agents; (iii) the use of group contact persons instead of the loan agent meeting directly with each individual borrower during the process of

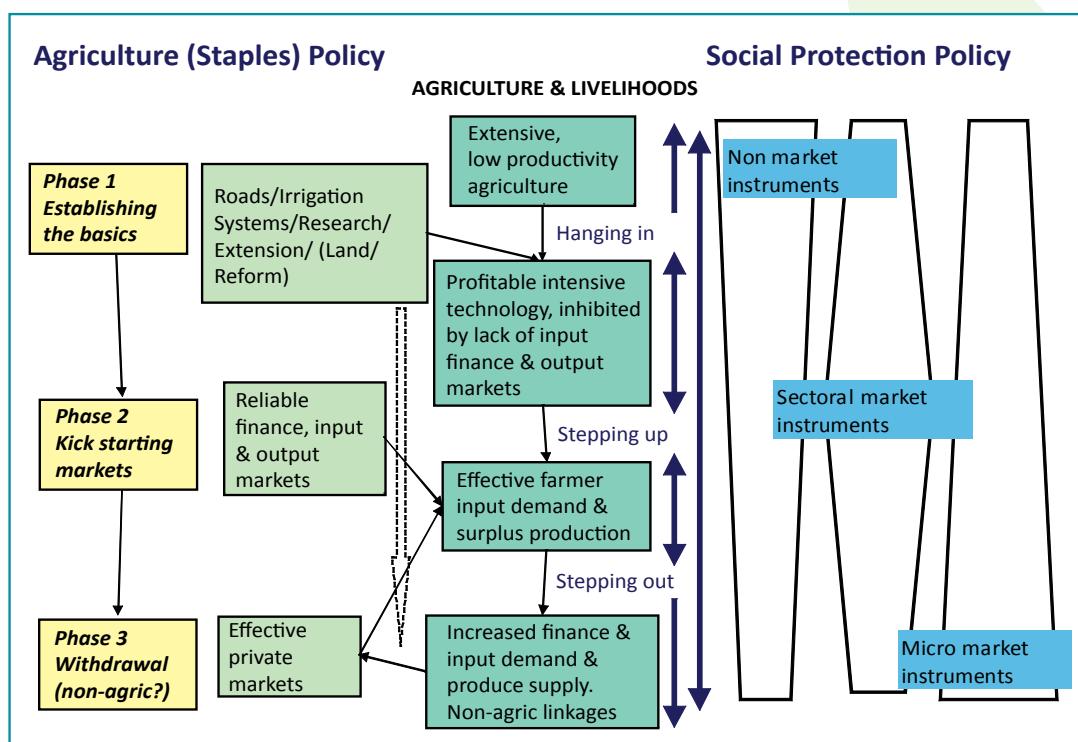


Figure 3. Phasing of agriculture and social protection policy (adapted from Dorward et al., 2006)

¹³For example in western Kenya the microfinance organization SAGA has successfully launched a so-called “Mkulima Loan” product targeted at two groups of smallholder borrowers: vegetable producers selling to Kisumu markets (i.e., quite strongly commercialized with limited seasonality) and rice farmers on a large irrigation scheme (geographically concentrated with good communications, a high degree of commercialization and low weather risk).

loan administration; and (iv) the use of bibliometric information (incorporated into smart cards) to enhance the quality of records regarding borrower repayment rates. They conclude that, though the use of such innovations may gradually become more common within rural lending in Africa, a period of (risky) experimentation will be required first. They therefore suggest that use of a carefully designed ‘challenge fund’ to take on the risks of such experimentation could significantly speed up the development and implementation of these innovations, and thus advance the spread of improved access to seasonal finance amongst African smallholders.

Conclusions and recommendations

The core message from this paper is a call for much more thinking and action that recognizes and addresses the dynamic structural changes that are a central feature of development and particularly agricultural development. Understanding this is not complex, and it does not complicate the tasks of most actors, instead it provides a solid foundation for recognizing changing multi-stakeholder interests in agricultural development and changing opportunities and constraints for agriculture to contribute to pro-poor growth and development.

Strategic and policy analysis informed by this thinking does, however, face important challenges. These include the need to recognize that there are multiple scales and phases of analysis and action. These involve different constraints (and pre-conditions), different potential synergies and competition, and therefore different policy sequencing needs for countries and regions at different stages of development and with different levels of economic activity and welfare, for high and low potential and for more accessible and more remote areas or countries, for food and cash crops with different (high and low input) intensification potential, and with or without significant asset specificity in processing.

Particular attention needs to be paid to constraints to development in the “early stages” of growth in poor rural economies, as these constraints are alien to much of the theory and experience of dominant policy analysis and ideology. Here the major micro-, meso- and macro-coordination challenges require different and changing balances between gift, hierarchy and market exchange mechanisms and hybrids. Agricultural development needs first to “establish the basics” with reliable technology, and with access to education, land and low cost services. This can then provide a platform for sustained and “crowding in” investments to kick start markets with continued

Table 1: Changing policies for food security, poverty reduction and economic growth

Policy goals	Requirements for short/medium term achievement (policy purpose)	Requirements for medium/long term achievement (policy purpose)
<i>Food security:</i> Secure and affordable access to food	Increased food self-sufficiency (household and national) with food delivery and/or productivity enhancing safety nets and humanitarian response	Increased household and national food market access (low and stable cost, secure, timely) through wider entitlements with (mainly) market economy based safety nets and humanitarian response
<i>Poverty reduction:</i> Real incomes of the poor increased and more secure, through low food costs, higher returns to labour, and safety nets.	Safety nets to increase/secure real incomes and develop/protect assets (see above)	Broad based growth with opportunities and wages for unskilled rural labour, low food prices, and safety net and humanitarian response as above
<i>Rural economic growth:</i> Increased levels of local economic activity, with stable income opportunities supporting poverty reduction and food security	Short/medium term achievement not possible.	Macro-economic stability and low interest rates; growth in agricultural and non-agricultural sectors tightening labour markets and raising real incomes with stable/affordable food prices. Development of market economy.

provision of technology and other public goods, coordination and “wise subsidies”. This requires private/public partnerships involving the state, the private sector, civil society, donors with state and market coordination, expertise and capital with complementary investments and activities. This in turn requires consistent, stable, flexible, transparent, clear and reliable policies from governments (and other actors) with clear exits and limits on state action and mutual accountability among all partners. Part of this process must involve coordination of agricultural and social protection policies. Figure 3 and Table 1 illustrate some of the policy transitions involved. Managing the many transitions and maintaining flexibility, while also maintaining trust and stability, is a major challenge, particularly in today’s increasingly globalised and unstable conditions.

There are, however, also durable principles. Some of these have been considered or alluded to above – for example, the need to match power with credible commitments, consistency and flexibility. This requires clear (but changing) definitions of state scope, clear governance and accountability systems, and investments to develop state and other actors’ capacities and systems, to match the demands made of them. There is a particular need for sound macro-economic management – not only to provide the basis for economic growth but also as a foundation for consistency and partnership. There should also be constant search for synergies – for example, between cash and food crop development, farm and non-farm development, productive and welfare investments, and between private and public interests and roles. Here the concepts of market facilitators and chain champions can be very useful and may allow less explicit state coordination and investment and more state emphasis on facilitating (not impeding) private and NGO coordination and investment. Despite (or indeed because of) the mixed record of farmer organizations, it is likely that capacity building in transparent and accountable farmer organizations will be a critical aid to coordination of market access, as will investment in MIS using mobile and other ICT technology. It is also important to invest in fora that promote dialogue and lesson learning within and across supply chains and countries, with action research. A supply chain approach, integrating producers, input and output market actors, and other service providers is critical to this and to wider policy development and investment. In all this the current challenges and interest in agriculture and agricultural markets present an opportunity that must be seized.

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Improving the performance of staple food markets to exploit the productive potential of smallholder agriculture

T.S. Jayne¹, Antony Chapoto², Bekele Shiferaw³

Abstract

This study examines competing visions of the role of the state in staple food markets to promote smallholder food production and national food security. The study reviews experience over the past 40 years to identify what has worked, what hasn't, and why. Most of our review focuses on the staple grain sectors of eastern and southern Africa, because it is in these regions where the most important advances in seed technology and production intensification have been made over the past 4-5 decades and where "green revolutions" briefly flourished in the 1970s and 1980s before stalling out. We review the main lessons learned from the marketing policy experiences during and after these emerging green revolutions. The study also presents a brief conceptual framework to understand how inelastic demand affects price risk and the options for relaxing demand elasticity constraints on food production intensification. We conclude by presenting the policy options and fundamental public investments needed to revitalize food marketing systems to support broad-based integration of smallholders into staple value chains as a means to catalyze productivity growth and food security in the region.

What is the problem?

Broad-based agricultural productivity growth is likely to be a pre-condition for sustainable poverty reduction and improved living standards in most of Sub-Saharan Africa. On the surface, the challenge of raising farm productivity could appear to be a difficult but at least relatively straightforward one: use the power of crop science to generate improved farm technologies, put them into small farmers' hands, and provide them with the knowledge to get the most out of these technologies. Over the past decades, several highly committed and well-funded efforts to kick-start "green revolutions" in Africa have been thwarted by their inability to anticipate and address downstream issues of marketing and governance. Experiences from the "green revolution" in Asia attest that widespread market development plays an important role in the process of adoption of new technologies, productivity growth and transformation of

smallholder agriculture. Failure to develop viable input supply systems for sustained provision of productivity enhancing seed and fertilizer technologies and market outlets for absorbing surplus production have often contributed to failure of agricultural transformation to take root in Africa. For example, the Sasakawa/Global-2000 programs have demonstrated that when smallholder farmers have access to improved seed and fertilizer inputs and the know-how about complementary crop management practices, they can temporarily generate impressive yield gains leading to bumper harvests. But once the program withdraws, the hard questions arise: how will farmers continue to acquire the improved seed and fertilizer? Who will supply these critical inputs to them? Who will supply the credit to enable the poorest households to afford these inputs?

Even when the supply of key inputs can be sustained, the significant challenges related to storage and distribution of the surplus production become impediments to sustaining farm productivity growth, especially if aggregate supply expansion depresses prices in the market. This is particularly relevant in the case of staple food grains, which tend to have low demand elasticities and, under conditions of underdeveloped market infrastructure, fail to efficiently link surplus and deficit areas. The key question therefore becomes how to expand and sustain the demand for the surplus produce in such a way that depressed producer prices will not create disincentives for farmers to invest in new technology, or even worse withdraw from markets and gradually retreat back into the "safety" of semi-subsistence farming. This will require system-wide coordination of the food value chains to ensure that the important public and private investments are made to effectively link farmers to the wholesalers, processors, retailers and ultimately the consumer. This suggests that investments in farm productivity growth must go hand-in-hand with complementary investments to improve and enhance the physical and institutional infrastructure for effective functioning of both input and output markets in the food system.

Over the past several decades, the role of output markets in supporting grain productivity growth has become widely recognized, and various approaches have been tried in Africa with different levels of success. Such efforts have involved i) state-led approaches to stabilize prices and integrate input

¹Professor of International Development, Department of Agricultural, Food and Resource Economics, Michigan State University. Corresponding author : (Jayne@msu.edu)

²Assistant Professor, Department of Agricultural, Food and Resource Economics, Michigan State University.

³Director of the Socioeconomics Program, CIMMYT.

delivery, farm credit and output markets through controlled marketing systems; and ii) ostensible attempts to transfer critical marketing functions from the state to private traders, which in most cases have been marred by a lack of trust, cooperation and coordination between the private and public sectors. Neither of these approaches has produced sustainable farm productivity growth or greater commercialization of smallholder agriculture in Africa. There is an emerging consensus that the status quo food-marketing situation in most African countries is not going to catalyze small farm productivity growth, and that new approaches will need to be found quickly. While productivity growth is important for generating marketable surplus (Barrett, 2008), there is a growing realization that such productivity change cannot be sustained without effective market development that will fuel the process of transformation through forward and backward linkages in value chains extending all the way from the farmer to the consumer. In addition, lack of access to reliable markets continues to lock millions of smallholder farmers into semi-subsistence production. Better functioning markets and productivity growth could open new pathways to escape poverty and hunger. Time is of the essence. Population growth without income growth is exacerbating poverty and causing more frequent and severe food crises. There is indeed an urgency to the challenge of making staple food markets work for small farmers.

This paper represents a renewed effort to identify strategies and policies that can sustainably promote smallholder farmers' access to markets, reduce risks, and expand market demand, so as to sustain smallholders' incentives to invest in productivity enhancing seed, fertilizer and other technologies. Our aim is to identify what has worked, what has not, and why. Most of our review focuses on the staple grain sectors of eastern and southern Africa, because it is in these regions where the most important seed technology advances have been made over the past 4-5 decades and where "green revolutions" briefly flourished in the 1970s and 1980s before stalling out. The vast majority of the evidence-based analysis of output marketing to support small farmers' use of modern seeds and fertilizer technologies is also in these regions where some progress has (or had) been achieved.

The rest of the paper is structured as follows. The next section presents a brief conceptual framework to understand the market structure and analyze food markets with inelastic

demand to develop strategies for relaxing elasticity constraints and expanding demand. The third section provides a historical review of alternative approaches for system-wide organization of food marketing and highlights the main lessons learned from marketing policy experiences in Africa. The fourth section reviews current knowledge with specific grain marketing interventions that have been used in the past to stimulate demand and sustain price incentives in the face of supply expansion. We conclude in the last section by presenting the policy options and the first-order output marketing improvements needed to reorganize and revitalize the food marketing system in support of increased integration of smallholders into value chains as a means to catalyze productivity growth and pro-poor 'green revolution' in Africa.

The nature of the solution: a brief conceptual framework

Structure of grain production and marketing systems in Africa

Food staples in Africa are predominantly produced by smallholder producers, cultivating small parcels of land and often using traditional and labor-intensive methods. Unlike in Asia, the level of intensification of production using modern land-augmenting inputs – improved varieties/hybrids and fertilizer – and complementary irrigation is quite limited. The extent of commercialization and share of the produce marketed in different countries also varies across commodities. In high-potential areas of eastern and southern Africa, maize remains the main staple food crop produced and marketed by smallholders. In some high-potential areas (e.g., Ethiopia) wheat and rice are also grown, while barley and small cereals (e.g., teff) are important in the highland regions. In the lower potential and drought-prone areas, food crops like sorghum, millets, pulses, oilseeds and cassava are widely grown. The surplus produce in rural areas is procured through a network of rural assemblers and brokers who buy directly at the farm gate in small quantities, or from small rural markets, and pass it onto rural wholesalers. The product is subsequently aggregated and transported to other secondary and tertiary markets for selling to larger wholesalers, processors and/or exporters. There is lack of widely recognized and adopted quality grades and standards and units of measurement, which increases the costs of grain procurement and market transactions. Lack of assurance and reliability of transactions often requires personal relationships and trust among the trading parties, or personal supervision

of quality standards and trade commitments at different levels in the supply chain. Low-cost and traditional storage, grain handling, and packaging methods are practised and there is little change in the form or value of the commodity other than spatial movements and associated transport costs (Minot et al., 2008; Shiferaw et al., 2009).

Participation of smallholders in markets is determined by several factors, including their asset position (e.g., land, labor, and capital), access and proximity to markets, organizational capacity, and their ability to produce a marketable surplus at costs that will make selling at prevailing prices attractive. Available evidence from nationwide and large-scale farm household surveys for maize indicates that only a very small proportion of households buy and sell grain in the same year (Jayne et al., 2006). Small-scale farm households generally fall into one of the following four categories with respect to the grain market (Table 1):

Sellers of staple grains: Roughly 20 to 35% of the smallholder farms sell maize in a given year. Of course this figure will rise in good harvest years and fall in a drought year. However, there are two sub-groups within this category:

- A very small group of relatively large and well-equipped smallholder farmers with 4 to 20 hectares of land, usually in the most favorable agro-ecological areas (about 1 to 3% of the total rural farm population), accounting for 50% of the marketed output from the smallholder sector. These farms tend to sell between 1 and 50 tons of maize per farm in a given year.
- A much larger group of smallholder farms (20 to 30% of the total rural farm population) selling much smaller quantities of grain, usually between 50 and 200 kilograms per farm. These households tend to be slightly better off than households that buy grain, but the differences are not very great in absolute terms. These households, especially the larger smallholder farmers, clearly benefit from higher grain prices, and have tended to advocate for the continuation of marketing boards procuring their crop at fixed support prices.

Buyers of staple grains: These rural households generally make up 50-70% of the rural population, higher in drought years and lower in good production years. These households are generally poorer and have smaller farm sizes and asset holdings than the median rural household. They are directly hurt by higher mean grain prices.

Households buying and selling grain within the same year: In all of the nationwide surveys, relatively few households both buy and sell maize (Table 1). Only about 5 to 15% of the rural population buys and sells maize in the same year. Many of these are relatively large and food secure farms that sell grain and buy back lesser amounts of processed meal. About 3 to 8% are relatively poor households that make distress sales of grain after harvest only to buy back larger later in the season.

Households neither buying nor selling staples: These households make up a small proportion of the rural population in areas where maize is the dominant staple crop. The Zambia results are different in this case because cassava is the main staple in northern Zambia, and because of this, a sizable fraction of the rural population at the national level is autarkic with respect to maize.

Grain marketing policies and market development will have differential effects on these different types of small-scale producers. For example, reducing marketing costs will narrow the price band and make some farm households facing low production costs increase their surplus and sell more. With reduction in marketing costs and increased access to markets, farm households facing high production costs may also reduce subsistence production and become increasingly reliant on markets as net buyers of grain staples (de Janvry et al., 2001). The challenge for agricultural marketing policy in sub-Saharan Africa is to design options that stimulate and sustain investments in productivity enhancing technologies, remedy market imperfections and increase market access and participation, expand demand, and benefit small-scale producers and poor consumers. These issues are discussed below and in subsequent sections.

Table 1. Distribution of small-scale farm population according to their position in the staple grain market, selected countries.

Household category with respect to main staple grain:	Zambia (maize)	Mozambique (maize)	Kenya (maize)	Malawi (maize)	Ethiopia (maize and teff)
----- percent of rural farm population -----					
Sellers only:	19	13	18	7	13
1. top 50% of total sales*	2	2	2	1	2
2. bottom 50% of total sales**	17	11	16	6	11
3. Buyers only	33	51	55	56	60
4. Buy and sell (net buyers)	3	12***	7	5	13
5. Buy and sell (net sellers)	6		12	3	12
6. Neither buy nor sell	39	24	8	29	2
	100	100	100	100	100

Notes: *after ranking all households by quantity sold, this row shows the percentage of households in the smallholder sector accounting for the first 50 percent of total maize sale; **percentage of households accounting for the other 50 percent of total maize sales. ***The survey in Mozambique was not able to ascertain quantities of maize purchased therefore whether these households are net buyers or net sellers is unknown. Roughly 1/2 of the households in category 5 (who buy and sell in the same year) are relatively well-off households producing large maize surpluses and relatively buying small amounts of processed industrial maize meal.

Source: reproduced from Jayne, Nijhoff and Zulu (2006).

The elasticity of the demand function

One of the key characteristics of staple food crops is their low overall elasticity of demand; income growth and price changes often lead to a lower proportional increase in demand for food staples. When demand is inelastic, technology adoption and productivity growth often lead to declining producer prices without a proportional increase in demand. If prices fall much faster than demand, this may have negative welfare impacts on producers unless farmers compensate for this loss through lower production costs derived from adoption of new cost-saving technology. However, crop production expansion is difficult to sustain in the face of highly inelastic product demand, which causes precipitous price plunges when local markets are unable to absorb surplus output. Such price drops are a major cause of subsequent farm dis-adoption of improved technology (Vitale and Sanders, 2005). This was the experience of the Sasakawa-Global 2000 programs implemented in many African countries in the 1990s (Putterman, 1995; Howard et al., 2003; Alemu et al., 2008). Figure 1 shows this schematically. If farmers' initial adoption of productivity enhancing technology causes the food supply curve to shift from S^0 to S^1 , prices will drop from P^0 to P^1 if markets are unable to absorb the surplus due to inelastic demand (D^0). The actual quantity supplied increases marginally

from Q^0 to Q^1 . In this environment, markets are not able to support sustainable farm technology improvements. This could be the case when surplus producing regions are poorly linked to deficit (net importing) areas within a country because of poor market infrastructure or when a country is unable to export the surplus. Thin local markets in many rural areas in Africa get saturated quickly when many farmers attempt to sell their produce right after harvest to meet various financial obligations.

In contrast, Figure 2 shows a situation of elastic demand. When demand is elastic, the market can absorb greater quantities of product without depressing prices. If the demand for grain were more elastic (as shown in Figure 2), the same expansion of the food supply curve from S^0 to S^1 would cause a much smaller reduction in farm prices, and a much greater ability to increase actual quantities supplied by farmers (Q^0 to Q^2). A major challenge of output market development, therefore, is to make the demand for staple food much more elastic. A related challenge is how to expand the demand for grain to maintain strong incentives for farmers, but in a way that does not price poor consumers out of the market.

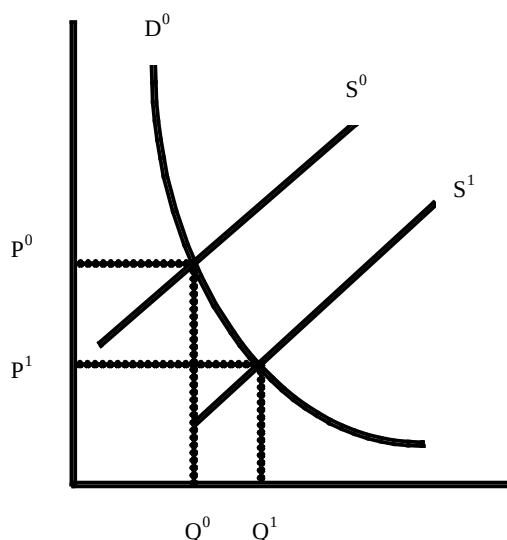


Figure 1. Supply expansion with inelastic demand

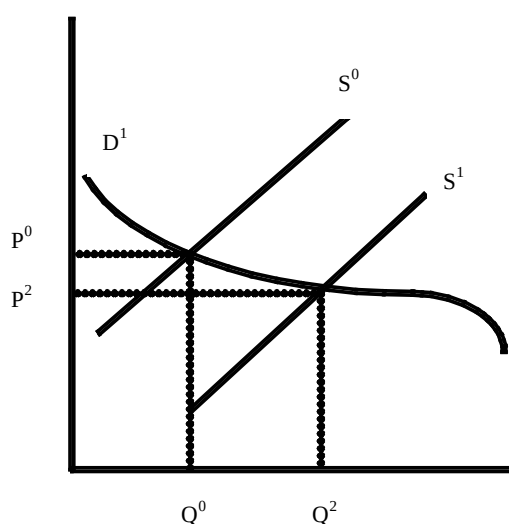


Figure 2. Supply expansion with elastic demand

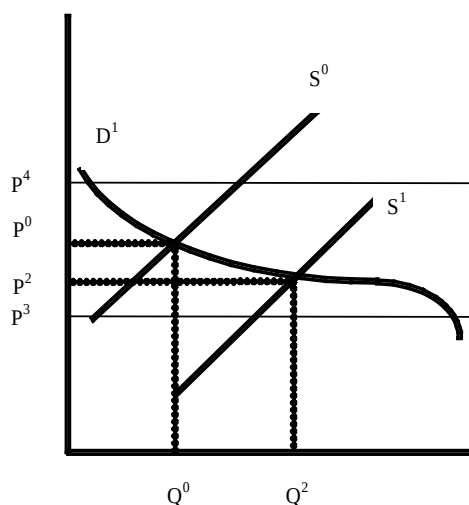


Figure 3. Supply expansion with elastic demand and trade linkages

A third scenario, shown in Figure 3, underscores the power of regional and international trade to stabilize food prices and support farm technology adoption. Figure 3 is similar to Figure 2, except that the magnitude of potential price fluctuations is truncated by trade possibilities. If a country's markets can be well integrated with surrounding countries, then if prices drop to a certain level (P_3), the country's surplus production will become competitive in regional or international markets, providing a vent for surplus production at a level equal to the price in international markets minus transport costs (P_3). Likewise, if prices rise to a certain point (P_4), surpluses in other countries can be brought into the country at a cost equivalent to the price of grain in the surplus country plus transport costs (P_4). However, the theoretical price stabilizing effects of trade can only be realized in practice if markets work well, which depends on getting the incentives right for traders to operate.

Factors affecting the elasticity and stability of demand

Fortunately, it is possible to alter the shape of the demand curve that small farmers face. The demand for staple grain crops can be made more elastic, and shifted outward, through market-facilitating public investments and policy choices and by nurturing important marketing institutions.

- 1) **Physical infrastructure:** The size of the market is determined by marketing costs. Transport costs are generally the largest single component of price differences between surplus and deficit areas (Gebremeskel, Jayne and Shaffer, 1998; Mittendorf, 1989). As transport costs decline, grain markets become more integrated and the overall size of the market expands for any particular farmer and demand becomes more elastic. This is analogous to the situation of a small country supplying product to the world market – the huge size of the world market relative to the small country's production makes the demand function that it faces perfectly elastic (flat). More generally, there is strong evidence that a country's level of infrastructural development is associated with its level of agricultural productivity (Antle, 1983).
- 2) **Regional trade:** Regional trade, in combination with good transport infrastructure between countries, has the potential to expand the size of the market, increase the elasticity of demand facing farmers, and reduce price instability. For non-tradable commodities where price shocks are

mainly generated by domestic events such as weather, the magnitude of the shock will largely determine the variability of domestic production. But local production shocks can be mitigated by regional trade, which tend to stabilize markets by linking together areas with covariate production (Koester, 1986). The size of a country matters. Larger countries typically have more diverse regional climatic conditions that reduce systemic risks at the country level. Regional trade has a greater potential to stabilize food prices when consumers can easily substitute one food type for another (such as maize and cassava in parts of southern Africa; wheat and rice in other areas), where cropping patterns are diverse, where production in different parts of the region are not highly correlated, and where the costs of transportation are low (Minot and Delgado, 2002; Byerlee, Myers and Jayne, 2005).

3) Streamlining regulations and trade barriers: Many African countries impose import tariffs on staple foods coming from neighboring countries. Other countries frequently resort to export bans. These trade barriers often vary unpredictably, and so make it risky for trading firms to invest in developing durable marketing networks across regions. Customs clearance procedures are often cumbersome. For example, permits to legally import grain into Kenya are available only in Nairobi (Nyameino, Kagira and Njuki, 2003). Traders wanting to move product from northern Mozambique to southern Malawi need to get export permits in Quelimane at the coast in northeast Mozambique (Tschirley, Abdula and Weber, 2005). These regulatory barriers impose transaction costs on traders that result in lower demand and lower prices for farmers (and higher prices for consumers). Streamlining the regulatory processes for regional trade can reduce downside price instability that often depresses farmer incentives to sustain their use of productivity enhancing cash inputs.

4) Rural financial markets to improve traders' capacity to absorb surplus production: While the importance of small farmer credit in promoting the uptake of improved farm technology is well recognized, the role of trader finance is also crucial. A major source of inelastic demand in traditional food markets is the constrained supply of trader

finance (Coulter and Shepherd, 1995). Market institutions such as warehouse receipt systems can inject needed liquidity into grain marketing systems and thus allow the system to better absorb surplus production in good years. But the development of these market institutions will depend on supportive government policies. So far, fledgling attempts to develop warehouse receipt systems and other innovative sources of trader finance in staple food assembly and wholesaling markets (e.g., Ghana and Zambia) have floundered due to direct government operations in markets that have been incompatible with the development of these institutions.

5) Policies toward subsidized imports and food aid: While local farmers are generally well served by regional trade, their interests can be undermined by subsidized food imports, particularly if this alters long run food consumption patterns. For example, large processing companies in urban areas are often able to acquire subsidized wheat and rice from international sources, which over time influences urban consumption habits. With few exceptions, most smallholder areas are not suited to wheat and rice production. The importation of subsidized wheat and rice undermines long-term demand and prices for the main staple grains, roots and tuber crops that small African farmers produce. For example, in India the demand for sorghum and millets – crops widely grown in drought-prone areas – has declined mainly due to public procurement and distribution systems that subsidize rice and wheat (Ryan and Spencer, 2001). In West Africa, the demand for subsidized rice and wheat has also increased, especially in urban areas, in many cases displacing consumption of traditional cereals (Vitale and Sanders, 2005). Similarly, inappropriate uses of imported food aid (e.g., the sale of imported food aid by NGOs during periods of local production surplus)⁴ are likely to depress small farmers' uptake of improved farm technology over time (Tschirley et al., 2004; Dorosh, Dradri and Hagblade, 2007)⁵.

6) Diversification of food consumption patterns: When food consumption patterns become more diversified, markets become more interlinked and stable than in cases where

⁴Many NGOs derive part of their annual operating budget by "monetizing" (selling onto local markets) food aid received from donor countries like the United States. In this way, a certain amount of food assistance to Africa is uninfluenced by weather and local supply conditions, and it is this component that has the greatest potential to disrupt local markets and affect small farmers' incentives.

⁵There is not a clear consensus on this point. Abdulai, Barrett and Hoddinott (2005), for example, contend that food assistance programs usually have not adversely affected small farmers' production incentives and may actually help them by generating community assets through public works projects.

one commodity dominates food consumption patterns. Especially in eastern and southern Africa, food production and consumption patterns have changed markedly over the past decade. The former dominance of white maize has given way to more diversified food systems. In many rural areas of Malawi, Zambia and Tanzania, cassava cultivation has increased dramatically. The increasing role of cassava, a drought-tolerant crop that can be stored in the ground, provides new potential to stabilize food consumption in the face of maize production shortfalls (Nweke, Spencer and Lynam, 2002). The availability of other drought-tolerant crops (e.g., cassava, sorghum, millets, pigeon pea) that are less prone than maize to extreme production fluctuations provides some relief in the degree to which maize supplies can fluctuate from year to year without seriously aggravating food insecurity. While not necessarily affecting the elasticity of demand for any particular food commodity, diversification of consumption and interdependence of demand for alternative staple foods tends to increase overall food supplies and therefore contribute to stability of food markets and prices over time.

7) Generating alternative sources of demand for grain:

Future projections indicate that the demand for livestock products, fruits and vegetables will increase as income grows and urbanization increases (Delgado et al., 1999). The population of Sub-Saharan Africa is currently undergoing dramatic changes in settlement patterns; about half of the population (projected to reach 1.2 billion) is likely to move to urban areas by 2020 (World Bank, 1996). The resulting high demand for poultry and milk products will induce greater derived demand for use of cereal grain as livestock feed. If supply can be increased, this could expand the total demand for coarse cereals and reduce the upward pressure on prices of other staple crops (e.g., maize). In addition, food and energy markets will become increasingly integrated in the future with the development of the bio-fuels industry. A local bio-fuels industry could become an important means of stabilizing downside price risk for small farmers, by offering a floor price in periods of excess supply. This would essentially make the demand for grain perfectly elastic at a certain floor price. The rise of a local bio-fuels industry will also create greater interplay between sugar and grain markets over time, which could contribute to price stability and less variable demand for smallholder staple crops.

8) Storage and processing: Recent studies in Africa have shown increased consumption demand for wheat and rice and other ready-to-use or processed products in urban areas. Urban consumption surveys in Nairobi, Maputo, and the Umtata area of eastern Cape, South Africa, attest to the rising importance of wheat and rice products in food consumption patterns (Muyanga et al., 2005; Tschirley, Abdula and Weber, 2005; Traub, 2005). One of the reasons for the declining demand for traditional staple crops is the high opportunity cost of time in food preparation for the family, which tends to shift consumption demand to alternative crops like rice which have relatively low processing costs or labor-saving processed products (e.g., breakfast cereals, bread, flour, pasta, etc). This indicates that with increasing urbanization and income growth, African consumers are likely to demand more processed and easy-to-prepare food products. A key strategy for increasing the demand for traditional staples grown by African farmers would therefore require increased investment in processing, packaging and storage systems that will improve the competitiveness and demand for these crops while also adding value and generating economic surplus.

9) Development of world food markets: Until recently, the world market for white maize was thinly traded and hence small absolute changes in import demand in southern Africa had the potential to influence world prices. The rationale for some level of stockholding is more compelling in such cases. However, in recent years, the white maize market has become much more heavily traded due to the effect of the North American Free Trade Agreement (NAFTA), which since 1997 has induced a large white maize supply response in the USA and other countries (USDA, 2010). These developments have mitigated the potential for white maize prices and supplies to become tight when the southern Africa region experiences a drought, and thus reduces the rationale for keeping large government stockpiles of white maize to stabilize supplies (Tschirley et al., 2004). Even considering the potential for high food import bills in years of world price spikes, prior analysis taking into account volatile world market prices in the 1970s (which were higher in real terms than world food prices in the most recent 2007-08 crisis) consistently showed that the costs associated with maintaining large national buffer stocks year in and year out are almost always greater than relying primarily on trade to fill residual food requirements.

To briefly summarize, staple food value chains that support sustainable farm productivity growth will have the following characteristics. First, transportation costs will be much lower than they are now. Much of the price instability problem, in particular the inability of markets to absorb increased output without huge price drops, is because the size of the market is severely limited by high transport costs. Well-functioning value chains will benefit from much greater public investment in roads, rail and port facilities. Second, small farmers will have greater access to seasonal finance to afford the cash inputs needed to intensify their food production, which has implications for rural financial institutions. Third, well-functioning marketing systems rely on accurate crop forecasts that enable market actors and governments to plan their decisions in advance based on accurate public information. Fourth, alternative downstream markets for grain will arise (either domestic or external) to act as shock absorbers by absorbing increased output in good years and reducing quantities demanded in short years. Fifth, a transparent price discovery process will support farm productivity growth by i) developing risk shifting tools and price monitoring systems that traders can use to stabilize returns to both themselves and to farmers, ii) providing feedback to policy makers as to how markets are performing, and iii) providing transparent decision rules for government intervention. The main challenge now is how to bring into fruition these important price-stabilizing and market-expanding benefits to stimulate the sustainable adoption of improved farm technologies by small African farmers. Concrete proposals to move toward achieving this vision are identified in the fourth and fifth sections of this paper.

Experiences with alternative approaches to system-wide organization of food marketing system

The market-strengthening and stabilizing approaches specified above can be achieved through a variety of public and/or private sector approaches to market development. There is widespread agreement in the literature that the state has a crucial role to play in developing strong output markets in Africa. However, there are major controversies as to what exactly these critical government roles are, and how they should be implemented. Identifying promising interventions or programs to defend output prices in the face of output supply expansion must be

considered within the overall system-wide value chain, e.g., how can specific interventions be made to function compatibly with other stages of the value chain.

A major insight from commodity value chain analysis (Taylor, 2005; Kaplinski and Morris, 2001) and the earlier industrial organization and commodity sub-sector literature of the 1970s, 1980s, and 1990s is that risks, uncertainties and lack of profitability at one stage of the system will impede incentives for investment at other stages of the system, depressing overall performance of the value chain.⁶ Much in the same way as the human spine and central nervous system transmit signals and coordinate the movements of the entire body, the wholesaling stage of the food system plays a similar coordinating role in food value chains. It is at the wholesale level where i) almost all of the seasonal storage takes place downstream from the farm, ii) most of the demand for financing grain purchases from farmers originates from, and iii) long-distance spatial arbitrage opportunities are identified to reallocate supplies from surplus to deficit areas and link farmers and assemblers with processors, retailers and consumers in distant areas. Moreover, certain kinds of programs with the potential to encourage small farm input use and productivity, e.g., warehouse receipt systems, hedging tools, etc., can only be functional within a system where the price discovery process is perceived to be based on market forces and not likely to be fundamentally altered by unpredictable government operations, and where enough volume goes through commercial trading channels to make these institutions viable (Coulter, 2005; Coulter and Onumah, 2002). The literature on food sub-sectors and value chains stresses that efforts to promote performance at either end of the value chain (e.g., assembly or storage investments at the village-level, or retail market development) can be stymied by poor performance at the crucial middle stages of the system (Shaffer et al., 1983). Therefore, a major challenge to making food markets function for the benefit of small farmers (and farm technology adoption in particular) is to achieve greater clarity as to the appropriate public and private roles in developing the wholesaling stage of food value chains – the backbone of the staple food marketing systems in almost all countries.

⁶For example, see Marion et al., 1979; Shaffer, 1980; Shaffer et al., 1983; Mueller, 1983; Marion and NC 117 Committee, 1986. Even earlier insights from the economics/business management literature (e.g., Drucker, 1958) stress the symbiotic relationships between production and marketing.

This section reviews the broad lessons from experience over the past 40 years with alternative general approaches to organizing food output markets (with a focus on the wholesaling stage) to encourage small farm technology adoption and productivity growth for the basic staples.

State-led systems

In recent years, parallels have been drawn between the food marketing systems of Asian countries at the time of their “green revolutions” and the marketing systems that may best achieve similar farm productivity growth in Africa (Sachs, 2005; Dorward et al., 2004). Others have pointed to the fledgling “green revolutions” experienced in eastern Africa, that appear to have been snuffed out after the state-led marketing boards (which operated mainly at wholesale level) were downsized. The experiences of countries like Kenya, Zimbabwe, Zambia, Malawi and Tanzania during the 1970s and 1980s demonstrate that a state-led controlled marketing approach can stimulate the adoption of improved grain seed technologies and complementary inputs to achieve impressive production growth (Byerlee and Eicher, 1997; Smale and Jayne, 2003). These experiences also demonstrate that the main challenge of these state-led approaches is not so much how to initiate farm productivity growth, but how to sustain it if the costs of the programs escalate and contribute to fiscal crises (Jayne and Jones, 1997; Kherallah et al., 2002; Gulati and Narayanan, 2003; Rashid, Cummings and Gulati, 2005; Avalos-Sartorio, 2006). In light of recent developments in much of Africa testing the return of the “development state”, this section reviews the main conclusions from the state-led approach to agricultural development of the 1970s and 1980s.

Starting at Independence in the 1960s and 1970s, a prominent goal of government policy in much of eastern and southern Africa was to promote smallholder welfare, using staple food production incentives as the main vehicle. This goal was achieved with great success in the 1970s and 1980s. Two main ingredients drove this production growth: input and crop marketing policies, broadly defined, and improved seed breakthroughs.⁷ The key features of the marketing policies were i) expansion of state crop buying stations in smallholder areas, ii) direct state control over grain supplies and pricing, iii) heavy subsidization of fertilizer

to encourage its use by small farmers, iv) efforts to stabilize and subsidize urban consumer prices without reliance on imports, and v) shifting the massive costs of these government investments and subsidies onto the Treasury. The expansion of state market infrastructure in smallholder areas facilitated the disbursement of credit and subsidized inputs to smallholders by allied state agencies designed to recoup loans through farmer sales to the marketing boards (Rohrbach 1989; Howard 1994; Putterman 1995). Smallholder maize yields and production grew impressively during the 1970s and 1980s.⁸

The state-led support for smallholder maize intensification during the 1970s and 1980s appears to have shifted production patterns away from other crops to maize, as well as supported an overall increase in cropped area (Smale and Jayne, 2003; Zulu et al., 2000). In Zambia, by 1990, maize accounted for 76% of the total value of smallholder crop production (Figure 4).

The “smallholder green revolutions” achieved temporarily in the 1980s in parts of the region (Eicher, 1995; Byerlee and Heisey, 1997) featured state-led investments in input delivery, credit disbursement, and major expansion of state crop buying stations. Throughout the 1980s and up to the initial reforms, official producer prices exceeded export parity prices in the major production regions of Kenya, South Africa and Zimbabwe, typically exporters during this period (Jansen and Muir, 1994; Wright and Nieuwoudt, 1993; Smale and Jayne, 2003). In almost all countries, a large proportion of smallholders benefited from the transport subsidies inherent in the boards’ pan-territorial pricing structure (Bryceson 1993; Howard 1994; Odhiambo and Wilcock, 1990). While currency overvaluation did introduce an often substantial indirect tax on food producers, especially in Tanzania and Zambia (Jansen and Muir 1994), this was largely offset by the package of state investments designed to increase food production incentives (primarily input subsidies, concessional credit, and investments in state crop buying stations, research, and extension).

These pricing and market support policies clearly encouraged the adoption of newly available hybrid maize seeds and stimulated the growth in smallholder grain area and yields during the 1970s in Tanzania and Kenya, and during the 1980s in Zimbabwe

⁷It is widely agreed that without the advent of new yield-enhancing maize seeds, the state-led marketing investments by themselves would have had a much smaller impact on smallholders’ productivity and incomes (e.g., Rohrbach, 1989).

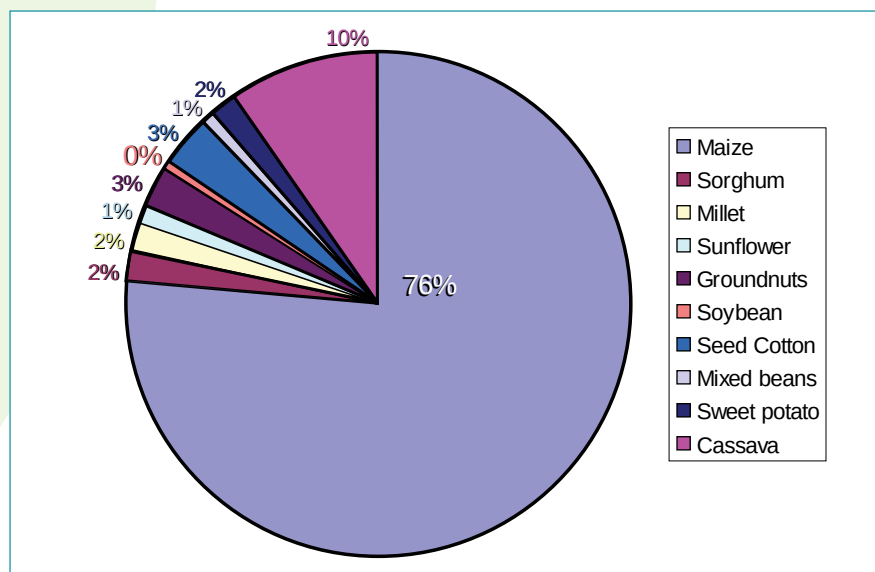
⁸The timing of these state investments was as follows: expansion of marketing board buying stations in smallholder areas (Zimbabwe 1980-1986; Zambia 1983-1989; Kenya 1980-1982; Malawi 1974-1985; Tanzania 1974-1979); expansion of state credit disbursed to smallholders (Zimbabwe 1980-86; Zambia 1983-88; Kenya 1975-1983); explicit or implicit subsidies on inputs (Zimbabwe 1980-91; Zambia 1971-1991; Malawi 1980-94). For details, see Jayne and Jones (1997).

and Zambia (Putterman, 1995; Jabara, 1984; Rohrbach, 1989; Howard, 1994). Per capita smallholder grain production in Zimbabwe and Zambia increased by 51% and 47% in the 10 years of heavy state intervention between the late 1970s and the late 1980s. In Kenya and Tanzania, per capita grain production rose 30% and 69% between the 1970-74 and 1980-84 periods.⁹

However, herein lay the groundwork for subsequent unsustainability. As the marketing board floor prices for grain were successful in promoting smallholder input use and production, especially in remote outlying areas, production began to exceed domestic demand requirements, and the costs of accumulating grain in public silos rose dramatically. Often the cost of growing and transporting the grain to urban areas exceeded the economic value of the crop.¹⁰ Strategic stocks sometimes rose to massive levels (especially in Zimbabwe, Malawi and Kenya), and often had to be exported at a loss to avoid the even greater financing costs of long-term storage and quality deterioration (Buccola and Sukume, 1988; Pinckney, 1993). Furthermore, marketing board operational inefficiency varied across countries, but adversely affected farmers' incentives to sustain their use of the improved input technologies in many countries (World Bank, 1981; Bates, 1989; Kaplinski and Morris, 2001; Amani and Maro, 1992).

Howard (1994) provides a detailed analysis of the rate of return to the maize seed research and marketing policies of the 1970s and 1980s in Zambia. Her analysis explicitly includes the costs of a full range of investments leading to hybrid maize adoption by smallholder farmers. Marketing costs accounted for roughly 59% of the total costs of all investments, in contrast to the seed research investments, which were only 3% of the total. Extension and other service provision programs accounted for the remaining 38%. The rate of return on maize research was favorable when the costs of marketing were not included. After the costs of all related investments (seed and agronomic research, extension, and marketing), however, the average rate of return to maize promotion in Zambia was negative over the 1987-91 period.

As the fiscal costs of state operations in support of smallholder food production mounted, and contributed to overall fiscal crises in these countries, donors changed course and declined to continue underwriting these costs. Continued donor lending and budget support to African governments began to be "conditional" on addressing the major sources of treasury deficits, and in many countries, food-marketing policies were indeed one of the main sources of fiscal crisis. After first supporting investments in African marketing boards during the 1960s and 1970s, donors now changed course and argued for



Source: Post-Harvest Surveys, 1990/91, Central Statistical Office, Lusaka.

Figure 4. Shares of crop production value of major crops produced by smallholder farmers in Zambia, 1990/91

⁹Jabara (1984) demonstrates that despite falling real food prices in Kenya during the 1970s, the profitability of grain production actually increased due to farm productivity growth achieved in part through state investments in agriculture. For detailed analyses of the effects of these state interventions on maize technology adoption, see Rohrbach (1989) and Howard (1994).

¹⁰Pan-territorial pricing was particularly burdensome, especially in Tanzania, Zambia and Zimbabwe, since it raised the share of grain delivered to the boards by smallholders in remote (but often agronomically high-potential) areas where transport costs were high (Bryceson, 1993; GMB, 1991).

their withdrawal. Several factors shaped this change. Donors lost patience with phased and partial reform programs that were increasingly seen as propping up costly and otherwise corrupt and unsustainable pricing and marketing policies rather than facilitating reforms (Jones, 1994). In addition, political economy models (e.g., Bates, 1981) suggested that state interventions in agricultural markets, while ostensibly designed for rural development or to correct for market failures, were in fact designed to serve the interests of a dominant elite composed of bureaucrats, urban consumers, and industry. Land allocation was a tool for meting out political patronage and loyalty, and as influential elites acquired big farms, they developed strong individual incentives for a state marketing apparatus that would ensure high prices and subsidized inputs for their farm activities.

By the early 1990s, governments such as Kenya, Zimbabwe, Malawi, Zambia and Tanzania had no choice other than to cut back on state marketing services because i) they could no longer sustain these expenditures in the face of mounting budget deficits, and ii) international lenders (mainly the World Bank and IMF) were unwilling to provide additional loans without guarantees that governments would address the sources of the deficits – with public maize and fertilizer marketing programs being major sources. In Zimbabwe, even though 17 additional permanent buying stations were established between 1985 and 1992, the number of seasonal rural buying stations declined from 135 in 1985 to 42 in 1989 to 9 in 1991. Disbursement of government credit to smallholders declined steadily from a peak of Z\$ 195 million in 1987 to under Z\$ 40 million in 1994 (in constant 1994 Z\$). Fertilizer purchased by smallholders has also stagnated in some countries after 1993 when major maize policy reforms occurred.¹¹ In Zambia, grain area, fertilizer use, hybrid seed purchases, and production have all declined since the late 1980s due to a combination of lower real producer prices, higher real fertilizer prices, deteriorating state marketing services, and a reduction in available state credit. Fertilizer nutrient use, which peaked in 1986/87 at 88,000 tons, declined to less than 60,000 in 1994/95. Hybrid maize seed purchases declined from 15,000 tons in 1989/90 to 4,799 in 1994/95. In Malawi, the use of hybrid maize and fertilizer expanded rapidly in the early 1990s, but then plummeted after 1994 due to the collapse of the agricultural credit system.

While the post-independence model of service provision to smallholders appears to have had important successes in boosting grain production and incomes in some rural areas, by the mid-1980s major problems had emerged in all the countries that propelled the grain marketing systems toward reform. Future discussions about state-led marketing approaches to support smallholder input intensification and productivity must address these problems:

- 1) **Cost containment of marketing board activities:** How can the state-led systems be designed to keep costs within sustainable levels? The major issues are: i) the more the state directly operates in markets, the more it tends to crowd out potential private sector activity, thus forcing the state to handle marketing tasks of the entire system; ii) how to defend producer incentives over time, especially if state activity is successful in stimulating farm input and production growth and finds itself accumulating expensive grain stocks; iii) related to ii, how to absorb and find economically viable uses of surplus crop output; iv) how to minimize the potential for marketing boards to be used in politicized ways that impose additional costs and inefficiencies on the state and often on both farmers and consumers (Sahley et al., 2005; Jayne et al., 2002); and v) how to avoid the treasury costs of state fertilizer and maize marketing operations that led to their implosion during the 1980s. Maize marketing and input subsidy programs were so large that they contributed to macroeconomic instability and hyperinflation in Zambia (Jansen and Muir, 1994), and to a lesser extent in Tanzania and Kenya (Amani and Maro, 1992; Odhiambo and Wilcock, 1990). Zambia's National Agricultural Marketing Board's operating losses were roughly 17% of total government budgets in the late 1980s (Howard and Mungoma, 1997).
- 2) **Credit systems:** While it is sometimes stated that small farmers' access to input credit for fertilizer and seed was caused by the transition to "liberalization" and the contraction of state marketing board activities (e.g., Dorward et al., 2004), studies at the time show that state systems of farm input credit were already in serious difficulty due to massive credit non-repayment. In Zimbabwe, almost 80% of smallholder recipients of state credit were in arrears in 1990 (Chimedza, 1994). In Zambia, which continued fertilizer

¹¹Kenya is a major exception to this (see <http://www.aec.msu.edu/agecon/fs2/kenya/pb07.pdf>).

and seed credit programs until 1999, repayment rates never exceeded 43% and were generally in the 20-30% range (MACO/ACF/FSRP, 2002). The state systems for seed and fertilizer delivery and crop payment became increasingly unreliable over time, especially in Zambia, Tanzania and Kenya, (Howard 1994; Amani and Maro, 1992; Westlake, 1994).

- 3) Pan-territorial and pan-seasonal pricing:** Uniform pricing has the effect of depressing the scope for private trade, and forces the state into performing most of the marketing functions at wholesale level. Pan-territorial pricing also encourages farmers near urban demand centers (and who are implicitly taxed through pan-territorial pricing) to resort to parallel markets (as occurred in Tanzania, Kenya, and Zambia during the 1980s) and/or switch to other, uncontrolled crops (as in Zimbabwe and South Africa in the late 1980s and early 1990s). Declining volumes through the state marketing channels further exacerbated the boards' trading losses.
- 4) Suppression of informal marketing channels:** Empirical evidence from the 1980s and 1990s found that the controlled marketing systems suppressed or imposed additional costs on parallel trading and processing channels that often served the interests of both producers and consumers more effectively than the official state apparatus (Odhiambo and Wilcock, 1990; Putterman, 1995; Mukumbu, 1992; Rubey, 1995; Jayne and Chisvo, 1991).

The prevailing grain wholesaling systems, circa 2009

Despite the conventional perception that food markets have been "liberalized", many African governments, particularly in eastern and southern Africa but also in parts of West Africa, continue to intervene heavily in food markets. The stated purpose of most government operations in markets is to stabilize food prices and supplies. Governments pursue price stabilization objectives through two main routes: i) marketing board operations and ii) discretionary trade policy instruments, such as export bans and import tariff rates. A defining feature of the marketing environment in the "liberalization period" in most of eastern and southern Africa has been the tremendous unpredictability and frequent change of direction

in governments' role in the market. In this shifting policy environment, the private sector's response in most countries has been muted, especially at the critical wholesaling stage (storage, linkages between farm assembly and wholesaling/processing stages, and long-distance trade, including regional trade).

Marketing board operations – Marketing board operations have generally been more modest in recent years than during the pre-control period. However, they continue to be major actors in their countries' maize markets. Using data provided by the national marketing boards between 1995 and 2004, the boards' annual purchases have fluctuated from an estimated 15-57% of the domestic marketed maize output in Kenya, 3-32% in Malawi, and 12-53% in Zambia (Jayne, Nijhoff and Zulu, 2006). These figures understate the boards' full impact on markets because they do not count their often sizeable maize imports and subsequent release onto domestic markets. Because the boards are typically the largest single player in the market and often behave unpredictably, their operations can create major risks and trading losses for other actors in the market. In countries such as Malawi, Zambia, Zimbabwe and Kenya, the marketing boards' involvement appears to have risen in recent years, as budget support from governments has shifted somewhat over the past decade from "conditionality" agreements to minimally tied or untied budget support.¹²

Discretionary use of trade policy instruments – In addition to direct involvement in crop purchasing and sale at controlled prices, governments influence markets and marketing participants' behavior through discretionary trade policy instruments, such as export bans, changes in import tariff rates, and government import programs.

Available evidence since 1990 indicates that governments' attempts to stabilize food prices in some cases has made food prices more stable (e.g., for Kenya, see Jayne, Myers and Nyoro, 2006), or more often, more volatile (Rubey, 2004; Tschirley et al., 2004; Nijhoff et al., 2003). The latter cases are exemplified by the Government of Malawi's response to an anticipated maize production shortfall in the 2001/02 season. Malawi faced a modest maize production deficit for its 2001 harvest, 8% below the country's 10-year mean. In September 2001, the grain trading parastatal, ADMARC, announced a fixed price for maize

¹²Conditionality agreements typically identified specific policy reforms or actions that governments would commit themselves to doing in exchange for receiving loans from international lenders. Untied loans are financial injections directly to the Ministry of Finance without specific strings attached as to how the funds are to be spent.

to be sold at its distribution centers and announced its intention to import maize from South Africa to defend this price (Rubey, 2004). Because ADMARC's selling price was considerably lower than the landed cost of importing maize, private traders had little incentive to import maize in this environment. However, the government imports arrived late and were not sufficient to meet demand. As a result, ADMARC depots began to experience stock-outs, and prices soared (Rubey, 2004). When it became clear that ADMARC's supplies were insufficient to last the full season, private traders scrambled to import, but for several months much of rural Malawi experienced grain shortages and prices were reportedly as high as US\$ 450 per ton in early 2002. The late-to-arrive ADMARC imports arrived during the good 2002 harvest. For financial reasons, ADMARC had to work down its stocks to free up resources, and these releases onto the market in a good production year produced 16 months of continuously declining maize prices, to the detriment of producers' incentives to intensify their maize production (Tschirley et al., 2004; Rubey, 2005). This case illustrates that well-intentioned but poorly implemented government actions can exacerbate food price instability rather than reduce it.

Similar problems arise due to uncertainty about when and whether governments will alter their import duties in response to a short crop. Traders that mobilize imports early face financial losses if the duty is later waived and competing firms (or the government parastatal) can import more cheaply. When governments create uncertainty over import tariff rates during a poor crop season, the result is commonly a temporary under-provision of imports, which can then result in shortages where local prices exceed import parity levels for periods of time (Nijhoff et al., 2003). Analysts not familiar with the details of these situations often erroneously interpret them as evidence that markets fail and that the private sector is weak, leading to a rationale for continued direct government involvement in marketing.

Since the early 1990s when the liberalization process began, the marketing boards in Malawi, Kenya, Zambia and Zimbabwe have frequently imported maize in volumes that are large compared to the size of the market, and sold at prices considerably below the cost of commercial importation. The expected return to private storage in this policy environment is considerably lower than what it would be if prices were allowed to fluctuate between import and export parity. This has impeded private investment

in storage, particularly at the wholesale level. Because governments often attempt to truncate the distribution of food prices at both the upper and lower ends, stockholding is risky and there are no assurances that normal intra-seasonal price rises will occur due to the uncertainty over government action. Moreover, most of the silo capacity in countries such as Kenya, Malawi and Zambia remains in public sector hands. The potential for selling parastatal storage facilities at concessionary prices as part of some future privatization plan acts as a deterrent to new commercial investment in storage (Kopicki, 2005). While some analysts point to the large intra-seasonal price variability observed in countries such as Malawi and Zambia as indicators of weak private sector capacity and the limitations of market liberalization, the market environment in most of the region does not provide a meaningful counterfactual to assess the private sector's capacity to engage in inter-seasonal storage.

In countries where government involvement in food markets is seen as part of a transitional phase towards full market reform, predictable and transparent rules governing state involvement in the markets would reduce market risks and enable greater coordination between private and public decisions in the market. The phenomenon of subsidized government intervention in the market, or the threat of it, leading to private sector inaction, is one of the greatest problems currently plaguing the food marketing systems in the region. Effective coordination between the private and public sector would require greater consultation and transparency with regard to changes in parastatal purchase and sale prices, import and export decisions, and stock release triggers (concrete proposals are discussed in the fourth section of this paper). As stated by Oygard et al. (2003), "unless some very predictable and credible management rules can be established for the reserve, private agents will be reluctant to hold stocks, out of a fear that the reserve will be sold out at unpredictable times at subsidized prices, undercutting the value of their stored commodity."

This approach does not imply that government need be impassive. The big problem is to avoid swamping the whole system with government stock releases or relief aid that is uncoordinated with what the private sector is doing.

Governance and markets – A complicating factor in supporting the development of food marketing systems to promote small farmer productivity growth is that food markets are politically sensitive. Elections can be won or lost through policy tools to

reward some farmers with higher prices and reward others with lower prices, and this is hardly unique to developing countries (Bates, 1981; Bates and Krueger, 1993; Bratton and Mattes, 2003; Sahley et al., 2005). The issue of how to stabilize food markets is transcended by issues of governance. The transition to multi-party electoral processes over the past decade may have intensified the politicized nature of food prices in some cases as political parties compete to show how they will deliver benefits to the public in times of need (Toye, 1992; Sahley et al., 2005). This kind of environment, in which political struggles are played out in food marketing and trade policies, create major challenges for developing a market environment that provides adequate scope and incentive for private trade. A comprehensive framework for addressing the challenge of making markets work better for smallholder farmers requires a political economy approach. A political economy approach is required to move beyond analysis that attributes failure to implement reforms and encourage market-based risk transfer mechanisms to insufficient “political will”. Likewise, a political economy approach is required to convincingly demonstrate how past failures of state intervention in markets can be overcome so as to address small farmers’ real needs for sustainably using improved seed and fertilizer.

A major challenge is how to move away from a situation where leaders feel they have to be seen as “doing something” by taking populist stances that may entrench dependence on food or fertilizer handouts in response to instability related food crises, but which do little to alleviate poverty or hunger in the longer run, and how to create constituencies for policies that are believed to promote market stability and small farm incentives to sustainably use improved seed and inputs, but which may not necessarily provide short-term patronage benefits. Possible policy options are discussed in the sixth section of this paper.

Experiences with specific market-oriented mechanisms to defend output price incentives in the face of supply expansion

This section summarizes the review by Byerlee, Myers and Jayne (2006) on specific marketing interventions and approaches to encourage the sustained adoption of productivity enhancing green revolution inputs by small farmers. There are three potential types of such policy responses. The first type – piloting and facilitating the adoption of market-based risk management instruments – is consistent with creating

space for private markets and transitioning to a market-based system, while retaining an important public goods provisioning role for governments. The second type, including strategic reserves, involves a strong role for government in the management of national food systems. Focusing on market-based risk management instruments might best be viewed as long-run investments that require the sustained development of marketing institutions, and which can eventually be fully consistent with long-run market development. Strategic reserves might best be viewed as short-run measures designed to achieve specific short-run food security objectives that, depending on how they are implemented, may be in conflict with transitioning to a market-based system.

There are many different types of market-based instruments that are either being used, or potentially could be used, to manage food system risks in developing countries. Similarly, there are many different participants in the food system that could potentially benefit from using these instruments, ranging from individuals, households, and firms engaged in producing, storing, processing, and trading food commodities to public marketing agencies participating in and regulating food markets. Table 2 summarizes the major types of market-based risk management instruments and also suggests the degree to which different potential users might find the instruments useful.

Because public and private sector use of futures and options markets are unlikely to coexist very easily, governments are going to have to make a choice between centralized control of procurement and hedging activities and a decentralized approach that encourages more private sector participation. The latter approach has significant advantages and is more consistent with the long-run emergence and development of market-based institutions. However, extensive decentralized use of futures and options contracts is not going to emerge rapidly or spontaneously. Growth will require public investments in education and capacity building, as well as institutional innovations that facilitate indirect use of these instruments by smaller scale farmers and traders.

One final point about futures and options hedging is that, even when relevant markets are available, they only allow risk reduction over the short run and are generally not useful for hedging annual income fluctuations over long time periods (Gardner, 1989; Lence and Hayenga, 2001). This is a limitation

in terms of the degree of risk reduction that is possible, but has the benefit of forcing market participants to continue to be responsive to longer-run changes in prices, which is desirable from an economic efficiency perspective.

Index-based weather insurance is a class of financial derivatives written against deviations from a threshold rainfall or temperature indices constructed from objective weather records measured at secure weather station locations throughout a country. Index-based weather derivatives are quite common in developed countries where contracts are primarily focused on heating-degree and/or cooling-degree-days in major cities, and are used by firms whose returns depend heavily on the weather (e.g., electricity generation). They are less common in developing countries. Weather insurance is not focused directly on managing price risks, at least for the micro-level product for farmers. In fact, when producers are receiving payouts on their rainfall insurance then yields should be low and prices generally

insurance will require public investment in developing both insurance products and the institutions to support viable insurance markets. This is another example of long-term institution and capacity building that is consistent with long-run market development.

In our assessment, commodity linked finance and village cereal banks are relatively far down on the list of institutional innovations options with the potential to cost-effectively address the problems of food price instability and market development.

Relying on a market-based approach to managing food system risks has a number of distinct advantages. From a policy perspective, a market-based approach to risk management should not require large persistent budgetary outlays as has occurred historically with price stabilization schemes. Perhaps the most important advantage of using market-based risk management instruments is that in general they facilitate and enhance the role of the private sector in the food system rather

Table 2. Market-based risk management instruments and their potential users

Potential user	Potential for risk management instrument				
	Credit markets	Warehouse receipts	Futures and options	Weather index insurance	Commodity-linked finance
Small-scale farmer	High	High	Low	Moderate	Low
Small-scale trader or processor	High	High	Low	Low	Low
Larger-scale farmer	High	High	Moderate	High	Low
Larger-scale trader or processor	High	High	High	Low	Moderate
Consuming households	High	Low	Low	Low	Low
Public food/strategic reserve agency	High	Moderate	Moderate	Moderate	Moderate

higher (but with incomes low due to reduced yields). In this way the insurance acts more like an income safety net for producers rather than price insurance. The weakness of the index-based weather insurance approach is that returns to individual farmers or traders (or the food prices paid by individual consumers) may not be strongly correlated with the weather index and hence the insurance payout. While index-based weather insurance may not be attractive to all food sector participants in all situations, these contracts do have considerable potential in managing risks and providing a safety net in times of climatic stress.

Similar to the case of futures, options, and warehouse receipt systems, the growth and development of index-based weather

than displace it. The use of market-based risk management can improve price discovery, enhance market efficiency, and improve price transparency and information dissemination throughout the marketing channel.

Despite the apparent potential for using market-based instruments to manage food sector risks, there has been little use to date of these instruments in low-income countries for a number of reasons. Contract enforcement may be difficult for food staples in times of local shortage. The small size of farms and traders serving the traditional food sector in these countries, as well as poorly developed financial markets,

also limit the liquidity required for successful trading. Few of these countries have the market intelligence systems, grades and standards systems, communication systems, storage and marketing infrastructure, and experience and education to use these markets effectively. Basis risk is another major impediment to both futures and options trading and index-based weather insurance.

One of the most serious impediments to innovation and development of risk management markets for food sectors in many countries is continuing discretionary state interventions in food markets. The discretionary nature of policy interventions reduces or destroys the incentive to participate in market-based risk management mechanisms because there is no incentive to manage risk when prices are being effectively stabilized via policy, and because such policies tend to disconnect local prices from world prices, which reduces the hedging potential of global markets. Furthermore, if government interventions are discretionary and difficult to predict, then they can add another layer of risk that individuals and firms may find difficult to hedge using available market-based risk management instruments.

Competing visions of staple food market development

In much of eastern and southern Africa, food markets continue to be plagued by a high degree of uncertainty and *ad hoc* government entry into and retreat from markets, despite official policy pronouncements that are largely inconsistent with actual state behavior. These inconsistencies give rise to problems of credible commitment regarding governments' policy statements, and hence create risks and costs for private traders. The high degree of policy uncertainty and control over trade impedes private investment to develop access to markets and services for smallholder farmers.

Many countries in eastern and southern Africa have continued highly discretionary market and trade interventions of various types, and hence an empirical assessment of these countries' food market performance since the 1990s reflects, not the impacts of unfettered liberalized market, but rather the mixed policy environment of legalized private trade within the context of continued strong government operations in food markets. There is widespread agreement that this food marketing policy environment, however it is characterized, has not effectively supported agricultural productivity growth for the millions of small farmers in the region.

Local banks also tend to withdraw from lending to the sector and allocate most of their investment capital to relatively safe and high-interest government bonds. In these ways, there is still a great deal of sectoral reform to be gained in Africa, not necessarily to liberalize private trade but to unencumber it from the risks and high costs posed by unpredictable government actions in food markets.

Three competing models have dominated policy discussions in Africa over the past decade regarding the appropriate role of the state in staple food markets (Figure 5):

Model 1 – State role confined to provision of public goods to strengthen markets: This approach relies on the private sector to carry out the main direct marketing functions, i.e., purchase/assembly from farmers, wholesaling, storage, transport, milling and retailing. The role of the state is confined to provision of public goods: market rules and regulations, physical infrastructure, regulatory oversight of finance, market information, investment in new technology, organizing farmers into groups for means of reducing costs and risks of accessing finance, inputs and marketing. This position is close to the “Washington Consensus”, which is now generally out of favor.

Model 2 – Rules-based state interventions to stabilize market activity: This approach also relies on markets to carry out most of the direct food marketing functions, but the role of the state is expanded to include direct marketing operations, especially in the arrangement of imports, the management of food buffer stocks, and the release of stocks onto markets when prices exceed a publicized ceiling price. The rationale for state operations is based on the premise that markets fail in some respects and direct rules-based state operations are necessary maintain food prices within reasonable bounds. The defining feature of Model 2 is that there is pre-commitment: the rules governing state operations are determined in advance, publicized, and followed in a non-discretionary manner. This approach appears to be favored by many technical analysts.

Model 3 – Discretionary state intervention to provide the state with maximum flexibility to achieve policy objectives: The defining feature of this model compared to Model 2 is that state operations are not confined to pre-committed rules that would constrain the state's ability to intervene only when these intervention criteria are met. Most governments in eastern and southern Africa are essentially following Model 3 and have

done so from the start of the liberalization process. In practice, Model 3 has provided a highly unpredictable and discretionary approach to grain trade policy – commonly imposing export and import bans, variable import tariffs, issuing government tenders for the importation of subsidized grain, and selling their grain stocks to domestic buyers at prices that are unannounced in advance and often far below the costs of procuring it.

There are very few examples of Model 1 for staple foods to examine in Africa or perhaps anywhere for that matter. The rationale for Model 2 is that well-executed parastatal price stabilization operations can, in theory, put an upper bound on food prices and also protect against downside price risk by defending floor and ceiling prices through stock accumulation and release onto markets. Successful implementation of Model 2 requires that marketing boards possess a great deal of technical and management skill.

The weaknesses of Model 2 are that i) given the long history of ad hoc state intervention in food markets, it is not clear whether Model 2 can be regarded as a credible policy; and ii) given constraints on available government funds for agriculture, spending on expensive government operations in food markets reduces the amount that can be spent on public investments that could potentially earn a higher social return.

Despite being the most common approach for the role of government in food markets, Model 3 is clearly vulnerable to lack of trust, cooperation and coordination between the private and public sectors. A discretionary approach to government operations creates great risks for the private sector and tends to impede it from performing functions that it would otherwise do more confidently under Models 1 and 2. The poor performance that results from this high degree of uncertainty and lack of coordination is often attributed to market failure, but a strong case can be made that the more central and underlying causes are chronic under-investment in public goods and a lack of credible commitment in the policy environment, leading to low levels of trust and coordination among public and private sector actors in the staple food systems.

Although price stabilization could, in theory, have important benefits for producers and poor consumers, along the lines of Model 2, these benefits do not appear to have been successfully achieved because they have been pursued more along the lines of Model 3, i.e., unpredictable and untimely changes in import tariff rates, ad hoc restrictions on private importation, etc. In fact, price instability appears to be greatest in the countries where governments continue to rely heavily on marketing boards and discretionary trade policies to stabilize prices and

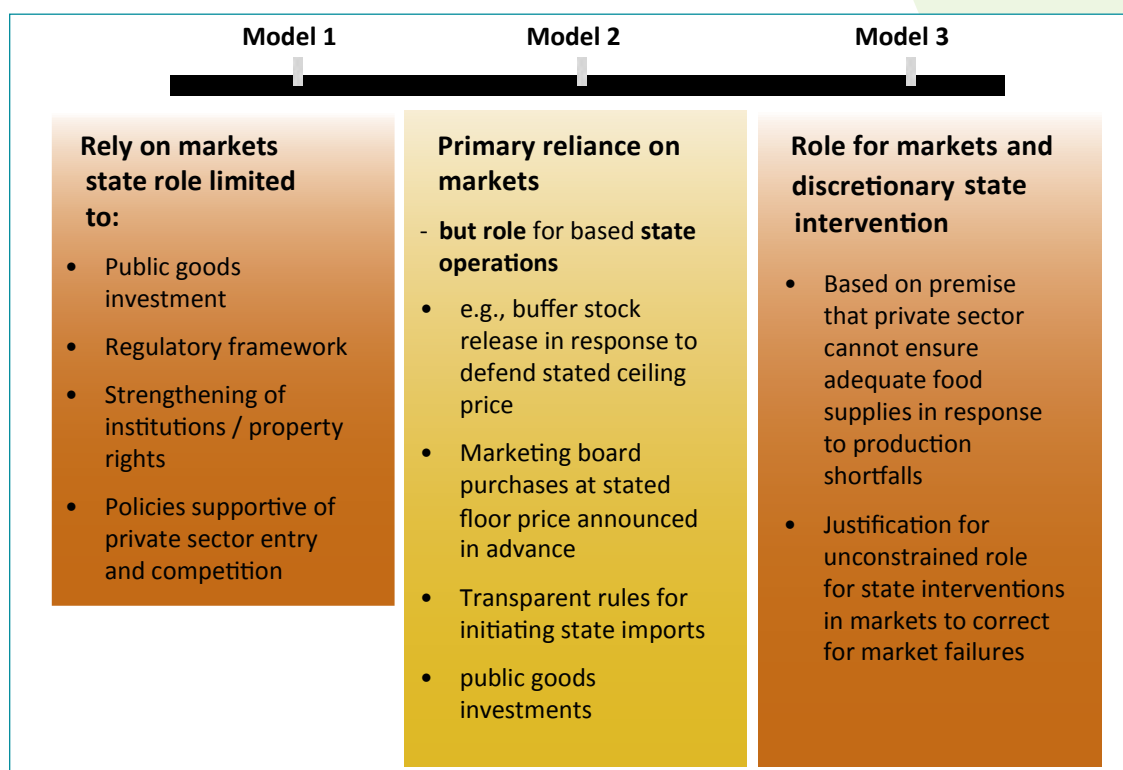


Figure 5. Competing visions of staple food market development

supplies (Chapoto and Jayne, 2009). Maize price instability in countries like Malawi and Zambia are extremely high despite the persistence of these government operations. In contrast, the operations of Kenya's maize parastatal have reduced price instability (Jayne, Myers and Nyoro, 2008). While it is difficult to estimate the counterfactual – that is, the level and instability of food prices that would have prevailed over the past 15 years in the absence of these government operations – there are strong indications that at least some aspects of government interventions in food markets have exacerbated rather than reduced price instability for both producers and consumers.

Conclusions and implications for green revolution strategies

The potential productivity gains achievable from improved crop science are enormous. However, there is a general consensus that the existing food marketing policy environment in most of Africa is not encouraging – and in many ways discouraging – the growth in farm productivity required to raise living standards and reduce poverty. One of the region's major development challenges is to identify and put into place the policies, institutions and investments that will enable agricultural marketing systems to catalyze productivity growth on the millions of smallholder farms in the region.

A major insight from commodity value chain analysis and the earlier industrial organization and commodity sub-sector literature of the 1970s, 1980s and 1990s is that risks, uncertainties and lack of profitability at one stage of the system will impede incentives for investment at other stages of the system, depressing overall performance of the value chain. In particular, efforts to promote performance at either end of the value chain (e.g., assembly or storage investments at village-level, or retail market development) can be stymied by poor performance at the crucial middle stages of the system (Shaffer et al., 1983). It is at the wholesale level where i) almost all of the seasonal storage takes place downstream from the farm; ii) most of the demand for financing grain purchases from farmers originates; and iii) long-distance spatial arbitrage opportunities are identified to reallocate supplies from surplus to deficit areas and link farmers and assemblers with processors, retailers and consumers in distant areas.

It is useful to distinguish between “first-order” marketing improvements – which are fundamental pre-conditions for

farm productivity growth to occur – and “second-order” improvements, which will support small farmer productivity growth as long as the fundamental first-order issues are meaningfully addressed, but which will have only limited impacts if they are not. The fundamental first-order improvements revolve around getting the critical middle stages of staple food value chains moving – the wholesaling and processing stages. A competitive wholesaling stage of the value chain tends to give rise to greater investment at the first-buyer (assembly) stage who buy direct from farmers. Wholesalers are also an important source of financing and contracting that enables assemblers to more aggressively compete for farm surpluses early in the season when prices are low. These kinds of developments help to reduce the magnitude of price gluts.

However, if the policy environment remains highly risky and uncertain, and if governments use their scarce resources in ways that do not provide greater profit incentives for the private sector, then there will be very limited scope for further investment in the wholesaling and assembly stages to provide smallholder farmers with the access to markets that they need. A highly uncertain policy environment full of risk will also scare off bank financing for needed investment in the sector. This path will lead to frustration over the private sector's apparent unwillingness to invest in support of smallholder agriculture. On the other hand, if the public sector defines its role clearly and implements these roles transparently and consistently, and also uses its scarce resources to invest in public goods that provide new profitable opportunities for private sector investment, then this approach is likely to result in much greater private sector investment in support of smallholder agriculture. Private capital tends to seek out profitable opportunities with tolerable exposure to risk. If the conditions are created for profitable private investment, the private sector has generally been able to respond. Private sector investment patterns and the supply of bank financing for private investment are largely outcomes of public sector behavior – policy choices, the integrity of institutions, and the ways funds are spent through the treasury.

Specific options to support productivity growth on African farms include the following:

- 1) **A more transparent and consultative framework for public-private sector dialogue**, one that moves towards greater coordination and predictability in government behavior.

The current policy environment in many African countries since the early 1990s features parallel systems in which the government and private sector both operate directly in food markets. The unpredictable and highly discretionary nature of government policy in grain markets has impeded private sector investment and commitment to value chain development, retarding overall progress toward economic growth and poverty reduction. If the future remains highly uncertain with respect to the role of government in the market, evidence has shown that there will continue to be an under-provision of investment in seasonal storage, transport and logistical networking, information systems and commodity exchanges, market risk-shifting mechanisms such as forward and future contracting, financing innovations like warehouse receipt systems, industry led processes for resolving contract problems, and other critical investments at the wholesaling stage that influence the overall development of the value chain (Coulter, 2005; Jayne, Nijhoff and Zulu, 2006; Kherallah et al., 2002; McPherson, 2002; Goldsmith, 2002). Greater predictability, consultation and trust between the public and private sectors could pull millions of smallholder farmers out of poverty and start economy wide growth processes.

- 2) **Public good investments to support the development of food markets.** Markets require investments in public goods to function effectively – roads, rail systems, port facilities, solid regulatory frameworks to support the development of transport, communication, and financial services, crop science and farm extension services to help farmers increase surplus production and fuel market expansion. Much of the problem with food price instability and the price slumps that often accompany output supply expansion is inelastic demand, i.e., small changes in output have large effects on price levels. Governments can play a critical role to support small farmer productivity growth by supporting the development of well-performing markets through public goods investments.
- 3) **Public good investments in physical transport infrastructure,** coupled with a policy environment to nurture regional trade and integrate smallholder farmers into regional and global markets can make the demand for grain more elastic, thereby enabling food markets to better absorb supply expansion caused by farm productivity growth.

- 4) **Recognize the role of producer organizations.** Under the conditions of incomplete markets and institutional gaps that limit commercialization of smallholder production, innovations in producer organization and collective action institutions can play an important role for African farmers. Producer organizations can play multiple roles in dynamic markets: i) increase market access through aggregation and collective marketing which enhance scale economies and reduce marketing costs for small producers; ii) improve access to rural finance and key inputs (e.g., seeds and fertilizer) at affordable prices; and iii) provide voice and representation to promote the interests of small producers in policy discussions. Given the unsuccessful experiences of producer cooperatives in the past – which often suffered from weak management, disincentives of relatively good farmers to remain in the organization, and heavy interference by governments – producer organizations need to be designed and promoted carefully and require supportive policies for their success. The role of the government would be to provide the appropriate legal and regulatory frameworks for proper functioning of farmer organizations and provide financial support to cover the initial transaction costs that prevent farmers from organizing themselves. The support provided for facilitating the establishment of these rural institutions should be commensurate with the public goods role of producer organizations in enhancing coordination and performance of rural markets (Kydd and Dorward, 2004; Shiferaw et al., 2009). Producer organizations aiming to improve market access for small producers need to be managed professionally as agri-business enterprises, free from rent-seeking behavior and irrational interventions by governments. Farmer organizations should complement the functions of the private sector and not replace it.
- 5) **Regional trade.** In combination with good transport infrastructure between countries, regional trade has the potential to expand the size of the market, increase the elasticity of demand facing farmers, and reduce price instability. For non-tradable commodities where price shocks are generated by domestic events such as weather, the magnitude of the shock will be closely related to the variability of domestic production. But local production shocks can be mitigated by regional trade, which tends to stabilize markets by linking together areas with covariate

production. The size of a country matters – larger countries typically have more diverse regional climatic conditions that reduce systemic risks at the country level.

- 6) Streamlining regulations and trade barriers.** Many African countries impose import tariffs on staple foods coming from neighboring countries. Other countries frequently resort to export bans. These trade barriers often vary unpredictably, and so make it risky for trading firms to invest in developing durable marketing networks across regions. Customs clearance procedures are often cumbersome. For example, permits to legally import grain into Kenya are available only in Nairobi (Nyameino, Kagira and Njuria, 2003). Traders wanting to move product from northern Mozambique to southern Malawi need to get export permit in Quelimane (Tschirley, Abdula and Weber, 2005). These regulatory barriers impose transaction costs on traders that result in lower demand and lower prices for farmers (and higher prices for consumers). Streamlining the regulatory processes for regional trade can reduce downside price instability that often depresses farmer incentives to sustain their use of productivity enhancing cash inputs.
- 7) Turning some grain marketing board silos and go-downs into storage leasing operations.** The current situation is characterized by a general shortage of storage space for grain, especially in urban areas, but little incentive for investment in commercial storage. Further study could identify the potential for farmer groups or traders to rent out storage space under 10-15 year leases. Leases of this time length are generally required to allow traders (the renter) to recoup the costs of the required rehabilitation investments to make the silos operational again. In countries such as Kenya, Zambia and Malawi, most of the marketing board silos were built in the 1970s and are in need of rehabilitation. Greater storage facilities, coupled with better financing arrangements, could help the commercialized grain marketing system to defend against downside price risk.
- 8) Support the development of rural financial markets to improve traders' capacity to absorb surplus production.** While the importance of small farmer credit in promoting the uptake of improved farm technology is well recognized, the role of trader finance is also crucial. A major source of inelastic demand in traditional food markets is the constrained supply of trader finance (Coulter and Shepherd, 1995). Market institutions such as warehouse receipt

systems can inject needed liquidity into grain marketing systems and thus allow the system to better absorb surplus production in good years. But the development of these market institutions will depend on supportive government policies. So far, fledgling attempts to develop warehouse receipt systems and other innovative sources of trader finance in staple food assembly and wholesaling markets (e.g., Ghana and Zambia) have floundered due to direct government operations in markets that have been incompatible with the development of these institutions.

- 9) Resolving the future uncertainty of marketing boards' role in grain markets.** There is something of a "catch-22" with regard to the development of new (or rehabilitation of existing) storage facilities in many African countries, despite the critical need for additional usable storage space in many areas. Most of the grain silo space in countries such as Kenya, Zambia, Zimbabwe, Malawi and Tanzania remains in the hands of government parastatals or cooperatives. Taking Kenya as an example, and despite the fact that additional usable storage facilities are a major contributory problem to output price slumps during good harvest years, there is a lack of clarity about whether and how the NCPB's assets are to be sold off or transferred to private firms under a comprehensive NCPB restructuring process. This uncertainty impedes the incentives for new private investment in grain storage (Kopicki, 2005). It is possible that NCPB assets could be sold at discounted prices to politically well-connected firms or individuals starting up new marketing firms. Their subsidized cost structure would put other competing firms (which might otherwise consider paying full commercial costs for investments in storage) at a competitive disadvantage. Private investment in capital-intensive storage and other dedicated marketing assets could be rendered unprofitable if the NCPB were to re-enter the market in a big way in the future, buying at above-market prices, selling at below-market prices, and covering its trading losses through the treasury. In this way, the uncertainty with regard to future maize marketing policy in Kenya is clearly impeding the development of the maize marketing system in a way that could over time allow it to reduce downside price risks for small farmers. Greater policy stability and future predictability of the policy and institutional environment are hence major priorities for supporting smallholder productivity growth.

10) New roles for marketing boards. If marketing board operations are to continue as part of a transition strategy, market stability could be facilitated by changing the boards' longstanding practice of setting pan-seasonal buying and selling prices (prices that are constant throughout the marketing year). By offering pan-seasonal prices, the boards eliminate incentives for farmers to store grain after harvest or to invest in storage facilities. It also reduces the incentives of wholesalers and millers to invest in adequate storage facilities, since they can buy from the boards at the same price throughout the year. And, even though food prices in wholesale markets fluctuate freely since the liberalization process began, the behavior of these markets is influenced greatly by marketing board pricing, which continue to be pan-seasonal.

11) Work with WFP and bilateral food aid donors to develop mutually beneficial policies towards food aid (and subsidized non-commercial imports). While local farmers are generally well served by regional trade, their interests can be undermined by subsidized food imports, particularly if this alters long run food consumption patterns. For example, large processing companies in urban areas are often able to acquire subsidized wheat and rice from international sources, which over time influences urban consumption habits. With few exceptions, most smallholder areas are not suited to wheat and rice production. The importation of subsidized wheat and rice undermines long-term demand and prices for the main staple grains, roots and tuber crops that small African farmers produce. Similarly, inappropriate uses of imported food aid (e.g., the sale of imported food aid by NGOs during periods of local production surplus) are likely to depress small farmers' uptake of improved farm technology over time (Tschirley et al., 2004; Dorosh, Dradri and Haggblade, 2007).

12) Consider developing specific risk-management marketing arrangements where feasible. The development of futures and options contracts in well-developed commodity markets could have some clear advantages for managing food price risks in low-income countries. However, such market-based risk-management tools are not likely to develop without active public policy support and more predictable government operations in markets. Direct trading of market-based risk management instruments by public food

marketing agencies to hedge government liabilities is an option that could be adopted very quickly. However, this is a risky venture for the public sector. Not only does such trading require considerable information and analytical capacity but is subject to the same problems of inefficiency and rent seeking that have plagued direct public intervention in food markets in the past, especially when there is no credible commitment regarding how the gains will be spent (and the losses financed). An alternative approach would be to encourage private sector use of these markets by making long-run investments in the standard public goods relating to the enabling environment for finance and risk markets, including grades and standards, credit market development, communication systems, market intelligence systems, regulations, and support for locally or regionally-based commodity exchanges and insurance products. Perhaps most important, governments can provide a predictable policy environment that does not destroy the incentives for private individuals and firms to trade market-based risk management instruments.

Change is also needed among "rich country" governments. The prevailing international agricultural trade policy environment is both hypocritical and not supportive of African farmers. International donors try to convince African governments of the virtues of liberalization and open markets, but then subsidize their agriculture and restrict markets for African exports in the process (World Bank, 2000). These subsidies (and the food aid generated from them) affect the long-term competitiveness of African agricultural production.

There is widespread dissatisfaction among developing countries with the framework for international agricultural trade agreements. In particular, access to developed country markets has not been achieved to the promised extent, and many developing countries have experienced import surges following trade liberalization. Moreover, the Agreement on Agriculture appears to have been designed largely with "developed country agriculture" in mind, as it institutionalizes the production- and trade-distorting practices employed by the most powerful countries. These countries now enjoy a unique privilege among WTO members, in the sense that the agreement gives them the legal right to continue to affect agricultural markets through their production and trade subsidies.

Each year, OECD countries provide roughly US\$ 50 billion per year in development assistance, while subsidizing their agricultural production by anywhere from US\$ 350 to US\$ 500 billion per year (McCalla, 2001). This is greater than the GDP of Sub-Saharan Africa (Wolgin, 2001). Some of these subsidies may help African countries, such as those that are net importers of grains. Recent OXFAM and IFPRI reports draw specific attention to the need for changes in developed country agricultural policies and a more level playing field in global agricultural trade agreements to raise agricultural growth and reduce poverty in Africa and other parts of the developing world. For developed country governments and their citizenry who are truly committed to making globalization work for poor people, most of whom are in agriculture, a more serious public discussion of agricultural protectionism in developed countries and its effects on global poverty will need to be forthcoming.

The real debate on globalization is, ultimately, not about the efficiency of markets, nor about the importance of modern technology. Rather, the debate is about the inequality of power (Sen, 2000). The future of the small farm in much of Africa will hinge on national and international negotiations regarding access to developing country markets for goods produced by African farmers and the international supply and price effects of multilateral trade agreements.

Lastly, an honest and open debate about the behavior both of donor organizations and governments in high-income countries that currently compromise the effectiveness of development assistance is needed. While these problems are thorny indeed, a more honest discussion is the first step toward tackling them. Failing to address them will simply prolong the problem. Given the general agreement that much larger financial commitments will be necessary to achieve a long-term growth path for African agriculture and its allied sectors, education and health, it will be crucial to develop the conditions for more effective absorption and use of development assistance. Reform is required both by donors and local governments, as well as in the international trade environment. This will certainly require enlightened leadership on all fronts, honesty about incentive problems, and the political will to overcome them. In such a political environment, there would be reason to be strongly optimistic about the potential for the small African farmer.

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Key actors, major initiatives, and principal funding agencies in Africa's agricultural commodity markets

Steven Were Omamo¹

Abstract

Anecdotal and empirical evidence from across Africa indicates that the continent's agricultural commodity markets do not in general function in ways likely to promote sustained agricultural development. Several initiatives in the private, public, and civil society sectors aim to improve conditions in these markets. This paper provides as comprehensive a summary of those initiatives as is possible based on published and grey literature sources. The aim is not to be fully definitive, but rather to provide a sense of the range, depth, and funding of these existing and proposed initiatives. First, the major current actors in Africa's food and agricultural markets are identified. The major funders of food and agricultural marketing initiatives are then considered. A range of initiatives in complementary sectors is also described. The picture that emerges is one of rich but uncoordinated diversity in both funding windows and operational initiatives.

Major current actors in Africa's food and agricultural markets

Private farmers, traders, processors, and consumers

The principal actors in Africa's food markets are the continent's millions of private farmers, traders, processors, and consumers. They vary greatly in size and scale of operation, ranging from tiny farms in the highlands of Rwanda and Burundi to large maize plantations in Zambia's Tonga Plateau; from itinerant hawkers peddling small cans of maize and beans at remote rural crossroads in Ethiopia's Ghibe Valley to the specialist Export Trading Company with far-flung operations in nine countries in eastern and southern Africa; from rudimentary cassava processing enterprises in rural homesteads across West Africa to the state-of-the-art facilities of Unga Mills of Kenya. Irrespective of their size and location, farmers are concerned with physical access to markets, with the riskiness of trade, and with the scope for increasing their shares of final prices. Traders and processors are concerned with costs of operation, and with accessing key trade-facilitating services, especially transport and finance.

Consumers (both individuals and firms) are concerned with price, quality, and convenience of purchased goods.

A number of large multi-national food companies have interests in Africa's food markets, including Archer Daniels Midland, Cadbury, Cargill, Del Monte, Nestle, and Unilever. Since the end of apartheid, South African food companies have gradually expanded their reach across the continent, most notably Bokomo, Maizena and Simba.

Food industry groupings

Most of these private farmers, traders, processors, and consumers operate individually, but many are members of national, regional, and international industry groupings. Most countries have national farmer associations with mandates to support farmers in a range of input and outputs markets. Examples include the Zambia National Farmers Union, the Uganda National Farmers Union, the All Farmers Association of Nigeria, and the Ghana National Association of Farmers and Fishermen. In the past, many of these farmer groups took the form of cooperative societies operating under official statutes that awarded governments majority holdings and thus control over key management decisions. Business principles were typically overwhelmed by political motives. Some farmer organizations still have such features. But with strong support from international bodies, such as the International Federation of Agricultural Producers (IFAP) and the Cooperative League of the USA (CLUSA), the new generation of associations has greater farmer ownership and control, and is therefore more commercially oriented. Many of these associations concentrate on cash crops, or on staple food crops produced by large farmers (e.g., the Kenya Cereal Growers Association). Those supporting smallholder staple food production and trade tend to be localized and multi-purpose.

Associations of food processors also exist in Africa, supported by such organizations as the International Association of Operative Millers. They are especially important in southern Africa. In South Africa, the National Association of Maize Millers and the Animal Feed Manufacturers Association and the National Chamber of Milling are strong representatives of the milling industry. Zimbabwe's Grain Millers Association and Malawi's Grain Traders and Processors Association play similar roles.

¹Deputy Director of Policy, Planning and Strategy, UN World Food Programme (WFP). The research on which this paper is based was funded by the Market Access Program of the Bill and Melinda Gates Foundation. The views expressed in the paper do not necessarily represent those of either the Foundation or WFP. Corresponding author (StevenWere.Omamo@wfp.org)

The East African Grains Council, covering Kenya, Tanzania and Uganda, was recently launched as an industry led initiative to prepare, disseminate and promote exchange of information on matters affecting the regional grain trade (further detail on this initiative is provided below under “regional initiatives”).

Consumer organizations exist in all but a few African countries. They are especially strong in Kenya, Mauritania, South Africa, Tanzania and Zimbabwe. With support from Consumers International, these groups undertake advocacy on a range of consumer rights issues, most notably food safety. With liberalization of trade in food and agricultural products outpacing the capacity of food standards authorities in many countries to enact and enforce adequate standards, these organizations advocate for the need to ensure the enactment and enforcement of minimum standards applicable to food sourced on both domestic and international markets.

Public sector agencies

Market liberalization in Africa highlighted major capacity gaps in the continent’s private sector (Kherallah et al., 2002). Given these limits, the political implications of national food security, and the key role that markets can play in determining food availability, access, and quality, few governments are inactive in food markets. Publicly controlled food marketing agencies exist across the continent. These bodies exercise varying degrees of compulsion over producers, traders, and processors. They are typically charged with stabilizing prices by purchasing and selling food on market. They also manage strategic food reserves, which can be substantial. For instance, Kenya’s strategic grain reserve stood at 540,000 mt in late 2007, equivalent to 20% of average maize harvests since 2002, and representing a market value of over US\$ 92 million. Spending on Zambia’s food reserve agency accounted for 15% of the country’s public budget for agriculture in 2004-05.

Most governments have departments devoted to provision of agricultural marketing services. In many countries, a principal service provided is collection and reporting of agricultural market information, typically focusing on prices of key staples and major cash crops. Many agricultural extension agencies include agricultural marketing support among the services they endeavor to provide farmers.

Many local authorities in rural areas influence food marketing directly through fees charged to farmers and traders wishing to sell produce in government-owned and operated rural marketplaces.

Several governments are experimenting with novel food marketing arrangements. For instance, the Ethiopia government recently launched the Ethiopia Commodity Exchange. The exchange trades in six commodities: coffee, sesame, haricot beans, teff, wheat and maize, providing a marketplace where buyers and sellers can come together to trade and be assured of quality, delivery and payment. The exchange includes a trading floor in Addis Ababa, six warehouse delivery locations, and 20 electronic price tickers in major market towns.

International and national non-governmental organizations

Several international NGOs have interests and activities in Africa’s food markets. Prominent among these are NGOs that “monetize” food aid to generate cash resources to cover non-food costs or finance food security initiatives more generally. Examples include Catholic Relief Services, World Vision, Save the Children, Land O’ Lakes International Development, and, until recently, CARE. While monetized food is often a valuable, flexible resource that these NGOs have put to good use in combating poverty and hunger over the years, it is controversial because when untargeted (or “open”) it can depress food prices in local markets, distorting incentives of producers and consumers. Definitive evidence of such distortion is limited. Slightly over 4% of the food aid received by Africa in 2006 (166,000 mt) fell into the category that could be monetized.

A number of international NGOs and their local counterparts are also active in market development. Prominent among them are: the Cooperative League of the USA (CLUSA), which specializes in supporting the development of farmer enterprise groups; TechnoServe, which promotes rural business development; CARE, which has developed expertise in a number of areas related to market linkage development; and the Citizen’s Network for Foreign Affairs (CNFA), which works to support the emergence of commercial rural input supply networks. Further details about the activities of these and similar organizations are provided below (in the section on bilateral donors).

Regional initiatives²

Comprehensive African Agricultural Development Programme (CAADP) - CAADP has been endorsed by African Heads of State and Government as a vision for the restoration of agricultural growth, food security and rural development in Africa (NEPAD, 2004). A specific goal of CAADP is to attain an average annual growth rate of 6% in agriculture. To achieve this goal, CAADP aims to stimulate agriculture-led development that eliminates hunger and reduces poverty and food insecurity. More specifically, the NEPAD vision for Africa holds that, by 2015, Africa should:

- Attain food security;
- Improve agricultural productivity to attain a 6% annual growth rate;
- Develop dynamic regional and sub-regional agricultural markets;
- Integrate farmers and pastoralists into a market economy; and
- Achieve a more equitable distribution of wealth.

CAADP is a strategic framework to guide country development efforts and partnerships in the agricultural sector. Similar to the broader NEPAD agenda, it embodies the principles of peer review and dialogue that, when adequately followed and applied, will stimulate and broaden the adoption of best practices, facilitate benchmarking and mutual learning and, ultimately, raise the quality and consistency of country policies and strategies in the agricultural sector.

CAADP directs investment to the following four mutually reinforcing pillars:

- Pillar I: Extending the area under sustainable land management and reliable water control systems;
- Pillar II: Improving rural infrastructure and trade-related capacities for market access;
- Pillar III: Increasing food supply, reducing hunger and improving responses to food emergency crises; and
- Pillar IV: Improving agriculture research, technology dissemination and adoption.

CAADP Pillar II is most relevant to the AGRA Markets Program. Implementation of the Pillar will entail design, funding, and implementation of activities aiming to: (i) improve local infrastructure (transportation, storage, packaging and handling systems, retail facilities, information technology and overall supply chains) for better connections to markets by African farmers; (ii) improve transportation: road, rail, marine and air freight; (iii) improve competitiveness through sound trade policies at the national, regional and continental level; (iv) expand domestic and foreign direct investment in agriculture; (v) strengthen capacity to participate in trade negotiations and meet markets access requirements for world trade through improved quality, grades and standards; and (vi) strengthen agribusiness capacities.

The country level CAADP implementation process is primarily one of aligning national agricultural sector policies, strategies and investment programs with the CAADP principles and targets, in particular the 6% growth rate and 10% public expenditure share for the sector. The CAADP process is supposed to build on ongoing country efforts and be led by national governments and other stakeholders, with the necessary support from the RECs and the NEPAD Secretariat. In line with the NEPAD principles of ownership and accountability, the country CAADP process is initiated on a demand-driven basis, through consultation between RECs and their member countries. Country Round Tables (CRTs) and Regional Round Tables are the loci for these consultations. Resulting from these CRTs and RRTs are National Compacts comprising high-level agreements between governments, regional representatives and development partners for a focused implementation of CAADP within the respective country. CRTs are meant to detail programs and projects that address national priorities, and that the various partners can support. National Compacts are to include defined actions, commitments, partnerships and alliances and guide country policy and investment responses, planning of development assistance, public-private partnerships and business-to-business alliances to raise and sustain the necessary investments (NEPAD Secretariat, 2005).

²The reader will quickly note that there is considerable overlap between the various initiatives described in this section, especially when these initiatives operate in the same country. Country level overlap may vary, since not all of the initiatives operate in every country.

Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA) - ACTESA is a multi-partner effort led by the Common Market for Eastern and Southern Africa (COMESA). The alliance aims to build regional cross-border partnerships and capacity that will strengthen innovative market institutions and link food-insecure smallholder farmers with growing national and regional markets for staple foods. The Alliance will broadly include commodities, such as staple grains (maize, sorghum, millet), staple roots and tubers (cassava, sweet potatoes), legumes and pulses (soy beans, pigeon peas, beans, groundnuts), bananas, seeds, fertilizer, and livestock and fisheries. The target beneficiaries are farming communities in selected areas that are drought prone, emerging from conflicts or otherwise vulnerable, and which are receiving support from food aid programs to improve their production systems.

The alliance will promote the premise that food aid assistance should be development oriented and should promote sustainability of food security among beneficiaries in the COMESA region. ACTESA will support and disseminate innovative mechanisms that will allow farmers to participate in markets in ways that will increase their food security and incomes. Improving market access will encourage these farmers to diversify production for sale, further increasing their incomes and spreading risks. Commodity producers (farmers) should be encouraged to become entrepreneurs who participate in commercialization and industrialization for value addition as they engage in market linkages. At the national and regional levels, improved market systems will increase availability of staple foods and affordable prices and promote regional market integration.

ACTESA recognizes that the growing structural food deficits in staple foods in many countries of Eastern and Southern Africa cannot continue indefinitely to be met by food aid. With CAADP, a unique opportunity exists for building regional consensus among countries and regional institutions around promising solutions to the constraints preventing the regional production and marketing of staple crops, livestock and livestock products. Through CAADP, key governments within COMESA have committed themselves to developing strategic plans for creating functional and competitive regional commodity markets. CAADP is mobilizing multiple stakeholders, including producers, policy makers, and emerging market institutions, around the need for market development as a key solution to food security constraints. Market institutions that support increased

commercialization of staples, such as commodity exchanges, trade facilitation services, warehouse receipts programs and grading and standards systems, are being developed in several COMESA countries.

COMESA, in collaboration with key partners, will capitalize on this opportunity to launch a rapid and broad transformational process focused on key markets with the goal of reducing food relief aid requirements for the Eastern and Southern Africa region through three interlocking strategic objectives:

- 1) Increasing farm incomes by engaging farmers with emerging market institutions to improve commercialization and profitability of staple productions;
- 2) Linking surplus areas to deficit areas by increasing regional trade of staple food commodities; and
- 3) Catalyzing industrialization through commercialization of smallholder producers in the value-chain.

Key program components include:

- 1) Launching a strategic alliance to build regional markets that serve the vulnerable;
- 2) Enhancing the capacity of farmer organizations to link producers to markets;
- 3) Building market institutions that serve the vulnerable;
- 4) Improving the enabling policy environment to facilitate markets; and
- 5) Promoting sustainability and food security.

Regional Agriculture Trade Expansion Support Program (RATES)- RATES is a USAID-funded program designed to increase value of agricultural trade within the East and Southern Africa region and between the region and the rest of the world. RATES focuses on developing commodity-specific regional trade initiatives through innovative private/public alliances and partnerships and works primarily through regional trade flow leaders, such as regional trade associations, national-level trade organizations, private companies and individual entrepreneurs. RATES is currently supporting activities in specialty coffee, maize and pulses, cotton/textiles and dairy.

Regional Agricultural Trade Intelligence Network (RATIN)-RATIN is USAID-funded initiative that brings together three similar but previously unconnected food market information systems in Kenya and Uganda to create a unified regional system that allows dissemination and sharing of agricultural information, aiming to promote cooperation within the region. The major task of RATIN is to supply traders with improved early warning marketing and trade information that would lead to more efficient and competitive transactions in food trade between surplus and deficit regions in East Africa. The main activity of RATIN is regional trade analysis of maize, beans and rice.

East African Grain Council (EAGC) - The EAGC is a membership-based organization, registered in Kenya but also covering Tanzania and Uganda, dedicated to the task of improving the policy and trade environment for the betterment of the grain sector from producer to consumer. Formed in collaboration with the Ministries of Agriculture and Trade in the three countries, the EAGC expects to achieve this by creating long-term solutions that will address the various issues and constraints of the grain industry in the region. The EAGC will:

- 1) Promote a well-functioning regional grain supply chain, focusing on trade issues affecting all sectors of the chain, and building a platform for reducing constraints in regional grain trade;
- 2) Build cooperation, interaction, partnerships, alliances, networks and market linkages;
- 3) Collect market data, generate information exchange and share regional expertise;
- 4) Promote investment in structured marketing systems including warehouse receipts and commodity exchanges;
- 5) Act as main certification authority in structured systems; and provide commercial services as needed;
- 6) Recognize and support accepted principles of international codes of corporate conduct;
- 7) Facilitate awareness of new technologies; and
- 8) Represent the regional membership at national, regional and international forums, and lead advocacy and lobbying actions for best interests of Council members.

Initial funding for EAGC has been provided by USAID-Kenya. With funding support from DFID's Financial Sector Deepening Trust for Kenya, the EAGC is currently coordinating a pilot Warehouse Receipt System in Kenya.

Market Information Systems and Traders' Organizations project

(MISTOWA)- MISTOWA was a USAID funded project administered by the International Fertilizer Development Corporation (IFDC) that focused on removing key obstacles to trade in West Africa, including:

- 1) Lack of access to timely information on prices and market opportunities;
- 2) Inadequate business skills of producers and traders to respond to production and market opportunities; and
- 3) Unfavorable trading environments, including tariff and non-tariff barriers (e.g., harassments at the national borders).

Although the project targeted all 15 ECOWAS member countries, activities were carried out most intensively in Ghana, Nigeria, Mali, Burkina Faso, Senegal, Benin, Togo, Côte d'Ivoire and Niger, with significant though lesser involvement of key partners in Guinea, the Gambia and Sierra Leone.

MISTOWA developed a very successful private/public partnership with "Busylab", a private software company in Ghana, to create an electronic agribusiness information exchange platform (www.tradenet.biz). The platform offers access to real-time market information (prices, offers to buy and sell, and contacts) on over 300 products and from over 500 markets throughout West Africa. Information is accessible via the Internet, as well as through related SMS services. TradeNet, formally launched in Accra, Ghana, in late January 2007, has assisted over 2,000 users to buy more and sell better.

To assist users in accessing TradeNet and a variety of other market information and business services, MISTOWA assisted partners in establishing over 100 "Agribusiness Information Points" (ABIPs) in 13 countries throughout West Africa. ABIP managers use TradeNet to facilitate producers and traders developing profitable market linkages.

MISTOWA provided over US\$ 1 million in equipment grants (computers, ICT equipment and Internet connectivity) and over US\$ 600,000 in competitive grants to many of its direct partners to support activities, such as trade exchange visits, participation

at regional trade fairs, and additional ICT, MIS, and organizational development and management trainings.

By the end of the USAID-funded (3-year) project period, MISTOWA had reached its goal of achieving a 20% increase in intra-regional trade recorded by targeted collaborating trader organizations. In fact, these organizations reported a 26% increase in intra-regional trade in selected commodities. In addition, MISTOWA partners voluntarily reported nearly US\$ 52 million in intra-regional trade concluded, partly as a result of MISTOWA support (trade partners were identified on TradeNet, deals were negotiated at MISTOWA-sponsored events, and trades were concluded as a result of sponsored trade exchange visits). Funds invested through the project equaled US\$ 11 million.

USAID support for MISTOWA has ended, but IFDC is committed to further developing the tools and concepts developed under the project. IFDC has recently received additional support from the Hewlett Foundation to carry out activities for several months until additional funding is secured. Many international development donors have expressed their interest in collaborating with IFDC to continue MISTOWA-type activities, seeing the project through to full fruition.

Network of Market Information Systems of West Africa

(RESIMAO)-RESIMAO was created in 1999, under the aegis of a USAID-funded project in Mali. Members are national public Market Information Systems from seven francophone countries (Benin, Burkina Faso, Côte d'Ivoire, Guinea, Mali, Niger and Senegal). Primarily focusing on cereals and livestock, RESIMAO members monitor their own range of commodities according to the country's needs and specificity.

Network of Economic Operators in the Food Industry (ROESAO)-

ROESAO was created in 2001 with nine member countries (Burkina Faso, Benin, Côte d'Ivoire, Ghana, Guinea, Mali, Niger, Senegal and Togo). ROESAO is organized around five commodity chains: cereals, horticulture, livestock, fisheries, and shea nut/butter. The members are traders, processors, producers and transporters. Each member country has a national coordination office, supported at the regional level by a permanent secretariat.

Network of Chambers of Agriculture of West Africa (RECAO)-

RECAO was created in 2001 and consists of the national Chambers of Agriculture of Benin, Côte d'Ivoire, Guinea,

Mali and Togo. Niger and Burkina Faso have also recently joined. RECAO's objective is to be an interface between regional intergovernmental organizations, the public, and the private agricultural sector. Its activities include information and communication, training, studies, and policy advocacy. RECAO is mainly supported by the PRIECA-AO project. The seven existing National Chambers of Agriculture constitute the General Assembly. The National Chambers are subdivided into 57 regional chambers active at district level, and made up of elected members of community chambers. There is a permanent technical coordination unit, based in Bamako.

Network of Farmers' Organizations and Agricultural Producers of West Africa (ROPFA) -

ROPFA was created in 2000 and is the official lobbying body for smallholder family farmers 10 countries (Benin, Burkina Faso, Côte d'Ivoire, the Gambia, Guinea, Guinea Bissau, Mali, Niger, Togo and Senegal). ROPFA is relatively well funded and supported by several external donors and technical partners. ROPFA is structured at three different levels: (i) national platforms (CNOP: Cadres Nationaux de Concertation des Organisations Paysannes); (ii) apex organizations or federations of commodity-based or sector-based POs; (iii) POs and groups of POs that are members of these national apex or federations. The latter two form the core and operational group of organizations and producers involved in local, regional and international trade.

The Federation of African Agro-Input Trade Associations

(FACIA)-FACIA covers ECOWAS countries and brings together 27 national associations representing more than 5,000 businesses. FACIA's objective is to improve the regional agro-input market, via dissemination of market and other information.

Major funders of food and agricultural market development in Africa

National governments

In 2006, African governments accounted for more than 60% of total annual funds flowing to African agriculture, roughly US\$ 5.5 billion. This was more than twice the level of overseas development assistance and more than five times the combined level provided by private foundations and private firms (through foreign direct investment). If the sources of funding for food and agricultural marketing initiatives in Africa depart significantly from this distribution, they would do so in favor of national governments. For most external donors oppose the activities of the publicly funded food agencies that, as shown above, take up large shares of national budgets.

Multilateral donors

Food and agricultural market development has long been an objective of multilateral aid to Africa.

International Fund for Agricultural Development (IFAD)

IFAD has a long history of funding food and agricultural market development initiatives, typically through loans to relevant government agencies and projects. IFAD-financed projects and programs in support of market development seek to influence the rate at which market development takes place, facilitate and broaden market access to rural producers, and establish fair market relations. Many projects help smallholders build understanding of how markets work, how to gear their production to the demands of potential buyers, how to access markets, and how to relate more effectively with traders and processors. IFAD provides support for formation and operation of commercially oriented organizations (groups, associations, cooperatives), including training in key skills in agribusiness. IFAD also provides support for improved production, storage, packaging and processing methods. Many IFAD projects involve investment to create conditions for greater private-sector investment – e.g., improved market organization, market information systems, and storage and transportation infrastructure. Improvement of policy and regulatory environment is an important aim of most projects. Between 1999 and 2001, the proportion of IFAD-financed projects with objectives relating to markets averaged 38%, approximately US\$ 53 million globally, US\$ 21 million in Africa (IFAD, 2003).

The World Bank

The World Bank was the principal driving force behind the agricultural market liberalization wave that swept across Africa in the 1980s and 1990s. As noted above, the private sector did not always expand into gaps left by withdrawing public agencies, and even if they could, newly weakened public agencies would have been unable to fill their prior roles. In many cases, this resulted in overall lower competition and efficiency in marketing institutions. Transaction costs and risks facing farmers increased, as did margins for traders, with negative impacts on food security. This experience is reflected in current Bank lending impinging on food markets, which falls largely in the area of social protection, safety nets, and social transfers that seek to cushion the poor and vulnerable from shocks of various kinds, within the context of broader Poverty Reduction Strategies. Common safety net interventions include cash transfers, food-related programs, price and other subsidies, and public

works. Recent projects featuring agricultural activities have been undertaken in the following African countries: Ethiopia, Niger, Senegal, Malawi, Madagascar, and Uganda. At issue in many of these projects is how farmers and other participants in agricultural markets can better deal with price and weather risks. Ethiopia is illustrative of the evolving approach.

The Bank is a key donor to Ethiopia's "Productive Safety Net Programme" that seeks to improve the efficiency and productivity of transfers to food insecure households, thereby reducing household vulnerability, improving resilience and promoting sustainable community development. Specifically, the Programme aims to replace emergency responses to chronic food insecurity with a multi-annual, predictable resource framework to protect households from shedding assets and eroding their chance of escaping poverty in the longer-term. Households are provided with enough income (cash or food) to fill gaps in their food needs and thereby protect their household assets from depletion. Programme components include public works ("food-for-work" and "cash-for-work") and direct support (food and cash transfers). The reliability of markets to deliver affordable food to needy populations is a central factor in determining the choice of instrument. It is also a key factor defining the underlying vulnerability that the PNSP seeks to address.

In a related initiative, the Bank has been collaborating with the WFP, DFID and the Ethiopia government on a weather-based insurance pilot project, to provide monetary compensation to Ethiopian farmers and protect them against drought risk (much of which is expressed in food markets). The first phase in 2004-2006 demonstrated that Ethiopian rainfall data are accurate and timely enough to allow Ethiopian drought risk to be transferred to international re-insurance markets. Establishment of a US\$ 7.1 million insurance policy demonstrated the willingness of international markets to contract on the basis of the Ethiopian data. On the basis of these outcomes and of experience in the first phase, WFP, the World Bank and DFID started to develop a comprehensive drought-risk financing scheme for the 5 to 8 million Ethiopians subject to transitory food insecurity. The second phase aims to scale up the financing package to US\$ 135 million, comprising contingent funding from bilateral, multilateral and insurance sources. In early 2007, the World Bank approved a US\$ 175 million safety-net operation for Ethiopia that includes a US\$ 25 million contingent grant based on the drought index designed by WFP.

European Union

The main thematic and sectoral areas covered by the European Commission's Directorate General for Development (DG DEV) include linking trade with development, regional integration and cooperation, support for macro-economic policies, promoting equitable access to social services, support for transport, promoting food security and sustainable rural development, and support for institutional capacity building. Support for integrated regional markets based on private sector development is a strong focus.

The European Development Fund (EDF) is the main instrument for providing Community aid for development cooperation. The tenth EDF covers the period from 2008 to 2013 and provides an overall budget of EUR 22.682 million. Of this amount, EUR 21.966 million is allocated to the ACP countries, most of which will go to Africa.

A key element in the EU strategy document for support to African agriculture, "Advancing African Agriculture," is trade facilitation, emphasizing quality assurance and improvement. This area of support will aim to strengthen Africa's ability to make markets work towards poverty reduction and recognize the crucial role of local and regional markets for agricultural produce. Proposed cooperation includes strengthening the ability to influence, establish and adhere to meaningful production and trade standards, in order to access or to continue accessing remunerative markets for agricultural produce and to guarantee product safety for consumers. Cooperation will focus on regional market strengthening, trade surveillance, alignment of classification systems and standards, strengthening institutions involved in testing and compliance and in negotiations on standards. As is the case with the World Bank and a number of bilateral donors, an additional area of cooperation for the EU will be in the area of reducing risks related to natural disasters and price shocks, with a focus on organizational questions and financial instruments. There will be cooperation on disaster preparedness, prevention and response; reduced risk farming methods; use of innovative financial risk management tools and continental and regional early warning systems. Cooperation will include capacity building of key public and private organizations and improving access of African countries to international financial and insurance markets.

African Development Bank (AfDB)

Noting that a dynamic private sector holds the key to future agricultural and overall economic growth in Africa, the AfDB's lending for agricultural development aims to promote development of policy, institutional, and legal environments conducive to private sector development. Promoting agribusiness and assisting member countries to strengthen linkages between farmers and agro-industry in order to improve farmers' access to markets is critical for generating and sustaining economic growth. Strong linkages with agro-industry and an efficient marketing infrastructure contribute to improve value-added to agriculture, reduce post-harvest losses and, stimulate supply response. Over the last five years, the AfDB has extended lines of credit totaling US\$ 56 million to agricultural initiatives in Africa.

UN World Food Programme (WFP)

WFP is a major actor in Africa's food markets. In 2006, WFP procured more than 158,000 mt of food domestically in Ethiopia, representing a value of US\$ 37 million. In Uganda, WFP purchased 162,000 mt of food, valued at US\$ 41 million. In Kenya, the total for the year stood at US\$ 30 million, in South Africa at US\$ 29 million. For Africa as a whole, between 2001 and 2006, WFP procured US\$ 977 million worth of food in domestic markets. WFP is launching a set of pilot activities, primarily in Africa, to further explore programming and procurement modalities that have the best potential to stimulate agricultural and market development in a way that maximizes benefits to smallholder farmers. This effort is known as "Purchase for Progress" or P4P.

Working with national governments and alongside bilateral partners, UN agencies, NGOs, farmers, traders, processors and research institutions, P4P will help create a platform of demand for food staples grown by small farmers in countries where WFP has operations. The aim is to help reduce the risks they face and boost farmers' incentives to invest in technologies and practices to increase and improve production. WFP will ensure that its actions are not displacing or disadvantaging the private sector, but rather promote fair prices and trade practices. WFP has received US\$ 10 million from the Howard Buffett Foundation for activities in Latin America, Liberia, Sierra Leone and Sudan, and a commitment of US\$ 66 million over five years from the

³WFP's collaboration with the World Bank on the disaster risk insurance pilot is described above (under "World Bank").

Bill & Melinda Gates Foundation to implement P4P in 10 African countries (including Burkina Faso, Ethiopia, Kenya, Malawi, Mali, Mozambique, Rwanda, Tanzania, Uganda and Zambia).³

UN Food and Agriculture Organization (FAO)

In 1994, FAO launched the Special Programme for Food Security (SPFS) to assist developing countries (Low-Income Food-Deficit Countries in particular) improve their household and national food security. To date, 44 Africa countries have been involved in SPFS pilot field activities, of which 10 of which are being scaled up through national programs. Central pillars are national leadership and local community participation and empowerment. SPFS activities are funded through FAO's Trust Fund for Food Security and Food Safety to which several donors have committed funds. The Italian Government is the main donor, having contributed EUR 60 million out of EUR 100 million committed. Other significant donors include Libya, the OPEC Fund, and the Kingdom of Saudi Arabia, each having provided between US\$ 1 million and US\$ 2 million.

FAO's major contribution to food marketing in Africa is the technical expertise it can bring to bear on food marketing problems. FAO's Agricultural Marketing Programme assists governments with the formulation and implementation of projects to improve marketing policy, support services, farm-market linkages, training and infrastructure. It also organizes training programs on request. FAO's Agribusiness Management Programme, with a strong emphasis on capacity building and human resources development at different levels, produces training materials, in particular for small farmers and managers of agro-processing enterprises who need technical and managerial training, including for business planning. It also advises on policies and strategies to improve agri-business competitiveness, including fostering better coordination and linkages among business partners.

FAO's work in agri-business linkages concentrates on how to develop and reinforce equitable and efficient linkages between all players along the food value chain. The aim is to create an awareness of the importance of farm/agri-business linkages and to develop guidelines for policymakers and planners on how to formulate strategic programs and overall strategies that would assist in building and maintaining successful farm/agri-business linkage programs. Business management support aims to help

micro and small rural entrepreneurs develop analytical and cognitive skills to cope with decision-making and problem solving for their enterprises. Training materials are developed to provide practical advice and information on management aspects that help entrepreneurs or potential investors run a sustainable business. A fundamental aim is integration of production, packaging, transport and storage of marketable commodities and value-added products from the farm through to the consumer and to support entrepreneurs in rural and periurban agribusiness development.

FAO has developed detailed guidelines for upgrading rural markets as one way to improve access to marketing opportunities. These guidelines aim to assist community planners, rural engineers and agricultural extension units to formulate and implement relevant market-development plans. Detailed instructions are provided on how to: design markets that meet a community's social and economic needs; work with communities to identify their marketing problems and to choose a site for a new market; use appropriate and simple methods to survey and plan the site layout and to design market buildings; prepare a market-development proposal and make budget estimates; undertake simple social and economic feasibility studies; look for financing and construct the market; and manage, operate and maintain the market.

The Consultative Group on International Agricultural Research (CGIAR)

During the 37 years of its existence, it is estimated that CGIAR has expended more than US\$ 4 billion in Africa. CGIAR research in the region focuses on the full range of the system's global research portfolio, encompassing genetic improvement of food crops, ruminant livestock, trees and fish important to the poor, integrated natural resources management, biodiversity research, policy research and capacity building. In addition to work on genetic improvement, natural resource management, and biodiversity conservation, CGIAR efforts include research on promoting opportunities for economic development through agricultural diversification and high-value commodities and products, as well as improving policies and facilitating institutional innovation.⁴

⁴Note, however, that the economics research portfolio included a small portion on markets, in a few centers, not in the entire system.

Table 1: Examples of USAID recent support to agriculture in Uganda – 1993-2008

Project title	Objective	Implementer
Investments in developing export agriculture (IDEA)	Increase the production and sale of high- and low-value crops by promoting closer relations among ugandan producers, buyers, and exporters (US\$30 million, nine years)	Chemonics
Agricultural productivity enhancement project (APEP)	Expand rural economic opportunities and increase household income in the agricultural sector by increasing food and cash crop productivity and marketing.	Chemonics
Strengthening the competitiveness of private enterprise (SCOPE)	Assist private sector leaders in targeted sub sectors to identify markets and set market targets, develop market strategies and plans, and work with the range of private and public sector actors and resources needed to support achievement of targets.	Chemonics
Support for private enterprise experience and development (SPEED)	Increase access to financial services, create and expand agricultural and non-agricultural enterprises, and strengthen legal and regulatory frameworks for business development in the sme and microfinance sectors.	Chemonics
Productive resource investments for managing the environment/ western region (PRIME/WEST)	Protect biodiversity assets, increase productivity of the natural resource base, and increase the potential economic returns to communities	Development Alternatives Inc.

Bilateral donors

United States Agency for International Development (USAID) -

USAID has long been a proactive supporter of private sector and agri-business development in Africa. It has financed programs promoting the development of a commercialized agricultural sector in many African countries, typically implemented by US development consulting firms such as TechnoServe, Chemonics, Land O' Lakes International, ACDI/VOCA, Abt Associates, and Development Alternatives Inc. The case of USAID support to Ugandan agriculture is illustrative (Table 1).

USAID has also supported long-term research and policy advocacy related to African agri-business and food markets by several US universities through its Collaborative Research Support Programs (CRSPs), which combine research and agri-business support. There are currently four CRSPs in operation relevant to the AGRA Markets Program. They are: (i) sorghum, millet, and other grains; (ii) beans and cowpeas; (iii) peanuts; and (iv) livestock. USAID has also funded technical support and policy research on food markets by US universities, most notably by Michigan State University in southern and eastern Africa. At the regional level, USAID has supported design and implementation of a number of initiatives aimed at promoting regional trade in food commodities. Two of these, the RATES

program and the RATIN program, were described earlier (under "regional initiatives").

Department for International Development (DFID)-Like the World Bank, DFID's market-related aid is increasingly framed and packaged within social protection-related initiatives, where efforts to "make markets work for the poor" are bundled together with efforts to mitigate risks facing vulnerable populations. DFID's point of departure is that risks facing the rural poor must be reduced if they are to engage effectively in markets. DFID is committed to significantly increasing spending on social protection in at least ten countries in Africa and Asia by 2009, supporting national programs and working with the UN and NGOs in fragile states.

Other bilateral donors-Other important bilateral donors with interests in Africa's food markets include the Danish International Development Agency (DANIDA), the German development agency Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), and the Netherlands Development Organization (SNV).

Much of the food market-related assistance from these three donors features support for targeted capacity building at given points along food value chains. For instance, in Kenya GTZ recently funded construction of a biogas facility for a

community slaughterhouse, and organizational strengthening for a milk producers association. SNV is supporting the Zambia Government's implementation of smallholder-oriented grain and input marketing improvements in Zambia.

Other support from this group of donors aims to improve framework conditions facing the private sector. For instance, DANIDA is supporting a 5-year US\$ 30 million effort in Ghana that aims to catalyze a "Golden age of Business" through legal and judicial reform, strengthening the culture for business, business support instruments to SMEs, and improved access to markets.

Complementary funds

Africa Investment Climate Facility (ICF)

Based on the Report of the Commission for Africa, the UK is developing a number of new initiatives aimed at improving the climate for business in Africa. One of these is the ICF, which aims to help lower the cost of doing business in Africa and promote a better investment climate across the continent. The UK government will provide US\$ 30 million over three years to the Investment Climate Facility for Africa. Royal Dutch Shell PLC and Shell Foundation also announced that they would contribute a combined total of US\$ 2.5 million over five years, and Anglo American confirmed that they would also contribute US\$ 2.5 million over the same period.

Recommended by the Commission for Africa and supported by the G8 at Gleneagles, the ICF will help bring about more business-friendly policies, laws and regulations across the continent, and strengthen the institutions that enable these to be administered. It will help bring about a more effective dialogue on investment climate reform between governments and the business community. The ICF will support such projects as streamlining business registration and licensing systems, reforming customs administration and taxation and removing barriers to competition. The ICF will focus its programs mainly in the 24 African countries that have signed up to the Africa Peer Review Mechanism under NEPAD. Over its initial phase of three years, the ICF expects to support initiatives costing up to a total of US\$ 120 million. But over its full life of seven years the ICF expects to be able to facilitate in excess of US\$ 500 million of reform work. Activities funded under the ICF are likely to include: research and analysis; legislative review and reform; capacity building of institutions, such as land registries, company registries and commercial courts; pilot projects, such

as streamlined business registration systems; and facilitation of better public private dialogue.

Millennium Challenge Corporation (MCC)

The MCC provides two different kinds of monetary assistance: compact agreements and threshold agreements. A compact is a multi-year agreement between the Millennium Challenge Corporation and an eligible country to fund specific programs targeted at reducing poverty and stimulating economic growth. The Threshold Program is designed to assist countries that are on the "threshold," meaning they have not yet qualified for MCA Compact funding, but have demonstrated a significant commitment to improve their performance. Of MCC's 16 Millennium Challenge Compacts, totaling about US\$ 3.8 billion, 9 are with African countries, and many seek to improve agricultural market access (Table 2).

Africa Enterprise Challenge Fund (AECF)

DFID is also developing the AECF to catalyze the private sector to innovate and find profitable ways of improving market access for the poor, with a focus on rural areas. AECF will focus on stimulating innovation in agricultural markets and deepening access to financial services. It will push the frontiers of market access for the poor in sectors particularly important to the poor, namely finance and agriculture. The focus will be on (i) catalyzing local supply chains, creating effective demand for the produce of smallholder farmers, (ii) supporting firms who provide intermediary services to small farmers so that they may access new markets, and (iii) introducing new production methods and establishing local production processes where none existed before.

Emerging Africa Infrastructure Fund (EAIF)

EAIF was established in January 2002 and is currently a US\$ 365 million debt fund, which aims to address the lack of available long-term foreign currency debt finance for infrastructure projects in Sub-Saharan Africa. EAIF was initiated by the Private Infrastructure Development Group (PIDG), whose founding members are DFID, the Netherlands Ministry of Foreign Affairs, the Swiss State Secretariat for Economic Affairs, and the Swedish International Development Corporation Agency. These PIDG members provide equity to EAIF through the PIDG Trust.

While EAIF lends on commercial terms, it aims to support projects that promote economic growth and reduce poverty, benefit broad-based population groups, address issues of equity

Table 2: Grants to African countries under MCC compacts

Country	Areas supported
Benin	Improvements in physical and institutional infrastructures, access to land, access to financial services, access to justice, and access to markets. US\$ 307 million
Cape Verde	Improvements in the investment climate, reforming the financial sector, improving infrastructure, increasing agricultural productivity and incomes of the rural population. US\$ 110 million
Ghana	Commercialization of small-scale agriculture, transportation, water and sanitation, and electricity. US\$ 547 million
Lesotho	Water for industrial and domestic use, disease control, health care infrastructure, and human resources for health capacity, and reduction in barriers to foreign and local private sector investment. US\$ 363 million
Madagascar	Property rights to land, access credit and protect savings, training in agricultural production, management and marketing techniques. US\$ 110 million
Mali	Bamako-Sénou Airport, the Niger River Delta, for irrigated agriculture. US\$ 461 million
Morocco	Productivity and employment growth in high potential sectors including fruit trees, small-scale fisheries, and artisan crafts. US\$ 697.5 million Financial services and support for small business creation and growth.
Mozambique	Improved water systems, sanitation, access to markets, land tenure services, and agriculture. US\$ 507 million.
Tanzania	Transportation, energy, and water. US\$ 698 million

and participation, and promote social, economic and cultural rights. Investments with a term of up to 15 years can range from a minimum of US\$ 10 million (or equivalent) to a maximum of US\$ 36.5 million (or equivalent) for any one investment. Loans are provided without the need for political risk cover.

United Nations Industrial Development Organization (UNIDO)

Through the regional programs of the African Union's African Productive Capacity Initiative (APCI), UNIDO is promoting regional integration, harmonization and cooperation. APCI enhances integration of the regional economic communities for increased market access, remove barriers to trade and help the beneficiary countries to diversify their export base. It will contribute to reducing trade impediments, promoting the harmonization of industrial, trade and technology policies and helping to ensure conformity and compliance with industrial standards and environmental norms.

UNIDO's Agro-Industries support service module comprises a range of technical assistance interventions and know-how, which encompass the following key areas:

- 1) Support and advice to official and private-sector decision-making bodies in various sub-sectors (food, leather, textiles, wood and agro-machinery) on technical-economic

development options for strengthening the agro-industrial sector and fostering the equitable integration of small-scale agro-based enterprises into market-oriented agro-produce systems.

- 2) Capacity-building at the institutional and industry levels to enhance industrial productivity and marketing performance in the agro-industrial sector. Particular attention is given to strengthening the capacity of technical support institutions and/or professional associations, as well as the creation of design centers and demonstration units for basic and advanced technologies (tools and machinery, CAD/CAM, automation, etc.).
- 3) Support to traditional agro-industries to improve their productivity and efficiency, increase their integration into global value chains, and support rural livelihood diversity. This is achieved through upgrading of technical skills, process optimization, diffusion of appropriate agro-engineering systems, product innovation/diversification, and the introduction of working methodologies and guidelines, etc. Special attention is given to marketing support, such as participation in trade fairs and missions, as a means of exposing the target beneficiaries to market requirements.

- 4) Participation in the work of international organizations and normative bodies, the promotion of research on priority/novel commodities, the preparation of training manuals and tool kits for agro-processes/technologies, and the dissemination of agro-industrial information for decision-making.

The commodities covered include food as well as important agro-based fiber products (wood, textiles and leather). In addition, special emphasis is placed on the agro-machinery and agro-chemical sub-sectors because of their essential underlying contribution to the development of agro-based industries.

African Capacity Building Foundation (ACBF)

The ACBF is an independent capacity-building institution established in February 1991 through the collaborative efforts of three multilateral institutions (AfDB, the World Bank, and UNDP), African governments and bilateral donors. The establishment of the ACBF was a response to the severity of Africa's capacity problem and the challenge to invest in indigenous human capital and institutions in sub-Saharan Africa. The current membership comprises the three sponsoring agencies (AfDB, UNDP and the World Bank), the International Monetary Fund (IMF), which joined the Foundation in April 2002, as well as 32 African countries and non-African countries and institutions. In addition, Japan and Canada have contributed resources to the Foundation. The Foundation's principal objectives are to:

- 1) Build and strengthen sustainable indigenous capacity for macroeconomic policy analysis and development throughout sub-Saharan Africa;
- 2) Improve through co-financing and other networking arrangements, the channeling of donor support for capacity building in the area of the Foundation's mandate;
- 3) Contribute to programs for the reversal of brain drain from the continent and encourage retention as well as intensive utilization of existing capacity;
- 4) Build capacity in key areas of the public sector with emphasis on the interface between the public sector, the private sector, and civil society; and

- 5) Provide support for regional initiatives in the area of research and training by establishing systematic links between economic research and training institutions and governments to foster greater understanding and communication between such entities.

In addition, ACBF seeks to build a partnership between African governments and their development partners, which allows for effective coordination of interventions in capacity building and the strengthening of African ownership, leadership and responsibility in the capacity-building process. The focus of activities is on improving public sector capacity for macro and sector policy design and management, as well as enhancement of effectiveness of institutions, processes, systems and procedures that support policy and institutional reforms critical for improved transparency, accountability and good governance in the public sector.

Conclusions

The picture that emerges from this survey is one of rich but uncoordinated diversity in investments to improve the functioning of agricultural markets in Africa. A more systematic analysis might reveal areas of complementarity and overlap among investments, and any scope for streamlining and harmonization that might exist. Such an analysis would add significantly to the literature.

A key recognition is that many of the initiatives described above exclude the public sector, either by design or default. This is a major gap, since a central challenge facing African countries remains how to fashion productive roles of states in markets. A central lesson of the Asian Green Revolution is that sustained agricultural growth hinges in part on forms of market stabilization that only governments can assure – stabilization offered in return for desired patterns of private investment. Some of the initiatives and measures described above might serve as platforms on which government-backed stabilization efforts might be built; the impacts of most of them likely would be accentuated in this way. Viable public-private partnerships in Africa's agricultural markets are a priority.

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Section 2

Seed and Fertilizer Markets

Tapping the potential of village markets to supply seed in semi-arid Africa: A case study comparison from Mali and Kenya

Melinda Smale¹, Latha Nagarajan², Lamissa Diakité³, Patrick Audi⁴, Mikkel Grum⁵, Richard Jones⁶ and Eva Weltzien⁷

Abstract

Village markets have potential to supply quality seed in semiarid areas, but little is known about them. This paper summarizes findings for case studies of village markets for pigeon pea seed in Kenya and millet seed in Mali. In the Mali study, village markets assure a supply of seed of identifiable, locally adapted, genetically diverse varieties as a final recourse in a risky environment where there are as yet no reliable formal channels, for which competitive varieties have not yet been bred, and the potential of agro-dealers to supply certified seed has not yet been exploited. In the Kenya study, well-adapted varieties have been bred, but no formalized channels of seed provision exist for pigeon pea and agro-dealers are active in selling improved varieties of maize and vegetables. In both studies, farm women are major seed trade actors. Vendor characteristics and location in seed program areas, but not price, are significantly associated with quantities sold. Formal and informal systems must be strengthened and linked for non-hybrid, dryland crops in order to exploit opportunities for better diffusion of quality seed, including the seed of both improved varieties and truthfully labeled landraces.

Village seed trade in semi-arid areas of Africa

Many farmers in semiarid areas of Africa have not yet benefited substantially from growth in agricultural productivity. Improved seed is crucial for achieving growth, along with other productivity enhancing inputs, such as soil and moisture amendments and mineral fertilizer. However, making seed markets work poses unique challenges in these environments, which are often also remote. Seed systems are typically informal, and farmers rely on each other for locally adapted varieties. They are not reliable clients for private seed companies because they purchase seed irregularly. Less improved germplasm has been developed for semiarid environments because of the high costs

of breeding and supplying seed – a situation that has worsened with decreasing public funding for agricultural research.

Periods of seed insecurity occur in remote, semiarid areas when spatially covariate risk of drought is high and many farmers fall short of seed. During such periods, farmers search for seed in open-air, village grain markets (Tripp, 2001; Sperling and Longley, 2002). Generally, seed transactions in grain markets are considered to be unfavorable because they provide no assurance of seed quality, unlike transactions with other farmers and kin, which are based on trust or direct observation. Procuring seed in grain markets is most often described as a last recourse.

In contrast, a study in Mopti Region, Mali (Sperling et al., 2006) documented that traders in village markets supported seed security by moving the seed of well-adapted landraces from surplus to deficit areas following several years of drought and locust infestation. Landrace identity, often linked to village of origin, was preserved when grain was purchased for seed. Other studies report successful dissemination of modern seed varieties through village trade (Sperling, Loevinsohn and Ntabomvura, 1993; Jones, Audi and Tripp, 2001).

Little is known about seed transactions in village grain markets, which are guided by local technical knowledge and standards, social structures and norms rather than government policies and regulations. The purpose of the exploratory research synthesized here was to better understand their potential to supply diverse, quality seed⁸. We define quality seed as viable, true-to-variety, and including, but not limited to, certified seed of improved varieties. The crops studied – pigeon pea in Kenya, and sorghum and millet in Mali – provide useful points of contrast. While both are grown in semiarid regions, pigeon pea is a cash crop with emerging export potential; sorghum and millet are staple crops of vital commercial and subsistence importance to the economy of Mali.

¹Melinda Smale, at the time of writing this paper, was a Senior Researcher at Oxfam America. Corresponding author: (melinda.smale@gmail.com)

²Latha Nagarajan: Research Associate, Rutgers University, New Jersey

³Lamissa Diakité: Sr. Economist, Institut d'Économie Rurale, Bamako, Mali

⁴Patrick Audi: Research Associate, ICRISAT-Nairobi, Kenya

⁵Mikkel Grum: at the time of writing the paper was at Bioversity International- Nairobi, Kenya

⁶Richard Jones: At the time of writing the paper - Asst Director, East and Southern Africa Division- ICRISAT, Nairobi, Kenya. Currently with IFDC, Nairobi, Kenya

⁷Eva Weltzien : Sr Breeder, ICRISAT-West Africa, Sadore, Niger

⁸The two studies summarized here are among several studies coordinated by the Agricultural and Development Economics Division (ESA) of the FAO from 2004. A common methodology was designed by FAO staff, project teams and consultants (see Lipper et al., 2010).

Research methodology

The research methodology included four principal elements: (i) an analysis of the seed value chain, (ii) a sample survey of farm households, (iii) a sample survey of vendors in markets most frequented by farm households, and (iv) analysis of genetic diversity of seed samples collected on farms and in markets. This paper focuses on findings from the vendor survey, drawing relevant information from the other research components.

Based on value chain analysis and previous field research, sites were purposively selected in dryland areas where seed projects or programs had been conducted. In Mali, two sites were identified with contrasting amounts of rainfall and market development in the drier, millet- and sorghum-based zones. A self-weighting, random sample of 300 farmers was drawn in 14 villages. The 12 markets in which sampled farmers most frequently participated were identified from the farm survey responses (Douentza, Petaka, Kiro, Kerena, Ngono, Dangol-Boré, San, Dieli, Fangasso, Lohan, Mandiakuy and Benena). In April 2007, at the onset of the planting season, a rapid vendor census was conducted in each market to identify traders who sold grain for seed as well as for food. A random sample of 102 of traders, stratified by crop and variety or type, was interviewed. Sampling fractions varied by crop and variety but averaged 45%. In Kenya's Makueni District, markets were also selected to represent a gradient of rainfall in areas and permit comparisons between areas that had benefited from publicly funded seed programs over the last 10 years. A total of 167 vendors, stratified by vendor type, were interviewed during the planting season (October–November, 2006) in seven village markets (Emali, Kalawa, Kasikeu, Kathonzweni, Mulala, Sultan Hamud and Wote), along with 400 farmers in surrounding communities. All shopkeepers and grain traders who sold grain as seed, and all open-air traders in markets where this group numbered less than 15, were interviewed. In markets with more than 15, every other trader was interviewed.

In addition to the vendor survey, vendor lots were purchased from each sampled vendor. Lots were grown out on-station to classify them genetically and link them to samples collected during the farmer survey. An infrastructure survey was also conducted through key informant interviews and direct observation. Team members recorded the general characteristics

of the markets, such as product scope, size and physical infrastructure.

Additional details on sampling of vendors and vendor lots can be found in Smale et al. (2008) and Nagarajan et al. (2008). Site maps and descriptions of the protocols used to measure genetic diversity of vendor lots are found in Smale et al. (2010) and Audi et al. (2010). Further information on the seed value chains can be found in Diakité et al. (2008) and Nagarajan et al. (2007). Baseline studies, available from the authors, provided more detailed information about the farmer surveys.

Data reported here are primarily descriptive statistics.

Multivariate, ordinary least squares (OLS) regressions were computed to explain variation in quantities supplied by vendors using Stata 9.

Findings

Characteristics of the seed value chain⁹

Sorghum and millet are the major crops of Mali, grown by subsistence-oriented producers in an agricultural sector that is almost entirely rainfed. National average yields for both crops are less than 1 ton per hectare. Low yields are often attributed to low adoption rates for improved seed. The most recent draft Agricultural Census reports that the proportion of cereals area under improved seed does not exceed 10%. Improved varieties of sorghum have been more widely adopted than improved varieties of millet.

Low adoption rates have been blamed on poor performance of the formal seed system. Despite an ongoing process of seed sector reform, liberalization of seed markets for sorghum and millet has not advanced as rapidly as liberalization of grain markets. The formal seed sectors for sorghum and millet continue to be largely state-run, with some participation by registered farmer cooperatives in multiplying seed. So far, commercialization of farmer-produced seed on more than a pilot scale has posed major challenges. At the time of the survey summarized here, no certified sorghum or millet seed was sold in any of the 12 markets studied.

Surpassing the performance of farmers' own millet and sorghum landraces in the Sahel has been difficult. International and national research centers accelerated breeding efforts from

⁹This Mali section draws from Diakité et al. (2008) where a full set of supporting references can be found.

1973, but new cultivars in the dry savannahs made little impact on yields. Of the improved varieties that performed well on research stations during that period, few performed better than landraces on farms, for several reasons. The first is that imported breeding material was unsuitable. Initially, an emphasis was placed on material that was successful in India but was not adapted to the high soil temperatures in the Sahel. The guinea races of sorghum that dominate in Mali differ from the caudatum and kafir races that make up the bulk of sorghum genetic materials grown in other regions of the world. Local sorghum and millet varieties also have photoperiodicity, which enables plants to adjust the length of the growth cycle to synchronize with the length of the rainy season. Unfortunately, early selection programs, combined with the effects of drought, led to the gradual elimination of photoperiodism in favor of a range of varieties with short, fixed cycle lengths.

These shortcomings have since been overcome by international and national breeding programs, but challenges remain. Attaining more than marginal changes in yield is difficult without hybrids, but while promising materials are in the pipeline, none have yet been released for either sorghum or pearl millet. A farmer needs relatively little seed to produce a sorghum or millet crop, which limits the quantities of seed demanded. Decreasing public funding has meant that no breeding is conducted for some agro-ecologies, including that of Douentza, where part of this survey was conducted.

Existing seed legislation in Mali states that only registered varieties may be certified, and the production of seed for commercialization of other varieties without authorization is forbidden. The latest draft law does not appear to forbid the production or sale of unregistered varieties, and stipulates different degrees of qualification that depend on the seed category.

There is no consensus about whether it is lack of effective demand or supply that constrains farmer use of certified sorghum and millet seed. Because the private sector has not taken responsibility for seed distribution, and the public sector has failed to supply improved seed in reasonable quantities, researchers have consistently called for more public research funding and private involvement in seed trade. A few have also called for the development of the informal seed system.

In contrast to Mali, there has been more rapid progress in liberalizing Kenya's seed sector. Since the 1990s, several international seed companies have entered the national market and more than 50 registered local seed companies have emerged that specialize in seed multiplication and distribution. However, most are oriented toward the needs of farmers in high-potential areas, marketing hybrid maize seed for which there is a regular demand and intellectual property is protected biologically. As a consequence of low profit margins, only a few of these companies sell non-hybrid seed of dryland crops, and when they do, they trade small amounts.

In Kenya, the formal seed sector deals in production and distribution of certified seed only as set out in the Seed and Plant Varieties Act (Chapter 326) of 1991 of the Laws of Kenya. Through this Act, the seed industry regulator, Kenya Plant Health Inspectorate Services (KEPHIS), is empowered to certify seed quality, protect plant breeders' rights through registration, coordinate the release of superior, well-adapted varieties, accredit and monitor retail outlets for certified seeds. Seeds of maize, pigeon pea, cowpea, beans, sorghum and millets are all subject to compulsory certification under the Act. The process of variety release and certification is lengthy and expensive especially for non-hybrid, improved varieties whose seed can be replanted for several years following initial purchase.

In recent years, pigeon pea, a dryland legume crop, has provided cash opportunities to farmers in semiarid regions in Kenya through its increased export potential, as well as providing food, fodder and fuel for local consumption. However, formal seed sector provision of improved pigeon pea seed is not evident. Pigeon pea growers in Makueni District therefore depend largely on seed programs or unregulated village trade to meet their needs.

The Kenya Seed and Plant Varieties Act neither regulates nor interferes in village trade of pigeon pea, assuming that it concerns grain rather than seed. The Act does prevent traders from labeling and packaging the grain they sell as seed. There are no provisions in the existing Kenyan seed laws to allow the sale of "truthfully labeled" or "quality-declared seeds" of open-pollinated varieties¹⁰, but nor are there laws to prevent the informal sale of improved seed by vendors in village markets.

¹⁰A more detailed account on FAO system of quality declared seeds can be found at <ftp://ftp.fao.org/docrep/fao/009/a0503e/a0503e00.pdf>

Site characteristics

The city of San and the town of Douentza are the market hubs of the market clusters identified in each study site of Mali, linked by a 400 km paved road. Farmers in Douentza, located in the Mopti region, rely primarily on millet and cowpea. They can count on only 200-400 millimeters (mm) of rainfall per year. San is located in the Segou region, which is a major producer and exporter of sorghum and millet, with a relatively more diversified cropping system. Rainfall rarely exceeds 600 mm per year. The villages in and around San are known for the grain quality of the millet they sell. Wholesalers in the Douentza town market import and trade the grain from San, as well as lower-quality millet from other regions. Both are suitable only for food because they are mixtures of varieties that are not well adapted to the growing environments around Douentza. The villages in the Douentza site generally trade grain among themselves because this region is less likely to produce a surplus, although there is some evidence that they also trade with drier areas further to the north.

Farming communities in San, although not necessarily individual farmers, are generally self-sufficient in millet and sorghum seed. None of the farmers in San reported having procured seed with cash since the first year growing their varieties; any transactions were gifts or exchanges. Nearly a third of farmers in Douentza reported having procured seed for cash, and the most recent year of seed procurement was 2005 – a planting season that followed two seasons of bad weather and a large-scale locust attack.

Makueni District is one of the three key pigeon pea-growing areas in Kenya, and two-thirds of the district is categorized as arid to semiarid. Farmers grow pigeon pea intercropped with maize and beans. Makueni District benefits from both a short rainy season (October to November) and a longer rainy season (February to May). Although rainfall in the briefer period is poorly distributed (less than 400 mm, on average), it is more reliable than during the longer period. Thus, farmers in Makueni District usually begin sowing major staple crops (maize, beans, sorghum, pigeon pea, and other legumes) at the beginning of the short rainy season.

Most farmers in the region use their own seed stocks for planting. Farmers who have not saved seed from a previous harvest search for seed immediately after the first planting rain, generally during the first week of October. After the droughts

that occur every three to five years in the district, farmers depend on village markets for their seed and grain purchases.

Weekly markets serve farmers living within a 50-100 kilometer radius. Those located in wetter areas offer more varieties and handle higher sales volumes than those in dry regions. Markets in the wetter areas are very close to a major paved road connecting Nairobi to the Mombasa port, which enables traders to transport their produce more efficiently. Markets in the drier interior have poorly developed transportation and road networks.

Seed relief programs have become routine following crop failure in this area. Often implemented as a disaster response with minimal planning, the seed type distributed may not be what is most appropriate or needed by farmers. To improve on this practice, since 2002, Catholic Relief Services (CRS) has provided seed vouchers to seed-insecure farmers so that they can procure locally adapted seed at organized seed fairs. This approach works well as long as local seed is available, which is usually the case except where large-scale and prolonged population displacements have occurred.

Seed trade in village markets complements publicly funded seed intervention programs in Eastern Kenya. More than 70% of the seed distributed to farmers through seed vouchers and fairs conducted as part of an emergency seed relief program were sold through local market vendors, and survey data confirm that vendors located in seed intervention areas sold more pigeon pea than those in non-intervention areas.

Market infrastructure characteristics

In Mali, all weekly fairs are conducted during the day from early morning until sunset, and except for the permanent market hubs in the town of Douentza and the city of San, none has electric lighting. Village marketplaces are cleaned by teams hired by the municipality. Formal hygiene control (use of garbage containers, drains, pest control) is minimal. Each village fair in the San site has at least one or two permanent shops and numerous permanent and semi-permanent stalls. Almost no permanent structures were found in the marketplaces of the Douentza site, and semi-permanent stalls were also less numerous.

The difference in market development between San and Douentza sites is pronounced. In the San site, the total number of vendors observed seated on the market floor ranged from

several dozen to perhaps 1,000. By comparison, that type of vendor probably numbered less than 200 in each market of the Douentza site. Mobile vendors were also plentiful in the fairs of the San site but rarely encountered in the Douentza fairs. Motorized transport was common in the San marketplaces and largely absent in the Douentza network. Hundreds of horse- and donkey-drawn carts arrived in the Fangasso and Dieli markets of the San site, while at most only about a dozen were observed in each fair of the Douentza site. Wells, pumps or tapped water were present in all the San marketplaces, but in only two of the marketplaces in Douentza.

In Kenya, marketing infrastructure was the most developed in Wote, the administrative and market hub of the district, and the least developed in Mulala village. With the exception of Wote, the markets located in the drier zones of the district (Kathonzweni, Kalawa) had no access to services such as electricity, banking or drinking water, while those in the slightly wetter areas, which also had better access to roads, did. Only Wote provided shaded stalls for non-resident, open-air traders. In all markets surveyed, resident traders had permanent structures, ranging from 10 in Mulala to 18 in Kasikeu. During the survey year, a relatively good year in terms of rainfall, the

participation of open-air vendors was highest in Kasikeu (21 traders) and Emali (18 traders) markets in the wetter zones, followed by Kathonzweni (12 traders) in the drier zone. The village markets of Wote, Kalawa and Mulala had the fewest open-air traders. In Wote, certain rules restricted the operations of open-air traders, while Kalawa and Mulala are relatively smaller, retail markets.

Vendor characteristics

In either site in Mali, only vendors seated in the open air sold grain as seed¹¹. No certified seed was sold in shops, by agro-dealers or by grain traders, and landrace grain suitable for seed was not sold by grain wholesalers or intermediaries. By comparison, the Kenyan team identified four types of seed vendors operating in the weekly fairs: (i) local shop owners, (ii) grain traders, (iii) farmer-traders and (iv) mobile traders. Agro-dealers, the only vendor type associated with the formal seed sector, traded agro-chemicals and maize or vegetable seeds of proprietary origin, but no pigeon pea.

Vendor characteristics are shown in Table 1. In Mali, virtually all seed vendors (all of whom were open-air vendors) in each site were women. Most vendors in Mali had never attended school,

Table 1. Characteristics of vendors in village markets of Mali and Kenya

	Mali			Makueni District, Kenya						
	Open-air			Permanet structures			Open-air			
	San	Douentza		Shop-keeper	Grain trader	All	Farmer- trader	Mobile trader	All	
	Site	Site								
<i>N</i>	45	57		64	36	100	53.0	14	67	
Mean										
Age	44.7	37.1	*	38	40.7	39	39.0	41.9	40.5	
Years in school	0.22	0.36		10.3	10.1	10.3	10.3	7.9	9.1	*
Years selling in this market	11.9	15.3		7.8	6.1	7.2	7.2	9.8	8.5	*
Percentage of vendors										
Female	97.9	98.9		60.9	52.8	58	58.0	92.9	75.5	*
Primary occupation										
Trader	56.7	5	*	68.8	80.6	73	73.0	50	61.5	*
Farming	28.5	93.5	*	28.1	16.7	24	24.0	50	37.0	*

Source: Authors' surveys.

*In Mali, denotes statistically significant differences between sites according to either parametric (chi-squared or t-test) or nonparametric test; in Kenya, statistical significance denotes between permanent structures versus open-air traders.

¹¹Research by Sperling et al. (2006) did identify wholesale traders who kept bags of seed during their seed security assessment, however. This may occur more during years of seed shortage, when demand is high.

and less than 10% stated that they were literate, including those who had attended adult literacy training in their maternal language. Most spoke not only their maternal language but also another local language needed for sales transactions. One vendor spoke French, the official language of Mali. Vendors were typically arranged in the market by affinity (village of origin, ethnicity).

In Kenya, 96% of open-air vendors and nearly three-quarters of all seed traders interviewed were women, and 88% stated they were literate. Educational attainment was higher among shopkeepers and grain traders (10.3 years) than open-air traders (6.6 years). Almost all traders (98%) in the markets surveyed belonged to the Kamba tribe – the dominant tribe of eastern Kenya – and they spoke and conducted the trading mostly in their maternal language. Traditionally, in the Kamba-speaking areas of eastern Kenya, women control the petty trading activities, especially in village markets. Ninety percent of the traders also had working knowledge of Kiswahili, one of the official languages of Kenya. Around 43% of the traders interviewed also could understand English, the other official language of Kenya.

The distribution of primary occupations differed significantly between Douentza and San, which reflects socio-cultural differences. Vendors in the Douentza site, where women are more involved in farming, reported almost unanimously that their primary occupation is farming. Only slightly more than a quarter (29%) of vendors in the San site listed farming as their major occupation, describing themselves instead as housekeepers who help their husbands farm. More than half (57%) of the San vendors reported that trading was their primary occupation, compared with only 5% in the Douentza site.

Major differences in other crops sold are also evident between sites in Mali. More than a third (36%) of vendors in the San site reported a major crop that was neither sorghum nor millet, reflecting the wider range of crops produced in this site as well as the broader range of products sold in the markets. In comparison, 95% of vendors in the Douentza site reported selling millet (83%) or sorghum (12%) as their major crop.

In Makueni District of Kenya, most farmer-traders consider farming their primary occupation. Grain vendors trade throughout the year and have permanent shops, but only sell seed just before the planting season. Farmer-traders and

mobile traders transact only during weekly open-air markets. The local shopkeepers and grain vendors traded all year round from permanent structures, whereas farmer-traders and mobile traders traded only once a week during market days, under the open air and with no fixed infrastructure.

In Kenya, increased investment in time and infrastructure further facilitated the specialization of shopkeepers and grain traders in trading. Of the 100 shopkeepers and grain traders surveyed, 73 vendors specialized in trading and considered it to be their primary occupation. They also handled a greater number of crops for sale (an average of five crops) through their shops. All the local shopkeepers surveyed sold grain/seed along with other consumption goods (such as toiletries, vegetables, oil, and matches). The open-air traders handled fewer crops (two on average). Only 33% (of the total 67 open-air vendors) considered trading as their primary occupation, and also considered themselves to be farmers.

Vendors in the Douentza site were slightly younger on average than those in the San site (37 as compared to 47 years). In Kenya, the average age of women open-air traders was similar (44 years) to those in Mali, compared with an average age that is slightly younger (39 years) among shopkeepers and grain traders. In Mali, traders had been selling their products for an average of 11 years. In Kenya, open-air traders had on average an additional year of experience compared to shopkeepers and grain traders (8 as compared to 7 years). Shopkeepers and grain traders explained that they needed more time to establish the minimum infrastructure for trading, which also depended on their initial financial status.

None of the women vendors in the Mali sample, as compared to nearly 44% of the Kenyan sample, owned mobile phones. Ownership by shopkeepers and grain traders were significantly more likely to own mobile phones, as well as other useful assets such as radios and bicycles, than open-air traders (Nagarajan et al., 2008).

Dimensions of access to quality seed

In this section, data describing the dimensions of access to quality seed are presented. Dimensions include (i) availability, (ii) transactions costs and prices, and (iii) information about the grain that signals its suitability for seed. We define availability as the quantity of grain and seed supplied by vendors.

Availability

Estimated amounts of grain and seed sold are shown in Table 2. All physical units of grain (seed) in the Douentza site were sold by the bowl, weighing 0.66 kg on average. Units of sale were larger in the San site (1.2 kgs on average). Total quantities of grain sold in the preceding month were difficult for vendors to estimate. Mean total quantities sold per vendor in April 2007 in the San site were nearly four times as great as those sold in the Douentza site. The quantities reported correspond to sales only within a 2-3 week period, or 2-3 weekly fairs, immediately preceding the expected planting rains. The peak time for seed sales in grain markets includes the period around the planting rains, but can extend later if farmers need to reseed due to an early dry spell that results in germination failure.

In Mali, estimating the amount or share of grain sold as seed, even within a fixed period, was extremely difficult for respondents. Respondents explained that they do not know if a client is purchasing seed unless he or she asks explicitly for seed or quizzes them about the provenance and attributes of the grain. A common response for a year after a good harvest was 2.3 or 2.4 buyers out of 10 are purchasing seed (23-24%), in either site. In years following poor harvests, the estimated percentage was significantly higher in the Douentza site than in San (4.7 compared with 2.9 seed buyers in 10, or 47% to 29%). In both sites the majority of vendors stated that the quantities they sold in the market varied substantially from year to year, depending primarily on the harvests.

Kenyan respondents were better able to estimate the amount of pigeon pea they sold. Both vendors and farmers reported that purchases made during the first two weeks after the onset of the rains were mostly for seed. Despite significant differences in physical infrastructure, there was no significant variation in the amount of pigeon pea supplied and sold among the seven markets surveyed. As might be expected, local shopkeepers and grain traders generally sold significantly more than open-air traders, and mobile traders sold significantly more than farmer-traders—except in the peak season, when all sold an average of only 16 kg/day (Table 2). Traditionally, in dryland environments, farmers or farmer-traders participate in large numbers immediately after the first rains, and transactions are extensive among all trader types.

Costs and prices

Prices for both millet and sorghum were higher in the Douentza site than in the San site, which is not surprising given that the villages are located in a harsher agro-ecology with sparse market infrastructure. Most vendors reported that prices varied by season inversely with the quantities available on the market (Table 2). More than 90% of vendors reported that prices were fixed on the day of the fair by market authorities and cultural norms, and daily variation occurred only in the larger markets. Credit arrangements are rare and usually occur among kin. Discounts were said to be uncommon and granted only to close relatives or friends or when large purchases were made.

In Mali, it was rare for a vendor to have purchased the millet or sorghum she was selling when interviewed (most had brought the grain directly from the family granary). In even fewer cases could a vendor tell us the amount she had paid per unit for grain they purchased and resold. The average markup in 17 cases was 0.83 CFA francs per kilogram.¹² In 13 of the 17 cases, the source was known by the vendor and was trusted as a supplier.

Price premiums for millet seed, compared with grain, are rare because seed purchased in the market is procured from grain vendors. Anecdotal evidence suggests that in years of seed scarcity, such as 2005, farmers are willing to pay a premium for locally adapted varieties.

Vendors in the San site, which is larger in scale and scope and where markets are more formally regulated than the Douentza site, pay market fees. Generally, storage at the market was rare. In the smaller village markets of the Douentza site, no fees are charged. The mean market fee paid in Douentza city was higher (100 FCFA), however, than that reported in the San markets (Table 2) – perhaps as a reflection of higher costs of physical infrastructure.

Vendors could not estimate the distance they traveled to the market, but based on their villages of residence, most of them, especially in the Douentza site, appear to have travelled from within a circumference of 5-10 kilometers on foot or in donkey carts. Vendors around the market hubs of San city and Douentza town live in nearby hamlets. Anecdotal evidence suggests that distances may be longer for vendors in the San site precisely because more of them consider their primary occupation to be

¹²Conversion rates on April 15, 2007 from Banque Centrale de l'Afrique de l'Ouest: US\$1 = 485.078 CFA franc; 1 CFA franc = US\$0.002062.

Table 2. Quantities, prices and market fees paid by vendors in village markets of Mali and Kenya

	Mali			Makueni District, Kenya						
	Open-air			Permanent Structures				Open-air		
	San	Douentza		Shop-keeper	Grain trader	All		Farmer-trader	Mobile trader	All
	site	site								
<i>N</i>	45	57		64 74	36 (48)	100 (122)		53 (61)	14 (76)	67 (198)
Mean total kgs sold per vendor ^a										
2-3 weeks before planting rains [#]	112	34.3	*							
One week immediately after rains	-	-		44.4	64	52.1		23.8	46.3	29.1 *
Mean expected price per kg^b										
Sorghum	88.9	98.7	*							
Millet	95.7	123.3	*							
Pigeonpea	-	-	-	30.0	30.8	30.3		29.0	30.4	29.3 *
Market fee										
Paying market fee(% of vendors)	93.5	37.1	*	98.4	100	98.9		88.5	100	91
Permit fee ^c	54.3	100	*	331.8	3433.3	3360		161.2	27.9	145.9 *

Source: Authors survey

Figures in parenthesis indicate number of vendor lots sampled.

* In Mali, denotes statistically significant differences between sites according to either parametric (chi-squared or t-test) or nonparametric test and in Kenya statistical significance between Permanent structures and Open-air traders.

In Mali, crops are sorghum and millet; in Kenya, pigeonpea. Periods are those in which farmers purchase seed in grain markets.

^b Expected price is the based on triangular distribution (minimum, maximum and mode) elicited from each vendor during the survey. For Kenya, the period is 3 years; for Mali, 2-3 weeks.

^c Market fees are in terms of FCFA in Mali and Kenyan Shillings in Kenya.

trading. For example, in Benena market in that site, a group of farmer-vendors had traveled across the border from Burkina Faso.

Hours spent in the market are limited by hours of daylight and the time needed to reach the market. Duration of stay is also influenced by the extent to which the vendor specializes in sales compared with other occupations. We observed that farmers often wanted to sell their millet or sorghum rapidly to make other purchases, conduct other business, and return to the village. Speedy transactions also help them avoid paying fees to sell in the markets. In contrast, vendors more specialized in commerce remained longer hours and often participated in

the city markets on days other than the weekly fair, paying the required daily fees.

In Makueni District of Kenya, the average price of pigeon pea lots sold across seven village fairs over the last three years (i.e., 2004-2006) was about 29 Ksh/kg¹³. The average lowest price of pigeon pea lots sold was 22 Ksh/kg (versus an average high of 40 Ksh/kg) and prices varied significantly among vendor types. The average low price obtained by open-air traders was lower (3 Ksh difference) than that of shopkeepers and grain traders (23 Ksh/kg). Often, during the planting season open-air vendors dispose of their produce early in the day, that is, they settle for lower prices in order to get back to their farming operations. However,

¹³At the time of the survey, the conversion rate was US\$1 = 73.6 KSh .

Table 3. Information about suitability of grain for seed in village markets of Mali

	San site	Douentza site	
N	46	57	
Percentage of vendors			
Providing no explicit information about the seed/grain lot to buyer	79.4	37.9	
Procuring lots from:			
Own fields or production units	46.9	84.1	
Other farmers	37.7	9.8	
Traders	15.4	6.1	
	100.0	100.0	
Percentage of vendor lots			
Varieties or types deliberately mixed by vendor	22.5	0	*
Identity of variety/type known	80.0	100.0	*
Of these,			
Known because all local people know it	19.2	21.3	
Known because it has been grown by vendor or vendor's production unit	48.7	76.5	*
Known because it has been grown by farmers from the same village as the vendor	12.1	2.16	*
	100.0	100.0	
Mean total years vendor has sold variety / type	11.2	14.4	*

Source: Market census survey (2006) and agro-morphological characterization of market seed (2007) samples.

from discussions with vendors, the Kenyan team understood that the average price of pigeon pea sold during the planting season is 10-15% higher than at other times of the year.

The functioning of village markets in Makueni District is governed by permits (i.e., market fees) for the conduct of sales inside the market premises. In principle, payment of a market fee is mandatory for all traders who participate in weekly markets. The amounts collected through market fees are used for the maintenance of market premises. The fee structure is based on sales volume and vendor type. Traders with permanent structures (local shopkeepers and grain traders) were required to buy a license from the local market authorities. Nearly all of the traders (96%) who participated in the weekly markets paid market fees ranging from 10 to 40 Kenyan shillings (Ksh) per day, depending on the market. Eighty-five percent of the traders expressed the view that official procedures were favorable for obtaining a license for trading in the village markets. Although inspection of sales during the market days and in other parts of the year is required by law, implementation is as low as 10% by the market administration. In rare cases, fines were imposed on

vendors. Amounts charged ranged between 300 and 1,000 Ksh for irregularities in trading.¹⁴

Eighty-seven percent of the vendors interviewed in Makueni District offered the same prices to all buyers; in very rare circumstances, discounts were provided to either friends or relatives. Differences were not significant by vendor type. Across vendor types, only 21% provided some kind of credit or advance to buyers, based on their trust and close association with the client. Credit provision was more prevalent among grain traders than shopkeepers, but no other differences were apparent.

Open-air traders traveled an average distance of 5.8 km to participate in weekly village fairs of Makueni District, on foot (56%) or by public transport. Open-air traders mostly brought their own farm produce (74%). Other vendor types procured pigeon pea from farmers in their own communities and brought it for sale in the fairs. The primary seed sources for local shopkeepers and grain traders were farmers (62%) or their own farms (37%). Only 1% of the total sample (167) procured their pigeon pea from other traders.

¹⁴The most common irregularities were poor sanitation in the trading premises – mice infestation – and presence of grain impurities.

Table 4. Information asymmetry in local seed markets of Makueni District, Eastern Kenya

Market location	No of seed lots	Percentage of seed lots classified as pure		Mean difference
		Vendor information	Agro-morphological information	
Kathonzweni	34	68	39	+29
Kalawa	12	50	54	-4
Wote	18	28	11	+17
Mulala	22	86	57	+29
Emali	38	84	26	+58
Kasikeu	48	54	30	+24
Sultan Hamud	27	68	5	+63
All markets	199	65	31	+34

Source: Market census survey (2006) and agro-morphological characterization of market seed (2007) samples.

Thus, in Kenya as in Mali, trader margins were not calculable for most open-air vendors. It would also be inaccurate to assign transport and fees to seed sales alone since typically, open-air vendors engage in multiple transactions on the day of the fair.

Information

For grain purchased in village markets to be suitable for seed, clients must know that it will germinate and recognize it as a variety that is adapted to the local growing environment. In the absence of a mutually recognizable variety name, knowing that the grain was brought straight from the seed or grain stores of a farmer in a nearby village is helpful. Seed is more likely to germinate if it has been brought directly from a farmer's granary; information about local adaptation is conveyed by village name. Near Douentza, particular villages are known for the quality of their seed or for maintaining seed with key attributes – such as early maturity (Sperling et al., 2006).

Farm survey evidence that the seed trade is more significant, and that grain is more likely to be suitable for seed in the Douentza site is borne out by the vendor survey. None of the vendors in the Douentza site mixed their grain (seed) lots, while more than a fifth of vendors in the San site sold mixtures, particularly of sorghum (Table 3). Sorghum mixtures are sold to brew beer.

Vendors in the San site also knew less about the grain they sold. All respondents in the Douentza site reported that they knew the identities of the varieties they were selling compared with only 80% in the San site. Of vendors who knew the identities of the varieties they were selling, more than three-quarters in the Douentza site grew the variety on their own farms, compared

to less than half in the San site. Only 6% of lots originated with other traders in the Douentza site compared with over 15% in the San site. In the Douentza site, 84% originated from the fields of the vendor or the granary of the production unit compared with 47% in the San site.

Vendors had been selling their varieties for a longer time, on average, in the Douentza market shed. Nearly 80% of vendors in the San site stated that they generally provided no explicit information about the grain lot to the buyer compared with only 38% in the Douentza site. Many vendors typically provide no information at all unless asked because they do not know the final use that will be made of the seed. Vendors reported that buyers asking about the characteristics of grain are likely to be new to the area or farmers purchasing for seed. Still, even in the case of seed purchases, about one-fifth of vendors told us that buyers know the variety or type by its physical appearance and do not necessarily ask for much information. Often the village of origin is the sole piece of information requested by buyers, or a confirmation that the source of the lot is the village or granary of the vendor.

In the Makueni District markets, 53% of shopkeepers and grain traders interviewed had no prior knowledge or information regarding the seed they sold. However, open-air traders had considerable knowledge. Most of the open-air traders are farmers, and as noted above, brought their own or neighbors' pigeon pea.

With regard to grain quality control, 33% percent of the vendors in the Makueni site differentiated grain from seed when they

procured it. Traders differentiated seed and grain based on physical purity (size, color, and cleanliness of the produce). Consciousness of quality was highest among open-air traders and grain traders (39% each), as compared to local shopkeepers (12%).

In recent years, noting farmers' preference for small seed/grain packs, traders in the Makueni site have begun to sell small, polythene bags of clean, sorted, farmers' seed that weigh between 0.5 and 1 kg. This practice is more recognizable among open-air traders (19%) than among grain traders and shopkeepers (14%), and thus among women vendors, who constitute the majority of this group. Farmers prefer the small packs for cost and cleanliness of the produce, although the price difference is negligible (1 to 2 Ksh/kg).

Mixtures were more common among the lots sold by shopkeepers and grain traders, as compared with open-air traders. During the 2006 short rainy season, of the total vendor lots, 35% were identified as "mixtures of unknown varieties," 21% were identified as "Kionza," a landrace of medium duration, 8% were "Kikomo," a landrace with a long growing period, and 8% were "Katoli #40", an improved, medium-duration type. However, agro-morphological characterization revealed considerable misclassification by vendors. Of the seed lots marketed as recycled-improved by vendors, only 62% were either local or mixed seed types; of the lots marketed as landraces, 42% were improved varieties or mixtures of improved varieties and landraces. Informational asymmetries varied by market (Table 4). Vendors from Kalawa market, who sourced most of their seed from within the village, provided the highest most accurate information on phenotypic purity; vendors from Emali and Sultan Hamud, who sourced most of their pigeon pea from outside the village, provided the least accurate information to their buyers.

Supplying diversity

About two-dozen varieties or types of millet and sorghum each were "named" by vendors in the 12 markets studied in Mali. Many of the names mean millet or sorghum "of the people" in various languages or dialects spoken. Only one name referred to a modern variety. Some names include grain color or size, or a description of the panicle ("horse's tail"). Most often the variety or type originated in a village that was located in the same commune where it was sold. One name refers to a variety retrieved when returning by land from Mecca long ago – perhaps

from Chad. Because they convey the ethnic or lineage affiliation of the person selling the grain or seed, names provide more information to Malian farmers than is apparent to outsiders – such as how the sorghum or millet is likely to have been managed on farm as seed or grain, and how it is stored.

A richness of names does not necessarily correspond to the diversity in traits and attributes on which semi-subsistence farmers in semiarid environments depend for production and consumption. In terms of named varieties, the richness of names within markets was also very limited. Names and morphological characterization of samples drawn from vendor lots were used to analyze diversity. While the mean numbers of named varieties per market in the Douentza and San sites were very close (3.17 and 3 respectively), the number of morphological clusters found represented at each market was substantially higher in Douentza (3.83) than in San (2.5). The morphological distinctiveness of the clusters was also greater in Douentza (1.92) than in San (1.1). These results indicate that substantially more genetic diversity was supplied to farmers in the village markets of the Douentza site.

In the Makueni District site, a total of 198 pigeonpea lots were on sale by vendors at the time of the survey. Of the total pigeonpea lots sold, local shopkeepers and grain traders stocked more lots (122) than did open-air traders (76). The maximum number of pigeon pea types (12 named plus mixtures) was sold in the Mulala market, and the least were sold in Kalawa and Wote markets (only two types in each). Mulala village is one of the few villages in Makueni District that has benefited from ICRISAT- and KARI-led farm demonstration trials over the last two decades, which may be one reason for the higher observed pigeon pea diversity.

Although Shannon diversity indices constructed from variety names did not reveal significant differences among markets, those constructed from agro-morphological data confirmed statistically greater pigeon pea diversity in Mulala market, where market infrastructure is the least developed. Further, computed values of indices based on named types overrepresented agro-morphological diversity.

Regression analysis

In Mali, the regression analysis confirmed that vendor characteristics are statistically significant determinants of quantities sold (Table 5). Site was significantly correlated with

Table 5. Factors affecting total quantities of millet and sorghum sold by vendors in village markets of Mali, April 2007

Variable	Definition	Coefficient	Standard Error	t-value	P> t
Constant	Regression intercept	176.79	97.37	1.82	0.0730
Market hub	San city, Douentza town = 1, else 0	-17.32	33.99	-0.51	0.6120
Site	San site = 1, Douentza site = 2	-171.12	37.43	-4.57	0.0000
Project village market	Market frequented by farmers sampled in project villages	98.96	30.36	3.26	0.0020
Time selling	Hours per day multiplied by number of days vendor sells in this market fair and others	0.30	0.06	5.24	0.0000
Expected price	Calculated as the mean of a triangular distribution elicited from vendor (minimum, maximum, mode)	0.81	1.02	0.79	0.4310
Age	Estimated age of vendor	-1.94	1.00	-1.95	0.0550
Education	Number of years vendor attended school	14.84	8.49	1.75	0.0840
F(7, 80)		12.76	Prob > F	0	
R-squared		0.5275	Adj R-squared	0.4862	

Note: Site, dominant ethnic group and crop sold are significantly correlated and only the site variable was included to represent the three variables. Whether the crop sold was sorghum or millet is not statistically significant. N=88.

major crop sold and vendor ethnicity, and quantities sold were lower in the Douentza site. The total time spent selling in the site, a measure of specialization in commerce as compared to farming, positively affected quantities sold; younger and more educated women sold more on average. Quantities sold are not responsive to expected prices during the period, which is consistent with the evidence that most prices are fixed and determined by a combination of social norms among market participants and institutional norms in any given market. More grain was sold in markets frequented by farmers who participated in a project whose goal was to strengthen local seed systems through farmer field schools and seed fairs.

In Kenya, as hypothesized, vendors located in weekly markets closer to communities where there were seed-based intervention programs in place traded greater quantities of pigeon pea (Table 6). Among vendor types, grain traders in the village fairs dominated through their sheer volume of sales, higher investment, and storage capacity. However, it is not clear if they sold more seeds than open-air traders, especially during the planting season. As in Mali, more educated vendors (although the effect of age was weak), and those with more specialization in trading, sold more. Quantities sold were not responsive to expected prices as most of these prices were the same for different types of pigeon pea sold and prices were fixed on the market day. Overall, the ownership of mobile phones

was not a significant factor influencing the sale of pigeon pea in the weekly markets, although there was a significant, positive association between mobile phone ownership and sales by grain traders and local shopkeepers. Many open-air traders (30%) during the survey gave a mobile phone number as their point of contact, which denotes the growing interest in exchange of market related information.

Conclusions

In Mali, village markets assure a supply of seed of identifiable, locally adapted, genetically diverse varieties as a final recourse in a risky environment where there are as yet no reliable formal channels and for which competitive varieties have not yet been bred. The San site, with the better developed market infrastructure, has more active grain markets, produces grain that is known for its high quality in consumption, and serves farming communities that are more likely to be self-sufficient in seed of sorghum and millet landraces. In these markets, grain trade by wholesalers and intermediaries dwarfs grain trade by petty vendors, and grain sold by petty vendors is less likely to be suitable for seed. The potential of agro-dealers to supply certified seed has not yet been exploited. At the time of this research, the major actors in the village market seed trade were farmwomen with little to no formal education, selling grain from their family stores as a means of procuring other supplies. Social

Table 6. Factors affecting total quantity of pigeonpea sold by vendors in village markets of Makueni District, November 2006

Variable	Definition	Coefficient	Standard error	t-value	P > t
Expected price in Ksh ^a	Calculated as the mean of a triangular distribution of prices elicited from the vendor (minimum, maximum, and mode)	0.3581	0.3309	1.08	0.281
Distance ^a	Km traveled to the nearest large market town from the weekly market	0.3701	0.1131	3.27	0.001
Education	Years vendor attended school	0.0581	0.0166	3.51	0.001
Age ^a	Age of the vendor (years)	0.3629	0.2375	1.53	0.129
Time selling	Number of hours per day multiplied by number of market days participated by the vendors in weekly markets	0.0056	0.0034	1.68	0.096
Mobile phone	Ownership of mobile phone: (1=yes; 0=no)	0.0881	0.1866	0.47	0.638
Seed quality	Ability to differentiate seed from grain (1=yes; 0=no)	-0.1765	0.1431	-1.27	0.219
Weekly markets location ^b	Location of market in area with producer marketing group intervention	0.2508	0.1384	1.81	0.072
	Location of market in area with no seed-based intervention	-0.7270	0.3302	-2.2	0.029
Type of the vendor ^c	Local shopkeeper (n = 64)	-0.2896	0.1802	-1.61	0.11
	Open-air trader (n = 67)	-0.2812	0.1708	-1.65	0.102
Constant	Intercept	0.6867	1.6568	0.41	0.679
Number of traders	167	F(11,155)	8.5		
R-squared	0.321	Prob > F	0.000		

Note: One hundred sixty-seven vendors from seven markets interviewed during October–December 2006 short-rains season.

^a Denotes variables that have been transformed into their natural logarithm values.

^b The omitted category is markets located in community-based seed production programs implemented in Sultan-Hamud, Kalawa, and Kasikeu village communities. The communities located in Wote did not have any seed-based programs, whereas communities located in Kathonzweni, Mulala, and Emali had producer marketing groups.

^c The omitted category of vendor type is grain traders (n = 36).

structure, agro-ecology and vendor characteristics determine quantities supplied rather than price, which is influenced for local market institutions and social norms, varying considerably over time but very little by vendor on any given day. There is some evidence that location in areas of seed projects is positively associated with quantities sold, but the potential for bias due to purposive placement has not been fully addressed.

In Kenya, no formalized channels of seed provision exist for non-hybrid, improved seed of dryland cereals and legumes such as pigeon pea sold in the village markets of Makueni District. Agro-dealers are active in selling only improved varieties of maize and vegetables. Shop-owners, grain traders, farmer-traders and mobile traders sell pigeon pea as seed. Most are also women, but more consider their primary occupation to be trading than

in Mali and they are considerably more educated. Shop-owners and traders have more assets and are more likely to have cell phones than traders in the other two groups and also sell more pigeon pea, but farmer-traders and mobile traders know more about what they are selling and provide more information to clients. There is variation in the integrity of varieties among markets, and the greatest diversity is found in Mulala, where market infrastructure is least developed. As in Mali, vendor characteristics and location in seed program areas, as compared to price, are significantly associated with quantities sold. The longer history of seed interventions in these sites relative to the sites in Mali supports this statistical result, although as in Mali, defining treatment and control areas with multiple scales of analysis and parameters was difficult.

Policy recommendations

Formal and informal systems must both be strengthened and linked for non-hybrid, dryland crops in order to exploit opportunities for better diffusion of quality seed, including the seed of both improved varieties and landraces. Although it is obvious that public, private, and voluntary actors will contribute to seed system development, especially in supplying seed of staple crops such as sorghum and millet, the optimal innovation system will depend on the context. Some general recommendations follow from the case studies presented and underlying research.

Both investments and changes in legislation are needed to better meet farmer needs in semiarid areas. With respect to investments, more public research funding for plant breeding remains necessary. For example, Mali's sorghum and millet breeding programs have so little funding that they have had to abandon some target ecologies. More effort should also be directed to involving the private sector at various nodes in the seed supply channel. In addition, the formal sector should leverage the social capital of existing farmer groups to test, evaluate, produce and disseminate improved seed. Public investments are needed to improve power and infrastructure in village markets. Public provision of information is important to support broad market participation because both informal social networks and more formal associations are exclusive. In order to reduce transactions and operating costs, ways of providing credit to traders should be examined.

With respect to legislation, the release procedure for improved seed should be shortened to two years or less. Government should coordinate among implementing agencies to monitor seed relief and protect farmers and seed systems (formal and informal) from poorly conceived seed aid practices. To improve the supply of well-adapted varieties from either farmer-selection or formal research, national legislation should be amended to enable production and sales of truthfully labeled and quality declared seed in village markets. To protect participants in village markets against misguided practices, traders need clear rules and regulations.

Seed policy should help to promote more efficient informal systems in semi-arid areas. In village markets, mechanisms must be designed to improve the quality as well as increase the range of quality-declared seed supplied. Seed fairs help stimulate demand and circulate seed of various types, as do small seed

packs and vouchers that are provided to traders in exchange for new seed. Both case studies identify open-air traders, most of whom are women, as sources of relatively good quality seed and related information. Vendors should be linked to seed sources such as seed programs and producer groups, and trained about seed. Traders and farmers need to be informed about the benefits of differentiating seed from grain. Trader associations might enable petty vendors such as the women interviewed to better meet the needs of their clients, especially if they are linked to producers of quality seed or are themselves organized and trained to produce quality seed.

A number of approaches have been piloted recently, and these are potential candidates for improving the supply of quality seed on a larger scale. The West Africa Seed Alliance (WASA) and Eastern and Southern Africa Seed Alliance (ESASA) seek to foster the expansion of existing seed companies and creation of new seed companies through supporting local entrepreneurship. Since private seed companies do not yet operate in the sorghum- and millet-based systems of the Sahel and state agencies are underfunded, ICRISAT has tested several models that draw on the comparative advantages of farmer organizations. Private, foundation seed companies that operate at cost to supply certified seed to farmers' organizations or traders are one model (Tripp, 2006). In early 2006, ICRISAT supported the production of foundation seed of various modern varieties of millet and sorghum in Niger. The foundation seeds multiplied were distributed through five different mechanisms: (i) farm trials and demonstrations; (ii) direct sales through input shops, agro-dealers and other outlets; (iii) seed fairs, at which seed was available in exchange for vouchers or cash; (iv) free distribution to vulnerable farmers; and (v) seed multiplication by farmers associated with FAO's community based seed project. Direct seed sales were found to be the most effective seed dissemination mechanism (Longley et al., 2008). Farmer organizations in Burkina Faso received training in marketing certified seed. Recently they have begun selling sorghum seed directly to input traders and emerging seed companies anxious to build their input distribution network. Two farmer organizations in Burkina Faso collaborate with the national agricultural research institution to produce foundation seed and certified seed under close supervision by researchers. The seed is distributed to other organization members for production of certified seed. This approach enables farmers to have access to a much larger range of varieties than can be provided strictly by the national system.

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Challenges of the maize seed industry in eastern and southern Africa: A compelling case for private–public intervention to promote growth¹

Augustine S. Langyintuo², Wilfred Mwangi³, Alpha O. Diallo⁴, John MacRobert⁵, John Dixon⁶ and Marianne Bänziger⁷

Abstract

Following the liberalization and restructuring of the seed sector, the maize seed industry in eastern and southern Africa has witnessed a proliferation of private seed companies. Whereas the total number of registered maize seed companies in major maize-producing countries increased four-fold between 1997 and 2007, the quantity of seed marketed barely doubled, suggesting that the seed production and deployment environment is less than perfect.

A study involving over 92% of all seed providers in east and southern Africa in 2007 showed that a number bottlenecks affect the entire maize seed value chain. The lack of access to credit constitutes a significant barrier to entry. Until governments and development partners make credit available to seed entrepreneurs directly or through risk sharing arrangements with commercial banks, national seed companies will not grow leaving the seed sector monopolized by the regional and multinational seed companies. In addition, the transfer of genetic materials between public and private sectors should be improved to allow easy access by seed companies to suitable and adapted varieties.

To allow for rapid regional spillovers of varieties released in one country to similar agro-ecologies in different countries, the implementation of harmonized regional seed laws and regulations should be expedited. Finally, the best strategies that increase the adoption of improved maize varieties should be explored and implemented to enhance seed demand.



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² Alliance for a Green Revolution in Africa (AGRA), Eden Square Block 1, 5th Floor, P.O. Box 66773, 00800 Westlands, Nairobi, Kenya (Formerly of International Maize and Wheat Improvement Center (CIMMYT) – Zimbabwe). Corresponding author (alangyintuo@agra-alliance.org)

³ CIMMYT – Zimbabwe, P.O. Box MP 163, Mount Pleasant, Harare, Zimbabwe

⁴ CIMMYT – Zimbabwe, P.O. Box MP 163, Mount Pleasant, Harare, Zimbabwe

⁵ CIMMYT – Kenya, P.O. Box 1041 Village Market, 00621 Nairobi, Kenya

⁶ Australian Center for International Agricultural Research (ACIAR), GPO Box 1571, Canberra ACT 2601, Australia (Formerly of CIMMYT – Mexico)

⁷ CIMMYT – Mexico, Km 45 Carretera Mexico-Veracruz, CP 56130 El Batán, Texcoco, Mexico

Fertilizer markets in Africa: Challenges and policy responses

Maria Wanzala-Mlobela¹, Balu Bumb² and Rob Groot³

Abstract

Most fertilizer markets in Africa have been liberalized to some extent and there is increasing government recognition of the important role of the private sector in the input marketing system. Nevertheless, fertilizer consumption in Africa remains low and fertilizer markets are small. The establishment of efficient and effective private sector-led fertilizer markets in Africa faces a number of key challenges and constraints on both the supply and demand sides, and overcoming them will require a range of well thought out and carefully implemented policy responses. Identifying these constraints and proposing the appropriate policy responses is the main purpose of this paper. The paper uses the modified industrial organization (I-O) approach to analyze the fertilizer market in Africa, elaborates the supply and demand constraints to its performance, and makes recommendations for policy responses. The key supply side constraints are policy and regulatory uncertainty, limited access to finance, and high inland transportation costs.

The demand side constraints consist of limited fertilizer adoption due to the absence of stable output markets for increased production, weak or non-existent extension systems and outdated fertilizer recommendations. The paper proposes strategic interventions by the public and private sectors that will achieve efficiency gains in the fertilizer supply chain by reducing costs and margins and eliminating bottlenecks, thus making fertilizer marketing more efficient. It also proposes strategic interventions on the demand side to help create demand in a way that is commercially sustainable. The paper draws four key conclusions. First, structure and conduct are not the main characteristics that explain performance in the African fertilizer market. A basic condition of the fertilizer market in Africa, namely the poor transportation infrastructure, has a defining impact on market behavior and hence on performance. Second, research is required to quantify the intangible costs incurred as fertilizer moves from the port to the farm gate. The findings can provide a solid basis for policy recommendations aimed at reducing transaction costs and improving the performance of fertilizer supply chains in Africa. Third, there is a need to reorient fertilizer subsidy programs, which are increasingly popular among

African governments, to provide purchasing power support to resource poor farmers. Fourth, the policy environment remains uncertain and non-conducive to well-functioning fertilizer markets in many African countries. Supportive, stable, market- and farmer-friendly policies should be implemented.

Introduction

Fertilizer markets refer to buying and selling, the economic incentive structure and the supply chain from the point of production/importation through distribution to the final consumer (the farmer). Highly functioning fertilizer markets have been recognized as a prerequisite for the success of efforts to improve agricultural productivity and hence increase agricultural output and farm income in Africa. The era of exclusive importation and distribution by state-owned enterprises and large donations of fertilizers from donors is largely over. Most fertilizer markets in Africa have experienced some degree of deregulation and liberalization and there is increasing recognition from governments that the private sector has a role to play in helping meet the needs of the farming community in general and smallholder farmers in particular. Despite these developments, fertilizer consumption in Africa remains low and fertilizer markets are small. Smallholder farmers still lack access to affordable fertilizers of the correct type, in a timely manner and from distribution points that are at reasonable walking distance. As a result, many governments have begun to rethink their decisions to withdraw from fertilizer markets – either the policy reforms have not been fully implemented or there have been policy reversals. However, it must be recognized that the establishment of efficient and effective private sector-led fertilizer markets in Africa faces a number of key challenges or constraints, on both the supply and demand side, and overcoming them effectively will require a range of well thought out and carefully implemented policy responses. Identifying these constraints and proposing appropriate policy responses is the main purpose of this paper.

Africa's fertilizer market in the global context

The majority of fertilizer consumed in Africa is imported. Conversely, Africa as a whole is a net exporter of fertilizer. Therefore, African fertilizer markets must be analyzed within

¹Senior Policy Economist, Policy Alignment and Program Development Directorate, NEPAD Planning and Implementation Agency. Corresponding author (MariaW@nepad.org)

²Principal Scientist and Program Leader, Agro-Economics Program, Research and Development Division, IFDC

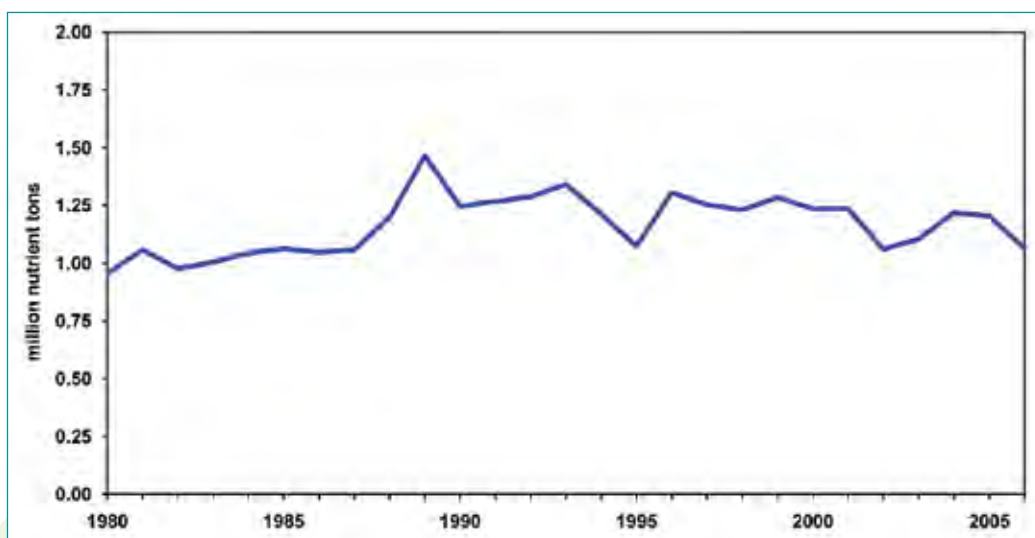
³Director, IFDC East and Southern African Division

the global context of fertilizer markets, that is, the constraints identified and policy responses recommended must take global considerations into account. Therefore, this paper will begin with an assessment of demand and supply conditions for fertilizer markets in Africa in the global context before focusing on analysis at the continental level.

Demand for fertilizer in Africa and the global context

Fertilizer consumption in Sub-Saharan Africa (SSA) has fluctuated considerably since 1980 (Figure 1). Consumption showed an upward trend between 1980 and 1990 reaching around 1.5 million metric tons per year (mtpy) in 1989/90, but after 1990

it exhibited a definite downward trend. Average fertilizer consumption in SSA decreased by 3%, from 1.1 million mtpy in 1995/96 to 1 million mtpy in 2005/06. Therefore, total consumption has not changed significantly between 1980 and 2005/06, averaging 1 million mtpy. Egypt, South Africa and Morocco are the leading fertilizer consuming countries in Africa as a whole; they consumed 3.2 million metric tons (mt) of nutrients and accounted for 69% of Africa's total fertilizer consumption in 2005/06. In global terms, fertilizer nutrient consumption was 161.4 million mt (2005/06) of which Africa accounted for only 3% or 4.7 million mt (Table 1).



Source: Derived From FAO data.

Figure 1. Sub-Saharan Africa: total NPK consumption, 1980–2006

Table 1. Fertilizer consumption in Africa and the world ('000 tons NPK)

Region	1990	1995	2000	2006
World	137.8	129.7	135.2	169.8
East Asia	36.5	45.3	45.0	68.3
South Asia	15.2	18.1	21.5	24.7
South America	5.0	3.5	9.5	12.7
Africa Total	3.6	3.5	3.9	3.8
Africa % Share in World	2.6	2.7	2.9	2.2
North Africa	1.7	1.6	1.9	2.0
Sub-Saharan Africa	1.2	0.7	1.2	1.1
South Africa	0.8	31.4	0.7	0.7
SSA % in Africa	33.3	31.4	30.8	28.9

Source: International Fertilizer Development Center (IFDC)

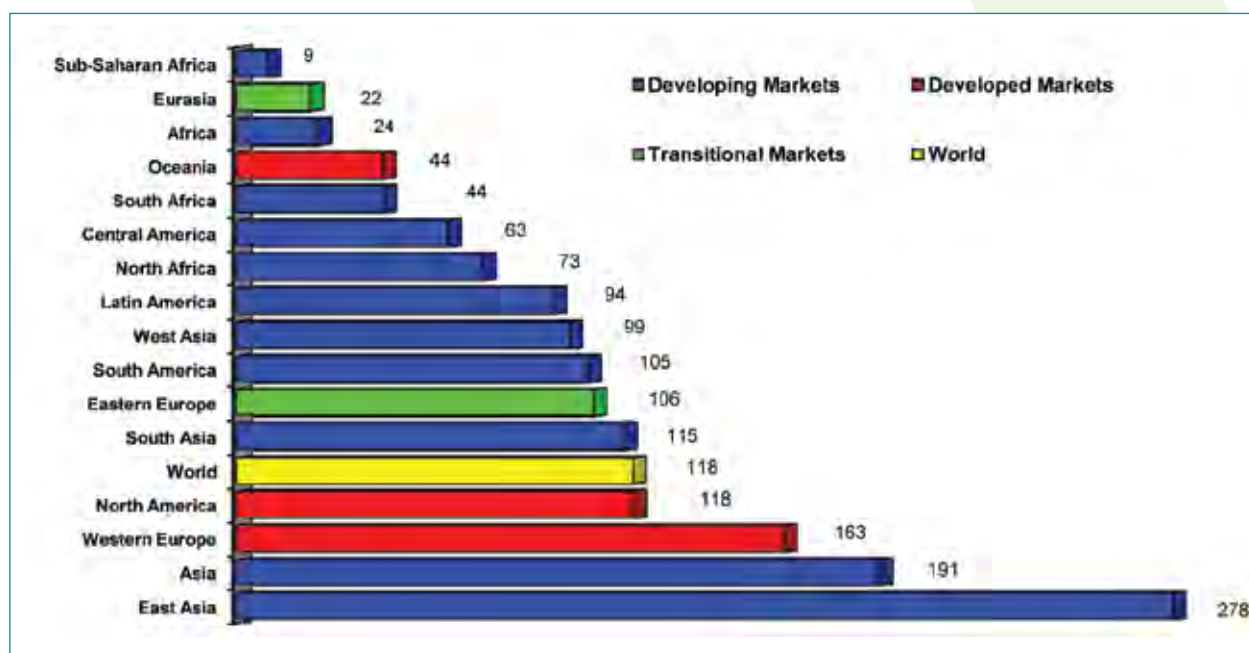
Africa's small share of global fertilizer consumption is a reflection of its small fertilizer markets, particularly in SSA. Out of the 44 countries in Sub-Saharan Africa, only nine use more than 50,000 nutrient tons; 10 countries use less than 10,000 nutrient tons (Table 2). These small fertilizer markets are a function of the low fertilizer use per hectare. Average fertilizer use in Africa is 10 kg/ha, equivalent to 10% of the world average, and almost 20 times less than the average for Asia (191 kg/ha) and nine times less than the average for Latin America (94 kg/ha) (Figure 2). Low fertilizer use per hectare does not auger well for achieving

food security or reversing severe soil nutrient depletion in Africa. Declining nutrient consumption and low fertilizer application rates have translated into cereal crop yields per hectare for Africa and SSA that are much lower than the world average (3.26 mt/ha) (Figure 3) and lower than what farmers are capable of achieving under conducive conditions. Nevertheless, it should be noted that during 1995/96 and 2005/06, cereal production and cereal yields increased by 18% in SSA – from 956 kg/ha to 1.16 mt/ha – indicating a growing efficiency in nutrient use.

Table 2. Sub-Saharan Africa: distribution of countries by the level of fertilizer use, 2005/2006 annual average

Fertilizer use (nutrient tons)	Number of countries
Less than 10,000	10
10,000 – 30,000	3
30,000 – 50,000	4
50,000 – 100,000	6
100,000 – 150,000	1
Over 150,000	2
Total	26

Source: IFDC From FAO data (no data for 18 countries).



Source: Derived From FAO data.

Figure 2. Per hectare fertilizer use by markets, 2006/2007 (kg/ha)

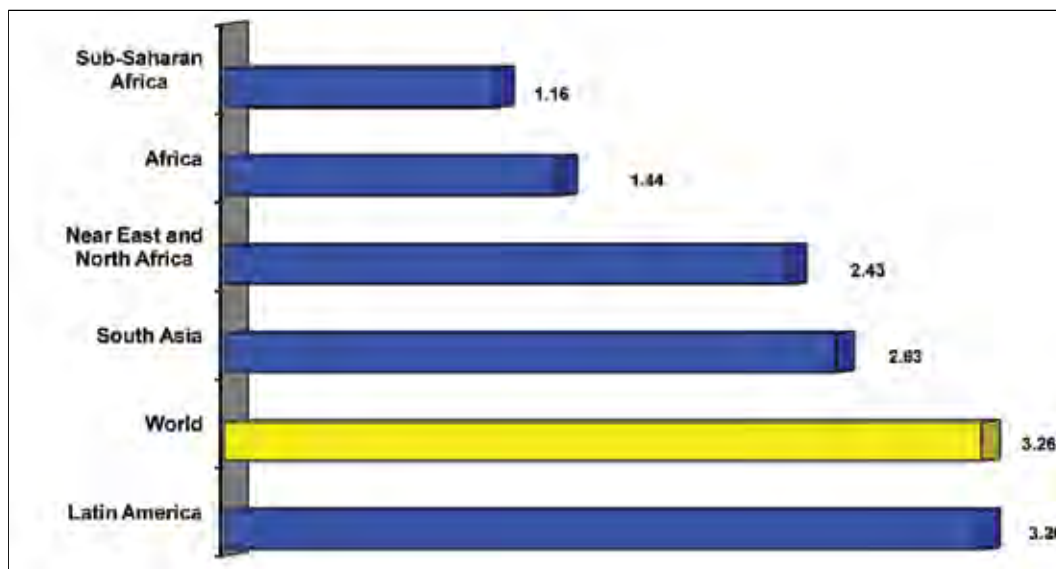


Figure 3. Cereal yields per hectare by regions, 2006/2007 (mt/ha)

Fertilizer production in Africa and the global context

Fertilizer production on the African continent is concentrated in North and South Africa. Production in SSA is extremely small, although there is some production starting up in Nigeria and forecasted for Tanzania and the Democratic Republic of Congo (DRC). A key reason for the lack of production is that SSA is largely deficient in the natural gas and raw material resources (phosphate rock, sulfur and potassium salts) required to produce fertilizer. Although there are numerous small deposits of phosphate rock throughout SSA, substantial commercial deposits

are found only in Tanzania, Togo and Senegal. The DRC is the only country in SSA with commercial deposits of potash. Nigeria, Angola, Equatorial Guinea, Ethiopia, Mozambique, Namibia, DRC, Madagascar and Tanzania are the only countries with natural gas. In comparison, there are significant phosphate rock deposits in South Africa and the country produces 90% of its phosphate fertilizer requirements and imports the rest. It does not produce potassium fertilizers. In North Africa, Morocco, Tunisia, Algeria and Egypt have substantial sources of phosphate rock and natural gas and produce both phosphate and nitrogen fertilizers.

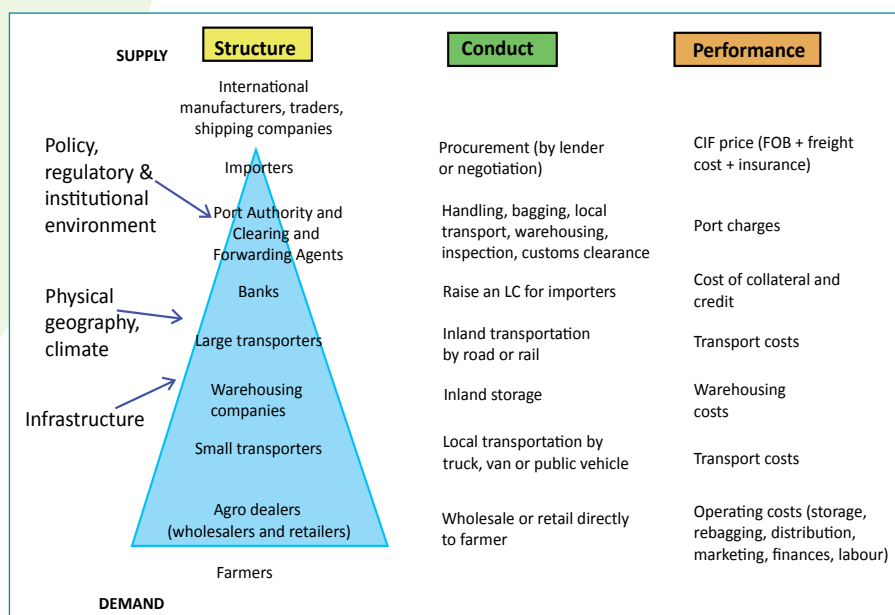


Figure 4. The fertilizer market in Africa: structure, conduct and performance

Total nutrient production in Africa was 5.5 million mt in 2005/06, an increase of 13% from the 4.9 million mt produced in 1995/96. However, this gain was offset by a 75% decrease in production in SSA – from 0.3 million mt to 0.09 million mt – during the same period. In terms of Africa's share of global fertilizer production, in 2005/06 the African fertilizer industry produced 3% of the world's total production of 164.9 million, which is similar to its share 10 years previously in 1995/96 (Figure 4). Egypt, Morocco and Tunisia accounted for the majority (78%) of the total production of 4.4 million mt. SSA accounted for only 1.8% of global fertilizer production in 2005/06 (Table 3).

Fertilizer trade: Africa and the rest of the world

Trade of total nutrients (imports and exports) increased between 1995/96 and 2005/06 for Africa as a whole and for SSA. Total imports for Africa increased from 1.4 million mt of nutrients to

has renewed interest among policymakers, the private sector and farmers in exploring the viability of national and regional fertilizer production in Africa (Figure 5). The US Gulf price of diammonium phosphate (DAP), a popular basal fertilizer for the production of maize in many African countries, increased by approximately 365% from US\$ 262/mt in January 2007 to US\$ 1,218/mt by April 2008. Similarly, between January 2007 and August 2008, the price of urea in the Arab Gulf (urea is a popular top-dressing fertilizer for maize production in Africa) increased by 200%, from US\$ 272/mt to US\$ 815/mt.

These unprecedented fertilizer price increases were due to a number of factors, including oil prices at over US\$ 100 per barrel that increased the demand for fertilizers to produce grain-based substitutes such as biofuel in Europe, the United States and Brazil; an increase in energy and freight prices; increased

Table 3. Fertilizer production in Africa and the world ('000 tons NPK)

Region	1990	1995	2000	2006
World	148.3	142.7	144.4	164.9
East Asia	26.2	31.8	34.8	55.9
South Asia	11.2	14.3	18.2	19.1
South America	2.7	3.2	4.0	5.6
Africa Total	4.9	4.9	5.3	5.5
Africa % share in world	3.3	3.4	3.7	3.3
North Africa	3.5	3.8	4.5	5.1
Sub-Saharan Africa	0.5	0.3	0.2	0.1
South Africa	0.8	0.8	0.6	0.6
SSA % in Africa	10.2	6.1	3.8	1.8

Source: IFDC

2.2 million mt of nutrients, an increase of 57%. The increase for SSA was 25%, from 0.8 million mt to 1 million mt. Total exports from Africa increased from 2.7 million mt to 3.1 million mt (an increase of 16%). The increase for SSA was 6%, from 78,000 mt to 82,500 mt. Table 4 shows net fertilizer trade for 2005/06. It can be seen that Africa as whole is a net exporter; it exports more fertilizer than it imports. However, SSA is a net importer of fertilizers.

SSA's almost exclusive reliance on imported fertilizer for its supply was not an inherent disadvantage before 2007 since there was ample supply of fertilizers in the global fertilizer market at relatively stable prices. However, the unprecedented increase in fertilizer prices between January 2007 and mid-2008

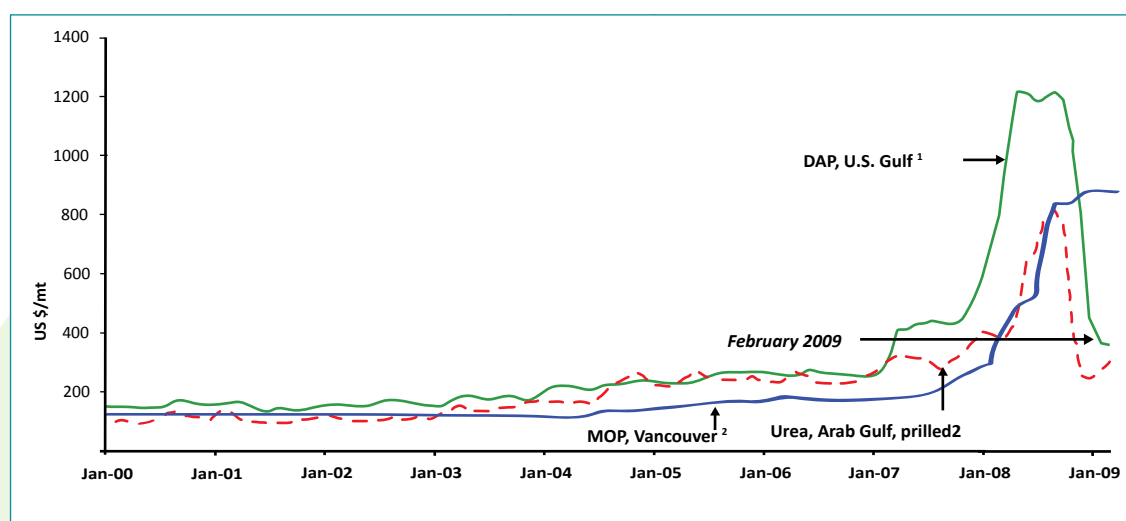
demand for grain-fed meat from the expanding middle-class societies of China, India and Brazil; and an increase in the price of natural gas, a major input for the production of ammonia for nitrogen fertilizers. However, farmers could not afford to purchase fertilizers at these astronomical prices, resulting in a drop in fertilizer quantity demand, leading to stock accumulation and drastic price declines (by mid-December 2008 the price of DAP had fallen to US\$ 469/mt and the price of urea was lower than pre-2007 levels at US\$ 247/mt). Although prices have since returned to pre-2007 levels due to the market correction, this experience clarified for African governments how vulnerable the continent is to global price volatility and has solidified interest in pursuing fertilizer production in Africa.

Table 4. Net fertilizer imports in Africa, by region (2006)

Year	Nitrogen	Phosphate	Potash	Total
(nutrient ton)				
Africa	(648, 412)	(1,580, 464)	412,517	(1, 816,359)
North Africa	(1, 347,002)	(1, 943,261)	90, 427	(3, 199,836)
Sub-Saharan Africa	491, 191	315, 687	184, 374	991, 252
South Africa	207,399	47,110	137,716	490,600

Nevertheless, investment in fertilizer production is only economically viable if it is for production of 300,000 to 500,000 mt, which requires a capital investment of over US\$ 500 million. Considering that only three countries in Sub-Saharan Africa consume more than 100,000 mt of nutrients, investing in large-scale production facilities in individual countries is not feasible. One option to pursue in the long run is to invest in fertilizer production in one country for local and regional consumption and export markets. However, for the short term, Africa will

number of countries. However, this response is expensive and in many cases unsustainable, and more importantly, it is typically implemented in a manner that eschews and undermines the private sector due to market distortions. A more viable alternative is to introduce policy measures that will reduce domestic marketing and transaction costs in the fertilizer value chain, and hence reduce the price paid by farmers by shifting the fertilizer supply curve to the right.



Source: IFDC

Figure 5. Fertilizer prices (f.o.b. bulk), monthly average, January 2008–February 2009

continue to import the majority of its fertilizer from the world market. Therefore, the retail price of fertilizer in Africa is determined by three factors: the world market price; exchange rates; and domestic marketing costs. Since Africa is a consumer in the global market, its response options with regard to reducing the price paid on the world market are limited. In this era of free trade and globalization, governments are also limited as to the extent by which they can manipulate exchange rates to mitigate the impact of price increases on farmers. Consequently, the key policy response has been increased use of subsidy programs in a

The remainder of this paper examines the fertilizer market in Africa, supply and demand side constraints to its performance, and makes recommendations for policy responses.

Conceptual framework: subsector analytical approach

Commodity subsector analysis provides an operational approach to analyzing market performance. A sector cuts across several industries, such as the food sector, which includes all the firms involved in the production and distribution of food. A subsector is defined as the entire range of business activities and services in the production and distribution of a specific commodity related vertically and horizontally by institutional arrangements, such as type of market exchange mechanisms (spot market, contracts, vertical integration), grades and standards, property rights and market regulations. The subsector approach also argues that the government must play a vital regulatory and facilitative role in system development (Shaffer, 1973, Holtzman, 1986). The horizontal dimension refers to firms within a particular industry. The vertical dimension refers to vertical coordination of product transformation and value-added by firm(s) at each stage of the subsector (from farmer to consumer) such as input distribution, production, assembly, storage, transport, processing, distributing, wholesaling and retailing.

There are key structural components that facilitate the vertical progression of a commodity such as fertilizer from the producer to the final consumer. The key components of a subsector are the supply chains – the marketing functions, institutional environments and marketing participants. Supply chains map the flow of raw material to final products.⁴

Various types of supply chains can exist in a subsector, each resulting in a different cost structure and final price. Supply chains can also be vertically integrated, whereby successive stages are absorbed under single ownership (for example, a fertilizer wholesaler can integrate forward into retailing, or an importer can forward integrate into wholesaling and retailing). Supply chains can also be of varying breadths (i.e., the number of competing firms at each stage). To move the commodity along the supply chain to the final consumer, firms carry out numerous marketing functions. These functions are the exchange functions of buying and selling; the physical distribution functions of transportation, storage and handling; and the facilitating functions of standardization, financing, risk-bearing and market information and research (Beierlein and

Woolverton, 1991). Marketing costs are generated by the various marketing functions carried out to move the commodity to the final consumer, and in doing so they add value as well as cost to commodities. These marketing functions and institutional arrangements are performed within each supply chain within a specific market environment. The aggregation of these supply chains defines the subsector, and the market environment is the context within which the marketing functions, institutional arrangements and market participants operate. The market environment comprises the institutional, social and demographic, and physical environment factors. The institutional environment is composed of the formal and informal rules, information flows (prices, supplies, levels and patterns of distribution), and enforcement institutions. Many institutional agencies are public sector entities, such as the Port Authority, Bureau of Standards, and Ministries of Agriculture. The types of marketing functions that have to be performed are determined by the physical characteristics of the commodity. Socio-demographic and physical factors also determine marketing functions that have to be carried out and the performance of the market. Market participants are marketing and facilitating intermediaries who perform one or more marketing functions in the subsector and use various institutional arrangements to coordinate their activities. The main purpose of the marketing intermediaries is to market and distribute the commodity in the least-cost manner and sell it at a price that will maximize their profit.

The subsector approach is based on the adaptation of the industrial organization theory (Bain, 1968; Scherer, 1980). This theory posits that the structure (S) of an industry strongly influences the competitive conduct (C) of firms within that industry, which in turn strongly influences market performance (P) (Bain, 1968; Scherer, 1980). Hence, the conceptual framework for subsector analysis includes components of structure, conduct and performance.

Industry structure refers to the characteristics of market organization that influence the nature of competition and pricing within the market. Some key indicators of market structure are: market concentration, product characteristics, entry and exit conditions, capital requirements, economies of scale, and vertical integration. Subsector organization refers to: timing of marketing

⁴The value chain is distinct from the supply chain, even though “value-chain” and “supply chain” tend to be used interchangeably in the literature and presentations. Analysis of supply chains focuses on production of the final output from the raw material making achieving productivity improvements the primary goal. The value-chain approach focuses on the consumer and the individual subsector, seeking to increase the value derived from the price paid by consumers for the various market actors that participate in converting raw materials to processed consumer products (Draft Framework Document for CAADP Pillar 2). For the purposes of this paper, the term “supply-chain” will be used to encompass both the supply-chain and the value-chain.

functions; number of stages; number of parallel supply chains; information systems; types of exchange; risk-sharing institutions and arrangements; the location and size of enterprises; seasonality; and production and consumption characteristics (Steffen, 1995). Market conduct refers to a firm's policies towards its product market and in response to moves made by its rivals in that market, in order to enhance its market share. There are three major areas firms focus on in this regard. First, price-setting strategies whereby the price can be the market-clearing price as in a perfectly competitive market; the monopolistic price (whereby the equilibrium price is set above the competitive level); or the oligopolistic price which falls in between these polar extremes of perfect and monopolistic competition. Second, they consider non-price strategies (promotion, product and distribution strategies). And third, firms seek strategic advantage and attempt to deter entry. Subsector conduct includes efforts to shift risk and gain market share, as well as coordination activities, such as the type of exchange arrangements used, information communicated, quality specifications and efforts to influence inter-stage cooperation and/or conflict.

Industry performance refers to the outcome or economic results of the structure of the industry and from the group of firms pursuing their respective lines of conduct. Both the industrial organization approach and the subsector approach focus on the performance consequences of alternative forms of industrial organization. The most popular performance dimension is economic efficiency, which has two aspects – allocative efficiency and technical efficiency. Allocative efficiency refers to the capability of prices to allocate resources efficiently in accordance with consumer preferences. It refers to the best choice of input combination, that is, whether the increased value from the use of an input (the marginal value product or MVP) is equal to or greater than the additional cost associated with the use of that input (the marginal factor cost or MFC). Accordingly, the rule for allocative efficiency of the marketing process is that additional functions and services should be performed until the additional cost associated with the performance of the marketing functions equals the increased value from performing the marketing functions and services. Allocative efficiency of a subsector can be evaluated by analyzing trader profit margins, that is, what remains once the trader deducts the marketing costs generated by the marketing process, plus a competitive return on

investment and entrepreneurship.⁵ With respect to the second dimension of economic efficiency, a firm is technically efficient if the production function yields the greatest output for any set of inputs. This performance dimension is concerned with the degree to which any output is produced in the least-cost way.

To increase the efficiency of the marketing process, it is possible to reduce the costs of performing a marketing function. This may involve eliminating marketing intermediaries, but marketing functions cannot be eliminated from the marketing process. Eliminating marketing intermediaries involves the transfer of marketing functions and costs to someone else. Therefore, two key issues concerning marketing functions are whether the necessary number of functions is being performed and whether these functions are being performed in the most efficient (least-cost) manner. In addition to the efficiency performance dimension, subsector performance dimensions are the dynamic performance dimensions of the marketing system. In other words, how effective is the system with respect to product suitability (quality, variety); system progressiveness (adoption of innovative handling and distribution methods such as re-bagging and various forms of vertical coordination); and equity of returns to system participants given distribution of investments, risk and responsibilities.

Operationalizing the approach: analysis of African fertilizer markets

Figure 5 illustrates the physical flow of fertilizer from the overseas supplier to the farm gate in the typical fertilizer market in Africa. In doing so it depicts the players in the African fertilizer market (structure), the functions performed by these main actors (conduct), and the costs and margins generated as these functions are carried out (performance). These functions are carried out within an enabling environment that is composed of public policies, the regulatory framework, laws and institutions, the physical geography and climate of the country, and the infrastructural set-up. The magnitude of the costs and margins generated by carrying out each function is influenced by the policy, regulatory and institutional environment as well as the basic market conditions (size of the market, infrastructure) and physical conditions (climate, soils, land formations, etc.).

This paper uses the modified industrial organization (I-O) approach to analyze the African fertilizer market. I-O theory

⁵In an efficient market, each firm sets price equal to marginal cost and operates at minimum average cost so that each firm is making zero economic profits or a competitive return on its investments.

recognizes that the basic conditions of a fertilizer market will influence structure and conduct, and hence performance. An important dimension of African fertilizer markets comes into play in this regard. I-O theory places heavy importance on structure of a market as an explanation for its performance – for example, if market performance is poor, the reason must be found in its monopolistic or oligopolistic structural characteristics. However, in Africa a particular basic condition of the fertilizer market adds an important explanatory dimension to market performance. Specifically, the poor state of the transportation infrastructure has a major impact on the performance of the fertilizer market. Therefore, in addition to the three characteristics identified by

I-O theory, this paper will add “outreach” as a fourth market characteristic to analyze fertilizer markets in Africa.

The fertilizer market in Africa is made up of various types of supply chains with different numbers of stages and actors at each stage. Figure 6 illustrates the six main types of supply chains (SC) found in SSA.

SC1 represents the typical organization of fertilizer supply chains in Africa where markets have been liberalized. Importers procure fertilizer from overseas suppliers and sell it mainly to wholesalers/distributors but also directly to retailers/agro-dealers. The latter typically occurs in countries like Uganda

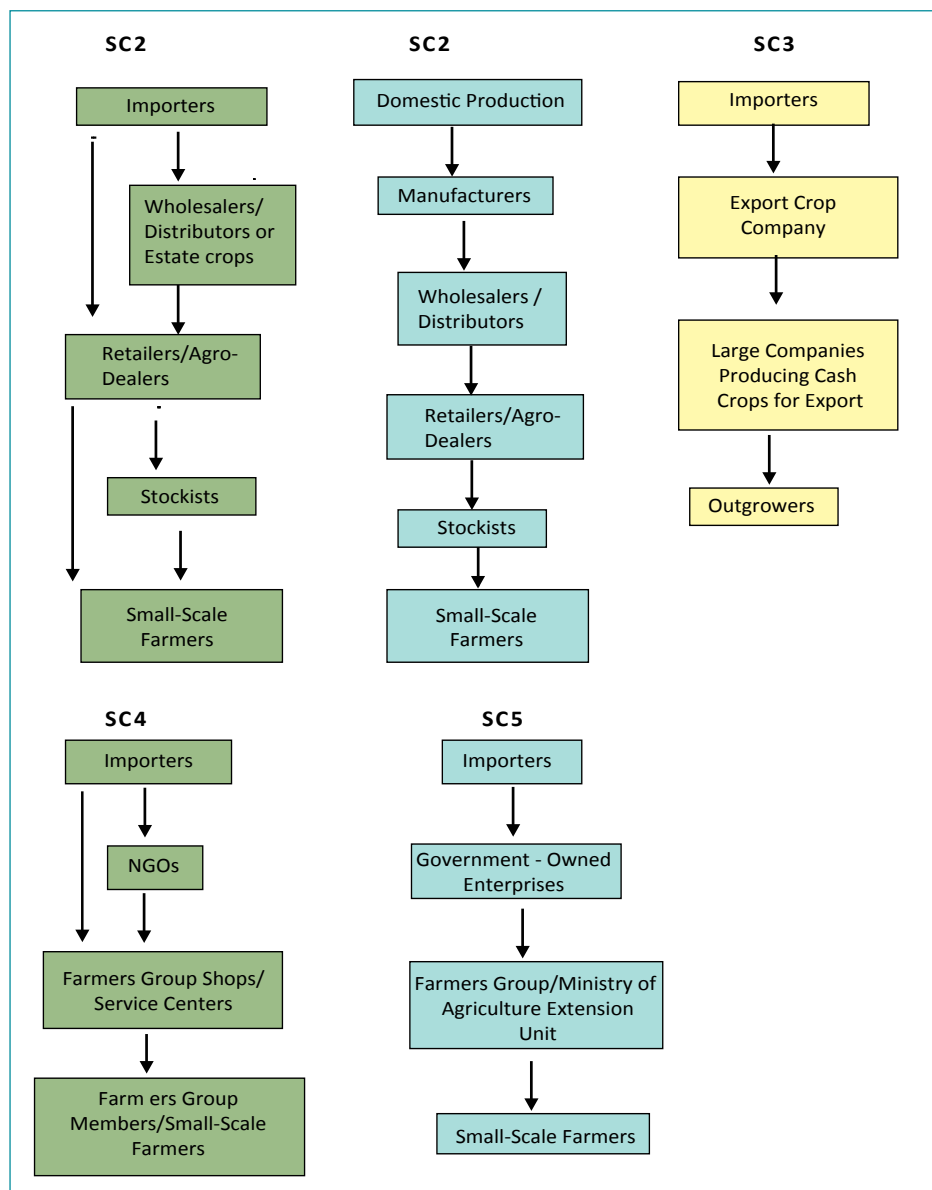


Figure 6. Types of fertilizer supply chains in SSA

where the wholesaler/distributor level does not exist or is insubstantial. Retailers/agro-dealers also sell fertilizers directly to small-scale farmers or sell it to stockists who then sell it to small-scale farmers. However, these supply chains are typically weak and undeveloped due to a number of supply- and demand-side constraints which will be elaborated upon later in this paper.

SC2 represents a more mature organization of fertilizer market with domestic production of fertilizers and distribution via well-developed wholesaler/distributor and retail networks. However, such systems only exist in North Africa and South Africa; there are few such systems in Sub-Saharan Africa.

SC3 is commonly found in the export cash crop sectors of SSA such as tea and sugar in Kenya, tobacco in Malawi, cotton in West Africa, and sugarcane in Mauritius. These companies either procure fertilizer directly from overseas suppliers or place orders with local importers for their contracted out-growers. They supply fertilizer on credit and deduct the cost of the inputs and other services at harvest time.

SC4 is found where NGOs implementing development projects also procure fertilizers for their farmers via local importers as part of their project objective of improving food security. The NGOs provide the fertilizers to their farmers directly for free, at subsidized prices or on credit. Alternatively, NGOs help their farmer groups set-up farmer service centers, which then purchase fertilizers from importers and sell it to members (at a discount) and to non-members.

SC5 occurs when government-owned enterprises procure fertilizers for their national fertilizer programs. They either procure it directly from overseas suppliers or via local importers using a tender system. These fertilizers are typically distributed via government parastatals or the ministry of agriculture extension service for free, at subsidized prices or on credit. The private sector is not involved in the distribution of fertilizers procured by the government.

Basic conditions – Small-scale farmers produce the majority of agricultural products in SSA, but they use little or no chemical or organic fertilizers to do so. More fertilizer is applied to staple foods than to export crops; 40% of the fertilizer consumed in SSA is used on maize, followed by other cereals (wheat, barley, teff, sorghum and millet). Fruits and vegetables and sugar cane account for 15% of fertilizer use, and rice, tobacco, cotton and traditional tubers (cassava, yams) account for 2-3% each (Morris

et al., 2007). Average fertilizer use in SSA is 10 kg/ha, one-tenth of the world average (100 kg/ha). Consequently, national fertilizer markets are small, with the majority of countries in SSA consuming less than 10,000 mt of nutrients per annum. These markets are characterized by too many products relative to market size. For example, the West African cotton sector has a high level of fertilizer product differentiation among different countries, despite the fact that they have similar soil types. Similarly, Malawi has 20 fertilizer products in use. Many are compound fertilizers, typically NPKs with minor variations in content. These are low-analysis fertilizers, and the nutrients are more expensive than the same nutrients found in straight high-analysis fertilizers because it is more expensive to manufacture smaller amounts of specific types of fertilizers.

Fertilizer markets in Africa underwent liberalization to varying degrees beginning in the late 1980s/early 1990s, but in many countries the government is still involved in fertilizer importation and/or distribution to varying degrees. The majority of fertilizer consumed in Africa is in granular form. Therefore, either it is imported already bagged or it is imported in bulk and bagged at the port at a flat cost per bag using equipment owned by the port authority and/or private bagging companies. With regard to handling and storage, palletization is often not used in Africa; instead bags are carried manually or dragged, which can result in torn bags and spillage. Fertilizer is hygroscopic, so improper storage can result in caking and/or its chemical composition can be affected due to exposure to heat and humidity. Losses due to improper handling and storage can therefore be quite high. The seasonality of demand for fertilizers and the low purchasing power of smallholders, which usually results in small and frequent purchases, increase transportation, storage and transaction costs.

Structure – In the majority of cases, the African fertilizer market resembles an oligopoly, particularly at the importer level with a few (typically five) importers accounting for 90-95% of the importer market share. However, this is not necessarily indicative of market concentration because, given the financial, logistical and management barriers to market entry, the fertilizer market in Africa lends itself to an oligopolistic character:

- First, importation of fertilizer is a capital-intensive venture. For example, procurement of 25,000 mt of urea from the Arab Gulf at US\$ 270/mt would require US\$ 6.75 million to purchase at July 2009 prices (f.o.b.). Few African

businessmen can raise this kind of money at one time, and stiff collateral requirements and high interest rates make borrowing from local financial institutions impossible for many. Therefore, importers have to use a letter of credit, which typically has a grace period of 90 to 180 days. However, it is impossible to ship and sell such a large quantity in this time frame, so domestic interest rates, (25-30% in 2009) become a factor. Moreover, to obtain the credit facility, importers have to meet the collateral requirements (typically 100-150% of the loan amount), have a solid financial and business record, demonstrated business and accounting skills and international trading experience. Consequently, only a small number of importing firms – typically those with connections to the international banking industry and linkages to the international fertilizer manufacturing industry – can survive, which contributes to the oligopolistic market structure.

- Second, fertilizer is a bulk product, so only firms that have strong logistics management skills can survive.
- Third, the fertilizer industry has economies of scale in production and procurement, which again contribute to the oligopolistic market structure of the industry.

Outreach – Importation of fertilizer into Africa is location-specific, while in most countries its consumption is highly dispersed and located at a distance from the port. Therefore, a reliable and efficient transportation system is required to move fertilizer to farmers in Africa. However, the road network in Africa, particularly in rural areas, is sparse and those that do exist are poorly maintained. This limits the distance traders and public transporters are willing to travel to deliver fertilizer to the farm gate and increases transaction costs (in terms of time and money) because trucks have to travel slowly and therefore take longer. Poorly maintained roads result in high maintenance costs for trucks, which increases transport charges and further contributes to high transaction costs. As a result, there is poor availability of fertilizers in rural areas and high prices for fertilizers that do reach the farm gate.

Conduct – Market participants in the fertilizer supply chain in Africa use three main strategies to maximize the value they extract from the final price paid by the consumer: price-setting strategies; non-price strategies; and strategies to gain

strategic advantage. The fertilizer market in Africa is typically very competitive at the wholesale and retail levels. In general, fertilizer wholesalers and retailers are “price takers” in the buying market; their suppliers quote the price and they accept or reject it in favor of another price. Mark-up pricing is commonly used to set the selling price at which these fertilizer traders set their selling prices to cover costs and make a normal profit (that is, zero economic profit) within the constraints set by market conditions. They operate on small profit margins and high turnover.

The degree of competition at the importer level is under dispute. Importers insist that despite the oligopolistic market structure, competition is fierce as importers compete for distribution channels. Typically, importers do not integrate forward due to the high overhead costs and risks involved. Studies on importer margins support this claim. However, studies have also revealed that in some countries, large importers may be able to exert their market power to set prices closer to monopolistic competition than perfect competition and obtain above-normal returns. For example, large importers in some countries publish and distribute a price list to their subsidiaries/agents and customers at the beginning of the trading season and maintain these prices throughout the season, regardless of market conditions, thus setting a price ceiling for other firms. In some markets there is a price leader (by virtue of its substantial market share and popularity of its fertilizer) that has the ability to influence market price up or down as a function of its larger volume.

With regard to non-price strategies, fertilizer firms have developed a variety of marketing strategies in an effort to differentiate their product(s) and themselves from their competitors and gain customers. One type of product differentiation employed in the fertilizer industry in Africa is branding by fertilizer importers, whereby importers typically use the name of their company as their brand name. Farmers are aware of the various brand names and prefer some brands to others; it is common for farmers to ask for a type of fertilizer by its brand name. However, with the exception of a few billboards, importers do not advertise. This is primarily because, given the small size of the fertilizer market in Africa, branding is a sufficient means of reaching consumers and the potential increase in sales revenue from advertising would be smaller than the associated cost.⁶

⁶In contrast, larger markets with more variety of needs among their customers and therefore a larger number of market niches, have to advertise to win over customers.

With regard to seeking strategic advantage, it is common for some of the smaller importers/distributors to purchase fertilizer from the large-scale importer and/or combine their shipments with them to reduce purchasing and shipping costs. Wholesalers and retailers will also combine transport to reduce transportation costs, and typically offer technical advisory services to customers as well as delivery and price discounts when a minimum number of bags are purchased.

Performance – As the main actors in the fertilizer supply chain carry out their functions, they generate costs and also take remuneration for their services in the form of profit margins. Figure 7 illustrates fertilizer supply chains for urea in Thailand, Tanzania (a coastal country) and Mali (a landlocked country) in 2006. Figure 7 illustrates the costs that are incurred as the various functions are performed along the supply chain, and illustrates their percentage contribution to the retail price. The main cost components are the product cost (f.o.b. and bagging), taxes and levies, transportation, finance and total profit margins by traders. Comparing the value chains for the

three countries provides some useful insight with respect to performance of the fertilizer market in Africa. It is evident that (in absolute terms) product costs are relatively similar in the three countries. They account for the largest component in the supply chain, representing 81% of the retail price in Thailand (US\$ 229/mt), 65% of the retail price in Tanzania (US\$ 251/mt) and 49% in Mali (US\$ 252/mt). However, all other costs are much higher in Tanzania and Mali than in Thailand. Whereas these other costs account for 19% of the retail price in Thailand, they account for 34.5% of the retail price in Tanzania, and 53% in Mali. Some proportion of these higher costs in Africa are legitimately incurred while performing the various marketing functions; however, some proportion of these costs are incurred as a result of the constraints imposed by the policy, regulatory and institutional environment. Consequently, the retail price of urea in Tanzania is 50% higher than that in Thailand and in Mali it is 80% higher. In general, in-country costs increased the cost of fertilizer to the farmers in Africa by 60-100% compared with 20% in Thailand.

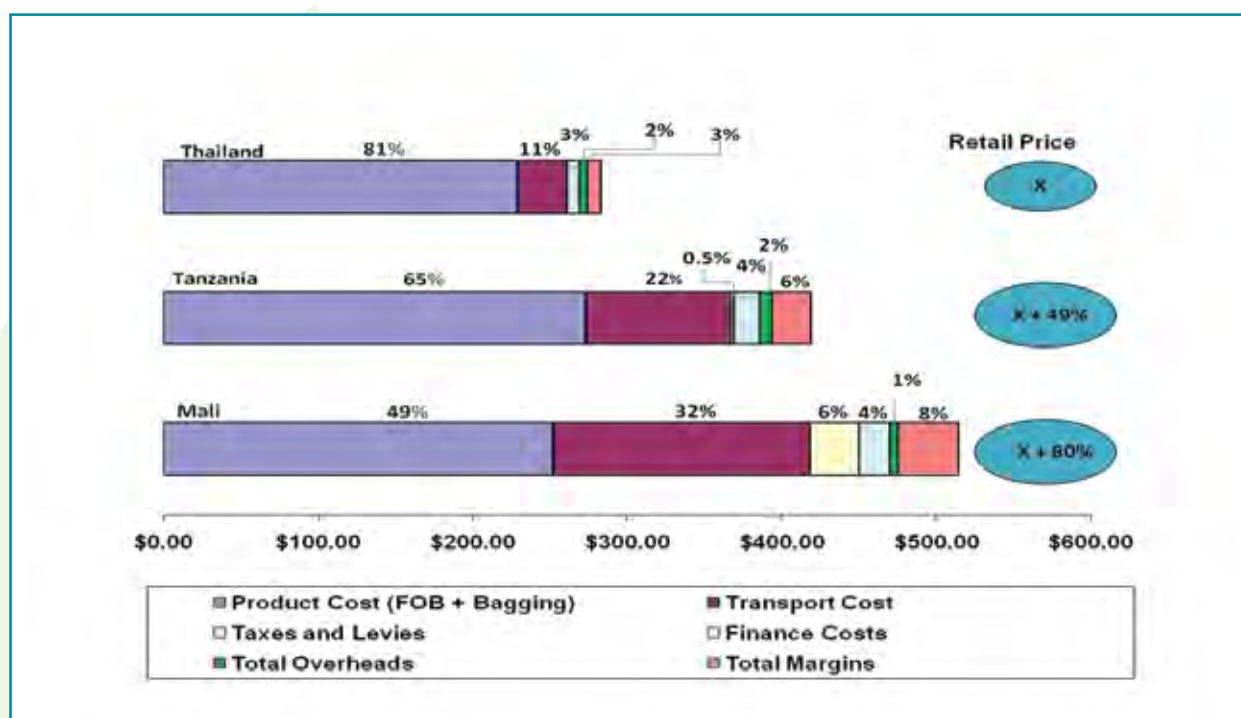


Figure 7. Fertilizer cost build up: Thailand vs. Sub-Saharan Africa (2006)

The other cost components that are responsible for the higher in-country costs in Tanzania and Mali are transport costs, total margins and finance costs. Taxes and levies are also a major factor in Mali. Total transport costs include ocean freight and port charges, inland transport and retail transport costs. These costs account for 22% (US\$ 93/mt) in Tanzania and 32% (US\$ 165/mt) in Mali compared with 11% (US\$ 31/mt) in Thailand. As is to be expected, transport costs are higher in landlocked countries like Mali compared with coastal countries like Tanzania, which do not have to contend with inland transport costs. In general, transport costs are US\$ 119/mt for coastal countries in Africa and US\$ 136/mt for landlocked countries. The higher transport costs in Africa are due to a number of factors. First, higher ocean freights and port charges in coastal African countries (US\$ 49/mt) compared with US\$ 23/mt in Thailand in 2006 due to relatively smaller cargo sizes, difficulties of finding return cargo and port congestion due to poor infrastructure. For example, cargoes to Thailand are 44,000 mt compared with the majority of fertilizer trade in SSA which is in small consignments of 1,000-25,000 mt (bulk) and 5,000–10,000 mt (bagged). Second, port charges in coastal African countries (US\$ 12/mt) are over 10 times higher than those in Thailand (US\$ 1/mt). A contributing factor is the various “fees” charged by the port authority and customs agents at the ports and countries of destination, which are undocumented. These illegal payments (or bribes) can be quite substantial in the fertilizer supply chains in Africa. They include fees for activities such as holding discharge space at the port, bribes so importers can avoid paying demurrage fees and so truckers can avoid long delays at border points. Inland transport costs are a third significant component of total transport charges. They can account for 20-40% of the retail value of fertilizers in Africa. Poor road conditions, high maintenance and fuel costs, and illegal payments at border posts all contribute to increased transport costs.

Total margins are the third-largest component of fertilizer supply chains in Africa. Importer, wholesaler and retailer margins account for 3% of the retail price in Thailand compared with 6% in Tanzania and 8% in Mali. Finance costs are the fourth-largest component in the three fertilizer supply chains depicted in Figure 7. They account for 4% of the retail price in Tanzania and Mali, compared with 2% in Thailand. Finance costs are composed of the costs of obtaining letters of credit (LC), bank fees, and interest rates incurred by importers, distributors and retailers.

The reasons for the discrepancy are the cost of opening accounts and the cost of LC in Thailand is much lower than that in Africa; it is 0.25% in Thailand, which is which is one-tenth the rate charged in Africa. Moreover, interest rates in Thailand are 5% per annum for importers and 7% for wholesalers and retailers, compared with 25-30% per annum in Africa.

What accounts for the higher costs and margins in African countries than in Thailand? A key reason is poor market development in Africa. Thailand has lower margins and overhead costs due to a higher level of development of retail networks in terms of quantity and quality of market actors (there is one retailer per 5,000 farmers in Thailand), fierce competition at all levels of the supply chain and the high volumes of business conducted. These attributes are absent in Africa’s fertilizer markets due to a number of supply and demand constraints that are inflating the magnitude of these costs above what they would be in a competitive market. That is, there is a component of each cost that can be justified by the function performed (whereby Price = Marginal Cost). But in African fertilizer markets the final consumer price is not equal to the marginal cost but is above it (Price > Marginal Cost), because there are rents or additional costs. These rents emanate due to the policy, institutional and regulatory environments in which the fertilizer market operates. The next section will elaborate on the nature of these constraints and provides a description of the cost savings that could be derived if these constraints were reduced or eliminated. Quantification of these cost savings, while challenging and in some cases impossible, would provide a solid basis for policy recommendations aimed at reducing transaction costs and improving the performance of fertilizer supply chains in Africa. Policy responses that could be introduced to address these constraints are proposed later in this paper.

Constraints to improved fertilizer market performance in Africa

Supply-side constraints

The supply-side constraints, the corresponding cost component and the cost saving are presented in Table 5. Demand-side constraints are discussed thereafter. The next and final section of the paper makes recommendations for policy responses to address these constraints.

Table 5. Identification of cost savings emanating from removal of supply-side constraints to improved fertilizer market performance in Africa

Supply-side constraint	Cost component	Source of potential cost savings
Function = Procurement		
Many countries have regulations that prescribe specific nutrient compositions or granule sizes of fertilizers that can be imported.	f.o.b. price	If these regulations were removed, importers could import fertilizers that are commonly found in international markets and still meet the agronomic needs of farmers. This is considerably cheaper than buying fertilizers that have been specially blended for the typically small fertilizer markets in Africa. This would also allow the introduction of innovations to reduce costs, such as bulk importation and blending.
Function = Financing		
Commercial banks have liquidity but they regard lending to agriculture as high-risk. To minimize risk they charge high interest rates and impose strict collateral requirements. As a result: a. Importers' margins are inflated by substantive finance charges. b. Agro-dealers and stockists have limited access to finance so they use their own savings to purchase fertilizers. This adds to transaction costs and restricts the scale of business operations.	Collateral requirement (100-150%); cost of credit (15-20%)	If risk-sharing mechanisms that mitigate the risk borne by financial institutions could be introduced, banks would be more willing to extend credit to importers and agro-dealers and at reduced interest rates and collateral requirements. a. The magnitude of finance charges in importer margins would be reduced. b. Agro-dealers would have access to credit so they would not incur the costs emanating from small consignment sizes, high frequency of purchases, low inventories resulting in lost sales and inability to achieve economies of scale in purchasing and transportation.
Function = Production		
Examples of government policies that undermine existing local fertilizer production activities: a. some governments import fertilizers instead of ordering from local fertilizer producers; b. foreign exchange restrictions which make importing raw materials for fertilizer production difficult.	f.o.b. price	If policies were supportive of local production, local fertilizer manufacturers would operate near or at capacity to produce fertilizer for local and regional markets at competitive prices.
Function = Port Charges and Handling		
Only port employees are allowed to unload ships, but ports are typically understaffed.	Handling costs and demurrage charges	If private companies were allowed to make their own arrangements for unloading, it would be accomplished more quickly. This would reduce handling costs and demurrage charges associated with the slow rate of discharge from ships.

Supply-side constraint	Cost component	Source of potential cost savings
Ports are underequipped (low number of shore handling cranes) and the off-loading equipment is not well maintained.	Handling costs and demurrage charges	If the port equipment was not insufficient and in poor condition, and private companies were allowed to operate at the port, ships would be unloaded faster. This would reduce handling costs and demurrage charges.
Insufficient number of bagging machines at the port and private companies are not allowed to operate.	Cost of bagging	If there were sufficient number of bagging machines at the port and private bagging companies were allowed to operate at the port, importers could import larger quantities in bulk and bag them at the port, which is cheaper than importing bagged fertilizers. This would reduce bagging costs and improve the quality of bagging.
Silt build-up at ports limits the size of ships that can be discharged.	f.o.b. price	Dredging of ports to permit entry of large ships carrying bulk cargo.
Inadequate warehousing facilities at the port (small sheds and/or low number).	Warehousing costs	If bulk storage capacity were adequate this would enable more efficient discharge from ships, thus reducing demurrage charges.
Function = Inland transportation		
Roads – the poor state of roads and numerous roadblocks cause significant time and fuel inefficiencies. Railway systems – inefficient, unreliable and undercapitalized.	Transport costs	If roads were improved and maintained, transport charges would not be increased to account for the cost of frequent maintenance/repair of trucks due to high wear and tear and fuel inefficiencies. If rail had been improved, importers could use rail instead of roads, which would reduce transport costs substantially (rail transport is 30% cheaper on average than road transport).
Function: Wholesaling/retailing to the farmer		
Quantity: The number of agro-dealers and stockists is insufficient and they are concentrated in towns and district headquarters. Few are located in villages closer to the farmers. As a result farmers have difficulty accessing inputs. Quality: Business and technical skills of agro-dealers and stockists are inadequate (product knowledge, information about fertilizer recommendations, bookkeeping and marketing skills).	Wholesaler and retailer margins (overhead and administration)	If there was a developed agro-dealer network, agro-dealers would operate more efficiently; instead, lack of competition, ineffective management and poor service delivery result in higher costs.

A key supply-side constraint is policy uncertainty and inconsistency. The majority of fertilizer markets in Africa have been liberalized and therefore the policy environment is generally conducive to the private sector. However, many African governments are unclear about their role in the fertilizer market; specifically, what they should do to support the fledgling private sector. At the same time, governments have little faith in the capability of the private sector. The result is two extremes in the governments' approach to the fertilizer market. One extreme is a 'hands-off' approach whereby the government has withdrawn completely and left the private sector unsupported in terms of providing a facilitating policy, regulatory and institutional environment. The other extreme is "government intervention" – government involvement in the importation and/or distribution of fertilizer via the reinstatement of old parastatals, typically implemented in the form of an unclear and inconsistent subsidy policy that eschews the private sector.

Where the subsidy programs do not involve the private sector, the result is market distortions due to the sale of subsidized fertilizers by the government parastatals and the displacement of commercial sales, which discourages the private sector. Even where the private sector may be requested to import on behalf of the government, the information regarding quantities and timing is not always clear or provided in a timely manner, and the terms of participation can pose risks for private importers who decide to submit bids. For example, tenders can be unrealistic as they require physical stocks to be positioned in-country prior to tendering which poses a huge risk for importers as they have no guarantee their bid will be successful. Therefore, despite the liberalization of fertilizer markets in Africa, continued government involvement to varying degrees is creating an unequal playing field and disrupting the development of the burgeoning private sector.

Other supply-side constraints are fertilizer regulatory systems that are either nonexistent or ineffective where they do exist and weak market information systems. Many countries either do not have a legal and regulatory framework regarding quality, standards, measures, safety in use and business ethics vis-à-vis the importation, distribution, marketing and use of fertilizer products in the country. Where these frameworks do exist, the quality control systems are weak and implementation capacity is limited. Laboratory testing facilities are absent or outdated and the majority of countries have no inspectors or there are

less than 10 inspectors for the whole country; hence inspection at the point of sale, where the risk of adulteration is highest, is limited.

Well-functioning markets require regular and accurate information about prices, quantities, stocks, deliveries and transaction costs. However, while in some countries information about output markets (commodity prices) is published in the daily newspaper, information collection and dissemination remain weak for input markets. The ministries of agriculture in many African countries do not have the human and/or financial resources to collect and disseminate market statistics and information. Consequently, importers, agro-dealers and farmers do not have sufficient, up-to-date information about market conditions to make intelligent decisions about where and when to buy and sell their fertilizers and other agricultural inputs.

Demand-side constraints

These consist of constrained fertilizer adoption due to the absence of stable output markets for increased production, weak or non-existent extension systems and outdated fertilizer recommendations.

Constrained adoption of fertilizers due to absence of stable output markets for increased production – The existence of reliable and stable output markets provide the incentive for farmers to use productivity enhancing technologies like fertilizers by providing reliable outlets for their marketable surpluses. However, while the markets for cash and export crops are well developed in SSA, the markets for food crops are poorly developed. Consequently, at harvest farmers are often faced with low prices, which reduce the incentive to use modern inputs.

Outdated fertilizer recommendations – Small-scale farmers in SSA lack knowledge about the correct and safe use of fertilizers. Very few farmers use basal fertilizers, some use basal (NPK) fertilizers for top-dressing, or they may use a mixture of both, due to knowledge and economic constraints. Moreover, even where farmers attempt to use fertilizers correctly their efforts are hampered by outdated fertilizer recommendations. Consequently, they use fertilizer grades and quantities that are not suitable for their soils and/or crop mix. This continuous cultivation without proper and adequate use of fertilizers has resulted in severe soil infertility and degradation problems in SSA. Consequently, crop yields and profitability are much lower than what is required to achieve food security and increased incomes.

Weak/non-existent extension systems – A key reason for the outdated fertilizer recommendations and poor farmer knowledge regarding correct fertilizer use in SSA is that many of the extension systems are defunct or if they exist, they are understaffed and under-equipped.

Policy responses

Supply-side policy recommendations

Create an enabling policy and regulatory environment –

Promoting market development through the appropriate policy and regulatory measures is the primary role of government in African fertilizer markets. However, market development is necessary but not sufficient to include resource-poor farmers in the marketplace because they do not have the purchasing power to participate. Therefore, government support to resource-poor farmers must become an integral part of efforts to support fertilizer market development in Africa. Government efforts should be aimed at establishing a level playing field for all market actors while enabling government to provide poor farmers with market access.

The most common policy response in support of fertilizer market development in Africa has been the introduction of fertilizer subsidy programs. However, fertilizer subsidies, which typically involve a reduction in the price to be paid for fertilizers, are expensive and often end up benefiting unintended segments of the farming population, such as cash crop farmers who can afford to purchase fertilizers at market prices. Fertilizer subsidy programs that have been implemented to date also tend to eschew, and hence undermine the private sector. Instead of fertilizer subsidies, governments should use the same funds to provide Purchasing Power Support (PPS) to resource-poor farmers by distributing input vouchers that can be redeemed by private companies. This approach will also strengthen the private sector. And instead of importing the fertilizers for their subsidy programs directly, governments could give this responsibility to private firms, taking care to notify them of their input requirements in good time to facilitate effective planning. In the interests of maximizing the success of the subsidy program, the criteria for participation should focus on demonstrated capacity of a firm to import fertilizers within a reasonable timeframe from the time the tender has been awarded.

African countries need to enact fertilizer laws and develop the capacity to implement them. This calls for efforts to develop

product standards and enforce truth-in-labeling. These initiatives should be backstopped by improving the capacity for physical spot inspections at the point of sale. The ensuing rules and regulations should be harmonized with those of neighboring states to promote cross-border trade.

Promote fertilizer production – A number of factors have contributed to the increase in global fertilizer prices (fluctuating oil prices, increased demand for grain to produce biofuels, increased demand for grain-fed meat by newly affluent middle classes in emerging economies, etc.). Consequently, fertilizer production in Africa has become more financially and economically feasible. However, it takes four to five years to get a new urea plant built and producing, so adding new nitrogen manufacturing capacity must be a long-term solution. In the short term, a more viable approach is to import straight high-analysis fertilizers in bulk and utilize the nutrients to blend fertilizers for African markets. Once market size increases sufficiently to justify investing in fertilizer production, the approach would be to improve utilization of existing capacity and consider reinvestment to improve technology before establishing greenfield plants.

Transportation and logistics – Transport costs comprise the largest cost component in the fertilizer supply chain after the price of the fertilizer, and logistics are critical for timely delivery of the right types of fertilizer in the right places. There is a lot of scope for reducing the cost of transporting fertilizers by upgrading road, rail and port facilities but by necessity this is a long-term solution because it is capital-intensive. However, there are some measures that can be undertaken within a relatively short period of time to reduce the costs and improve the performance of transport and logistics activities in the fertilizer supply chain. First, governments should liberalize port activities to allow private-sector participation. This could result in an immediate increase in the availability of port handling equipment (number of bagging machines and shore-based handling cranes) at no cost to the government. The immediate benefits would be improved services and reduced port costs for importers. Second, establish bulk fertilizer holding warehouses where large fertilizer manufacturers would place fertilizer in the warehouse and small consignments of 100 mt or more could be purchased by small importers when needed at globally competitive prices. Third, with respect to inland transportation, governments should ensure that policies allowing the free

movement of fertilizers across borders are being implemented. Once funds are available, the priority should be to improve port facilities to reduce port congestion, improve port capacity and improve the road and rail infrastructure.

Introduce financial mechanisms to share risk among stakeholders – There is a need to introduce risk-sharing mechanisms to link commercial banks with importers and agro-dealers in a manner that will spread the risk among banks, fertilizer market actors, and donors. Specifically, governments and donors could create loan guarantee funds that will facilitate local importers to procure fertilizers on international markets at more favorable terms and to finance stocks for agro-dealers.

Human capital development – The quantity and quality of human capital all along the fertilizer supply chain needs to be improved. The number of agro-dealers needs to be dramatically increased and coverage improved so that farmers have access to fertilizers at affordable prices and in a timely manner, and farmers in the rural interior don't have to travel more than 10 km to buy a bag of fertilizer. Similarly, the marketing and technical skills of importers, agro-dealers and stockists need to be improved and linkages between them established and strengthened. Importers need better linkages with market actors upstream and downstream to improve service delivery, and develop business linkages with regional counterparts through study tours to expand market share and better serve African farmers. Agro-dealers and stockists require training in business management and product knowledge which they can then impart to farmers. Farmers require intensive and regular training in the correct and safe use of fertilizers, the economics of fertilizer use and marketing options for the different crops they produce.

Market information – Ministries of agriculture need to establish and operate market information systems to provide information to importers, agro-dealers, farmers and policymakers about market conditions. This flow of information should be regular and timely, and the content should be accurate. In this way every market participant can have access to reliable information about prices, stocks and deliveries in various segments of national, regional and global markets, and use this information to make the right decisions.

Demand-side policy recommendations

Development of crop output markets – Measures should be implemented to improve the prices received by farmers and dramatically increase output market demand. Output market demand can be increased by scaling-up and replicating output markets on different fronts – out-grower schemes, periurban agriculture, niche markets and non-traditional exports. The prices received by farmers can be improved by promoting the development of producer associations, dissemination of market information, introduction and enforcement of grade and standards for quality produce, improved storage and agro-processing facilities and warehouse collateral to facilitate the purchase of agricultural produce at harvest time.

Technology transfer interventions – There is a need to educate farmers about the proper use of fertilizers and management practices. This is best done by a revival of the extension systems of the ministries of agriculture that are designed to reach the widely dispersed farming community in Africa. The government extension system can be complemented by technical advisory services provided by trained agro-dealers, particularly for those farmers who are located within 10-30 km of the main district capitals and towns where agro-dealers tend to be concentrated. Farmers can be educated about correct fertilizer use and improved agronomic practices through fertilizer trials, demonstrations and field days. One-day training programs for farmers, agro-dealers and extension workers should also be organized. In addition, laboratories and facilities should be provided to enable soil analysis and testing to update the fertilizer recommendations and make them more appropriate to the different agroecological zones and input and output market realities faced by farmers.

Summary and conclusions

This paper has proposed strategic interventions by the public and private sectors that will achieve efficiency gains in the fertilizer supply chain by reducing costs and margins and eliminating bottlenecks, thus making fertilizer marketing more efficient (reduce the farm-gate price of fertilizers) and increasing the viability of its use. It has also proposed strategic interventions on the demand side to help create demand in ways that are commercially sustainable.

The paper has three key conclusions. First, structure and conduct are not the main characteristics that explain performance in the African fertilizer market. A basic condition of the fertilizer market in Africa, namely the poor transportation infrastructure, has a defining impact on market behavior and hence on performance. Specifically, the poor transportation infrastructure creates a disincentive for importers and agro-dealers to travel to the rural interior where fertilizer is needed most. The result is poor availability of fertilizers close to the farm gate and high farm-gate prices of fertilizers that do reach farmers due to high transport costs. The importance of this cannot be overemphasized, given that transport costs comprise, on average 30-50% of the farm-gate price of fertilizers in Africa.

Second, research on the intangible costs incurred as fertilizer moves from the port to the farm gate is required to reduce the price paid by African farmers for fertilizers. The price paid for fertilizers in Africa is higher than anywhere else in the world. Although global fertilizer prices have returned to pre-2007 levels, the factors that contributed to the increase in fertilizer prices, particularly the high oil and energy prices, are still very much in effect and are expected to become permanent features of the global agricultural landscape. Hence, it is unlikely that world market price will decrease in the near future. Therefore, the price of fertilizer in Africa can only be reduced through policy and market development efforts aimed at improving the efficiency and effectiveness of the domestic fertilizer market. Transport costs comprise the second-largest component of the farm-gate price of fertilizer after the purchase price, but the investments required to comprehensively address this bottleneck are huge, and it is a long-term intervention which is further complicated by the fact that transport cuts across many sectors of the economy. The remaining cost components account for approximately 20-30% of the farm-gate price of fertilizers. These costs are made up of tangible and intangible costs that are incurred as fertilizer moves from the port to the farm gate. The tangible costs are legitimately incurred as market intermediaries perform the various marketing functions involved. However, some proportion of these costs (the intangibles) is incurred as a result of policy, regulatory and/or institutional constraints. This paper has provided descriptions of the cost savings that could be derived if these constraints were reduced or eliminated. Quantification of these cost savings – while challenging and in some cases impossible – would provide a solid basis for policy recommendations aimed at reducing transaction costs and

improving the performance of fertilizer supply chains in Africa. Therefore, research is required, first to quantify these costs and then to design interventions to effect relatively small cost-savings that combined can result in substantial reductions in the price of fertilizer.

Third, there is a need to reorient fertilizer subsidy programs, which are increasingly popular among African governments, to provide purchasing power support to resource-poor farmers. This will enable the governments to achieve the twin objectives of market development and improved food security by supporting fertilizer market development in the private sector while ensuring that resource-poor farmers can participate in the fertilizer market.

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Building sustainable fertilizer markets in Africa

Michael Morris, Loraine Ronchi and David Rohrbach¹

Abstract

Fertilizer use will have to increase in Africa if the region is to meet its agricultural growth targets, poverty reduction goals, and environmental sustainability objectives. Policies and programs are needed to encourage fertilizer use in ways that are technically efficient, economically rational, and market friendly. This paper seeks to contribute to ongoing efforts to build sustainable private sector-led fertilizer markets in Africa by highlighting lessons learned from past and present fertilizer promotion initiatives. Armed with these lessons, policy makers can avoid repeating mistakes made in the past, and they may be able to replicate successful features of ongoing fertilizer promotion initiatives. The paper discusses factors explaining low fertilizer use in Africa; reviews past experience promoting fertilizer use in Africa; briefly describes several multi-country initiatives to promote fertilizer; examines in some detail efforts being made to increase fertilizer use in Malawi (whose fertilizer program has received considerable coverage in the international media) and Rwanda (whose recent foray into fertilizer markets represents an experiment in market development); and presents a set of guiding principles to help in the design of future fertilizer promotion initiatives. An important conclusion is that since it is not always known what interventions will work in a particular setting, there is merit in continuing to experiment, as long as care is taken to document the results and learn methodically from experience.

Introduction

Agriculture's central role in supporting broad-based growth has been conclusively demonstrated in many parts of the world, especially in Asia during the Green Revolution. Agriculture is the backbone of the rural economy in most African countries and has the potential to play a role in Africa² similar to the one that it played in Asia, but agricultural growth in Africa has generally been disappointing. Over the past 20 years, in most African countries agricultural GDP per capita has risen very little, if at all, and in some countries it has actually fallen. For the region as a

whole, what was once a downward trend in food production per capita has stabilized since 1990, but only a handful of countries have experienced significant gains (Byerlee, Diao and Jackson, 2005).

Low fertilizer use is one of the main factors explaining lagging agricultural productivity in Africa. In 2006/07, the most recent year for which data are available, the average intensity of fertilizer use in Africa was only 9 kg/ha of cultivated land, much lower than in other developing regions (IFDC). Even when countries and crops in similar agro-ecological zones are compared, the rate of fertilizer use is much lower in Africa than in other developing regions, and crop yields are correspondingly lower.³

The striking contrast between the limited use of fertilizer in Africa and the much more extensive use of fertilizer in other developing regions has stimulated considerable discussion about the role of fertilizer in the agricultural development process, as well as debate about what types of policies and programs are needed to realize the potential benefits of fertilizer in African agriculture. In every region of the world, the intensification of crop-based agriculture has been associated with a sharp increase in the use of chemical fertilizer. Given the generally low levels of fertilizer use in Africa, there can be little doubt that fertilizer use will have to increase if the region is to meet its agricultural growth targets, poverty reduction goals, and environmental sustainability objectives. For this reason, policies and programs are needed to encourage fertilizer use in ways that are technically efficient, economically rational, and market friendly.

Over the years, many attempts have been made to promote fertilizer in Africa, but with little success. Recently, the advent of the global food price crisis spurred renewed interest in fertilizer promotion as a way to boost food production, reduce food imports, and safeguard food security at the household level. Beginning in 2008, following sharp increases in international food prices, governments in many developing countries implemented emergency food production programs that included support to fertilizer promotion activities. Many of these programs had

¹The authors are with the Agriculture and Rural Development Unit, Africa Region, World Bank. The views expressed are those of the authors and do not represent the official position of the World Bank. Corresponding author (mmorris@worldbank.org)

²For simplicity, throughout this paper the term "Africa" is used to denote "Sub-Saharan Africa."

³It is difficult to generalize about the extent to which crop yields in Africa are depressed because of low fertilizer use, because crop response to fertilizer depends on complex interactions among many different factors. For a review of the literature on crop response to fertilizer in Africa, see Yanggen et al. (1998). Trials carried out in cereals by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) have shown consistently that adoption of improved seed typically produces a 10-15% yield gain, but application of even small doses of fertilizer typically produces a 30-50% yield gain (Steven Twomlow, pers. comm.).

dual objectives: (i) in the short run, increase food production to counter effects of high food prices, and (ii) over the longer term, increase agricultural productivity to raise incomes and reduce poverty.

This paper seeks to contribute to ongoing efforts to build sustainable fertilizer markets in Africa by highlighting lessons learned from past and present fertilizer promotion initiatives. Armed with these lessons, policy makers can avoid repeating mistakes made in the past, and they may be able to replicate successful features of ongoing fertilizer promotion initiatives. Counting this introduction, the paper includes five sections. The second section discusses factors explaining low fertilizer use in Africa. The third reviews past experience promoting fertilizer use throughout the region. The fourth section briefly describes several multi-country initiatives to promote fertilizer and examines in some detail efforts being made to increase fertilizer use in Malawi (whose fertilizer program had received considerable coverage in the international media) and Rwanda (whose recent foray into fertilizer markets represents an experiment in market development). The last section summarizes emerging lessons and draws conclusions designed to help guide future fertilizer promotion initiatives.

Reasons for low fertilizer use in Africa

Low use of fertilizer in Africa is commonly blamed on market failures, especially information failure in product and credit markets. But this explanation requires some unpacking. When demand for fertilizer is weak and supply of fertilizer is constrained, it is hardly surprising that fertilizer use remains low. The market clears, but since the financial prices prevailing in the market reflect unnecessarily high transactions costs, the quantities of fertilizer bought and sold are lower than they would be if constraints could be removed. Low use of fertilizer therefore reflects markets that are clearing properly, but because the financial prices observed in the market contain distortions, the quantities being transacted are (for downstream markets) economically and socially sub-optimal. In this context, policy makers need to concentrate on identifying and removing the underlying constraints and/or correcting for the underlying market failures that are leading to weak demand for fertilizer and constrained supply.

Many initiatives have been launched in Africa to remove fertilizer market distortions and unleash the power of the private sector to procure fertilizer and deliver it to farmers. In a small number of cases, liberalization of fertilizer markets has had positive impacts, for example in Kenya, where fertilizer availability and use increased markedly following the introduction of market reforms in the late 1980s (see Jayne et al., 2003). Yet Kenya's experience is atypical, and use of fertilizer continues to grow very slowly in most places. Why is this?

Factors constraining fertilizer demand

Evidence reviewed in Morris et al. (2007) suggests that demand for fertilizer is often weak in Africa because incentives to use it are undermined by the low level and high variability of crop yields on the one hand, and the high level of fertilizer prices relative to crop prices on the other. The demand-depressing effects of unfavorable price incentives are aggravated by many other factors, including the general lack of market information about the availability and cost of fertilizer, the inability of many farmers to raise the resources needed to purchase fertilizer, the high opportunity cost of capital (which if available often can be invested in other activities the returns to which are higher and/or more assured), and the lack of knowledge on the part of many farmers about how to use fertilizer efficiently. Because of these factors, fertilizer use is often unprofitable in Africa at current prices, particularly in marginal environments of low production potential, in remote areas poorly served by roads, and when the crops being grown are low-value food crops.

Factors constraining fertilizer supply

These constraints on the demand side are mirrored on the supply side by factors that reduce the timely availability of affordable fertilizer in the market. In many African countries, private investment in fertilizer distribution is discouraged by an unfavorable business climate characterized by excessive regulations, an abundance of taxes and fees, and high levels of rent seeking. As a result, fertilizer marketing is left mainly in the hands of inefficient public agencies. More fundamentally – and regardless of whether it is being done by public agencies or private firms – fertilizer distribution is unprofitable in many parts of Africa because of the weak and dispersed nature of demand, the small market size, high transportation costs stemming from inadequate road and rail infrastructure, and the limited availability and high cost of financing.

Slow emergence of the private fertilizer industry

Given the generally weak demand for fertilizer and the many constraints on supply, it is not surprising that few African countries have vibrant and competitive fertilizer industries. Without vibrant and competitive industries, fertilizer is rarely available when it is needed, where it is needed, and in the formulation that is needed. Even when farmers understand the benefits of fertilizer, know how to use it, and have the resources to purchase it, they may not be able to find adequate supplies in the market.

Factors that have hindered the emergence of a vibrant private fertilizer industry in Africa include the following:

- **Unfavorable business climate:** Private firms have been reluctant to invest in fertilizer marketing in Africa because they believe they cannot earn an attractive return on their investment. The bottom ranks of international business competitiveness tables are heavily populated with the names of African countries, which tend to score poorly in business investment climate surveys relative to countries from other regions. Common problems cited by firms trying to do business in Africa include poorly defined rules of the game, weak regulatory enforcement, a proliferation of taxes and fees, cumbersome bureaucratic procedures, a lack of security, and widespread incidence of corruption.
- **Uncertain policy environment:** Too many policy makers in Africa still think that the private sector cannot be relied upon to supply fertilizer and other inputs in a cost-effective manner. They believe that the public sector should carry out these activities. Unfortunately, attempts to improve the reliability of fertilizer distribution through public interventions often have the opposite effect, as government policies and programs show little consistency and frequently change in the face of shifting political winds. Arbitrary and often unpredictable government interventions in fertilizer markets produce an adverse impact at the micro-level (by undermining incentives for private fertilizer dealers at the wholesale and retail levels) as well as at the macro level (by complicating planning for the agencies and firms that import fertilizer).
- **Weak institutional and regulatory systems:** In a marketing system led by the private sector, one of the critical roles for government is to protect the interests of consumers and

the general public by formulating and enforcing a legal and regulatory framework with respect to quality, standards and measures, safety in using and disposing of inputs, and business ethics. Even in African countries where fertilizer laws exist, their enforcement is generally inadequate. For example, in 2000 Nigeria experienced a serious problem with adulterated and mislabeled fertilizer products, yet regulations proved ineffective in addressing the problem (IFDC, IITA and WARDA, 2001).

- **Weak market information systems:** Many countries lack effective market information systems to support the development of well-functioning input markets. Importers and wholesalers often have limited information about where fertilizer is available in regional and global fertilizer markets, in what formulations, and at what prices. Similarly, dealers and farmers often do not know where fertilizer is available within the country, in what formulations, and at what prices.

Past experience promoting fertilizer in Africa

Efforts to promote fertilizer have had a checkered history in Africa (for reviews, see Kherallah et al., 2002; Crawford, Jayne and Kelly, 2006; and Morris et al., 2007).

Post-colonial period (1960s to mid-1980s)

Prior to the mid-1980s, most of the fertilizer promotion schemes implemented in Africa featured one or more of the following characteristics:

- **State-dominated fertilizer supply:** Fertilizer imports and distribution were often carried out by state-owned enterprises, which usually had to follow bureaucratic procurements procedures that hindered flexibility. Thirty of thirty-nine countries surveyed by FAO in the mid-1980s followed this approach (FAO, 1986).
- **Price controls:** Prices of fertilizer were usually set by government fiat. Prices were often made pan-territorial and pan-seasonal, ostensibly so that all regions and all farmers would be treated equally.
- **Price subsidies:** Subsidies were frequently introduced to make fertilizer more affordable for farmers. Subsidies ranged from 10% to 80% of the full procurement cost. Overvalued exchange rates often provided an additional indirect subsidy on imported fertilizer.

- **Subsidized credit:** State and parastatal input suppliers and government-owned banks often provided credit to farmers for financing fertilizer purchases. Interest rates were usually set below market rates and in some cases were negative in real terms.
- **Fertilizer aid:** Development organizations often provided fertilizer as aid-in-kind. Most of this fertilizer was sold to farmers at below-market prices or distributed free, and the type of fertilizer supplied sometimes had little relevance to local needs.

In some cases and for brief periods, the early programs to promote fertilizer succeeded in increasing fertilizer use and boosting food production. Yet in nearly all cases, the gains were not sustainable. Not only did the schemes impose high and unsustainable fiscal burdens on government treasuries, they also failed to boost agricultural productivity because of chronic problems with late or insufficient delivery of fertilizer. The fertilizer that did make its way to farmers often ended up being captured by wealthy farmers who least needed assistance, rather than reaching the smallholders who were supposed to benefit.

Structural adjustment period (mid-1980s to 2000)

During the 1980s and 1990s, when fertilizer sectors in many African countries were privatized and liberalized, many fertilizer promotion schemes also underwent changes. Announced reforms often included removal of price controls, elimination of subsidies, and withdrawal from the market of public agencies and parastatals. The degree to which these reforms were actually implemented varied considerably. In some countries, fertilizer promotion programs continued, albeit with modifications, as when governments attempted to reduce fiscal outlays by targeting fertilizer subsidies at poorer farmers (as in Zambia, Nigeria, and Zimbabwe during the 1990s). In other countries, parastatals were shut down, and subsidies were eliminated. These reforms succeeded in reducing the costs of fertilizer programs, but the gains came at a price. Following the withdrawal of government agencies, private operators did not step in to fill the gap as had been expected. As a result, fertilizer consumption decreased in many African countries, sometimes dramatically.

Mixed approaches (post-2000)

By the late 1990s, stagnating yields, declining soil fertility, and lingering food security problems had revived interest in promoting fertilizer in many African countries. Partly in response

to these calls, pilot schemes were launched in several countries that featured the distribution of fertilizer without charge or at heavily subsidized prices. At the same time, perhaps in recognition of the fact that low fertilizer use is caused by many factors, efforts to promote fertilizer became increasingly eclectic and diverse. Different entry points were targeted, including:

- **Technology generation:** Recognizing that generalized fertilizer recommendations were not being adopted by many farmers, especially small-scale farmers, researchers established networks to conduct applied research designed to identify location-specific combinations of soil fertility management practices that could be adopted by farmers with different resource bases and varying risk preferences (e.g., the SoilFertNet network in southern Africa).
- **Technology transfer:** Recognizing that many African farmers lacked the crop and land management skills needed to use fertilizer efficiently, NGOs and some government extension services organized large demonstration programs to show the benefits that could be realized from appropriate use of fertilizer and complementary inputs (e.g., Sasakawa Global 2000 programs in 10 countries).
- **Input market development:** Recognizing that established small- and medium-sized rural traders lacked experience in marketing inputs, development organizations began funding NGOs to provide technical product and management training for retailers willing to stock inputs (e.g., The Rockefeller Foundation supported programs in eastern and southern Africa).
- **Output market development:** Recognizing that farmers are more likely to borrow money to invest in fertilizer and other inputs when output markets are secure, governments and development organizations renewed efforts to interlink markets for production credit, inputs, and outputs (e.g., cotton parastatals in West Africa).

While these initiatives varied in terms of strategy and tactics, each had its own advantages and disadvantages. A consistent theme was the effort made to scale back the role played by public agencies and parastatals in sourcing fertilizer and distributing it to farmers. In contrast to traditional models that had typically featured centralized state control of fertilizer distribution activities, most of the new initiatives were based on schemes in which leading roles were assigned to private firms,

NGOs, farmers' organizations, or industry trade groups. Another feature of the new initiatives was their reduced scale, which improved operational flexibility but decreased overall coverage. This sometimes had the effect of leaving farmers in low-potential and physically remote zones without an alternative to the disbanded government input distribution programs.

Today, the situation is little changed. Efforts continue to increase the role of private operators in fertilizer marketing, but with few exceptions the response from the private sector has been muted. Macroeconomic instability and high interest rates, lack of marketing skills and finance, and inadequate regulatory systems and market transparency continue to limit the active involvement of the private sector in the input distribution business in many African countries. Years of discrimination and neglect have left the private sector underdeveloped and input markets fragmented. The slow response from the private sector has even led to a reversal of market liberalization policies in many countries, along with the re-introduction of fertilizer subsidies in some instances.

Overview of ongoing initiatives

Undeterred by the legacy of failure, governments, development organizations, and funding agencies have continued to promote fertilizer in Africa. This section briefly reviews several multi-country initiatives and then discusses in some detail the experiences of Malawi and Rwanda, two countries in which innovative approaches to promoting fertilizer have been piloted, with varying degrees of success.

Multi-country initiatives

Sasakawa Global 2000 (SG 2000): A joint program of the Sasakawa Africa Association (SAA) and the Global 2000 program of the Carter Center, SG 2000 was launched during the mid-1980s with the goal of doubling or tripling cereal crop yields in Africa. This ambitious objective was to be achieved by transferring improved agricultural technology to small-scale farmers. The first two SG 2000 country programs were launched in 1986 in Ghana and Sudan; additional programs were subsequently initiated in eight additional countries (Nigeria, Burkina Faso, Mali, Guinea, Ethiopia, Tanzania, Malawi and Mozambique). Beginning in 2004, operations in some of these countries were phased out so the program could concentrate on a small number of focus countries.

The approach used by SG 2000 involved three main components: (i) crop production demonstration plots, (ii) post-harvest technology demonstrations, and (iii) input dealer development activities (Howard et al., 1999). The first and third of these involved fertilizer. In supporting the establishment of large numbers of crop production demonstration plots, SG 2000 made sure that participating farmers had access to the recommended quantities of fertilizer, with the objective of demonstrating the effectiveness of fertilizer in raising yields while at the same time building future demand for fertilizer among farmers. To ensure that adequate supplies of fertilizer would be available in the market to satisfy the increased demand, SG 2000 worked with local traders (mainly village-level retailers but also some regional wholesalers) to help them become familiar with fertilizer procurement and distribution procedures.

While the impacts of SG 2000 varied considerably across countries and between components, it is fair to say that the program's efforts to promote fertilizer use had limited lasting impact. The crop production demonstration plots were frequently effective in demonstrating that proper application of fertilizer could have a significant impact on yields, and the input dealer development activities usually helped ensure the procurement and distribution of the fertilizer needed for the demonstration plots, but in retrospect it is clear that the SG 2000-supported interventions failed to establish the basis for a viable private sector-led commercial fertilizer industry. Anecdotal evidence suggests that in most of the areas where SG 2000 was once active and has since withdrawn, fertilizer use has dropped significantly, and even though many farmers who participated in the SG 2000 programs remain convinced of the benefits, they lack the means to purchase fertilizer, have difficulty finding it in the market, or both.

The Millennium Villages Project (MVP): This initiative grew out of the UN Millennium Project and is led by science, policy and planning teams from The Earth Institute of Columbia University, Millennium Promise, and the United Nations Development Programme (for background, see UN Millennium Project, 2005). The objective of MVP is to help rural African communities lift themselves out of poverty by putting science and technology to work to tackle interrelated problems in the areas of food and nutrition, health, and education, among others. The approach used by MVP is being pioneered in about one dozen villages in

10 African countries. Once the effectiveness of the approach has been demonstrated, the sponsors intend to scale up interventions to the regional and eventually national levels.

Improving agricultural productivity has been a major theme in many MVP sites. To this end, MVP has introduced improved seed, fertilizer, crop chemicals and improved crop management practices. Since many households in the MVP sites lack the resources to pay for improved inputs, MVP has often elected to distribute them at no cost. Uptake of the inputs has led to marked production increases in at least some of the MVP villages and improvements in food security for many participating households.

Since MVP is still a work in progress, it is too early to assess its performance. To date no rigorous impact evaluation work has been done, so claims regarding the alleged successes and failures of the approach are not subject to independent empirical verification. However questions have been raised about the considerable administrative costs of the approach, which it is charged are likely to prevent scaling up to a significant level (Buse et al., 2008). With regard to the agricultural activities in particular, critics of the MVP approach have pointed to the high fiscal costs associated with free distribution of inputs, especially fertilizer. MVP proponents have countered with the argument that the fiscal cost of subsidizing inputs is lower than the cost of importing food for distribution to destitute households (J. Sachs, pers. comm.).

Regardless of whether or not the fertilizer being distributed through MVP programs is being used cost-effectively, it seems unlikely that the demand for fertilizer being created through MVP schemes will stimulate the emergence of a viable commercial fertilizer industry. Procurement of MVP fertilizer is handled largely by program staff, who arrange for transportation to the villages and local storage prior to distribution to the recipient households. The lack of concern to develop sustainable private sector-led fertilizer industry presumably reflects the desire of MVP leadership to produce “quick wins.” It may also reflect the belief that use of fertilizer by poor rural households to produce low-value food crops is unlikely to be financially profitable, justifying continuing participation by the public sector in fertilizer distribution activities.

The Alliance for a Green Revolution in Africa (AGRA):

Established in 2006 by The Rockefeller Foundation and the Bill & Melinda Gates Foundation, AGRA is currently working with African governments, other donors, non-governmental organizations, the private sector, and farmers to improve the productivity and incomes of resource-poor farmers in Africa. AGRA is or expects to be working in a number of areas, including: (i) developing better and more appropriate seeds; (ii) fortifying depleted soils through responsible use of soil nutrients and improved management practices; (iii) increasing incomes through improved access to agricultural input and output markets; (iv) improving access to water and raising water-use efficiency; (v) encouraging government policies that support small-scale farmers; (vi) developing local networks of agricultural education; and (vii) understanding and sharing African farmer knowledge.

The AGRA Soil Health Program is investing in four main areas:

- Improving knowledge, application, and adoption of integrated soil fertility management practices;
- Improving economic access to fertilizer for poor farmers;
- Increasing physical access to fertilizer for poor farmers; and
- Developing policy and incentives to promote adoption of improved soil fertility management practices.

Implementation of the AGRA Soil Health Program is only just getting underway, so it remains to be seen what activities will be supported. However given the strong links between AGRA and The Rockefeller Foundation, it seems likely that efforts will be made to broaden and deepen the successful work financed by The Rockefeller Foundation in eastern and southern Africa during the 1980s and 1990s to build fertilizer distribution networks in rural areas. Working with local organizations in rural Kenya, Malawi, and Uganda, The Rockefeller Foundation supported a number of pilots:

- Training rural retailers to develop their technical, product management, and business management skills;
- Linking certified agro-dealers to agricultural input supply firms using partial credit guarantees that covered 50% of the risk of default;
- Repackaging seed and fertilizer into small packs to increase affordability for farmers; and

- Organizing agro-dealers into “purchasing groups” to facilitate bulk purchasing of fertilizer from suppliers.

Although implemented on a limited scale, these efforts to strengthen rural fertilizer distribution networks achieved promising results. In Malawi, a survey of rural markets showed that the majority of farmers in areas where the program was active had started to buy their inputs from local agro-dealers, not from the government-owned Agricultural Development and Marketing Agency (ADMARC) or from large commercial distributors in urban areas. As the number of agro-dealers expanded, the distances traveled by smallholder farmers in search of inputs were reduced. The range, volume, quality and prices of agricultural inputs supplied into rural areas also improved significantly. Meanwhile, the default rate on the credit guarantees was less than 1% during the time when the program was active. The low default rate was attributed to the high quality of the technical and business management training received by the agro-dealers, and to their use of collective action to ensure repayment. Finally, as a result of increased involvement in seed and fertilizer sales, agro-dealers became important extension nodes, and several seed, fertilizer, and agro-chemical companies now use the agro-dealers to conduct demonstrations of new technologies.

Country case studies

Malawi - Agriculture accounts for 38% of Malawi’s GDP, 85% of employment and 85% of foreign exchange earnings. Eighty-eight percent of the country’s population lives in the rural areas. Tobacco is the dominant cash crop, with smaller contributions from sugar, cotton, tea and coffee. Over 95% of all smallholders grow maize and depend on this crop for food security. The majority of Malawi’s farmers are extremely poor. Fifty-two percent live below the poverty line and 22% are classified as ultra-poor. Forty-three percent of children under five years of age are stunted (Republic of Malawi, 2006). Forty-six percent of smallholders own less than one hectare. Most of these households fail to produce enough grain to meet their annual requirements. Many are forced to sell family labor during the planting season in order to earn cash necessary to purchase food and agricultural inputs. Most smallholders use fertilizer, though very few purchase fertilizer at commercial prices. The majority relies upon input subsidies to help offset high retail costs. An estimated 55% of smallholders plant hybrid maize. (Republic of Malawi, 2006).

Fertilizer subsidies and food security: Malawi has recently received international acclaim for having achieved national food security following a long period characterized by chronic food production shortfalls. Food production in the country has indeed increased dramatically, thanks in part to large investments in fertilizer subsidies. Maize production almost tripled between the drought-affected 2005 harvest and 2007 (Figure 1), leading the Government to negotiate a deal to export 400,000 tons of maize to Zimbabwe. The combination of favorable rains and fertilizer use helped Malawi achieve a high maize harvest in 2008 as well, and a surplus is expected again in 2009. In recognition of these achievements, the President of Malawi, Bingu wa Mutharika, received the prestigious Agricola Medal from the Director General of FAO for “transforming the country’s economy from a state of food deficit to a net exporter of maize”. The regional Food Agriculture and Natural Resources Policy Analysis Network (FANRPAN) likewise awarded the President its first Food Policy Leadership award for “transforming the country from a food importer to a food exporter”.

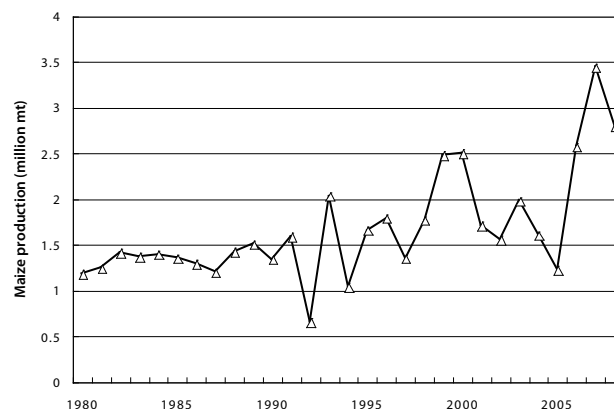


Figure 1. Maize production, Malawi, 1980-2008

While the benefits of fertilizer use are undisputed, rising maize prices have raised questions about the size of the production gains achieved in Malawi. In 2007, rising domestic prices undermined the country’s efforts to sell 400,000 tons of maize to Zimbabwe (Figure 2). Despite estimates of a 1.2 million ton grain surplus, grain shortages started to appear six months after the harvest. The estimated harvest in 2008 was said to be the second largest in the nation’s history. Yet three months after the harvest, the Government instituted price and trade controls in an effort to limit the rise of consumer prices.

By September 2008, maize sales from the parastatal Agricultural Development and Marketing Corporation (ADMARC) were being rationed. Nonetheless, by January 2009, average prices in the informal market had reached record levels.

Several explanations have been offered for such unprecedented increases in consumer prices following seasons of record harvest. The Government has put forward three explanations. The first is that Malawi experiences 30% to 40% grain losses in storage, though the last formal estimate from the Ministry of Agriculture placed the figure at 13%. The second is that private traders have been hiding large stocks in an effort to drive up prices. The third is that private traders have been hiding large exports to neighboring countries. There is little evidence to support these charges, however, so the most likely explanation for the rise in maize prices is that national production estimates have been systematically biased upwards.

Fertilizer subsidies: Malawi's Agricultural Input Subsidy Programme (AISP) has recently received a lot of attention, but it is important to note that the country has been subsidizing the distribution of fertilizer to small-scale farmers since the early 1990s through various projects and programs (Table 1). Throughout most of this period, the majority of smallholders were given 10 to 15 kg of free fertilizer, along with a few kilograms of hybrid or open-pollinated maize seed. However in 2005/06, the magnitude of the Government's effort increased sharply. Under AISP, almost 1.5 million smallholders – nearly half of all small-scale farmers in the country – were provided a 70% subsidy on 100 kilograms of fertilizer, along with a small allotment of open-pollinated maize seed.

Table 1. Malawi: Agricultural input subsidies, 1990-2008

Program	Years	Fertilizer	Maize seed
Universal Fertilizer Subsidy	1990/91-1995/96	5 to 10 kg basal and/or top dress	n.a.
Agricultural Productivity Investment Programme	1997/98-2002/03	5 to 10 kg basal and/or top dress	n.a.
Starter Pack	1998/99-1999/2000	10 kg basal and 5 kg top dress	2 kg hybrid
Targeted Inputs	2000/01-2004/05	5-10 kg basal and 5-10 kg top dress	2-5 kg hybrid or open pollinated
Agricultural Input Subsidy	2005/06 – ongoing	50 kg basal and 50 kg top dress	2 kg hybrid or 4 kg open pollinated

Source: School of Oriental and African Studies et al, 2008.

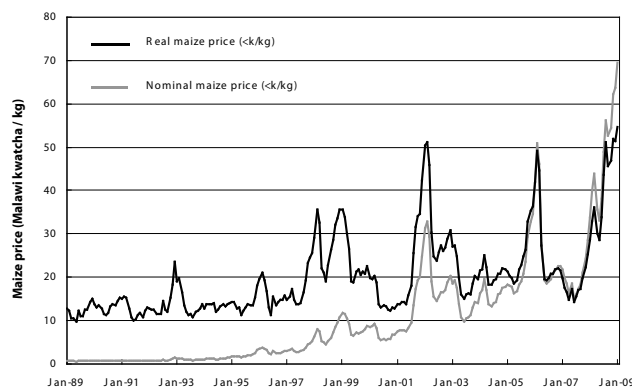


Figure 2. Average retail maize prices, Malawi, 2000-2009

Since 2005/06, AISP has continued to grow in size. In 2008/09, over two million smallholders were provided a 92% subsidy on 100 kilograms of fertilizer, along with a 100% subsidy on two kilograms of hybrid maize seed or four kilograms of open-pollinated maize seed. One million additional households received flexible vouchers redeemable for maize seed or legume seed or cotton seed. Fertilizer subsidies had been extended to tobacco, tea and coffee producers. Cotton farmers were eligible to receive subsidized pesticides, and most smallholders received free supplies of grain storage chemicals.

The rapid expansion of AISP had considerable cost implications for the Government. In 2008/09, following the sharp rise in international fertilizer prices, the AISP had grown to consume more than 70% of the rapidly growing budget of the Ministry of Agriculture and Food Security (MoAFS). The cost of the fertilizer subsidy alone represented nearly 14% of the national budget, equivalent to nearly 6% of the country's GDP (Table 2).

Not surprisingly, implementation of the AISP became a major preoccupation of the Ministry's directorate and of the national extension services.

Table 2. Malawi Agricultural Input Subsidy Program (AISP) cost, 2005/06 to 2008/09

	2005/06	2006/07	2007/08	2008/09
Program cost (US\$ million)	51.0	74.0	115.0	221.4
Program cost (% of national budget)	5.6	8.4	8.0	13.5
Program cost (% of GDP)	2.1	3.1	3.4	5.5

Source: Dorward and Chirwa, 2009.

Why subsidize fertilizer?: In Malawi, the main justification for enormous public investments in subsidizing fertilizer and other agricultural inputs has been the need to enhance household and national food security. The targeting of subsidies to poorer farmers represents a social welfare investment – the goal is to help these families produce a larger share of their own food requirements. This goal is particularly important given both the volatility of grain prices and occasional uncertainty in grain supplies.

In addition to wanting to safeguard food security of poor households, the Government of Malawi is also concerned to avoid the high costs of maize imports. In years of significant shortage, maize is generally imported by road from South Africa. Maize grain purchased in South Africa generally costs US\$ 130 to US\$ 150 per ton, and transport costs add US\$ 80 to US\$ 150 per ton to the delivered price. These transport costs can increase significantly if southern Africa as a whole experiences grain shortages and transport systems become clogged. Mainly for this reason, Malawi seeks to be self-sufficient in maize and would prefer, if possible, to be a maize exporter in most years.

Although subsidies in Malawi started out being targeted mainly at maize, over time they have been extended to a wider range of crops, based on the knowledge that some farmers seek to assure their food security by producing cash crops and buying maize. If cash crops can be made more productive, reckon policy makers, these households obtain more money with which to purchase maize.

AISP overview: AISP has a fertilizer-subsidy component and a seed-subsidy component. The Government tenders for the competitive supply of almost all of the fertilizer that is distributed through the Programme. Suppliers are responsible for importing the fertilizer and delivering 50 kg bags to parastatal warehouses run by the Smallholder Farmers Fertilizer Revolving Fund of Malawi (SFFRFM). From these warehouses, the fertilizer is distributed to sales centers run by the SFFRFM or by ADMARC. All of the seed handled by AISP is sourced through the commercial market.

The Government distributes to designated households vouchers redeemable for one 50 kg bag of basal fertilizer and one 50 kg bag of top-dress fertilizer. Voucher recipients are supposed to be members of poor households who would otherwise have difficulty affording fertilizer. They are chosen with the assistance of local authorities. Farmers who grow tobacco, coffee and tea receive only fertilizer vouchers. Farmers who grow maize receive an additional voucher for 2 kg of hybrid maize seed or 4 kg of open-pollinated maize seed. Farmers who do not qualify for fertilizer vouchers generally receive a “flexible voucher” redeemable for maize seed, legume seed or cotton seed.

When farmers redeem fertilizer vouchers, they must pay a top-up amount, whose value is set each year. In 2008/09, the MK 800 per bag top-up payment was equivalent to about 8% of the value of the fertilizer received. No top-up payment was required for redeeming the seed vouchers. Cotton farmers received vouchers for a limited quantity of free pesticides (i.e., no top-up payment was required). Most maize farmers received free access to chemicals for grain storage.

During the 2006/07 and 2007/08 cropping seasons, farmers were allowed to redeem vouchers with private input distributors. This practice was eliminated in 2008/09, allegedly because large numbers of counterfeit vouchers were turned in by private distributors. However there is evidence that most of the counterfeit vouchers were in fact turned in by ADMARC and SFFRFM depots. Questions also arose about whether some vouchers were being improperly redeemed for items other than seed, fertilizer and crop chemicals, such as tin sheets or hoes – although there is limited evidence of this in practice. A more significant problem, at both parastatal and private depots, appears to have been the taxing of voucher redemption. Many farmers apparently were asked to pay more than the stipulated top-up payment in order to redeem their fertilizer vouchers.

Because AISP has grown so large, the Programme plays a dominant role in influencing the development of input markets in the country. Most of the fertilizer and maize seed sold in Malawi now is handled under AISP. In 2008/09, due in part to the rise in fertilizer prices, unsubsidized commercial sales of fertilizer have fallen, and the subsidy Programme may account for over 70% of all fertilizer sales. This means that the subsidy Programme is a major determinant of the development of agricultural input markets. In this context, if AISP fertilizer distribution is restricted to parastatal depots, private retail trade declines, not only for fertilizer but also for complementary inputs such as seed and crop chemicals.

AISP payoffs: AISP was formally evaluated in 2006/07, and another evaluation is currently underway. An important objective of these evaluations is to determine the cost-effectiveness of the subsidies. To this end, the authors of the 2006/07 evaluation calculated a series of benefit-cost ratios contingent on maize price, maize yield, and the degree of displacement of commercial fertilizer purchases. Using a set of plausible values for these three key parameters, the benefit-cost ratios ranged from 0.76 (assuming a low maize price, low maize yield, and high level of displacement) to 1.36 (assuming a high maize price, high maize yield, and low level of displacement). The level of benefits delivered by the subsidy depends critically on the quality of Programme management. The displacement of commercial purchases must be reduced below the 30% to 40% levels apparent in 2006/07. Fertilizer must be delivered and applied on a timely basis. Benefits are also influenced by the crop management capacity of farmers, because good weed control helps assure higher yields. Finally, the returns to fertilizer subsidies are higher when the country is a net importer of maize, rather than a net exporter, because when the country is a net importer the incremental maize production is valued at the (high) import parity price and not the (low) export parity price.

AISP prospects: To date the Government of Malawi has not given any indication that it plans to scale back the size (and cost) of AISP. Nor has it announced any plans to encourage farmers to graduate from the Programme. On the contrary, it has already announced that farmers will pay 40% less for fertilizer in 2009/10 than they paid in 2008/09.

The development partners who directly or indirectly support AISP are encouraging the Government to explore ways of improving the Programme's efficiency, with an eye to reducing

the heavy fiscal drain posed by the very high overall cost. Some relief will surely come from the sharp decline in the costs of fertilizer on international markets that began in the latter half of 2008. There is also talk of reducing the crop coverage by barring tea and coffee farmers from participating in the Programme, although tobacco and cotton farmers would continue to be eligible. While the total number of beneficiaries is expected to increase, proposals are being drafted to improve the targeting to ensure that only the poorest households receive vouchers. Finally, suggestions are being considered for improving the security measures necessary to reduce acceptance of counterfeit vouchers (Ministry of Agriculture and Food Security, 2009).

Improving the efficiency of the subsidy: Policy makers and AISP administrators continue to debate whether and how the input subsidies should be targeted. Some argue that a universal subsidy would save money, because it would be very easy to administer, but others contend that a universal subsidy would be inefficient because it would greatly increase the displacement of commercial input purchases. On the other hand, even with vouchers, displacement is taking place. Dorward et al. (2008b) estimate that in 2006/07, upwards of 40% of commercial fertilizer sales were displaced by AISP. If displacement is regularly taking place on this scale, it would be very inefficient because it would mean that public funds are being used to pay for large quantities of fertilizer that farmers would normally be willing to purchase themselves.

The efficiency of the subsidy could also be improved by reducing the amount of fraud and corruption in the distribution and redemption of vouchers. It has been suggested that the vouchers should be printed outside the country, to improve the security measures and reduce counterfeiting. Plans are being floated to strengthen the central logistics unit to improve (i) monitoring of fertilizer imports and tracking of shipments to rural distribution points and (ii) overseeing the allocation and redemption of vouchers.

Reducing the costs of fertilizer: The main justification for the subsidy Programme is that farmers cannot afford improved agricultural inputs, particularly fertilizer. The implication is that if the price were reduced, farmers would be able to purchase inputs on their own, making the subsidies unnecessary. A number of proposals have been advanced for reducing the cost of fertilizer, and some of these are currently under evaluation.

Domestic manufacture of fertilizer is one obvious option for reducing costs. This could be based on local production using domestic materials (e.g., through exploitation of the country's rock phosphate deposits) or local blending of imported raw materials. Opportunities for local manufacture or blending of imported raw materials are also being pursued at the regional level in eastern and southern Africa.

A second option for reducing the cost of fertilizer may be to pursue bulk imports, with an eye to capturing quantity discounts. However a potential problem associated with bulking of imports is that it could invite collusion among suppliers unless contracts are competitively negotiated. Opportunities for bulking of fertilizer imports are also being pursued at the regional level in eastern and southern Africa.

A third option for reducing fertilizer costs is to reduce marketing margins in the distribution chain. The Citizen's Network for Foreign Affairs and AGRA have supported training of agro-retailers in an effort to improve business practice, and create a more competitive inputs market. Unfortunately these efforts are now being undermined by the termination of private sector participation in the redemption of fertilizer vouchers.

A fourth option for reducing the cost of fertilizer is to change the composition of the basal fertilizer being supplied for maize. Malawi purchases an expensive compound made up of 23% nitrogen, 21% phosphorous, no potassium and 4% sulfur. Data from fertilizer field trials suggests similar yields could be achieved with a less expensive formulation of 20% nitrogen, 10% phosphorous, no potassium, and 4% sulfur.

Increasing returns to fertilizer: Changing the composition of the basal fertilizer being used for maize offers an easy means to reduce fertilizer costs. It could also bring an additional benefit in the form of increased productivity, because soil tests suggest that phosphorous is not the most limiting factor in most of the nation's soils. More generally, substantial opportunities exist to better target nutrients to the varying soil and rainfall conditions throughout the country. Rather than offering every smallholder the same fertilizers, productivity gains could be derived from targeting nutrients by agro-ecology and yield target.

The Government faces a difficult trade-off between investing in subsidizing more fertilizer to achieve production gains in the short term and investing in research and extension systems to improve fertilizer productivity in the medium and long term.

That the subsidy Programme is already exacting an opportunity cost can be seen in the limited investments currently being made in research and extension activities that could improve the efficiency of fertilizer use. For example, very limited funding is available to promote the application of rotations with nitrogen-fixing legume crops and the use of manure. Similarly, very little is being done to evaluate how the returns to fertilizer among poorer households could be increased using techniques such as micro-dosing.

Last but not least, the returns to fertilizer applied to maize are bounded by the level of maize farm gate prices. These are constrained by high transport costs and the poor quality of many rural roads. On the other hand, since only about 15% of all maize farmers sell grain, and these households tend to own more assets than the average household, selling prices are relatively less important for poorer households.

What alternatives to AISP?: While considerable attention is being addressed to improving the efficiency of AISP, some have argued that the objectives of the Programme could be achieved more reliably through alternative types of programs. These are worth mentioning, because they call into question the logic of continuing AISP.

While the primary objective of AISP is to improve household food security, it is possible that this objective could be more reliably achieved by lowering consumer prices for maize grain. This is an important insight, because despite the achievement of record levels of estimated maize production, during the past two seasons Malawi has experienced abnormally high maize prices. In recent years, Malawi has experienced some of the greatest volatility in maize prices of any country in southern Africa. This induces risk-averse households to continue growing maize, instead of diversifying into other, higher value cash crops. And it undoubtedly contributes to higher malnutrition levels among poorer households that are unable to afford to buy grain when prices rise. The Government has started to adopt risk-management strategies in an effort to reduce this price volatility. These include weather insurance, price hedging and improved warehousing. Malawi is also reexamining the appropriate size and spatial distribution of its strategic grain reserve.

A growing debate has also promoted consideration of the trade-offs between subsidizing maize fertilizer and providing poorer households with cash transfers. Each year an unknown

proportion of the recipients of subsidized fertilizer either sell their vouchers or sell the fertilizer they receive because they need the cash for alternative purchases. Malawi is currently finalizing a national social protection policy and broadening experimental investments in cash transfer programs. One of the largest national social protection programs offers both direct cash payments to households with limited labor and cash for work. Recent monitoring efforts highlight the multiplied gains in community incomes derived from these transfers. Better monitoring of the investments being made with these transfer programs can offer a valuable indication of where most farmers believe they can obtain their highest investment returns.

Building viable fertilizer markets in Malawi: The strong commitment of the Government of Malawi to making fertilizer cheaply available to the nation's farmers has received extensive coverage in the international media. This commitment is grounded in the belief that the benefits of increased fertilizer use – increased food production, enhanced household food security, and reduced reliance on food imports – outweigh the considerable financial costs of the subsidy. In this context, the fertilizer policy debate in Malawi has tended to revolve not so much around whether fertilizer should be promoted and under what circumstances, but rather around how fertilizer should be procured and distributed to farmers at affordable prices. Many politicians in Malawi share the view that fertilizer is expensive, so it must be subsidized. These same politicians believe that subsidies should continue indefinitely, as long as the circumstances that create the need for fertilizer continue to prevail.

Given this motivation, it is interesting that AISP involves the use of vouchers. Normally vouchers are used to steer subsidies to particular groups of intended beneficiaries and/or to encourage purchasing of fertilizer from private distributors. Neither of these rationales is relevant in Malawi at present, since the coverage of AISP has become almost universal, and since private traders are barred from participating in retail fertilizer distribution activities. So vouchers seem like an unnecessary complication.

The Government of Malawi says it has chosen to exclude private traders from participating in the AISP voucher program because it does not trust them to abide by the rules of the program. It is alleged that in the past many traders accepted vouchers as payment for goods other than fertilizer, but this has not been documented conclusively. Ironically, even though private traders

are currently barred from accepting AISP vouchers, many of the larger traders support AISP, because they are still allowed to participate in the international procurement of fertilizer. These traders know they can make attractive profits by importing fertilizer in bulk, selling it to the Government, and delivering it to one of three main warehouses in the country.

Up until now, the Government of Malawi, with help from some donors, has been willing and able to support the high fiscal costs of fertilizer promotion programs. Should this cost become unsustainable, as many observers have predicted, then it will be necessary to devise an exit strategy. At that point, the case for building viable private sector-led fertilizer markets will become paramount.

What policy measures could be implemented to soften the impact of the Government's eventual withdrawal from fertilizer procurement and distribution activities while laying the groundwork for private operators to step in? To begin with, farmers could be weaned from direct subsidies on the retail price of fertilizer by having the size of the top-up payment increase over time. The adjustment process could be made more market friendly by allowing competitive forces to determine the size of the top-up payment. For example, for a 50 kg bag of urea, the Government could agree to pay the first Kwacha 4,000, and farmers would have to pay anything above that amount. Fertilizer companies would be free to set the final price paid by farmers. Companies offering lower prices would sell more fertilizer, and those offering higher prices would sell less.

Measures designed to phase out direct subsidies on retail fertilizer prices could be combined with measures designed to strengthen private fertilizer distribution systems. Different options can be envisioned. For example, fertilizer transport costs could be subsidized, either across the board (e.g., by arranging for shipment to rural distribution points via Government-owned vehicles) or selectively (e.g., by offering retailers a bonus for fertilizer sold through shops located in remote areas). Similarly, Government funds could be used to provide partial loan guarantees on inventories held by retailers. The purpose of these measures would be to encourage the expansion of competitive trade as a means to reduce costs and promote price discipline.

Rwanda-Agriculture is the backbone of Rwanda's economy, accounting for about 32% of GDP, 80% of employment, and 63% of foreign exchange earnings. In addition to being economically

important, the agricultural sector plays a key strategic role in ensuring national food security, contributing 90% of the country's food needs. Because of its large size, the agricultural sector is one of the key engines of growth for Rwanda (Table 3).

largely due to Government investment in food crops through the Crop Intensification Programme (CIP).

Fertilizer use in Rwanda is low: Although reliable data are lacking, recent estimates put average fertilizer use between

Table 3. GDP growth, Rwanda, 2003-08 (% per annum)

Sector	1996-2002	2003	2004	2005	2006	2007	2008
Total GDP	10.5	0.3	5.3	7.2	7.2	7.9	11.2
Agriculture	10.2	-4.7	0.1	4.8	1.1	0.7	15.0
Industry	7.9	3.0	12.8	7.5	10.9	10.2	10.7
Services	10.6	4.5	7.9	9.1	10.9	12.8	7.9

Source: World Bank 2009, MINECOFIN

Rwanda has slightly more than 1.5 million hectares of arable land, 90% of which is found on hillsides. Because the country's population density is the highest in Sub-Saharan Africa (355 inhabitants/km²), most arable land is already being used. Rwandan agriculture faces several major challenges: (i) a binding land constraint that rules out bringing more land under cultivation; (ii) small average land holdings of 0.3 hectares; (iii) poor water management resulting from very low levels of irrigation (only 15,000 hectares are irrigated in the entire country); (iv) low levels of improved input use; (v) lack of extension services; and (vi) the limited commercial orientation of most farmers, who are constrained by poor access to output and financial markets.

With the country's land frontier effectively exhausted, future agricultural growth will have to come from intensification of existing farming systems. Agricultural intensification must take place in the context of a potentially fertile, but challenging, physical environment. Steep terrain makes good land husbandry a strict necessity to curtail erosion and otherwise maintain the quality of the soil, as well as an environmental prerogative. Arable land on hillsides constitutes the vast majority of the total agricultural land in the country, but erosion washes away 1.4 million tons of fertile soil per year. Given the high dependence on rainfed agriculture, irrigation is critical to reducing the sector's vulnerability to climatic variation and increasing incentives for intensification. Keeping of livestock- and fisheries-related activities are gaining in importance, but production of crops – both food crops and cash crops – still contributes the lions' share of agricultural output and growth. In 2008, food crop production registered substantial growth over the previous year (16.4%),

4-10 kg/ha annually (MINAGRI, 2007), among the lowest in the world. The low level of fertilizer use provides grounds for concern, because soil nutrient mining is taking place as farmers extract more nutrients from their fields than are being replaced. Henao and Baanante (2006) estimate that the average annual rate of soil nutrient loss is around 77 kg/ha. This very high rate is largely due to the combined impact of erosion, high population pressure that pushes farmers onto marginal land and reduces or eliminates fallowing, and the widespread presence of acidic soils that constrain fertility and diminish fertilizer response (IFDC, 2008). For these reasons, efforts to promote fertilizer use in Rwanda are increasingly being mounted in tandem with efforts to promote sustainable land management practices designed to curb erosion, improve soil structure and improve soil composition. A recent needs assessment commissioned by the Rwanda Ministry of Agriculture and Animal Resources (MINAGRI) estimated the annual fertilizer needs of the country at nearly 56,000 mt.

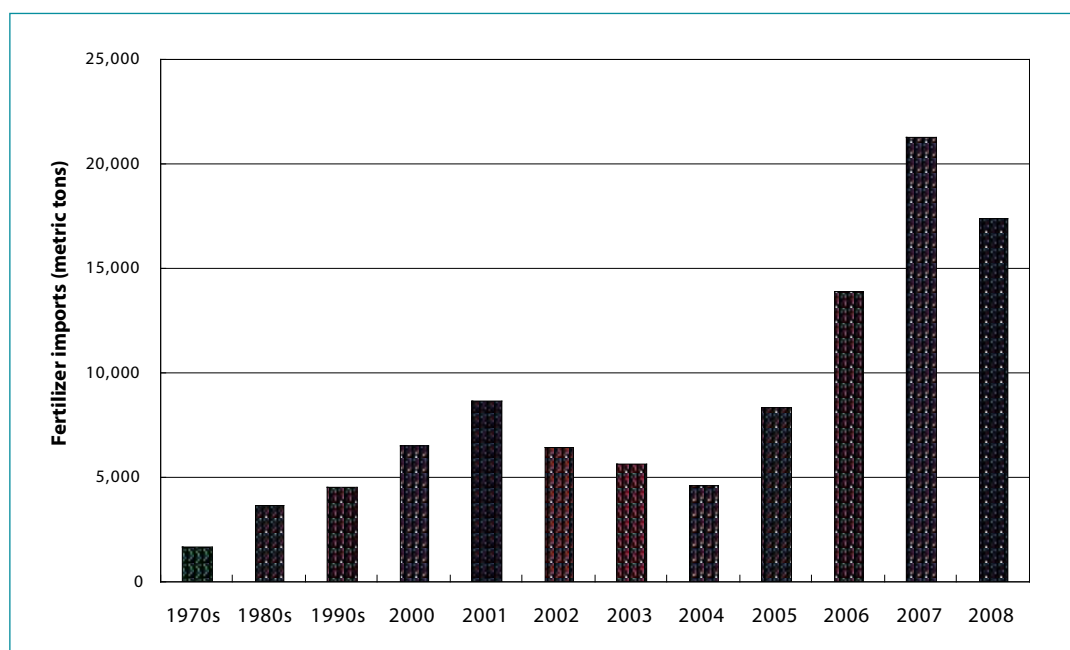
Farmers in Rwanda use both organic fertilizer and chemical fertilizer. All of the chemical fertilizer is imported. Imports have fluctuated over the years, reflecting changes in domestic policies as well as the effects of pronounced variability in international fertilizer prices. Figure 3 shows an important rise in fertilizer imports beginning in 2006. Fertilizer imports peaked at nearly 23,000 mt in 2007 before falling to 16,827 mt in 2008, when international fertilizer prices rose meteorically.

In 2007, fertilizer use was distributed across various crops, with most used on tea (45% of all fertilizer), followed by potato (28%), rice (6%), coffee (1%), and other crops (21%) (MINAGRI, 2007). This pattern likely differed from earlier years, because 2007 was

the first year of the Government's CIP, which promoted fertilizer use on food crops – potato and wheat in the north, maize in the east and cassava in the south. In addition to these food crops, CIP also targeted cash crops in the west.

In 2008, fertilizer use shifted even further to food crops, in part because of the lingering aftermath of a downturn in coffee production, but also because of the Government's decision to promote food crops in response to the global food price

international transport costs are especially high, as reflected in the fact that fertilizer is typically up to 50% more expensive in Rwanda than in neighboring Kenya. Where demonstration plots and associated extension information have been provided, Rwandan farmers have begun to appreciate the value of fertilizer, but such appreciation is not yet widespread. Even when farmers are convinced of its value, their ability to purchase fertilizer is often constrained by a lack of access to finance. Supply side



Sources: MINAGRI 2007, RRA/Customs, BNR, MINAGRI

Figure 3. Rwanda fertilizer imports, 1970s to 2008 (MT)

crisis. Roughly 83% of the fertilizer imported in 2008 was used on food crops, primarily maize, wheat, rice and potato (the remaining 17% was used mainly on tea). The amount of fertilizer used in Rwanda falls well short of estimated national fertilizer requirements. The quantity of fertilizer imported in 2008 represented just 30% of the country's estimated total needs and only 45% of the estimated food crop needs.

Reasons for historical low fertilizer use in Rwanda: Fertilizer use in Rwanda is low for many of the same reasons that fertilizer use is low in Africa more generally. On the demand side, incentives to use fertilizer are undermined by the variability of crop yields, attributable to the country's high dependence on rainfed agriculture. Until quite recently, the relatively high cost of fertilizer compared to output prices provided further disincentive. Because Rwanda is a land-locked country,

constraints are in part a consequence of the demand side issues. Fertilizer distribution may be unprofitable because of the weak level of effective demand, as well as the relatively high cost of procuring fertilizer in small, fragmented orders that then must be transported overland at great expense.

Although the prospects for fertilizer market development in Rwanda are constrained by many of the same factors found elsewhere in Africa, at the same time it is important to note that Rwanda differs from most other African countries in three respects. First, the potential demand for fertilizer in Rwanda is not dispersed widely. The country is small and very densely populated – as densely populated as the South Asian countries were when fertilizer use took off in those countries. Second, public expenditure management in Rwanda is widely acknowledged to be unusually transparent, with high levels of

accountability. Third, the Government of Rwanda tends to take a very tough stance on corruption, both at the national and local levels.

Policy and market structure for fertilizer in Rwanda: Faced with declining agricultural productivity, the Government of Rwanda first showed an interest in promoting fertilizer during the late 1980s. At that time, agricultural programs and projects began to distribute fertilizer to farmers, often free of charge. These programs, which were maintained over many years, did not result in any measurable increase in the commercial demand for fertilizer, even when the price was subsidized.

In 2002, the Government introduced policies that favored a more market-oriented approach to the development of the fertilizer sector. In an effort to create greater profit opportunities for private operators, unauthorized distribution of free or subsidized fertilizer was made unlawful, and import and custom duties on fertilizer were suspended. In 2006, a subsidy was introduced covering transport costs from Kigali to remote production zones. In 2008, the food crisis response year, the subsidy was extended to cover the full cost of inland transportation from the coastal ports, which had risen from US\$ 160/mt in 2006 to US\$ 200/mt by 2008 (IFDC, 2008).

Despite these efforts, fertilizer markets in Rwanda remained thin, and few private operators established a presence in the industry. Importing of fertilizer by private traders continues to be negligible, with virtually all importation being done by Government agencies (most notably OCIR-Thé and OCIR-Café, the national tea and coffee boards), as well as by donor-financed projects. Most fertilizer imports take the form of small orders placed individually on international markets. There is no domestic fertilizer manufacturing capacity and only one small fertilizer blending plant in the country, located in Kigali, with the capacity to blend and repackage. Private fertilizer distribution networks are still very underdeveloped. A recent survey carried out by IFDC identified about 40 private fertilizer dealers in Rwanda, but in 2008 when MINAGRI assessed the capacity of these dealers, only 29 were deemed competent.

Given the lack of capacity in the private sector to procure fertilizer efficiently, in 2006 the Government took steps to capture economies of scale through bulk fertilizer procurement. With the help of experts engaged by the Clinton Foundation, a bulk order was placed combining the fertilizer needs of

OCIR-Thé and OCIR-Café and augmented by a US\$ 3.5 million grant from the Foundation to pay for fertilizer needed for food crops. Following its reception in Rwanda, the fertilizer was sold to farmers at the actual import cost (border price). Domestic transport costs were absorbed by the Government. Encouraged by the initial experience, the Government thereafter continued its policy of bulk procurement, without further support from the Clinton Foundation. The following year, 2007, the bulk procurement coincided with the initiation of the CIP. Bulk procurement took place again in 2008. The Government is currently engaged in discussions with its East Africa Community (EAC) neighbors to negotiate a bulk purchase at the regional level.

Crop Intensification Programme (CIP): In 2007, the Government of Rwanda launched the Crop Intensification Programme (CIP), whose objectives included raising productivity in leading food crops, boosting food production, and safeguarding national food self-sufficiency. Under CIP, the Government procured improved seed and fertilizer, which it distributed to farmers in selected zones chosen for their food crop production potential. During the first year of the Programme, roughly 9,000 MT of fertilizer were imported and distributed by MINAGRI. Yields of CIP target crops showed positive results (for example, wheat yields more than doubled, and maize yields increased by about 90%).

Input distribution activities carried out by the Government during the first year of CIP yielded a number of important lessons. In particular, the Government's self-assessment of the CIP experience in 2007 pointed to the role of the public sector in fertilizer distribution in explaining the poor cost recovery of fertilizer advanced to farmers. Only 5% of the value of the fertilizer that was distributed was ultimately recovered. This outcome was not entirely surprising, since in Rwanda, as in many other countries, Government loans to farmers are generally regarded as gifts, and since the business of loan recovery is in any case extraneous to other Government activities. The self-assessment flagged the loan recovery rate as a major impediment to the sustainability of the Programme.

The 2007 CIP was a pilot program whose principal objectives were to increase food crop productivity and boost food production in the country. Inducing private sector participation in inputs procurement and distribution was not an explicit goal during the first year. In assessing the early performance of CIP, however, the Government recognized the desirability of phasing

out public involvement in the fertilizer sector, and it flagged fertilizer distribution as a key area for reform in the following season.

Response to the 2008 food price crisis: As a land-locked country, Rwanda is particularly vulnerable to unfavorable developments in global markets, because increases in prices of imported commodities are often compounded by concurrent increases in fuel and transport costs.⁴ In 2008, with world food prices at historic levels, Rwanda suddenly found itself facing heightened food security concerns. Policy makers therefore turned in the direction of boosting domestic production of food staples – and promptly found themselves facing an astronomical fertilizer import bill. The steep increase in the fertilizer import bill was caused partly by higher prices (the weighted average price of fertilizer formulations imported into Rwanda had almost doubled from 2007 to 2008) and partly by the greater quantities of fertilizer needed for the food price crisis response of expanded food crop production. All told, the Government found itself needing nearly US\$ 11 million to supplement what it had planned to spend on fertilizer imports. This gap was ultimately bridged with the help of a US\$ 10 million grant from the World Bank-administered Global Food Price Crisis Response Program (GFRP).

In this context, the Government undertook decisive policy actions designed to improve access to fertilizer through the private sector. In addition, the Government boosted efforts to increase availability of improved seed for food crop production. The Government enlisted technical assistance from the World Bank and IFDC, the latter already active in Rwanda through a

Dutch-financed project.⁵ IFDC technical assistance was requested to develop a market-friendly fertilizer distribution system, in line with the Government's pro-private sector fertilizer development strategy. Other development partners also participated in the initiative, each contributing to the rapid implementation of a fertilizer auction and voucher scheme for "Season 2009A" (mid-September 2008 to mid-January 2009).

Rwanda fertilizer auction and voucher system (2008): In 2008, the Government of Rwanda and its partners mobilized to put in place an auction system designed to encourage private firms to replace public agencies in retail fertilizer distribution. In an effort to secure the best possible procurement price, the Government placed a single bulk order for fertilizer imports. With the dual objectives of phasing out of the business of distribution and attenuating the abnormally high global fertilizer prices prevailing at the time, the Government organized a series of auctions through which fertilizer was sold to private operators. To the extent that winning bids were below the procurement price, the Government subsidized the price of fertilizer at auction level. Ceiling prices (Table 4) were then put in place for retailed fertilizer to ensure that the subsidy was passed to farmers.

In line with the national policy objective of increasing domestic food production, MINAGRI also introduced a fertilizer voucher system, which was channeled through the CIP and which targeted smallholder producers of wheat and maize. Farmers holding vouchers were entitled to a further discount of 50% off the ceiling price for fertilizer. Because a condition of the Programme was that vouchered fertilizer had to be used in combination with improved seed, farmers eligible to receive

Table 4. Fertilizer import and retail prices, Rwanda, 2008

Fertilizer type	CIF ex-Kigali (RWF/kg)	Average auction price	Subsidy at auction (%) ^a	Ceiling price (RWF/kg)	Ceiling subsidy (%)	Voucher value (RWF/kg)
Urea	508	330	33	410	20	205 b
DAP	791	470	35	550	30	275
NPK 17-17-17	613	400	41	480	22	N/A

Exchange rate: USD 1 = RWF 565.

^a Subsidies calculated relative to the ex-Kigali CIF purchase price

^b Representing an additional 50 percent subsidy.

Source: MINAGRI

⁴Transport costs from the coastal ports of Kenya and Tanzania make imported commodities 40-50% more expensive in Rwanda than the countries of transport origin (IFDC 2008).

⁵"Catalyzing Acceleration of Agricultural Intensification for Stability and Sustainability" (CATALIST).

vouchers had to show that they were in possession of improved seed (farmers who did not already have improved seed were provided improved seed free of charge by MINAGRI). Rice and potato farmers, who required less incentive to take up intensification technology, did not receive fertilizer vouchers, but they were free to purchase fertilizer from private distributors wherever these operated in the country (and not only within CIP zones), at the ceiling price that had been subsidized through the auction system. A public relations and extension team was created to accompany the implementation of the voucher program, to promote awareness of the program and ensure proper use of fertilizer. Finally, when the Government introduced the voucher system, it encouraged financial institutions to increase lending to program participants, both the fertilizer distributors that had participated in the auctions, as well as cash-strapped farmers. The hope was that by leaving the business of lending to financial institutions, fertilizer credit recovery would be considerably better than in the previous year.

Outcome of the 2008 auction and voucher system: With a very tight time schedule for implementation, the auction and voucher system was put in place in just six weeks during August and September 2008, with the goal of making fertilizer available in time for the 2009A season cropping of maize, wheat, potato and, to a lesser extent, rice.⁶

Auction: MINAGRI established eligibility criteria that private traders had to meet in order to participate in the fertilizer auction, including the presence of a viable distribution network in the districts pertinent to the lots being auctioned. The first auction generated a high level of interest, with 29 qualified bidders participating. The number of bidders fell to 8, 14 and 9 in the second, third, and fourth auctions of the season, respectively. Some decline in the number of bidders was to be expected, since the auction approach was very new in Rwanda, and some of the initial bidders lost interest when they discovered they were less well equipped for profitable distribution than they had estimated. However, the drop in numbers of participants was due as well to poor communication regarding the timing of the later auctions, which occurred because of the tight timetable. Still, even the reduced number of participants ensured an acceptable level of competition and

no collusion was observed. The Rwanda auction was judged by IFDC to have been “one of the best first auctions” for fertilizer that IFDC had ever witnessed. All told, over the four auctions related to the 2009A season, 10 bidders submitted winning bids. These bidders represented a mix of private fertilizer dealers, cooperatives, and middlemen. Almost all had previous experience in the fertilizer import business, but as it turned out, they had much less experience in fertilizer distribution.

Out of 14,324 mt of NPK 17:17:17, urea and DAP available in 2008 for distribution through the program, 7,404 mt was sold at auction (52%). A further 1,063 mt (7%) was sold via supplementary contracts⁷ at auction prices, leaving almost 6,000 mt still in stock at the end of December. For every auction sale, the floor price set by the Government was met or exceeded by bidders (Table 4). The “loss” absorbed by the Government on auctioned fertilizer – effectively a subsidy, implemented at the wholesale level – averaged 33% for urea, 35% for DAP, and 41% NPK 17:17:17 of the ex-Kigali price.⁸ Retail ceiling prices set on the sale of fertilizers to farmers represented 20%, 30%, and 22% subsidies on the ex-Kigali procurement prices for urea, DAP and NPK, respectively (Table 4). Of the fertilizer sold at auction, some 26% was subject to vouchering through the CIP.

Vouchers: Under the CIP, 18,825 vouchers were distributed, representing enough fertilizer to cover 53% of the area planted to maize and wheat in CIP-targeted areas (equivalent to more than one-third of the total area planted to maize and wheat nationwide in 2008). Use of fertilizer and improved seed for wheat and maize outside the voucher program was observed to be very low. Each voucher provided a 50% discount on 50 kg of urea and 100 kg of DAP – enough to treat one hectare. As mentioned above, participating farmers who did not already have improved seed were provided with 30 kg of maize seed (hybrid or open-pollinating varieties) or 100 kg of wheat seed per voucher. Due to the small landholdings in Rwanda, usually several farmers got together to share one voucher, but the voucher was registered under only one farmers’ name. Because of the practice of sharing vouchers, the total number of farmers who received them can only be estimated based on the observations of the service providers tasked with voucher distribution. The service providers indicated that typically

⁶The main rice planting season in Rwanda is Season ‘B’ (roughly February to June).

⁷Due to the inability of some winning bidders to come up with the needed financing, the unredeemed fertilizer was sold by MINAGRI at auction prices to interested dealers.

⁸The floor price set by the government was below the historically high import cost of the fertilizer. The government deliberately sold fertilizer at a loss for two reasons: (i) to ensure affordability to farmers as part of the food crisis response, and (ii) to encourage private traders to participate in the auction.

two or three farmers shared vouchers. This suggests that the vouchers benefited an estimated 46,209 farmers, each of whom received enough fertilizer to treat 0.41 hectares, which is slightly above the national average landholding.⁹ Assuming an average household size of five people, this suggests that about 230,000 people shared in the impact described in the next section.

The cost of the auction and voucher system during Season 2009A was moderate, especially in light of the extremely high fertilizer prices prevailing at the time in world markets. The auction subsidy (representing the difference between the import price paid by the Government to procure fertilizer in the international market and the average price paid by winning bidders) came to US\$ 3.6 million. The voucher subsidy (representing the total value of the fertilizer vouchers that were distributed) came to US\$ 1.2 million, for a grand total of US\$ 4.9 million in subsidy costs. Operating costs¹⁰ for the program were just under US\$ 0.5 million,¹¹ for a total program cost of around US\$ 5.3 million. To put this figure in perspective, the value of the incremental production of maize attributable to the auction and voucher system was conservatively estimated to exceed the total program cost by a wide margin (see below) – and maize was only one of several crops targeted. These back-of-the-envelope calculations of course give only an indication of the program's cost-effectiveness. A more complete analysis will be possible only when data are available on production increases in all the affected crops (not just maize), as well as on changes in the use of complementary inputs.

Initial indications of impact: Even at this early stage, three broad avenues of impact can be distinguished for the CIP fertilizer auction and voucher program. The first avenue relates to the impact on CIP wheat and maize production through the voucher program. The second avenue of impact relates to the impact on yields of potatoes and rice – crops which did not receive vouchers, but which benefited from the local availability of affordable fertilizers through the auction and ceiling price policies. The third avenue relates to the impacts on fertilizer use resulting from the strengthening of private distribution channels for fertilizer. While a full assessment of these three avenues of impact would require in-depth evaluations, which have not yet been undertaken, data collected on the numbers of CIP

(voucher) participants, crop yields, and crop production, provide an initial indication of the Programme's impacts. The picture emerging from preliminary quantitative data is supported by qualitative interviews conducted with a range of stakeholders, including MINAGRI staff, development partners, extension and voucher service providers and farmers.

Impact on maize and wheat production: Under CIP, wheat and maize yields increased 16% and 73%, respectively. Uptake of improved inputs for these crops by farmers who did not receive vouchers is thought to have been negligible and area expansion was low (5% maize, negative for wheat) so much of the yield improvement can be directly attributed to the voucher program of improved inputs. Few data are available on farm-gate prices of maize, but the additional maize produced under CIP (75,000 mt) was worth around US\$ 30 million dollars at prevailing prices. This would have represented a significant income boost for the roughly 40,000 maize farmers who participated in the Programme and their families, even assuming a less-than-perfect price pass through to farmers. These indicators of impact are only indicative, of course, and there is a need to undertake a thorough impact assessment on income and poverty.

Impact on yields of potato and rice: Only 26% of all fertilizer sold through the auction system was distributed through the CIP via vouchers; the rest (including all NPK 17:17:17) was sold by private distributors at specified ceiling prices. During the period when the auction (and ceiling price) system was put in place, national yield and production data were collected through MINAGRI's annual crop assessment survey. Measuring the impact in any observed yield and output increases at a national level will most likely mute the potential impact of auction-affected yields, given that the quantities distributed at auction account for only 45% of estimated national food crop needs. Nevertheless the crop assessment shows a rise in national yields for potato and rice of 8% and 18%, respectively (MINAGRI, 2009b). National-level data give only a gross indication of impact on the yields of potatoes and rice that stem from the local availability of affordable fertilizers through the auction and ceiling price policies. To fine-tune attribution to the Programme, a crop assessment specific to areas in which distribution networks were supplied through the auction system would have

⁹Kirehe, the district that received almost a third of the vouchers for maize, has a population density that is lower than the population densities found in other districts.

¹⁰Operating costs do not include technical assistance received from the World Bank and IFDC. In addition, the cost to MINAGRI of improved maize and wheat seed distributed under the voucher program was USD 879,646.

¹¹These costs were judged by MINAGRI to have fallen relative to the cost of the same government-supported CIP fertilizer distribution program of the previous year, despite higher levels of outreach.

to be undertaken, to determine whether yields and production of the target crops differed significantly in those areas compared to other areas that did not access fertilizers, or did so to a lesser degree.

Strengthening of private fertilizer distribution channels: The third avenue of impact has a longer term horizon for evaluation. It has already been noted that the auction generated acceptable levels of competition among the participating bidders. Only time will tell whether or not the auction has contributed to the achievement of the Government's long term goal of launching a sustainable private sector-led fertilizer industry, but this will depend critically on the incorporation of a number of key lessons identified from the 2008 experience in promoting private sector fertilizer distribution:

- **Need for a longer time horizon to organize and communicate the auction:** Although there were enough auction participants to ensure competitive bidding, the number of participants declined during successive rounds of the auction. While this reflected partly the presence during the initial rounds of "entrepreneur-middlemen" with little or no prior experience in fertilizer distribution who later dropped out, the decline was also due to communication difficulties in short time frame.
- **Need for training in fertilizer markets and auction participation for the private sector:** The successful bidders included producer cooperatives (10%), fertilizer dealers (40%), and entrepreneur-middlemen (50%). The inexperience of at least some of those in the latter category resulted in either (i) underestimation of distribution costs, leading to overbidding and eventual losses; and/or (ii) lack of experience in distribution, leading to overestimation of the capacity of the distribution network specified at auction.
- **Need to build capacity for adequate retail distribution networks:** Some winning bidders – especially entrepreneur-middlemen – delivered fertilizer purchased at auction to a central location within a given production zone, but from there they had no means to move the product to more remote areas of the production zone. In a number of cases, MINAGRI was forced to step in and negotiate supplementary contracts with local distributors. Such retail distribution challenges affected roughly 60% of the total volume of fertilizer that was put up for auction.

- **Need to improve access to finance at the auction level:** A few winning bidders were unable to mobilize the bank financing needed to execute their purchases. In these cases, unredeemed fertilizer was re-auctioned, and the bidder disqualified from further participation.
- **Need to improve access to finance at farm level:** Many farmers reported experiencing difficulties in accessing finance to pay even the vouchered cost of fertilizers, due to either a lack of savings or insufficient access to credit from banks and microfinance institutions (MFIs) operating in rural areas. Financing for fertilizer purchases came largely from own-capital (39%) or value chain finance (55%) advanced by distributors (largely facilitated in turn by the Government, which accepted auction payment delays in exchange). MFI finance accounted for only 6%. This was in a sense understandable, given the low level of formal financial inclusion among farmers and the limited time available to properly sensitize MFIs and allow them to set up accounts with potential farmer participants. MFIs also needed the time to implement their own loan evaluation procedures, which are not very expedient.
- **Need to control border leakage:** Some fertilizer apparently made its way out of the country, in violation of Programme rules. Cross-border leakage appears to have been minimal, however, thanks in part to vigorous efforts made by law enforcement agencies to monitor illegal shipments. In October 2008, 14 people including several Government employees and district leaders were arrested and charged with diverting fertilizer to other countries. Twenty-seven others are under investigation to determine whether they also took part in the illegal selling of fertilizer (New Times, 14 October 2008).

Despite these minor difficulties, all of which were overcome, the pilot auction system was considered very successful.

Conclusions and recommendations: The Government of Rwanda has conducted an initial self-assessment of the CIP auction and voucher program (MINAGRI, 2009b). Assessed against the Programme's objectives of increasing fertilizer use, improving food security, and involving the private sector in fertilizer distribution efforts, the outcome of the pilot auction and voucher system was considered positive overall.

Key achievements included:

- Food production increased significantly. Food availability per capita is estimated to have risen from 1,857 kcal in 2007/08 to 2,100 kcal in 2008/09 (MINAGRI, 2009a and 2009c);
- Many food crop farmers used fertilizer for the first time (including the vast majority of vouchered farmers); and
- The fertilizer auction system successfully replaced public distribution of fertilizer with private distribution.

The fertilizer subsidies in the Rwanda Programme were intended to be market smart. Ensuring that the subsidies remain market-smart going forward will go a long way to ensuring the sustainability of some of the Programme's key achievements.

Key lessons learned that will help to ensure improved performance in the future and continued success include:

- Greater efforts are needed to sensitize farmers about the costs and benefits of fertilizer use, as a way of motivating them to invest in fertilizer;
- More time and some capacity building are needed to enable MFIs to lend farmers working capital; greater savings mobilization among farmers, particularly at current high commodity prices, should be a priority activity among MFIs and rural banks;
- Repackaging of fertilizer into smaller packs would lead to increased uptake of fertilizer, especially for non-CIP crops such as beans that are often grown on very small plots; repackaging of fertilizer into smaller packs would also help to relieve financing constraints, particularly if the fertilizers were packaged (and vouchered) separately for basal dressing (DAP) and top dressing (urea);
- Printing and distribution of vouchers is still costly and efficiency gains are possible; and
- Additional resources are needed for monitoring and evaluation activities to permit accurate and objective impact assessment and evidence-based policy analysis.

Building viable fertilizer markets in Rwanda: The Rwanda fertilizer auction and voucher system was put in place at a time when Rwanda's food and fertilizer markets were experiencing unprecedented turmoil. The operating norms of the system will

need to be carefully re-assessed to ensure that they continue to reflect rapidly evolving market realities. For example, it will be important to verify that auction floor prices paid for fertilizer reflect the actual replacement cost of fertilizer as fertilizer prices drop.

Going forward, to maintain confidence among private operators the Government of Rwanda will have to maintain consistent rules of the game and ensure timely redemption of vouchers. Ensuring that the rules of the game continue to promote opportunities for all private operators will be critical to success over the longer term.

The Government should continue to concentrate on playing an enabling role. It should focus on the public goods aspects of fertilizer markets, for example by making investments that increase the profitability and reduce the risk of fertilizer investments made by farmers, that strengthen the capacity of farmers to use fertilizer effectively, or that promote financial literacy.

The dramatic fall in international fertilizer prices that has occurred since the introduction of the auction and voucher system should significantly reduce the level of subsidy and contribute to the fiscal sustainability of the Programme. Even so, the Government is unlikely to maintain its fertilizer activities indefinitely, even at lower levels of support. For this reason, it continues to explore ways to devolve further responsibility to private operators. If this strategy is to succeed, the pace at which the public phase-out strategy implicit in the auction and voucher design will be taken up by the Government should be articulated and clearly communicated to all participants – traders as well as farmers.

Summary and conclusions

Fertilizer use will have to increase in Africa if the region is to meet its agricultural growth targets, poverty reduction goals, and environmental sustainability objectives. Policies and programs are needed to encourage fertilizer use in ways that are technically efficient, economically rational and market friendly.

Despite numerous initiatives to promote fertilizer, fertilizer use continues to grow very slowly in most African countries. Why is this? As discussed above, slow growth in the use of fertilizer in Africa can be explained by both demand-side and supply-side factors. Many of these factors are structural in nature, meaning

they cannot easily be addressed by “quick fix” approaches designed to show rapid impacts. Rather, they require consistent policies backed by sustained investments, things that all too often have been lacking in many African countries.

Insights gained from past approaches

Many initiatives have been launched to build strong fertilizer markets in Africa, but relatively little progress has been achieved in most cases. This paper has examined selected fertilizer promotion schemes, past and present. The picture that emerges is mixed. Although it is not possible to identify any unequivocal success stories, many of the initiatives have generated some useful insights that can help to inform the design of future programs to build strong fertilizer markets.

Sasakawa Global 2000: The primary objective of the SG 2000 program was to demonstrate that technologies are available “on the shelf” to enable doubling or even tripling of food crop yields in Africa. Because the emphasis was mainly on increasing production, little effort was made under SG 2000 (at least not initially) to strengthen inputs delivery markets. It was almost as if the SG 2000 program was designed on the assumption that once the efficacy of seed-fertilizer technology had been demonstrated, input supply would take care of itself. Perhaps predictably, this approach proved insufficient. The production demonstration plots in many cases achieved their objective, but not until the SG 2000 program was well advanced did it become evident that seed and fertilizer supply networks were not going to spring up spontaneously, just because the farm-level technologies were proving to be effective.

Millennium Villages Project: The MVP similarly was designed with the primary objective of demonstrating proof of concept – in this case, the concept that an integrated approach to the interlinked problems of food and nutrition, education and health can significantly improve the welfare of poor African villagers. With MVP, the ends justifies the means, and MVP staff have done whatever is needed to ensure that improved inputs for agricultural production are delivered on time and in sufficient quantities to stimulate the desired increases in food production. Often this has meant using political influence to convince public agencies to prioritize the needs of the Millennium Village farmers, who often receive inputs on a priority basis compared to farmers in other villages. Building sustainable input supply systems is not an explicit priority of MVP, so there is little reason

to expect that MVP interventions will have a significant impact in terms of laying the groundwork for viable fertilizer markets.

AGRA’s Soil Fertility Initiative: While still at an early stage of implementation, the AGRA soil fertility initiative appears to be taking an approach that is fundamentally different from the approaches taken by earlier programs, in the sense that it is explicitly seeking to lay the groundwork for viable private sector-led input markets. Building on the experience of successful pilot efforts supported by The Rockefeller Foundation carried out in eastern and southern Africa over the past 15 years, AGRA seems willing to make the sustained investments that will be needed for input distributors to succeed. These include investments in market infrastructure, financial services for market participants, risk management instruments, and human capital, among others. Time will tell whether this approach can be implemented on a sufficiently large scale to make an impact at the regional and national levels.

Malawi case study: Successive governments in Malawi have invested considerable time, effort, money and political capital in promoting the use of fertilizer. Although the performance of Malawi’s various fertilizer promotion schemes remains subject to debate, one thing that is clear is that it has proved difficult to involve the private sector to a meaningful extent in state-supported fertilizer promotion schemes. Lingering mistrust between Government officials and industry representatives has led to the effective marginalization of most private input supply firms, who today play a restricted role in an area of activity that they once dominated. As a result, fertilizer procurement and distribution activities in Malawi today are carried out mainly by ADMARC and other Government agencies, at considerable cost to the national treasury. With no clear exit strategy, and with the cost of the program growing steadily, the Government will be challenged to mobilize the resources needed to sustain the program over the longer term.

Rwanda case study: The Government of Rwanda has become involved in fertilizer marketing activities only recently. Faced with the global food crisis, which could eventually threaten national food security, it has acted swiftly to ensure the import and distribution of fertilizer. To their credit, Rwandan policy makers recognize the importance of drawing in private sector participation, with an eye to the eventual disengagement of public agencies. In the absence of proven methods for

building private sector-led fertilizer markets, they have shown a willingness to experiment with innovative approaches – for example, the fertilizer auction system – that can actively draw in the private sector. Since these approaches are still relatively untested, there is a recognition that occasional temporary setbacks are likely to occur as the Government, its development partners, and private firms engage in what is essentially a process of trial-and-error experimentation to find solutions that will work in the Rwandan context. The importance of tracking progress is therefore not only indispensable to Rwanda, but also to other countries as they seek for more sustainable input market development.

Entry points for future interventions

Taking into account lessons learned from past experience, what can be done to build vibrant and sustainable fertilizer markets in Africa? In considering possible entry points for public interventions, it is important to adopt a long-term perspective. Past efforts to promote fertilizer in Africa all too often focused narrowly on stimulating immediate increases in fertilizer use with the help of fertilizer price subsidies – budgetary payments made by governments or development partners to reduce the cost of fertilizer at the farm level. This approach is politically popular, because elected officials like nothing better than to make small handouts to large numbers of farmers who are also voters. It is however also very limited. Governments can do many things to promote fertilizer beyond artificially reducing the cost to farmers through direct price subsidies, and in fact other measures will often be more cost-effective and financially sustainable. Public interventions can be used to help farmers, but they can also be used to help fertilizer importers and manufacturers, fertilizer distributors at the wholesale and retail levels, financial services providers, and other key actors on the supply side. More fundamentally, public interventions can involve not only direct budgetary payments designed to influence fertilizer prices in the short run, but also a wide range of other measures that improve the profitability of fertilizer over the medium to long run by directly or indirectly influencing market prices, costs incurred, or benefits received by consumers and producers of fertilizer.

Building viable fertilizer markets in Africa can be accelerated through use of “market-smart subsidies.” Market-smart subsidies are temporary interventions that work singly or in combination to lower the price and/or improve the availability of fertilizer at the farm level in ways that encourage efficient use of fertilizer while at the same time promoting private investment in fertilizer

markets. Market-smart fertilizer subsidies differ from traditional fertilizer subsidies in that they are time bound, do not distort the relative price of fertilizer relative to other inputs so as to encourage excessive and economically inefficient use of fertilizer, and are designed to shift incentives faced by buyers and sellers in ways that are consistent with the development of sustainable private markets for fertilizer. Market-smart subsidies also differ from traditional subsidies in that they target a wider range of potential entry points, not just the price paid by farmers when they purchase fertilizer.

Demand-side approaches

Demand-side approaches for promoting fertilizer market development are designed to strengthen demand for fertilizer at the farm level. In market economies, stronger demand at the farm level can be expected to elicit an increase in supply, as profit-seeking input distributors respond to new opportunities to increase sales and income. Demand-side approaches often include extensive fertilizer demonstration programs, often combined with free distribution of sample packs to encourage farmer experimentation. Demand-pull approaches may also involve subsidies, which keep fertilizer prices artificially low and make fertilizer more affordable to farmers facing cash constraints. Subsidies can be effective in stimulating increased use of fertilizer, but in view of the high fiscal and administrative costs of the typical subsidy program, many African countries are seeking a wider range of instruments to strengthen demand. To this end, improving access to finance is an essential parallel development needed to support demand-pull approaches to fertilizer market development. Savings mobilization, capacity building for microfinance institutions, and improving the financial literacy of farmers will go far to relieving what is often a critical constraint to effective demand, namely, farmers’ lack of purchasing power.

Supply-side approaches

Supply-side approaches for promoting increased fertilizer market development are designed to improve the availability and affordability of fertilizer in the market. They focus on policy reforms, institutional changes and supporting investments that can make fertilizer production and distribution more profitable. In the short run, increased profitability will encourage suppliers to offer more fertilizer at the prevailing market price. Over the long run, sustained high profitability will draw new firms into the market, increasing supplies. As in the case of liberalization of food markets, a predictable and rule-based policy environment

must be the first priority for making a rapid transition to private fertilizer markets.

In competitive markets, prices are determined through transactions negotiated among many sellers and buyers. In such markets, individual firms cannot influence prices, so their profits depend on the size of their costs. For this reason, many supply-push approaches focus on opportunities to reduce the costs associated with fertilizer production, procurement and distribution. Reductions in the cost of procuring and distributing fertilizer often can be achieved by improving the business environment, reducing logistics costs (especially transport) and improving the availability and lowering the cost of financing. Introduction of risk-management instruments for fertilizer manufacturers, importers and distributors may also be important in raising long-term profitability levels.

Available instruments for building strong fertilizer markets

Sustainable growth in fertilizer use in Africa is unlikely to happen unless resources can be shifted to activities that address the many underlying structural problems affecting incentives to supply fertilizer and to use fertilizer. These activities may include policy and institutional reforms, as well as public investment in infrastructure, knowledge generation and dissemination, capacity building, and improving the resource base on which African agriculture depends.

Policy reforms are needed to stimulate private investment in and commercial financing of the agricultural sector. Relevant options include: trade policies that promote the free flow of goods, macroeconomic policies that facilitate access to foreign exchange, tax policies that do not place an undue tax burden on productive inputs, policies that promote competition by facilitating entry and exit of firms, and land tenure policies that increase farmers' access to credit and encourage increased agricultural investment.

Institutional reforms are needed to ensure smoothly functioning commercial exchanges at all levels of the value chain. Areas needing particular attention often include: development and implementation of quality controls, enactment and enforcement of contract law, prevention of excessive consolidation of market power, and creation of farmers' cooperatives and professional organizations.

Investment in infrastructure is needed to reduce fertilizer costs, increase farmers' share of output prices, and improve the

reliability of service (both timeliness of delivery and maintenance of quality of the product). Improvement of the entire range of transportation infrastructure is fundamental to these objectives, including improvement of rural roads, major highways, railways and ports.

Strengthening in agricultural research and extension services is needed to improve their responsiveness to the needs of farmers and to allow them to adapt with greater agility to the commercial realities of the fertilizer sector. Some rethinking about how these services are organized and funded may be necessary, including consideration of public/private partnerships. Also some realigning of the criteria used to develop fertilizer recommendations may be needed to arrive at a cost-effective balance between farmers' need for location- and farm-specific recommendations, and fertilizer suppliers' need to limit product variety to realize economies of scale.

Capacity building is needed to improve the knowledge and skills of farmers and commercial actors. Training needs typically differ by cropping system, level of market development, and infrastructure. Key needs include basic literacy and numeracy, business management training, and knowledge of fertilizer products. The problem must be addressed by improved public education systems, as well as through training programs that target the needs of farmers and traders. The Rwanda experience emphasizes the need for capacity support of private sector actors, both in procurement and distribution.

Improvements in the agricultural resource base are needed to help improve the quality of soil and water resources so as to increase crop responses to fertilizer and reduce the risk of crop loss. The potential public-good nature of some of these improvements suggests that governments, possibly in partnership with the private sector, might need to be involved in irrigation and water control, and soil conservation and erosion control.

Guiding principles for fertilizer program design

Faced with the rather daunting list of possible interventions to strengthen fertilizer markets, policy makers often ask what are the most important actions – those that should be taken first. While it would be nice to be able to offer a standard prescription, unfortunately this is not possible. Many constraints to fertilizer market development recur throughout the region, and the set of constraints that are truly binding tends to vary

from country to country. This means that in every individual situation, careful diagnosis is needed to identify interventions that are appropriately tailored to the prevailing circumstances. And it must be admitted that even when the binding constraints have been appropriately identified, it is not always known what interventions will work in a particular setting. For this reason there is merit in continuing to experiment, as long as care is taken to document the results and learn methodically from experience.

In designing interventions to promote increased fertilizer use, policy makers and project designers should bear in mind the following 10 guiding principles if they want to ensure that the interventions will help build strong markets for fertilizer:

- 1) **Promote fertilizer as part of a wider strategy.** Fertilizer is not a magic bullet. Interventions designed to promote increased use of fertilizer should be developed within the context of a wider sector strategy that recognizes the importance of supplying complementary inputs, strengthening output markets, and appropriately sequencing interventions.
- 2) **Favor market-based solutions.** Long-term solutions to the fertilizer problem will have to be market-based. Interventions designed to promote increased use of fertilizer should be designed to support market development and not undermine incentives for private sector investment.
- 3) **Promote competition.** Competition in fertilizer markets is needed to ensure good performance. Barriers to entry into fertilizer distribution should be reduced (except possibly in the very short run), and markets should be competitive to ensure the lowest cost and best quality service.
- 4) **Pay attention to demand.** Farmers' effective demand, shaped by the financial profitability of fertilizer use, should be the ultimate driving force of input supply systems and the foundation of a sustainable fertilizer promotion strategy.
- 5) **Insist on economic efficiency.** Fertilizer promotion efforts should be driven by economic considerations. Interventions designed to promote increased use of fertilizer should be carried out only where it is economically efficient on average to use fertilizer.
- 6) **Empower farmers.** Farmers should be in the driver's seat. Interventions designed to promote increased use of fertilizer should empower farmers to make their own decisions on the most appropriate way to manage soil fertility in their particular farming context.
- 7) **Devise an exit strategy.** Governments should not be in the fertilizer distribution business for the long haul. Public sector interventions designed to promote increased use of fertilizer should be designed with a clear exit strategy, except for a few long-run public-good functions, such as market regulation, infrastructural development and R&D on natural resources management.
- 8) **Pursue regional integration.** Market size matters, so trade matters. Countries should seek regional integration and harmonization of fertilizer policies to reap economies of size and scope, which are especially important in a region such as Africa with so many small countries.
- 9) **Ensure sustainability.** Solutions must be designed for the long term. Interventions designed to promote increased use of fertilizer should be economically, institutionally, and environmentally sustainable.
- 10) **Promote pro-poor growth.** Equity considerations matter. Assuming the previous nine guiding principles have been followed, a final consideration is that public interventions designed to promote increased use of fertilizer should also aim to promote pro-poor growth. In exceptional circumstances, poverty reduction and/or food security objectives may even be given precedence over efficiency and sustainability goals, if it can be determined that fertilizer interventions are a cost-effective way of addressing these problems.

Final thoughts: Need for further research

An interesting feature of the policy dialogue surrounding fertilizer market development in Africa is that often it is driven by ideology, rather than evidence. Design of fertilizer policies and programs in Africa continues to be hampered by a lack of up-to-date and reliable data on the coverage and impacts of existing initiatives. Thus there is a need to strengthen monitoring and evaluation efforts, to shed additional light on what works and what doesn't work with regard to fertilizer market development initiatives. Needed also are more and better ex-post impact assessment studies, which tend to be technically challenging

because of their inherent complexity and because the difficulty of measuring key parameters such as yield increases and income gains. More and better empirical information is needed to make fertilizer policy analysis more results based and less subject to political manipulation.

Areas in which additional research is needed to inform the design of future interventions include the following:

- **Financial profitability of fertilizer use.** The reluctance of farmers in Africa to use fertilizer may be rational if investment in fertilizer is financially unprofitable. Under what conditions is fertilizer use financially profitable? The answer to this most basic of questions is likely to vary depending on the crop, on agro-climatic conditions, on the production technology, on prices of inputs and outputs, among other factors.
- **Economic profitability of fertilizer use.** Even in cases where fertilizer use is financially unprofitable, if market prices do not reflect the true opportunity cost of production inputs and outputs, it is possible that fertilizer use is economically profitable. Under what conditions is fertilizer use economically profitable? In order to answer this question, it is necessary to identify distortions in the economy that may be driving a wedge between financial economic prices.
- **Impact of fertilizer programs on crop yields and production.** Fertilizer promotion programs generate benefits only if they succeed in significantly raising yields in zones where crops are currently being grown or in encouraging farmers to increase the area planted. To what extent do fertilizer promotion programs lead to improved yields, expanded area, or both?
- **Economics of manufacturing fertilizer locally.** The recent spike in fertilizer prices in international markets has led to calls for the development of local manufacturing capacity in Africa. But would investing in local manufacturing capacity reduce the cost of fertilizer more than, say investing in improved port facilities and better domestic road and rail networks?
- **Benefits of bulk purchasing.** Analysts say that a major factor contributing to the high cost of fertilizer in Africa is the small size of fertilizer markets, which prevents suppliers from capturing economies of scale. Efforts are being made

in a number of countries (and in some cases among groups of countries) to pool orders as a way of obtaining price discounts and lowering unit transport costs. Does bulk purchasing really deliver cost savings as has been claimed?

- **Displacement of commercial purchases by fertilizer subsidies.** Fertilizer programs involving the use of subsidies will fail to generate incremental benefits if distribution of subsidized fertilizer merely has the effect of displacing commercial fertilizer sales. To what extent does distribution of subsidized fertilizer lead to additional use of fertilizer?
- **Returns to public investment in fertilizer programs.** Public support of fertilizer promotion programs – including fertilizer subsidies – is justifiable only if resources invested in such programs deliver attractive returns relative to alternative investments. What are the incremental benefits generated by public investment in fertilizer programs, and how do those returns compare to returns from investments in alternative activities?

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Section 3

Strengthening Finance, Insurance and Market Information

Credit for small farmers in Africa revisited: Pathologies and remedies¹

Hans P. Binswanger^{2,3} and Rogier van den Brink⁴

Abstract

Developing successful rural finance institutions has been one of the most intractable issues in development. This paper reviews the generic difficulties confronted by rural finance and proposes a way to overcome them by combining a number of features of successful micro-finance institutions with (1) farmer-owned insurance funds at village, district and national levels; (2) insurance of national catastrophic risks in national insurance markets; and (3) international insurance.

Introduction

Africa desperately needs poverty-reducing economic growth at far higher levels than currently prevail. It is difficult to see how this can be achieved without increasing private investment in agriculture and improving access of farmers to agricultural credit, in particular medium-term credit. Nevertheless, since the late 1980s, many countries and donor organizations have stepped back from targeted agricultural credit programs, given the extremely poor track record of such programs the developing world over (e.g., Von Pischke, Adams and Donald, 1983; Adams and Flitchett, 1994; Besley, 1994; Mathieu, 1998; OED, 1993; Yaron, 1992; Yaron et al., 1998). And even in developed countries, their track record is sometimes hardly any better. This paper revisits the reasons for the failures of the past and suggests a set of possible remedies for the future.

We first analyze the main theoretical and empirical reasons for the past problems of medium-term credit provision to farmers in developing countries. These include the following generic problems: (i) low demand for credit; (ii) heterogeneity; (iii) seasonality; (iv) covariant risks; (v) moral hazard⁵; (vi) inability of crop insurance to solve the combined problem of co-variant risk and moral hazard; and (vii) difficulty of mortgage lending based

on individual farms, as well as group assets⁶. We then suggest a number of specific solutions to the generic problems, based on theory and empirical evidence. Finally, based on this analysis, we design a hypothetical agricultural credit program – the Community Trust Bank. We conclude by a call for trials, piloting and action research into the feasibility of the proposed solution.

Generic problems

Low demand for credit

One reason for the failure of many well-intended agricultural credit programs stems from a fundamental – and economically rational – lack of demand, given the incentives farmers face. For instance, in land-abundant situations, soil fertility conservation may be more cost-effectively achieved by shifting cultivation under a long fallow system, leading to a lack of demand for the type of inputs associated with agricultural intensification (Pingali et al., 1987; Binswanger and McIntire, 1987). Low demand for credit can be the result of the low profitability of agriculture and the high transactions and transportation costs farmers face. In areas of low population density farmers may have difficult access to markets (e.g. distance, lack of transportation infrastructure), which increases farm gate prices for inputs and lowers prices for outputs (Sadoulet and de Janvry, 1995). And in yet other cases, profitability can also be low because of the existence of monopolies and monopsonies in input and output markets, which discriminate against small farmers.

Heterogeneity

In Sub-Saharan Africa in particular, extreme heterogeneity raises transactions costs and aggravates asymmetric information problems, as well as resulting moral hazard problems (Binswanger and Rosenzweig, 1986). For instance, even within a particular agro-climatic zone, differences between villages, farmers and plots can be great. Between villages there may be substantial differences in micro agro-climate, rainfall in a given year, infrastructure, and access to markets. And within a village, the farming community may be very heterogeneous in terms of assets, income, managerial capability, age and gender. Even rainfall may differ from one end of the village to the other. And individual farm plots may again be very different in terms of soil

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²Hans Binswanger is a retired World Bank staff member. His last position was Senior Advisor to the Vice-President of the Africa Region.

³Corresponding author (binswangerh@gmail.com)

⁴Rogier van den Brink is Land Reform and Land Policy Coordinator for the Africa region of the World Bank.

⁵A glossary of technical terms is provided at the end of the paper.

⁶Yaron (2004) also reviews these and additional barriers to financial intermediation in Africa, as well as numerous approaches and examples of how to overcome them.

types and position on the slopes of the watershed area (Chavas, Kristjanson and Matlon, 1991). Any credit provider who is not a village “insider” would therefore face substantial difficulties in collecting information about prospective borrowers *ex ante* and assessing the borrowers’ true efforts in paying back loans *ex post*. Hence, the transactions costs of operating a credit scheme by such outsiders would be substantial, and issues of moral hazard and adverse selection will constrain the successful operation of the scheme. Communities, on the other hand, are “insiders” and do possess the necessary information about individuals’ repayment capacity and trustworthiness.

Seasonality

The agricultural marketing chain from farmer to market is characterized by severe seasonality problems, as the following stylized description illustrates. At the start of the growing season, farmers want to borrow, or withdraw their savings, to buy inputs. This leads to a liquidity crunch in local-level financial institutions. Savings will be withdrawn *en masse*, while no new deposits will be made available out of which to lend. At harvest time, a similar liquidity crunch develops, because when agricultural traders want to borrow to purchase the new crop, farmers cannot have yet deposited the proceeds from their crop sales. Finally, in the run-up to the next rainy season, input merchants want to borrow for inputs before output merchants have deposited the proceeds from their crop sales.

The group lending procedures, regular and frequent repayment schedules, and regular savings obligations used by micro-finance institutions to increase repayments and improve client and institutional performance means that micro-finance is not well suited to clients with seasonal farming activities (Gine, 2004). But seasonality also has severe negative consequences for local financial institutions. Liquidity management is very difficult, as the peaks and valleys of credit demand and supply cascade throughout the agricultural cycle. Local agricultural banks will need very high reserves to manage during the peak periods, but these same reserves will then sit idle during the valley periods. This liquidity management problem becomes especially severe when there is only one season.

Covariant risks

These imply low financial intermediation. Potential borrowers in the farm economy typically face common shocks – covariant risks

– from a number of sources (e.g., the weather, pests, and prices). They therefore have great difficulties in guaranteeing credit for each other. And their problems become especially severe when there are several common shocks in a row. These covariant risks typically undermine group-lending schemes. Again, to avoid insolvency, a local financial institution would have to hold very high reserves. Conversely, private moneylenders are therefore often seen to be lending out of equity, not out of deposits, and have “reserve ratios” of 100% (Binswanger and Rosenzweig, 1986; Binswanger et al., 1993).

Seasonality and covariant risks together explain why the micro-lending successes are largely concentrated in irrigated areas, with lower agricultural production risks than dry-land agriculture, or in periurban areas, where there is a significant non-farm sector, which does not exhibit covariance with the farm sector. The successful Grameen Bank programs in Bangladesh confirm this pattern. Lending to its members is mainly for low-risk activities with a regular income stream, e.g., trading and other non-farm activities, and the purchase of milk cows (Khandker, 1996). In rural areas in Africa, indigenous financial institutions, such as Rotating Savings and Credit Associations (ROSCAs), diversify their membership (e.g., include a mix of professions and occupations) in an attempt to diversify risk (van den Brink and Chavas, 1997). Finally, we have been unable to find a successful micro group-lending scheme that lends for dryland agriculture.

Moral hazards

These result from asymmetric information⁷. The term “moral hazard” describes the opportunistic behavior of a borrower who exploits the lack of information by the lender. With respect to farmers, the type of moral hazard and asymmetric information that is typically associated with farming is best illustrated by the popular caricature of the farmer, who is always poor, eternally subject to bad weather, or, when the weather is good, bad prices or exploitative traders.

Moral hazard is a constraint to lending to individual borrowers anywhere. But in rural areas it is compounded by heterogeneity and high risk. In addition to constraining individual lending, farmers sometimes collude collectively when they claim, as a group, to be affected more severely by adversity than is the case in reality. Only if there is a massive, clearly observable and verifiable drought or flood does the asymmetric information

⁷There is large literature that analyzes how informational problems produce the key market imperfections that plague financial markets. The seminal publication is Stiglitz and Weiss (1981).

problem disappear for the lender, as verification of a major event is easier than of moderate shocks. But when shocks are not severe, influential farmer lobbies may collude to extract debt rescheduling or debt forgiveness from their lenders, often successfully enlisting politicians in the cause. The resulting need for a re-capitalization of agricultural credit institutions will then typically be transferred to the national budget. Failing agricultural, or rural, financial institutions have been notorious for aggravating macro-economic difficulties (Yaron, 1992).

Crop insurance and the problems of covariance and moral hazard

Crop insurance programs have long been advocated to overcome the riskiness of lending in rural areas, usually in the form of insuring loans or loan service payments. However, crop insurance can only play a limited role in reducing the agricultural risk facing farmers, because crop insurance programs face the same problems that agricultural credit faces: heterogeneity, asymmetric information, covariant risks, and moral hazard. Transferring the risk of agricultural credit to an insurer who faces the same problems as the lender therefore cannot be the solution. The documented failure or huge subsidy dependence of crop insurance all over the world is ample testimony to its inability to overcome these problems (Hazell, Pomareda and Valdéz, 1986).

An alternative version of crop insurance often advocated is rainfall-based insurance. Here, payouts are automatically linked to rainfall deficits in a particular area, rather than on crop yields. Unfortunately, the correlation between rainfall and output, or rainfall and price risk is rarely strong, even at the village level, and much less so at more aggregate levels, where the necessary rainfall data are usually available. A rainfall-based crop insurance scheme will only work in cases of massive droughts or floods, when moral hazard problems are insignificant anyway.

Difficulty of mortgage-based lending

Mortgaging of farmer or group assets is a well-known solution to improve repayment incentives. But the international evidence shows that there is little agricultural term credit in developing countries based on mortgaging individual farms. The reason for the dearth of mortgage-based agricultural lending may simply be related to low population density and the absence of private and tradable property rights in land. However, mortgaging is very often also absent in areas with high population densities and private property regimes, or in areas where common

property allows for individual rights to specific plots to become very secure and tradable, at least inside communities. In these cases, the absence of mortgaging is because the community, or the society at large, does not allow a financial institution or moneylender to foreclose on someone's land or other agricultural property. This may be because land is an important social safety net, with no alternative social insurance mechanisms available. But even in developed countries, where such mechanisms are available, farmer bailouts to prevent foreclosure are not uncommon.

Obviously, if foreclosure is impossible, land loses its attractiveness as collateral. Alternatives exist in the form of buildings and tree crops, but since these are permanently fixed to the land they are often equally unsuitable to function as collateral. And collateral alternatives that are not fixed to the land will of course miss the important collateral quality of immobility.

Theoretically, a group could offer its land, held under common property, as collateral. In practice, this runs into even greater social resistance. Who would seize the land and homes of an entire poor community, forcing the group to resettle? Hence, in many cases, mortgaging can only be used as a repayment incentive within the community, and only when land is both scarce and tradable within the community.

Generic solutions

What would be the generic principles involved in solving the above problems? What would be the operating guidelines for a hypothetical financial institution, expected to be reasonably successful in delivering agricultural term credit to small farmers in Africa?

Low demand for credit

The solution is to focus on areas of high population density, periurban areas, and areas in close proximity to markets or with good links to markets. In these areas, the profitability of intensive agricultural production based on purchased inputs will be relatively high. This will induce an effective demand for agricultural credit.

Heterogeneity and moral hazard

Because a group knows its members better than anyone else, group, rather than individual, lending or joint liability has been part of many micro-finance systems and credit cooperatives

to reduce the high levels of idiosyncratic risk associated with heterogeneity and to overcome moral hazard at the local or community level (Ghatak and Guinnane, 1999). In micro-finance institutions, group lending is most often combined with other incentives, such as increasing loan amounts over time, short maturities, and the threat to cut off any future lending in the case of default, regular repayment schedules and regular forced savings. Gine (2004) reviews the empirical evidence on the impact of these practices, which shows that they significantly increase repayment rates, and therefore are an effective means to overcome problems of heterogeneity and moral hazard at the local level. However, the empirical studies reviewed by Gine (2004) still differ on whether these practices increase borrower welfare and productivity.

Group credit also reduces transactions costs for the lender, because the group consists of village insiders who have a lot of information already. In addition, they will “subsidize” transactions costs by volunteering their own time, labor and resources to collect additional information, define agreements and enforce contracts. The concept of group credit implies that the group will be jointly liable for the credit of each and all of its members. At the group’s discretion, individual repayment schedules can be flexible, matching individual cash flows, and various methods of enforcing compliance can be used, e.g., holding periodic meetings frequently enough to collect even very frequent individual repayments. Borrowers should be allowed to choose different repayment schedules, and to switch among them. As mentioned above, group lending cannot, however, insure the group against covariant risk, and other means to do so are discussed below.

But moral hazard also arises at other than the local level. Minimizing opportunistic behavior could in principle be achieved by a combination of the principles of subsidiarity and incentive compatibility at each of the levels where it arises. Moral hazard must be solved at the level with the best information (subsidiarity), and the agents in charge of enforcing repayment and monitoring shocks must face the appropriate incentives (incentive compatibility).

As mentioned above, financial institutions are often subject to political pressures to reschedule or forgive agricultural debts. The solution therefore also needs to ensure that the institutions are isolated from the opportunistic behavior described above, as well as the state.

Seasonality

Client diversification, linking the credit program to clients with different cash flow profiles, can reduce the liquidity management problems stemming from seasonality. A financial institution dealing with agricultural credit will need to be part of a wider network, and include deposits from, and loans to, the rural non-farm sector. Seasonality problems will be even further reduced by including the urban sector. Linkages to urban and foreign capital markets are also essential for the profitable placement of idle deposits, and to borrow added liquidity at low cost. Successful cooperative agricultural finance institutions in the developed world, such as the RABO Bank of the Netherlands, and Crédit Agricole in France, all have more urban than rural business.

Covariant risks

In addition to dealing effectively with seasonality, client diversification of the types just described also assist in insuring against covariant risks. But client diversification is usually not enough, and some form of insurance will be needed. It is important to bear in mind that covariant risk arises at three levels, and solutions to insure it are needed for each of these levels: (i) one, two, or three villages experience a local shock; (ii) one, or a few districts experience a district shock; and (iii) large parts of the country experience a national shock.

A proposed institution

The above generic solutions to generic problems can be translated into the design of a hypothetical financial institution, the “Community Trust”, which could be expected to overcome the set of problems identified above and therefore be successful in providing agricultural credit to small farmers. The Community Trust design also reflects lessons from the experience of formal and informal savings and credit institutions around the world and in Sub-Saharan Africa. Suggestions are made to adapt the idea of the “Community Trust” to particular local situations.

The Community Trust entails setting up two separate financial organizations – the medium-term credit window (the Community Mortgage Bank), and the credit insurance window (the Reserve Funds). These could be separate organizations, or two units within the same organization. Most likely they would be set up as second tier institutions, using existing finance and micro-finance institutions to retail their products. This dual set up is not only derived from a theoretical perspective, but it is in fact commonly

found in very popular indigenous savings and loan institutions, the ROSCAs, which have a successful track record in mobilizing savings and extending medium-term credit.

The Community Trust will operate without any explicit or implicit guarantees from the state for deposits or loans. This will be straightforward with respect to explicit guarantees, but much more difficult with respect to implicit guarantees. To reduce expectations of an implicit guarantee, the institution will need to build up a track record free of “bail outs”, or develop efficient bankruptcy rules.

Credit insurance – the reserve funds

Only farmers are likely to have the information enabling them to judge whether other farmers face a real calamity or are pretending to do so. The first organizational principle therefore is “peer review”. This puts other farmers and villagers in charge of enforcing repayment and judging whether a calamity has occurred which merits using insurance and reserves. To provide the peer reviewers with incentives compatible to making the correct call, they should be the owners of the insurance and reserve system. The institution is composed of Reserve Funds operating at the various geographic levels to insure the risks faced by the medium-term credit organizations. It will operate as a hierarchy of geographic levels, and will also need to be re-insured internationally for national shocks. In our hypothetical example, four insurance funds are set up and operate at three levels. These are (i) the Community Reserve Fund for individual, idiosyncratic shocks; (ii) the District or Regional Reserve Fund for local covariant shocks; (iii) a National Reserve Fund for district co-variant shocks; and (iv) international re-insurance for national co-variant shocks.

Community Reserve Fund

A community association owns and administers this fund to minimize the transactions costs. The fund is established from members’ own, obligatory savings, and external start-up funds, which can be in the form of concessionary loans or grants. The Reserve Fund insures the repayment of a credit for a person who, through no fault of her own, faces repayment difficulties. Each member taking out a loan is obliged to buy the local loan insurance⁸. The decision to use the Reserve Fund is taken by the community. The accumulated excess reserves will lead to rebates on the insurance premium. The fact that the community

owns the fund means that the right incentives exist to use the fund sparingly, because this will translate into lower insurance premiums. A community reserve fund can also be combined with the other practices common in microfinance institutions discussed above, which have been shown to increase repayment rates, and it could collaborate with other institutions or programs which provide improved financial savings opportunities to rural dwellers.

District Reserve Fund

A regional or district association of the farmers’ organizations or village banks of the district owns and manages this fund. The fund insures the local village banks against local shocks. Association members decide when to cover arrears of one or several community banks. The accumulated excess reserves lead to rebates on the insurance premium.

National Reserve Fund

This fund is owned by farmers’ organizations to cover shocks in one or several districts. Lenders providing loans charge an insurance premium for national shocks to their borrowers, which is transferred to the fund. Low use of the insurance fund leads to rebates on the insurance premium.

International reinsurance

To insure against national shocks, the National Reserve Fund should be able to reinsure itself internationally. A variant of a crop or rainfall insurance could be applied, as well as price insurance via forward transactions in the commodity markets. Note that international reinsurance will only be required to address the problem of national shocks, not problems at lower levels. International reinsurance should be possible, because shocks affecting entire provinces or the nation as a whole are more easily verified by outsiders than individual, local or district level shocks, and because such large shocks lead to economies of scale in information gathering and claims settlement.

Initial and sustainable financing of the Reserve Funds

Members’ own insurance premiums, or forced savings, are the main source of funding for the Reserve Funds. An external institution could provide a small grant, or concessionary loan, to assist in starting up each of the funds. IDA grants could be used as well, but IDA loans should only be used if they can be made without a government guarantee, to avoid the moral hazard mentioned above.

⁸In the ROSCA's found commonly in Cameroon, this reserve fund is called the “trouble bank”, and it serves to collateralize the medium term loans given out (van den Brink and Chavas, 1997).

To sustain the reserve funds, a mandatory loan insurance premium is charged to the term borrowers. For instance, the village bank charges 14% for a loan, but the borrower also has to pay, say, 2% for each of the three reserve funds (local, regional and national), and for the international reinsurance for a total interest rate of 20%. Incentives are compatible in this set-up to manage the various reserve funds carefully. Member associations themselves, i.e., those with the best information about members' behavior, own and are in charge of managing the funds. Community and district reserve funds are owned and managed by farmers in the same community or district. Therefore, incentive dilution and information problems are minimized. Financial incentives will be such that high insurance pay-out rates will lead to high insurance premiums, and therefore a high final interest rate, whereas low pay-out rates will lead to premium rebates and a low final interest rate.

Insurance of interest payments only

Flexible loan term structures can help reduce the cost of insurance. To minimize the insurance premium for the reserve funds, these could insure only the interest, not the principal of the loan. Payouts from the insurance fund during one year would result in a lengthening of the mortgage term by one year. If the risk of an idiosyncratic or covariant shocks is one year in four, that would add on average 1.25 years to the term of a five year loan.

Medium-term credit – the community mortgage bank

We use the example of an institution based on mortgaging of land, but in principle other collateral alternatives could form the basis of the institution. However, some type of collateral will in general be needed to make the credit market work, given imperfect information. If we assume for the moment that such collateral alternatives to land mortgages are absent, the setting in which the mortgage bank will operate will need to have some form of a land market, otherwise a credit market failure will be likely (Binswanger and McIntire, 1987).

Recall that for mortgage-based lending to work, a number of conditions need to be met. Land needs to be scarce, so that it has real value. Secure, individual property rights need to exist that are inheritable and freely transferable, at least within the community. Note that this need not be private ownership based on title deeds. Secure, inheritable and transferable usufruct

rights will do as well. In many traditional rights systems, and increasingly in formal land tenure systems (e.g., the Mexican Ejido) the usufruct rights have become tradable within the community, with the consent of the community, and such systems can be generalized to other countries. Similar property rights often exist for in informal settlements in urban and periurban areas.

Therefore the mortgage bank need not be confined to rural areas, and the necessary links with urban and periurban areas with low covariance of income can be established. Mortgaging of individual land rights will also require some form of community driven land administration and land registration. The type of loans which the Mortgage Bank would target are for lumpy investments which would require several years to pay back, given the particular repayment capacity of the borrower. Poor people normally use sweat equity to build their homes over several years, financing materials and skilled labor as and when they can afford them, given their meager cash flows. The loans from the Mortgage Bank would allow them to accelerate the process. Investment in tree plantations or small-scale irrigation infrastructure would be other typical examples of loans. Repayment periods could be in the order of 2 to 5 years.

Even with usufruct mortgages, the main repayment incentive will consist of the blacklisting of individuals in arrears. The individual in question will be excluded from new loans, and repayment would be maintained following a standard and often repeated game argument in which the benefits of continued membership of the Mortgage Bank exceed the one-off benefit of loan default (Abreu, 1988).

However, shocks will occur, and some individuals will fall into arrears. To cope with this eventuality, an additional system can be used to minimize the use of foreclosure on mortgages first formally pioneered in a production credit program in the Dominican Republic (Strasma, 1995). The community first arranges for a temporary loan of your land (or part of your land) to another community member or agreeable outsider. The new "tenant" will clear the arrears, farm the land for one year, and pay the next installment.

If the land is exceptionally valuable, the tenant may also pay some residual rent. The details of this system can be adapted to specific settings. In fact, private moneylenders in certain parts of Africa already operate a variant of this system: informal

adjudication of land rights allows them to farm land that has been pledged until the loans are repaid. The principle is that the “mortgaged” land is first being lent to somebody who can use it. The borrowing member pledges the usufruct of his or her land for a period commensurate with the value of the loan payments. Borrowers do not lose their property rights, only the temporary usufruct. The usufruct mortgage is the formal mortgage of the usufruct right over the land.

Even then, there will of course be cases when a borrower will not recover his or her ability to resume payments of the loan, and default becomes unavoidable. In that case, the community should be willing to enforce the usufruct mortgage, and force the individual in arrears to sell the rights in the land to another community member or to an outsider.

These decisions are entirely up to the community, which can make its own policies and exceptions. For instance, if a member dies, the community may want the spouse and children to be protected from foreclosure. It could finance this type of exception by using part of the Reserve Fund, or by arranging for a long-term lease of the land until the children can resume cultivation. In all events, the community needs to make clear and transparent rules on how to handle foreclosure and exceptions – “bankruptcy rules”.

As with any other financial institution, community-based mortgage banks could choose to lend out of their own members’ deposits, or to borrow funds for “on-lending” from the banking system at the district or national level. If a Mortgage Bank defaults, it would be blacklisted. It would no longer have access to new loans and would lose its ability to borrow further in the district or national financial system.

Capital and governance structure of the National Reserve Fund and National Mortgage Bank

Farmers will need a blocking minority in the shareholding structure of the national institutions to oblige these institutions to do business with them. Other shareholders should include the urban poor, or associations representing them, and various types of other domestic investors. A credible foreign investor would also be necessary and should have a blocking minority to insulate against political interference at the national level. The state should be isolated from any contingent liability arising from difficulties of the insurance and mortgage bank. Grants or concessionary loans would need to be sourced to provide the initial paid-in capital for the farmers and the urban poor.

A national mortgage bank could use existing micro-finance institutions to on-lend and administer the insurance policies, thereby saving on transactions costs. The micro-finance institutions would benefit by having attractive new products.

Summary and conclusion

We started by listing the fundamental problems and generic solutions of the demand and supply of agricultural credit in Sub-Saharan Africa: low demand for credit, heterogeneity, seasonality, covariant risks, moral hazard, inability of crop insurance to solve the problems of covariance and moral hazard, and the difficulty of mortgage-based lending.

We attempted to solve each of these problems in turn, in the process designing a hypothetical financial system composed, at each geographic level (local, district and national), of a medium-term credit window – the Community Mortgage Bank – and a credit insurance window – the Reserve Fund. The National Reserve Fund would be re-insured internationally.

The system would focus on high intensity areas and areas with good market linkages to avoid a lack of effective demand for credit. Heterogeneity would be addressed by using the concept of joint liability under group lending with flexible repayment schedules, and a Community Reserve Fund to deal with individual idiosyncratic risk. To cope with seasonality, the system would include links to non-farm and urban sectors and financial markets (rural non-farm, urban and international).

The potential impacts of covariant risks and moral hazard would be minimized by operating a system of Reserve Funds, which is mainly financed from members’ own obligatory loan insurance premiums. These insurance premiums partially collateralize the lending and also provide a savings function. At each geographic level, the relevant Reserve Fund would be owned and managed by farmers themselves. The loans provided by the Community Mortgage Bank would have flexible term structures so that only the interest needs to be insured. The loans would be based on a particular form of mortgaging, under which only the usufruct right would be mortgaged, instead of the full private property right. When a member has loan repayment difficulties, he or she will be obliged to temporarily lease out the usufruct right of the land, until his or her repayment capacity has been restored. The sale of the individual farm to other members of the community, or to outsiders with the consent of the community, would only take place after several years of temporary leases.

We understand that the proposed financial system attempts to solve a problem that has bedeviled the agricultural development of Sub-Saharan Africa, and many other developing areas, for decades. A dose of healthy skepticism by the reader is therefore warranted. But we believe the search for a solution needs to continue⁹. Each characteristic of the proposed financial institution is desirable from a theoretical perspective, and many of them have individually also proven to be empirically robust. What is new in the proposed solution is the combination of these characteristics in an internationally consistent system. We believe the proposed approach can work. We call upon the development community to invest resources in its piloting.

Definitions

Asymmetric information: the two parties to a contract do not have the same information.

Idiosyncratic risk: risk that affects only one individual or family, e.g., a broken leg, a fire in the house.

Incentive compatibility: a situation in which economic actors have all the information they need and face the right incentives to optimally solve a problem.

Moral hazard: situation under which one party could exhibit opportunistic behavior because of asymmetric information problem.

Subsidiarity: principle under which decisions, functions, and public goods production take place at the lowest possible level. Only when a lower level cannot perform a function should it be passed to a higher level.

Systemic shocks or co-variant risks: risks that exhibit a positive correlation with each other. Examples are droughts, floods, animal and crop epidemics, locusts, and collapses in prices.

Transactions costs: costs of information gathering, contracting and enforcement of contracts.

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⁹Yaron (2004) has already produced a skeptical, yet helpful review of our proposal. He particularly highlights the requirement for community cohesion and strong honest leadership, the risk of elite domination of the proposed scheme at the community level, and the complexities of understanding and managing co-variant risks and the respective reserve funds at the different levels as factors that might limit the applicability and success of our proposed approach. He therefore advocates a cautious approach to testing at relatively small scales.

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Climate risk, information and market participation for African farmers

James Hansen^{1,2}, Stephen Zebiak¹, Walter Baethgen¹, Amor Ines and Daniel Osgood¹

Abstract

Through its impact on production and price volatility, influence on farmer management, disincentive effect on market institutions and role in dynamic poverty traps, climate-related risk contributes to the widespread failure of markets to benefit smallholder farmers in Sub-Saharan Africa. It impedes farmers' participation in markets by reducing both demand for, and supply of, rural market services. We discuss several promising opportunities to improve management of climate risk within the agricultural sector of Africa – use of seasonal forecasts for adaptive management and to coordinate input supply, weather index insurance, food crisis management, and trade to manage price volatility – that depend on or benefit from climate information. These interventions have not been fully exploited, in part because of gaps in existing climate information products and services. A common climate-informed crop monitoring and forecasting platform, which provides continuously updated, probabilistic information about climate impacts at a suitable spatial resolution, could enhance the value of climate information for multiple interventions. In the context of such a system, we discuss the rationale for translating climate information into agricultural production terms, the relevance of the lead-time/accuracy tradeoff, opportunities to improve lead-time and accuracy, and opportunities to address data scarcity. If value-added climate information is to contribute significantly to efforts to improve the livelihoods of African farmers, we argue that gaps in climate data, information services, delivery mechanisms, early response mechanisms and coordination must be addressed in parallel.

Introduction

Climate-related risk is one of several factors that contribute to chronic poverty, constrain farmers' participation in markets, and impede progress toward a profitable agricultural sector, particularly in the dryer (i.e., dry sub-humid to arid) rainfed regions of Sub-Saharan Africa (SSA). The Comprehensive Africa Agriculture Development Program (CAADP) (NEPAD, 2002), identifies "vagaries of climate and consequent risk that deters investment" as one of six key challenges to achieving a productive and profitable agricultural sector across Africa. Efforts to make markets work for smallholder farmers in SSA

should consider the range of opportunities to manage climate-related risk. Several opportunities to better manage climate-related risk and reduce its negative consequences require or benefit from climate information. Progress is constrained, in part, by a substantial gap between the current supply of climate information products and services, and the needs of development at the scale of the MDGs (IRI, 2006). In this paper we: (i) survey the ways that climate risk impacts the livelihoods and market participation of African smallholder farmers, (ii) discuss several promising interventions that use climate information to reduce the negative impacts of climate risk, and (iii) explore opportunities to increase the utility of climate information for risk management within smallholder agriculture in SSA.

Climate risk, rural livelihoods and market participation

Climate-related risk impedes farmers' participation in markets both by reducing demand at the farm household level and by affecting supply through impacts on market development (Kelly et al., 2003; Poulton et al., 2006a). Although climate risk impacts the agricultural sector at multiple scales, available evidence is better developed at macro- (i.e., national economies) and micro- (i.e., farm household) scales than at the meso-scale of agricultural market value chains. At the macro-scale, Brown et al. (2008) found that drought risk has a detectable negative impact on GDP growth in about a third of the countries in SSA. The World Bank (2006) estimated that climate variability reduces Ethiopia's economic growth by one third, and that a single drought event reduced growth by 10% during the subsequent 12-year period. Current understanding of the mechanisms by which climate variability impacts rural livelihoods and market participation is incomplete particularly at the meso-scale, yet provides some insights into opportunities to intervene.

Climate impacts on production and prices

In the tropics, year-to-year climate variability affects crop production primarily by driving the supply of soil moisture, although temperature fluctuations can be important where either high or low temperatures are near the limits of crop tolerance. Because biological response is nonlinear and generally concave over some range of environmental variability, climate variability tends to reduce average yields.

¹International Research Institute for Climate and Society, PO Box 1000, 91 Route 9W, Palisades, NY 10930, USA.

²Corresponding author (jhanzen@iri.columbia.edu)

Climate-driven production fluctuations contribute substantially to volatility of food prices where remoteness, the nature of the commodity, transportation infrastructure, stage of market development or policy limit integration with global markets. Poorer, landlocked, drought-prone countries are particularly susceptible to climate-driven staple crop price fluctuations (Byerlee et al., 2006). In SSA, high transport costs and poor market infrastructure contribute to the sensitivity of staple crop prices to climate (Zimmerman and Carter, 2003). Price volatility tends to be generally greater for horticultural crops that cannot be economically stored or transported long distances.

Excessive food price volatility affects net sellers and net buyers differently (Poulton et al., 2006b). For net sellers, it is a disincentive to invest in intensified production of staple crops. On the positive side, the tendency of crop yields and prices to move in opposite directions tends to buffer the incomes of net sellers. However, it exacerbates food insecurity for poor net buyers – the majority of farmers in SSA – and encourages them to allocate scarce resources to staple crop production for household consumption, instead of higher-value, market-oriented commodities that might enable them to escape poverty (Fafchamps, 1992). Poulton et al. (2006b) argue that price volatility and its impact on transaction costs are a disincentive to development of the entire agricultural supply chain.

Climate impacts on farm households

Ex-post impacts of climate shocks on assets - Climate-related disasters impact poor countries, and the relatively poor within countries, disproportionately (Carter et al., 2007; Easterly, 2001; Gaiha and Thapa, 2006). A severe, uninsured climate shock, such as a drought or flood, can have long-term livelihood consequences through direct damage to crop and livestock productivity, infrastructure, the few productive assets of the poor, and sometimes health. Vulnerable households employ a range of strategies to cope with the resulting crisis, including liquidating productive assets, defaulting on loans, migration, withdrawing children from school to work on farm or tend livestock, severely reducing nutrient intake, and over-exploiting natural resources. Coping strategies that allow households to weather a crisis in the short term often sacrifice capacity to build a better life in the future (Alderman et al., 2006; Carter and Barrett, 2006; Carter et al., 2007; Dercon, 2004; Dercon and Hoddinott, 2005; Hoddinott, 2006; McPeak and Barrett, 2001).

Ex-ante impacts of climatic uncertainty on management -

The uncertainty associated with climate variability creates a moving target for management that reduces efficiency of input use and hence profitability. Under rainfed conditions, crop responsiveness to fertilizer (Christianson and Vlek, 1991; Pala et al., 1996) and planting density (Anderson, 1984; Myers and Foale, 1981), and hence optimal rates and profitability of production inputs (Hansen et al., 2009; Jones et al., 2000; Piha, 1993), vary considerably from year to year as a function of water supply. Management that is optimal for average climatic conditions can be far from optimal for growing season weather in most years (e.g., Figure 1). Estimates based on agronomic models, and assuming expected profit maximization (Hansen et al., 2009; Jones et al., 2000; Royce et al., 2001), show that this “moving target effect,” in the absence of risk aversion, reduces the efficiency of input use and reduces income substantially, e.g.,

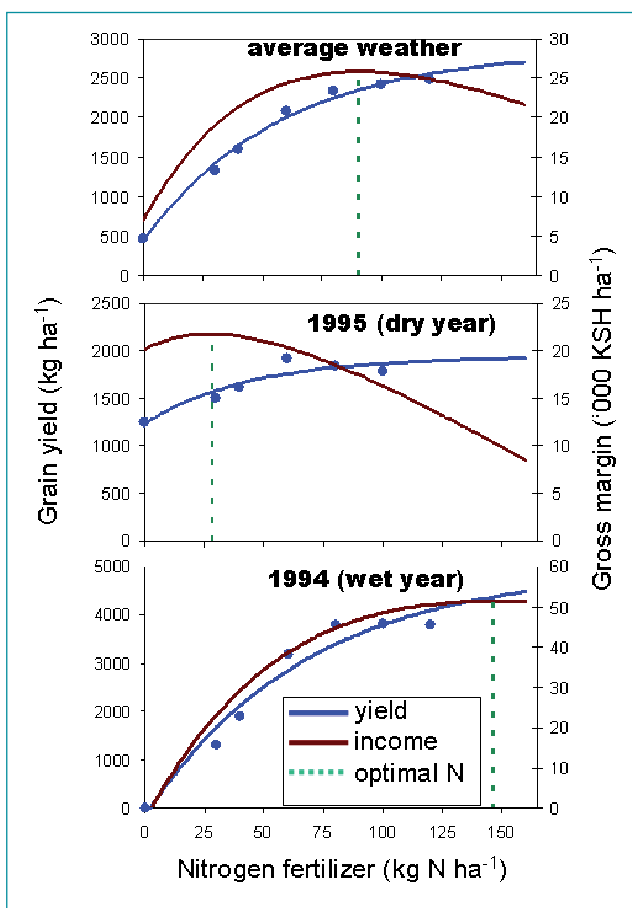


Figure 1. Profit-maximizing nitrogen fertilizer levels for all years and an individual dry and wet year, Katumani, Kenya. Assumptions and methods are described in Hansen et al. (2009).

Table 1. Impact of uncertainty and risk aversion on optimal maize management and resulting yields and returns, Katumani, Kenya.
Simulation methodology and assumptions are described in (Hansen et al., 2009).

	Gross margin	Yield	Fertilizer	Planting density
Scenario	KSH ha-1	Mg ha-1	kg N ha-1	plants m-2
Perfect information	23,006	3.10	56	3.9
Risk-neutrality ($r_p=0.0$)	13,851	2.34	50	3.5
Slight risk aversion ($r_p=0.5$)	13,357	2.24	47	3.1
Typical risk aversion ($r_p=1.0$)	12,343	2.03	40	2.2
Moderate risk aversion ($r_p=2.0$)	11,989	1.92	30	2.2
Strong risk aversion ($r_p=3.0$)	11,283	1.72	24	2.2

15-30% of the average gross value of production and 24-69% of the average gross margin for two semiarid locations in Kenya (Hansen et al., 2009; Table 1).

The tendency of smallholder farmers to be averse to risk leads to further loss of opportunity, beyond the moving target effect, in climatically favorable and even average years. To protect against the possibility of catastrophic loss, smallholder farmers employ a range of precautionary strategies that include selection of less risky but less profitable crops or cultivars, under-use or avoidance of inputs such as fertilizers, avoidance of credit, and shifting from productive to non-productive but more liquid assets as precautionary savings (Dercon, 1996; Fafchamps, 2003; Morduch, 1990; Paxon, 1992; Rose, 2001; Rosenzweig and Stark, 1989; Zimmerman and Carter, 2003). For the risk-averse smallholder farmer, climate-related risk appears to be a significant disincentive to investing in productive assets (Barrett et al., 2007; Fafchamps, 2003) and adopting improved technology (Barrett et al., 2004; Kebede, 1992; Marra et al., 2003).

The influence of climate risk on fertilizer use is a particular concern, given the strong link between widespread soil nutrient depletion and declining per-capita food production across SSA. A few studies (Dercon and Christiaensen, 2007; Simtowe, 2006) now provide empirical support for the belief that climate risk is a key obstacle to adequate fertilizer use in SSA. Binswanger and Sillers (1983) suggested that production risk might reduce fertilizer use by about 20%, based on limited evidence extrapolated from Asia and Latin America. However, Morris et al. (2007) argue that cereal production risk is considerably higher in many African countries and therefore leads to much greater reductions in rational fertilizer application rates under

plausible assumptions about risk aversion and cost of credit. To illustrate the potential impact of climate risk on fertilizer use and profitability, we extend a recent simulation study of the potential value seasonal rainfall forecasts for rainfed maize management under risk neutrality in semiarid Kenya (Hansen et al., 2009), assuming a plausible farm with 1.4 hectares available for market-oriented maize; and with US \$300 y-1 (KSH 30,326 y-1 based on the December 2004 exchange rate in Hansen et al., 2009) secure income from other sources, less fixed expenditures. These assumptions are well within ranges elicited from 40 farmers in the region, although we assume a less diversified farm than is typical. We identified management (among 11 fertilizer rates $\times$ 4 planting densities) that maximizes expected utility of net annual farm income subject to the 1.4 ha area constraint, based on a constant partial risk aversion (r_p) formulation. The large difference in returns based on perfect information and risk neutrality (Table 1) represents the cost of the “moving target effect” mentioned earlier. Under our assumptions, climate risk reduces fertilizer use by about one half for a strongly risk-averse farmer, with corresponding reduction in mean yield and gross margin.

Available evidence suggests that the cost of ex-ante risk management responses may be greater than the direct, ex-post impacts of shocks (Elbers et al., 2007), and is greatest for the relatively poor within a poor rural community (Rosenzweig and Binswanger, 1993; Zimmerman and Carter, 2003). The impact on demand for production inputs must have an adverse effect on incentives to develop input markets, but studies on the magnitude of impact on markets are lacking.

Climate impacts on market institutions

Farm-level climate impacts on demand for agricultural inputs and services and on the reliability of production can be expected to adversely affect market development. Risk also has more direct impacts on the incentives that agricultural market institutions face. Although risks related to policy (e.g., contract enforcement) and coordination seem to play a more significant role for market institutions than for individual farmers, market institutions still face considerable risk that is linked to climate.

Risk aversion appears to affect other actors within the agricultural sector beside farmers. Spatially correlated, catastrophic losses from climatic or other shocks can exceed the reserves of an insurer or lender, and lead to financial market failures in many low-income countries (Besley, 1995; Miranda and Glauber, 1997; Poulton et al., 2006a). The link between climate risk and rural market development is most apparent for financial services (i.e., credit, insurance). Where they exist, rural banks generally don't lend to smallholder rainfed farmers unless their risk is reduced, for example through collateral, or severe enforced penalties. The willingness of banks in Malawi to lend to smallholder farmers who hold rainfall index insurance (Hellmuth et al., 2009; Hess and Syroka, 2005) demonstrates institutional risk aversion. Climate-driven volatility of production and prices is likely to be a deterrent to rural market development more generally, although published evidence is sparse. Kelly et al. (2003) argue that efforts to develop agricultural input markets in SSA are most successful when they include policy mechanisms for controlling risk to suppliers.

If they are not targeted and managed well, the actions that governments and aid organizations take in response to climate shocks can have major impacts on incentives for private sector market development. An increasing, and sometimes overwhelming, majority of international assistance to Africa is devoted to disaster response (Abdulai et al., 2004; Barrett and Carter, 2001). In Ethiopia, for example, the USA spends US\$ 200-300 million per year on food aid and only US\$ 4 million per year on agricultural development according to Abdulai et al. (2004). Climate (primarily drought) and conflict account for the vast majority of humanitarian assistance. Abdulai et al., argued that humanitarian assistance, particularly in the form of food aid, can be a disincentive for governments to invest in agricultural research and development. Although food aid has had a mixed record, the evidence suggests that targeting

and management have improved and that incentive effects on market development are more often positive than negative (Abdulai et al., 2005; Barrett, 2002; Hoddinott, 2008). Kelly et al. (2003) argue that large-scale seed distribution programs, designed to speed recovery following drought-related food crises, have reduced incentives and increased the risks facing private sector input suppliers. Alternatives such as distribution of cash or vouchers redeemable for production inputs can avoid the problems and stimulate markets.

Climate risk and poverty traps

The failure of markets to benefit many smallholder farmers is not just a result of inadequate market development or infrastructure. More fundamentally, poor market participation reflects a syndrome of low-level equilibria, or poverty traps, characterized also by dominance of subsistence staple crop production, poor adoption of innovation, persistent food and livelihood insecurity and, at an aggregate scale, economic stagnation and often chronic dependence on humanitarian assistance (Barrett, 2005; Barrett, 2007). A dynamic poverty trap occurs when there is a critical threshold of household assets, below which individuals are unable to accumulate the necessary resources to escape poverty (Barrett, 2005; Carter and Barrett, 2006). Climate-related risk contributes to such poverty traps in at least three ways. First, through ex-post coping responses, severe or repeated climate shocks can push households to divest productive assets to a point below the poverty trap threshold. Second, ex-ante risk management strategies reduce the productivity and profitability of existing assets, and discourage accumulation of productive asset accumulation. Third, the tendency for risk tolerance to decrease with decreasing resource endowment (Pope and Just, 1991; Wik and Holden, 1998; Yesuf and Bluffstone, 2007) contributes to the higher opportunity cost of climate risk for the relatively poor, and hence to locally increasing marginal productivity – a precondition for the existence of multiple dynamic equilibria associated with a poverty trap (Carter and Barrett, 2006). Furthermore, constraints such as climate-related risk that impact institutions or governments operating at an aggregate scale can further constrain economic opportunities and hence reinforce poverty traps at the household level (Barrett and Swallow, 2006; Carter and Barrett, 2006).

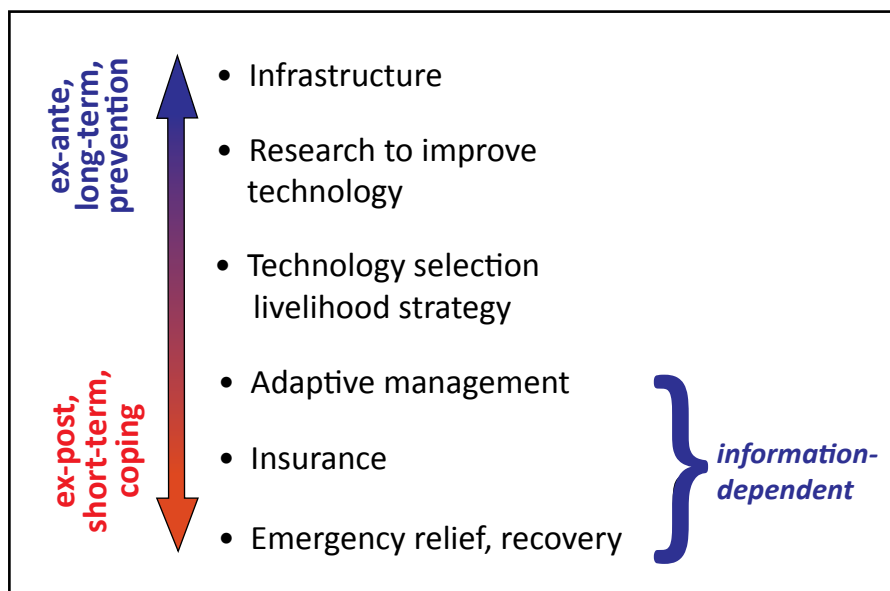
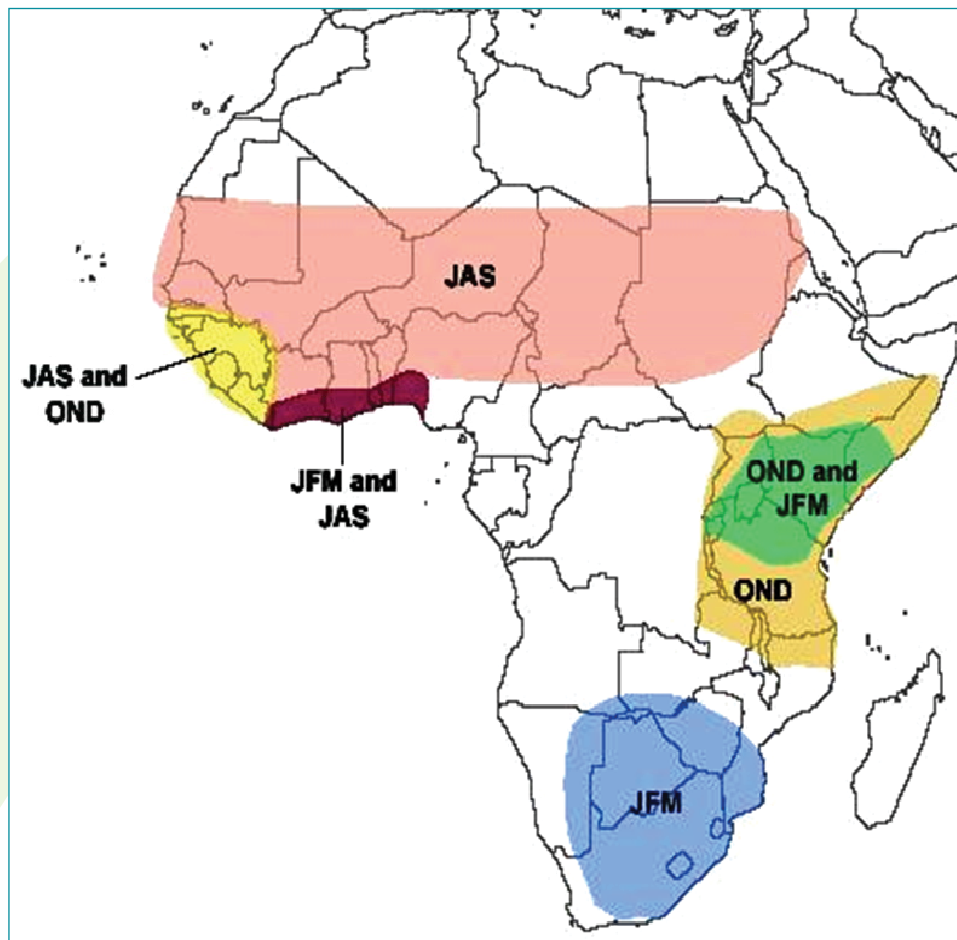


Figure 2. Examples of climate risk management interventions, ordered from ex-ante to ex-post.



Source: (IRI, 2006).

Figure 3. Regions and seasons in Africa with established predictability at a seasonal lead time. JAS = Jul-Sep, OND = Oct-Dec, JFM = Jan-Mar.

Opportunities to use information to manage risk

A wide range of technologies, management strategies and policies target climate-related risk. In terms of timing, they range from long-term investments that reduce vulnerability future shocks, to ex-post responses to climate shocks (Figure 2). We focus here on a few promising interventions that have implications for market participation for African farmers, and that involve use of climate information (historic records, monitoring and prediction).

Seasonal forecasts for adaptive management

Rainfall is predictable at a seasonal lead-time, in several agriculturally important regions and seasons in SSA (Figure 3), due to the interaction between the global atmosphere and the more slowly varying, underlying ocean and land surfaces. Significant predictability coincides with cropping seasons in the October-December “short rains” in East Africa (much of Kenya, eastern Uganda and northern Tanzania), Sudano-Sahelian West Africa, and in southern Africa up to southern Zambia. There is established but weaker predictability for the northern spring “long rains” in East Africa, and the northern winter in the coastal countries of West Africa.

Seasonal climate forecasts match the period between the many climate-sensitive decisions that must be made prior to planting, and harvest when outcomes of those decisions are realized. By reducing uncertainty about growing season conditions and the outcomes of management, skillful seasonal forecasts can, in principle, provide: opportunities to adopt improved technology, intensify production, replenish soil nutrients, invest in more profitable enterprises when climatic conditions are favorable or near average, and more effectively protect their families and farms against the long-term consequences of adverse extremes. Research with smallholder farmers in dryland locations in SSA demonstrates a high level of interest in forecast information and promising management responses (Hansen et al., 2007; Ngugi, 2002; Phillips, 2003; Roncoli et al., 2009; Tarhule and Lamb, 2003; Ziervogel, 2004). However, widespread communication failure, including limited and inequitable access, and a mismatch between farmers’ needs and the scale, content, format, or accuracy of available information products and services (Archer, 2003; Ingram et al., 2002; O’Brien et al., 2000; Phillips, 2003; Ziervogel, 2004) have limited the widespread use of seasonal forecasts among smallholder farmers. Regional climate outlook

forums (RCOFs) – the main mechanism for producing and disseminating seasonal climate forecasts in SSA – have given the agricultural sector little influence over the design of information products (at a cost to salience) and little ownership of the process (at a cost to legitimacy) (Cash et al., 2006; Hansen et al., 2007).

Constraints related to communication can feasibly be overcome. In terms of information products, research in several contexts (summarized in Hansen, 2002; Hansen, 2005) reveals that, if farmers are to use seasonal forecast information, it should (i) be downscaled and interpreted at a local scale; (ii) include information about within-season rainfall characteristics beyond seasonal total; (iii) express accuracy in transparent, probabilistic terms; and (iv) be interpreted in terms of agricultural impacts and management implications. Opportunities to improve delivery of climate forecast information are discussed later in this paper. Adoption rates and reported benefits have been reasonably high in pilot projects in Zimbabwe, southern India and Burkina Faso, where extended interaction between smallholder farmers and researchers reduced some of the communication barriers (Huda et al., 2004; Meinke et al., 2006; Patt et al., 2005; Roncoli et al., 2009).

Coordinating input and credit supply

Adaptive management in response to forecast information at the farm level requires a degree of coordination between demand and supply of production inputs such as fertilizers. Access to production inputs and credit constrains flexibility to intensify production generally, and particularly in response to forecast information (Ingram et al., 2002; Ngugi, 2002; Phillips, 2003; Phillips et al., 2001; Vogel, 2000), but the constraints might be reduced if forecast information allows market institutions to profitably coordinate supply of financing and key production inputs to demand by farmers. There is anecdotal evidence that seasonal climate forecasts already enter into the strategies of some input suppliers in SSA. According to Malusalila (2000), SeedCo – a seed producer and supplier operating in southern Africa – factors seasonal forecasts into their recommendations to farmers using different animals to represent the climatic sensitivity of groups of maize cultivars. Faida Seeds, which contracts private farmers throughout Kenya to produce maize and sunflower seed, has avoided climate-related losses since 1997 by participating in regional climate outlook forums, and by avoiding high-risk locations for seed multiplication, scaling down production, and emphasizing drought-tolerant cultivars when

forecasts show enhanced probability of drought conditions (C. Ng'ang'a, Managing Director, 2004, pers. comm.).

In principle, seasonal forecasts seem to offer opportunity to improve the availability and terms of credit on average, particularly in low-risk years when crops are more responsive to production inputs and risk of default is reduced. However, experience in Zimbabwe during the 1997-98 El Niño event is often cited as a basis for concern that forecasts will hurt farmers by making credit less available when adverse conditions are predicted but not realized (Glantz, 2001; Patt et al., 2007; Phillips et al., 2002). Interest in incorporating climate forecast information into the design of index insurance bundled with credit (see below) offers potential for a more robust approach to managing credit supply in response to climate information (Carriquiry and Osgood, 2008; Osgood et al., 2008).

While seasonal forecast information should be able to serve the needs of both farmers and input suppliers, input markets need longer lead-time than farmers if they are to adjust supply to changing demand in response to the information. Regional input supply chains should benefit from the greater predictability that exists at aggregate scales (Gong et al., 2003).

Weather index insurance

Recent innovations have resulted in a resurgence of interest in managing risk for smallholder rainfed agriculture through insurance and related financial risk transfer instruments. Basing insurance payouts on an objectively-measured index (e.g., rainfall amount, modeled water stress) that is correlated to loss instead of actual losses, overcomes problems with moral hazard, adverse selection and high transaction costs (needed to verify losses) that have generally made traditional indemnity-based insurance nonviable for smallholder farmers in developing countries (Barrett et al., 2007; Hess and Syroka, 2005; McCarthy, 2003; Skees and Enkh-Amgalan, 2002). Recent reviews by Barrett et al. (2007) and Hellmuth et al. (2009) summarize experiences and synthesize lessons from relevant index insurance applications.

Barrett et al. (2007) proposed a typology of index insurance applications to livelihood systems characterized by dynamic poverty traps. A productive safety net protects productive assets to prevent a currently non-poor household from falling

below a poverty trap threshold in the face of a shock. A pilot project targeting drought-related livestock mortality in northern Kenya (Mude, 2009) is a good example of a productive safety net application of index insurance. Second, what Barrett (2005) termed a “cargo net” seeks to facilitate exit from a poverty trap, e.g., by increasing productivity of a household’s assets, removing entry barriers to profitable livelihood opportunities, or targeting the conditions that favor poverty traps. By addressing the risk aversion of lenders, a pilot index insurance project in Malawi provided smallholder rainfed farmers with access to a bundle of credit, production inputs for groundnut and maize, and the groundnut export market (Hess and Syroka, 2005; Osgood et al., 2007). Evidence suggests that strong demand for the insurance was associated with demand for credit, and not income or consumption smoothing (Gine and Yang, 2007)³.

Although there is a great deal of interest in rapidly scaling up this type of insurance application, it seems likely to be economically viable without subsidy only in contexts where risk is the only constraint to access to substantially more profitable livelihood opportunities. Third, a humanitarian safety net protects those in poverty from permanent destitution or health impacts in the face of shock. One of the first examples in SSA was a project of the World Food Program and Ethiopian government on rainfall insurance project designed to provide more timely access to funds to respond to emerging drought-related food crises. Contracts provided a payout directly to the national government for relief activities if an index of rainfall from a set of stations across the country falls below a specified threshold (Stayton and Hess, 2006; Wiseman and Hess, Submitted). This model has potential to greatly improve the timeliness of crisis response if donors would be willing to make the substantial shift from crisis reaction toward anticipatory payments in the form of premiums.

Index insurance applications need both good characterization of risk (i.e., the probability distribution of the index) in order to price the insurance properly, and the final index value at harvest. The effectiveness of index insurance as an alternative to indemnity insurance depends critically on having a viable index that is closely correlated to the targeted loss, which for most agricultural applications is crop or forage productions. Basis risk – the gap between an insured index and the risk it is meant to

³In their adoption study, Gine and Yang (2007) compared farmer take-up rates between two packages – the standard insurance and loan package, or a loan that was offered without insurance but secured by guaranteeing the loan repayment to the bank itself. They interpreted lower uptake of the package with insurance as evidence of lack of demand for insurance. In light of the overwhelming demand for the bundled package by farmers outside their study, who didn't have the option of borrowing without insurance, their results support the conclusion that farmers placed little value on the insurance beyond its intended role of providing access to credit (Hellmuth et al., 2009).

target – is regarded as the price paid for removing moral hazard, adverse selection and their resulting transaction costs as barriers to insuring vulnerable farmers against climate-related risk. Transparency and acceptability to clients and other stakeholders, vulnerability to manipulation, data requirements, and robustness and geographic coverage in regions with sparse data are also important considerations. In their review, Hellmuth et al. (2009) cite quality and quantity of meteorological and other data as a key constraint to scaling up index insurance applications for development and disaster management. Seasonal rainfall forecasts are sometimes seen as a threat to weather index insurance because they could threaten the financial viability of insurance by allowing farmers to purchase insurance only in years with enhanced drought risk and probability of payout (Hess and Syroka, 2005; Luo et al., 1994). Theoretical arguments and a numeric example from Malawi suggest that incorporating seasonal forecast information into the design of the contract could increase the livelihood benefits (Carriquiry and Osgood, 2008; Osgood et al., 2008), at least in the case where insurance is meant to support access to credit and intensified, market-oriented production.

Food crisis management

Assistance, particularly food aid, in response to a major food crisis can have complex impacts on farmers and on agricultural input and output markets (Abdulai et al., 2004; Barrett, 2002). Assistance that is targeted and managed well can protect the productive assets of vulnerable households, foster investment and intensification through its insurance effect, and under some circumstances, stimulate development of the value chain for agricultural products. Such assistance also carries the potential for creating large price fluctuations, disincentives to agricultural production and market development, and dependency, particularly if inadequate targeting or management allows leakage to unintended beneficiaries. Assistance must therefore be well targeted, both in terms of recipients and instruments (e.g., food aid distributed through markets or feeding centers, wash transfers, food for work) in order to avoid perverse incentives and foster long-term development.

To ensure that intervention is well targeted, institutional procedures typically require a high degree of certainty, in the form of verifiable market, consumption or health impacts, before initiating action. The verification-appeal-funding-delivery process that characterizes much of food security relief imposes a lag of at least several months between detection of a likely

shortfall and delivery of assistance to rural populations. The resulting delay greatly increases the humanitarian and persistent livelihood impacts of the crisis, and the cost of delivering food aid (Barrett et al., 2007; Broad and Agrawala, 2000; Haile, 2005). Early response is therefore essential to effective food crisis management, and the availability of early warning information is a precondition.

Several international organizations (e.g., FEWSNET, JRC, FAO, AGRHYMET, SADC/RRSU) and countries implement food security monitoring tools that include rainfall monitoring, satellite vegetation monitoring, and simple water balance-stress index models that incorporate historic and monitored weather data, to estimate food crop or forage production shortfalls in SSA in advance of harvest. Such early warning systems are among the best-developed applications of climate information in SSA, and are our starting point for discussing opportunities to enhance the utility of climate information for African agriculture.

Managing price fluctuations

Because of the adverse impacts of variability on commodity prices, the use of advance information to manage regional trade and storage for staple foods to stabilize prices is appealing, particularly in drought-prone, landlocked countries. The current policy environment in many countries greatly complicates the management of price volatility through international trade. Although structural reform policies have expanded the role of the private sector in international trade of agricultural commodities, their incomplete implementation has created coordination problems and ambiguity about the role of government vs. the private sector in many countries of SSA (Byerlee et al., 2006; Jayne et al., 2006). They have also generally reduced capacity to store grain to buffer prices. On the other hand, sub-regional economic communities (IGAD, ECOWAS, SADC) are reducing the political obstacles to intra-regional trade, and provide a mechanism to coordinate trade regionally.

Because of the lead time involved in international trade, the use of forecasts several months before harvest can be expected to improve the management of trade and storage generally (Arndt et al., 2003; Chen et al., 2008; Hallstrom, 2004; Hill et al., 2004). Economic equilibrium modeling in Mozambique suggests considerable potential aggregate benefits of market applications of climate forecasts (Arndt and Bacou, 2000; Arndt et al., 2003). Spatial equilibrium modeling of the global rice market shows that the impacts of ENSO events on producer and consumer welfare

can be reduced substantially by removing trade barriers and investing in storage capacity (Chen et al., 2008). Unfortunately, the literature seems to offer little direct guidance on the use of climate or production forecasts to manage agricultural trade and grain storage in SSA.

Value-added climate information for agriculture

Adaptive management of input supply and use, index-based crop and livestock insurance, managing intra-regional trade, and food crisis early warning and response share a common need for the best possible estimates of weather impacts on crop or forage production. They differ primarily in the timing of key actions and hence the lead-time of information required. A common climate-informed crop monitoring and forecasting platform, which provides continuously updated, probabilistic information about climate impacts at a suitable spatial resolution, could serve these multiple applications (Figure 4). The discussion that follows is meant to illustrate possible avenues for enhancing the utility of climate information products for a range of risk management applications in the context of smallholder agriculture in SSA.

Translating climate information into agricultural production terms

To be useful, raw climate information must be translated into impacts and management implications within the system being managed, whether through quantitative methods or through

a subjective process. Crop production is a function of dynamic, nonlinear interactions between weather, soil water and nutrient dynamics, management, and the physiology of the crop. The same amount of rainfall will have different impacts on the crop growth and final yield, depending on the characteristics of wet and dry spells and on the crop stage when a deficit occurs.

Therefore models that simulate the dynamic interactions between rainfall, the soil water balance and a crop's growth and development processes tend to provide more accurate estimates of yields than can be obtained from statistical relationships with seasonal average weather.

The accuracy-lead time tradeoff

Within a growing season, the accuracy of a crop production forecast will generally improve with decreasing lead-time. Consider a simple yield forecasting system that simulates crop growth with antecedent weather observations up to a given forecast date sometime within the season, then samples weather data from each available past year to simulate the remainder of growing season (Figure 5b). The resulting distribution, which approximates the climatic component of uncertainty, will necessarily narrow as the forecast date advances through the growing season (especially when the crop approaches growth stages that are critical for determining yields), and an increasing proportion of weather data is observed rather than sampled

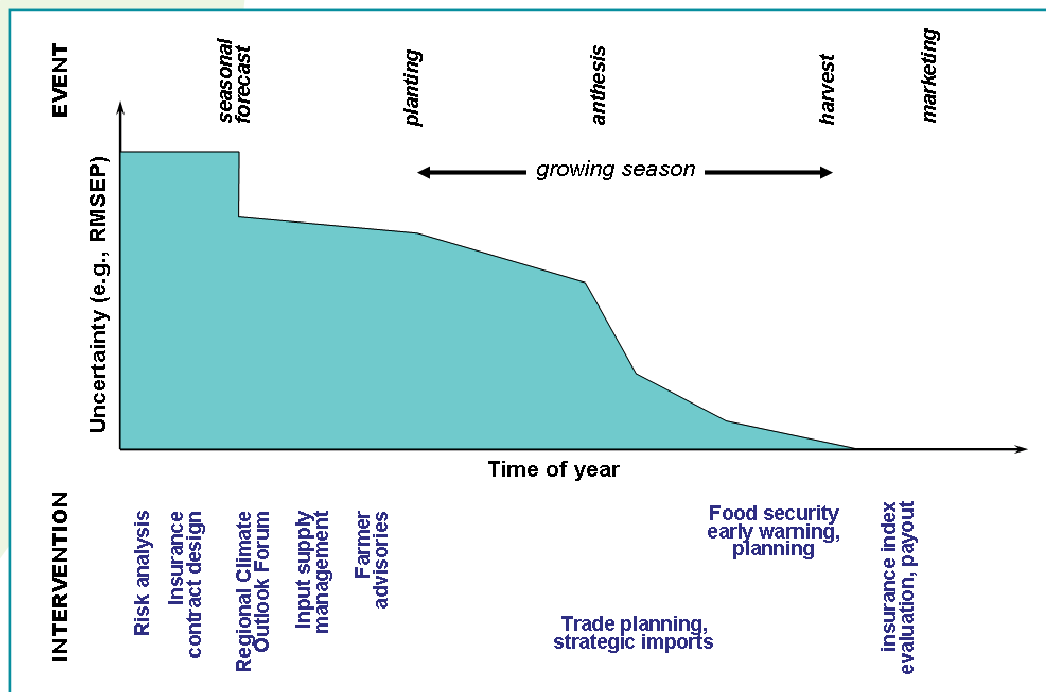


Figure 4. Timing of information needs for several risk management interventions, and accuracy-lead time tradeoff in a stylized crop forecasting system.

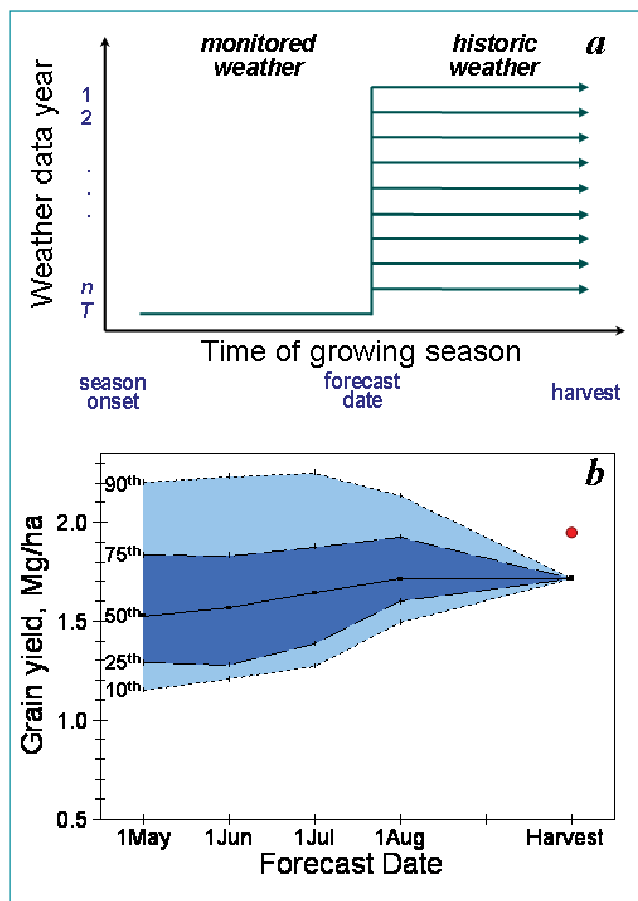


Figure 5. (a) Schematic of simulating with antecedent weather data in year T, and all other years of within-season weather data, to characterize the climatic component of uncertainty (after (Hansen et al., 2006)); and (b) resulting forecast distribution illustrated for 1989 climatology-based Queensland, Australia wheat forecast, showing forecast percentiles by forecast date, and observed yield (based on Hansen et al., 2004).

from the climatological distribution (Figure 5a). The uncertainties of crop yield forecasts made before sowing or early in the growing season can be very large.

In principle, the best outcomes should result when the degree of uncertainty of advance information is understood and factored into decisions. Presenting yield forecasts in probabilistic terms, updated continuously as the growing season unfolds, will allow decision makers to weigh the tradeoff between lead time and accuracy, assess when evidence of an impending threat is sufficiently certain to warrant action, and hopefully contribute toward more timely decisions based on more objective rules. This is most apparent in the case of management of food crises, where there is a clear tradeoff between timeliness and targeting, but is also relevant for management of trade and price

fluctuations, and for within-season farm decision-making. While farmers are locked into some decisions once the crop is planted, tactical decisions such as split fertilizer rates, and intensity of weeding and pest control can take advantage of the increasing accuracy as the season progresses.

Improving lead-time and accuracy

By reducing the range of variability of weather for the remainder of a growing season, the ability to predict rainfall at a seasonal lead-time raises the prospect of increasing accuracy (at a given lead-time) and lead-time (at a given accuracy) of crop production forecasts made within the growing season. This has been demonstrated, for example, for wheat in eastern Australia (Hansen et al., 2004) and sorghum in Burkina Faso (Mishra et al., 2008). Because the proportion of total uncertainty due to climate decreases through the growing season, the potential improvement in accuracy from incorporating seasonal forecasts is expected to be greatest early in the growing season (Hansen et al., 2006). For forecasts made before the start of the growing season and at a lead-time that allows farmers to adjust strategic decisions, there is suggestive evidence (Cane et al., 1994; Dilley, 1997; Hansen, 2005; Mishra et al., 2008; Rosenzweig, 1994) and at least one demonstration (Hansen et al., 2004) that crop yields may be more predictable than growing season rainfall. This is because initial soil moisture storage and early rainfall, prior to the forecast date, provide some information about final yield; and because most of the predictability of seasonal rainfall is due to predictability of frequency of rainfall events (Camberlin et al., 2009; Hansen and Indeje, 2004; Moron et al., 2006; Moron et al., 2007), which are associated with sequences of dry and wet spells and hence influence the soil water balance and crop response. Model-based crop forecasts can exploit this information, which is typically discarded when seasonal rainfall forecasts are presented.

Satellite remote sensing provides a complementary source of near real-time, spatially contiguous information about the state of the crop and soil. Data assimilation techniques can optimally integrate remote sensing information into agricultural systems models to improve accuracy, reducing the accumulation of errors associated with crop model structure, initial conditions and input data. Information about the state of the crop canopy from remote sensing can be used to update the state variables of a crop simulation model during the growing season, calibrate

model input parameters, or statistically correct final yield simulations (Dorigo et al., 2007; Moulin et al., 1998). There is also potential to assimilate remote sensing of soil surface moisture content, which is expected to improve with the planned launch of the Soil Moisture Active Passive (SMAP) satellite, into the soil water balance component of crop models (Das and Mohanty, 2006; Ines and Mohanty, 2009).

Dealing with data scarcity

Availability of quality, spatially contiguous data (e.g., meteorological, soil, crop distribution, production statistics) required to reliably estimate or predict crop response to climate is a challenge in much of SSA. Ongoing investment (AfricaSoils.net) is improving the coverage of reliable soil data. Needed dynamic data that comes with historic time series information (i.e., agricultural production, weather) are more challenging. Long-term records (required to downscale seasonal forecasts and to quantify accuracy and risk) of rainfall data at a sufficiently high spatial (required to locate areas at risk) and temporal resolution (required for realistic soil water balance and crop response to rainfall timing) are particularly important for model-based crop forecasting. Rain gauge coverage over most of Africa is seriously inadequate, and reporting rates have been declining (Washington, 2006). Data rescue is needed to digitize older paper archives, and in some cases, to locate records that may reside in former European colonial powers.

Satellite remote sensing provides a complementary source of rainfall estimates with complete spatial coverage. Merging station and satellite data on a daily time step has the potential to fill gaps in space and time. Current satellite-based rainfall data products are limited by their short duration, and often by coarse spatial and temporal resolution. METEOSAT geostationary satellite images extend back to 1978, with full spatial coverage of Africa at a frequency of at least two images per hour and a spatial resolution of roughly 3-6 km. Removing biases in satellite rainfall estimates requires local calibration, ideally using the full set of quality controlled stations that each country maintains rather than the small fraction that are publically available. With modest investment and cooperation of national meteorological services, it is feasible to process and merge older satellite images with all available observations to produce a ≥ 30 -year, roughly 10 km gridded, daily rainfall time series across SSA.

Expanding the role of value-added climate information

Improvements in climate information products, such as those discussed in the previous section, will not be sufficient to improve management of climate risk for smallholder agriculture or meet the needs of all agricultural stakeholders. A multi-stakeholder, cross-sectoral assessment of the use of climate information in Africa concluded that merely improving the supply in climate data or observing infrastructure would have little impact on development (IRI, 2006). It attributed the substantial gap in the provision and use of climate information to “market atrophy” associated with long-term interaction between ineffective demand by development stakeholders and inadequate supply of relevant climate information services. Several gaps need to be addressed in parallel to improved delivery of climate information, if value-added climate information is to contribute significantly to efforts by AGRA and others to improve the livelihoods of African farmers.

Climate data

In SSA, an average of one station per 26,000 km², or 1/8 the minimum recommended by the World Meteorological Organization (WMO), reports observations through the WMO (Washington, 2006). Observing infrastructure has deteriorated and reporting rates have declined over the past 2-3 decades. Substantial investment is needed to reverse these declines and enhance spatial coverage of observation infrastructure, and to rescue and digitize paper records. As discussed earlier, there is opportunity to supplement the sparse observation record with spatially contiguous, high-resolution satellite rainfall estimates. However, typical restrictive data policies prevent any investment in observing systems from translating into development impact. There is an urgent need for policy to treat climate data as a public good and a resource for development.

Climate information services

Structural reform policies in the 1990s encouraged national meteorological services (NMS) to raise revenues to supplement shrinking public funds. In many cases, the unfortunate impacts include: (i) treating data as a source of revenue rather than a public good, (ii) prioritizing commercial aviation over other sectors such as agriculture, and (iii) reducing the capacity of NMS to provide services to agriculture. Where this has happened, NMS need to be realigned, resourced and trained as providers of services for development and participants in the development process.

Mali's agro-meteorological information service is often cited as a model for SSA (Hellmuth et al., 2007). Information disseminated to the farming community includes 10-day agro-meteorological bulletins and short-range weather forecasts, but not seasonal forecasts. Multidisciplinary working groups helped bridge a divide between climate, agricultural, and emergency response communities that has frustrated efforts elsewhere in Africa. A set of participating farmers tests and refines services, disseminates information to the broader rural population, and evaluates impacts. On-farm evaluations showed substantial apparent yield and income benefits. Cooperating farmers test and refine services, disseminate information to the broader rural population, and evaluate impacts. On-farm evaluations suggest that the information service has improved farm management, fostered adoption of new technologies, and stimulated demand for additional information.

Delivery mechanisms

Because of their dispersion, poor state of rural communication infrastructure, and weakness of many national agricultural extension systems in SSA, effective and timely information delivery to smallholder farmers is a particular challenge. Pilot-scale research focused on agricultural applications of seasonal forecasts has explored several delivery mechanisms, and provides useful insights. Group interaction with a trained facilitator appears to be the most effective method for communicating climate information in a way that farmers can use. A workshop setting allows a facilitator to use a combination of visual and narrative methods to present local forecast and historic climate information, provide help with understanding probabilistic information, facilitate discussion about management responses, and provide feedback to improve climate information products and services (Hansen et al., 2007; Patt et al., 2005; Roncoli et al., 2009). Group interaction among farmers appears to contribute a great deal to understanding, and to willingness and ability to act on climate information (Marx et al., 2007; Roncoli et al., 2009). Where they are functional, climate information services should ideally be integrated as a routine part of agricultural extension services. Where agricultural extension services are not able to meet the demand, agribusiness and NGOs may have potential to serve as communication intermediaries, although experience with a parastatal cotton company in Burkina Faso suggests that there might be incentive to manipulate the delivery or interpretation of information to protect business interests (Ingram et al., 2002).

ICT-based communication (radio, cell phones, internet) offers potential to support timely delivery of climate information to rural communities at relatively low cost, but cannot replace the trust, visual communication of location-specific information, feedback and mutual learning that face-to-face interaction provides. In Africa, rural radio is probably the lowest cost vehicle for delivering climate information to rural communities at a large scale. Initiated in 1997 by the African Center for Meteorological Applications for Development (ACMAD), RANET (Radio and Internet for the Communication of Hydro-Meteorological and Climate Related Information) combines digital satellite technology, weather and climate information, low-cost community-owned radio stations, and wind-up radio receivers, to provide climate and other information to remote communities in several African countries (Boulahya et al., 2005). Facilitated radio listening groups, tested in Uganda, combine the benefits of media-based dissemination and facilitated group interaction (Orlove and Roncoli, 2006; Phillips and Orlove, 2004). The proliferation of mobile phone technology in rural SSA can potentially be exploited, particularly for information that is required frequently and with short lead-time. In India, the M.S. Swaminathan Research Foundation and others promote "Village Knowledge Centers" as a means to provide information to rural communities and to empower the women who are trained to operate them. It is an attractive model for delivering relevant and timely climate information to agricultural stakeholders (Raj, 2005), but the poor state of Internet connectivity will limit its application in SSA in the near term.

Early response mechanisms

The availability of early warning information is a necessary but not sufficient condition for effective response to an emerging food crisis. If food crisis management is to protect long-term livelihood potential, the availability of early warning information must be coupled with investment in well-targeted early response capacity. A number of sophisticated early warning systems have been developed independently of the political response process. In other cases, the decision process is poorly defined, subjective, and prone to political pressure. In the best cases, existing institutional procedures that require a high degree of certainty before taking action contribute to delays in responding to emerging food crises (Broad and Agrawala, 2000; Haile, 2005), and need to be adjusted to accommodate anticipated improvements in early warning information. Long-lead, climate-informed, probabilistic early warning of food

production shortfalls should be coupled with quantitative, spatial indicators of vulnerability, and with parametric response trigger mechanisms (Byerlee et al., 2006), particularly given the combination of new opportunity and increased complexity that explicitly probabilistic, long-lead information introduces. International organizations such as the UN World Food Programme increasingly recognize the need for a more proactive approach to food crisis prevention and early response. For crises that require international assistance, financing – often delayed either by the appeal process of host governments or by donors that wait for impacts to reach the media before they act – is a bottleneck that needs urgent attention (Haile, 2005). Response to localized climate shocks may be strengthened through community level early response mechanisms such as disaster management committees, assuming that effective information delivery mechanisms can also be put in place (as discussed above).

Coordination

Each of the opportunities to manage climate risk discussed in earlier in this paper depends on effective collaboration among stakeholders at several levels. Different interventions are needed in climatically favorable and climatically adverse years. The ability to anticipate climate conditions near the start of the growing season seems to offer some prospect for reducing resource competition and exploiting potential synergies between short-term food crisis management, and intensified production needed for long-term development (Barrett and Carter, 2001). Coordination among farmer demand for production inputs, the input supply chain, and credit supply would improve the prospect for taking advantage of favorable climatic conditions. Poor coordination between government and small-scale private sector traders can undermine efforts to manage trade to control price volatility (Jayne et al., 2006). Coordination among insurers, rural banks, input suppliers, and marketing through a farmer association seemed to be a factor in the apparent success of the Malawi groundnut insurance pilot project (Hellmuth et al., 2009; Hess and Syroka, 2005) discussed earlier. Given ideological differences between communities, economic interests of the substantial relief industry built around food crisis response, and the historic separation of humanitarian relief, agricultural development and meteorological institutions within national governments and even the UN, developing effective coordination among the relevant stakeholders may prove to be among the

most difficult challenges to managing risk for the benefit of smallholder agriculture in SSA.

Conclusions

Climate-related risk is one of several obstacles to improving livelihoods and making markets work for smallholder farmers in Sub-Saharan Africa. The ex-post and ex-ante impacts of covariant climate shocks such as drought overwhelm traditional rural risk management strategies, and are appropriate targets for development investment. Weather index insurance addresses some of the challenges that have made insurance infeasible for smallholder farmers in rainfed environments. Yet insurance is not a panacea, but a complement to a range of other relevant risk management interventions. A more holistic approach to reducing the negative impacts of climate risk also includes adaptive management at the farm and input supply chain levels, food crisis management (a form of insurance), and the use of trade and perhaps storage to manage price volatility. These interventions have not been fully exploited, in part because of gaps in existing climate information products and services. Typically, either (i) development applications that deal with climate risk are constrained to make do with whatever information is readily available, leading to ineffective demand, or (ii) information needs are addressed on an ad-hoc basis for each application or stakeholder, often at a pilot scale, and often just for the duration of a funded project. There is considerable overlap in the type of information required by the various risk management interventions that we discussed. Information-related constraints to several interventions could be alleviated by investing in a common climate-informed crop monitoring and forecasting platform. We discuss several technically feasible opportunities to add value to raw climate information.

Institutional and policy constraints related to climate data, information services, communication, response capacity and coordination must also be addressed if climate information is to serve the needs of farmers and market stakeholders in SSA. While these do not seem to be intractable, they are likely to be more challenging than the technical issues related to climate information. Given the pervasive influence that climate risk has on farmer livelihoods and market participation, they may be worthwhile targets for investment and advocacy.

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Insuring against drought-related livestock mortality: Piloting index-based livestock insurance in northern Kenya

Andrew Mude¹, Sommarat Chantarat², Christopher B. Barrett³, Michael Carter⁴, Munenobu Ikegami⁵ and John McPeak^{6,7}

Abstract

Climate related shocks are among the leading cause of production and efficiency losses in smallholder crop and livestock production in rural Africa. Consequently, the identification of tools to help manage the risks associated with climatic extremities is increasingly considered to be among the key pillars of any agenda to enhance agricultural growth and welfare in rural Africa. This paper describes the application of a promising innovation in insurance design – index-based insurance – that seeks to bring the benefits of formal insurance to help manage the weather-related risks faced by rural crop and livestock producers in low-income countries. In particular, we highlight the research and development agenda of a comprehensive effort to design commercially viable index based livestock insurance aimed at protecting the pastoral populations of northern Kenya from the considerable drought-related livestock mortality risk that they face. Detailing the conditions that make the pastoral economy in northern Kenya an ideal candidate for the provision of index-based insurance products, the paper describes the contract design, defines its structure, offers analysis that indicates a high likelihood of commercial sustainability among the target market and describes the process of implementation leading up to the launch of a pilot in Marsabit District of northern Kenya in early 2010.

Introduction

Downside-production risk is a considerable constraint to agricultural production and development whose impact is particularly felt by smallholder farmers and livestock keepers whose meager resource base offers them few effective options to manage this risk. As is true in most of rural Africa, thin

markets, poor physical and institutional infrastructure and weak access to credit and savings markets compound the problem of production risk that poor farmers and livestock keepers face.

Climate extremities are the greatest source of agricultural production risk with droughts and floods resulting in total or partial crop failures as well as forage and water scarcity that reduce livestock productivity and, in severe cases, lead to widespread livestock losses (Thornton et al. 2008; Hellmuth et al. 2007; IPCC 2007). Over the past decade or so, natural disasters, particularly droughts and floods, have risen sharply worldwide with the biggest increase in low-income countries whose disaster incidence rose at twice the global rate (Tebaldi et al. 2006; IFCRSC 2004). In much of rural Africa, where water harvesting, irrigation and other similar water management methods are under developed and the impacts of climate change are expected to be especially pernicious, managing agricultural production risk becomes increasingly important (Thornton et al. 2008; Hellmuth et al. 2007).

The increasing recognition of the considerable risks faced by the smallholder agricultural sector and the non-trivial impact of these risks on agricultural growth and rural welfare have placed a spotlight on risk and lifted the management of risk to a place of priority with regards to interventions to catalyze agriculture in rural Africa (World Bank 2005; Barrett et al. 2007a). Consequently, the past several years have seen the development of innovative interventions for managing weather-related agricultural risk. Of these, index-based insurance products represent a promising and exciting market-based option for managing climate related risks that vulnerable households are exposed to.

The creation of insurance markets for events whose likelihood of occurrence can be precisely calculated and associated to a well defined index is increasingly being championed as a way by which the benefits of insurance can be offered to relatively poor and remote populations (World Bank 2005; Barrett et al.

¹ Economist, International Livestock Research Institute, Nairobi, Kenya. Corresponding author (a.mude@cgiar.org)

² Assistant Professor, Crawford School of Economics and Government, The Australian National University

³ Stephen B. and Janice G. Ashley Professor of Applied Economics and Management, Charles H. Dyson School of Applied Economics and Management, Cornell University

⁴ Professor and Director of BASIS Program, Agricultural and Resource Economics, University of California, Davis

⁵ Post-Doctoral Scientist, International Livestock Research Institute, Nairobi, Kenya

⁶ Associate Professor, Department of Public Administration, Syracuse University

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2007b; Skees and Collier 2008; Skees et al. 2006; Hellmuth et al. 2009). Index-based insurance holds considerable appeal for both commercial and development purposes because it allows for management of covariate risk – particularly those related with weather fluctuations – and avoids the serious adverse selection and moral hazard problems that have long plagued conventional crop and livestock insurance programs throughout the world.

This paper underscores the potential of index-based insurance to manage weather related risk faced by rural farmers and livestock keepers by highlighting a comprehensive effort to catalyze a commercial market for index-based livestock insurance (IBLI) in Marsabit District of northern Kenya. This IBLI product has many innovative features. It appears to be the first to develop the index insurance product from longitudinal household data so as to minimize basis risk in product design. It is one of the first developed to protect the productive asset holdings of the poor and vulnerable rather than just their income streams. It is one of the first to be based on more spatially distributed remotely-sensed vegetation data, rather than rainfall series from a sparse set of fixed point meteorological stations, as the IBLI index is derived from satellite-based normalized difference vegetation index (NDVI) series that summarize the state of rangeland forage availability at high spatiotemporal resolution. Finally, IBLI Marsabit was designed to complement a new (unconditional) cash transfer program (the Hunger Safety Nets Program, HSNP) the government launched in the area and the IBLI impact evaluation design explicitly enables identification of the independent and synergistic effects of HSNP and IBLI as alternative means of addressing the risk and financial constraints faced by the poor.

In the next section we summarize the main principles of index-based insurance contracts. In Section three, we start by highlighting some of the key characteristics of northern Kenya and its economy that make it particularly suitable for risk-management via index-based insurance contracts, then describe the various elements of the IBLI research and development agenda. Section four profiles the key processes involved in the implementation and sale of IBLI and finally, Section five concludes.

Index-based insurance

Like any insurance product, index-based insurance aims to compensate clients in the event of a loss. Unlike traditional insurance, which makes payouts based on case-by-case assessments of individual clients' loss realizations, index-based insurance pays policyholders based on an external indicator that triggers payment to all insured clients within a geographically defined space. For index insurance to work, there must be a suitable indicator variable (the index) that is highly correlated with the insured event. Using a data source that is promptly, reliably, and inexpensively available (and that cannot be manipulated by either the insurer or the insured), an index insurance contract makes the agreed indemnity payment to insured beneficiaries whenever the data source indicates that the index reaches the "strike point," or insurance activation level.

For example, if one is insuring against livestock mortality, then rainfall or forage availability may be suitable indicators if drought or a shortage of forage, or a combination of the two, often result in above-normal livestock mortality. One could then write an insurance contract based on some statistically specified function of a rainfall or forage indicator to protect against specified levels of aggregate livestock losses. The contract would specify its geographical reach, temporal (or seasonal) coverage, the strike level, and the relevant premium and payment terms.

An index-based insurance product has significant advantages over traditional insurance. Traditional insurance requires that the insurer monitor the activities of their clients and verify the truth of their claims. For relatively small clients in infrastructure-deficient environments like the northern Kenyan arid and semi-arid lands (ASALs), the costs of such monitoring are often prohibitive. With index-based insurance products, all one has to do is monitor the index, thereby sharply reducing costs. Furthermore, by using an index based on variables that cannot be influenced by any insuree's behavior, index-based insurance products overcome the key asymmetric information problems that plague traditional insurance contracts: that more (less) risk-prone individuals will self-select into (out of) the contract and that insured individuals have an incentive to take on added risk – phenomena known as "adverse selection" and "moral hazard", respectively.

These gains from index-based insurance come at the cost of "basis risk", which refers to the imperfect correlation between

an insuree's potential loss experience and the behavior of the underlying index on which the insurance product payout is based. Individuals can suffer losses specific to them but fail to receive a payout because the index does not trigger. On the other hand, lucky individuals may receive indemnity payments that surpass the value of their losses. While this problem cannot be completely eliminated, we have carefully designed the IBLI contract to minimize basis risk and therefore to maximize its value to the insured population.

Economic and social returns to IBLI for the ASAL

In Kenya's arid and semiarid lands (ASALs), drought is the most pervasive hazard, natural or otherwise, encountered by households on a widespread level. This is especially true for northern Kenya, where more than 3 million pastoralist households are regularly hit by severe droughts. In the past 100 years, northern Kenya recorded 28 major droughts, four of which occurred in the last 10 years. For livelihoods that rely solely or partly on livestock, the resulting high livestock mortality rate has devastating effects, rendering these pastoralists among the most vulnerable populations in Kenya. As the consequences of climate change unfold, the link between drought risk, vulnerability and poverty becomes significantly stronger.

In such an environment, the economic and social returns to an effective program that insures pastoral and agro-pastoral populations against drought-induced livestock losses can be substantial. To the extent that the likelihood of severe herd mortality reduces incentives to build herds, insuring livestock against catastrophic loss would address the high risk of investment in such environments. By thus stabilizing asset accumulation this should improve incentives for households to build their asset base and climb out of poverty, thereby enhancing economic growth.

One of the principle negative effects of a risky environment is that it depresses the development of financial markets that are a critical pillar of economic growth. Private creditors are often hesitant to offer uncollateralized loans particularly when borrowers' capacity to repay is closely tied to risk outcomes. In such an environment, financiers might become willing to lend if the assets that secure their loans could be insured. Livestock insurance, which can be used as collateral, can thereby potentially "crowd-in" much-needed credit for enterprises and individuals in the region without leaving creditors overexposed.

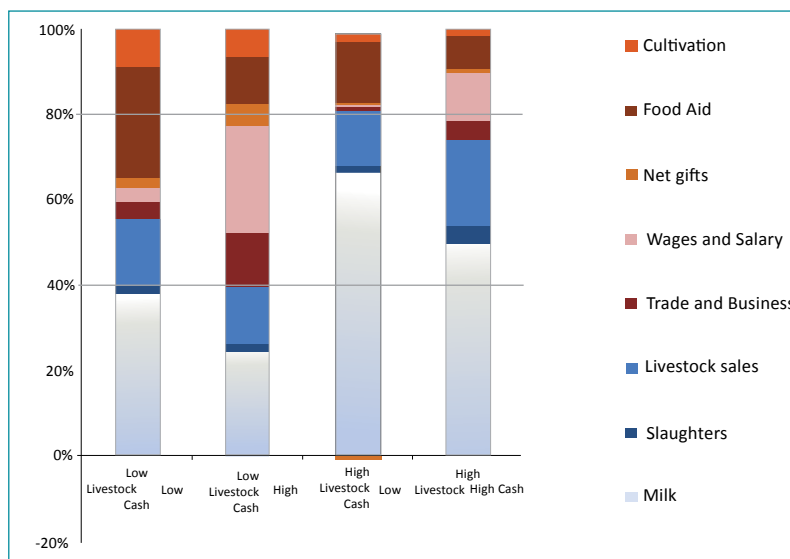
Finally, because it provides indemnity payments after a shock, livestock insurance could help stem the collapse of vulnerable, but presently non-poor households, into the ranks of the poor following a drought (or related crisis) due to irreversible losses from which they do not recover. This is a particularly salient point given the increasing empirical evidence of behavioral response consistent with the presence of dynamic poverty traps among pastoralists of northern Kenya (Barrett and McPeak, 2005; Lybbert et al., 2004; McPeak, 2001; Santos and Barrett, 2006). Poverty traps manifest in the form of a dynamic herd-size threshold above which herds accumulate to a high-level equilibrium and below which herd sizes naturally diminish to a low-level equilibrium below the poverty line. For those with herd sizes slightly above this threshold, protecting them against losses that will naturally lead them toward chronic poverty is an important priority that IBLI could theoretically fill (Barrett et al., 2008; Chantarat et al., 2009b).

IBLI design and implementation challenges

Despite the contractual advantages of an index-based insurance product, as well as the potential economic and social benefits, four major challenges confront the creation of an IBLI contract and ensuring a sustainable market for it:

- High quality data are required to accurately design and price insurance contracts and determine when payouts should be made;
- Design of an optimal insurance index that to the maximum extent possible reduces the risk borne by the target population so that the value and potential demand for the product are high;
- Effective demand for IBLI insurance among a target clientele largely unfamiliar with insurance in general and index-based agricultural insurance in particular; and
- Cost-effective ways of delivering IBLI insurance to small and medium scale producers in remote locations.

Given the promise of IBLI to manage the considerable drought-related mortality risks that pastoral and agro-pastoral populations face and the challenges associated with introducing a novel and relatively complex product to a remote and largely illiterate population, it was necessary to develop a comprehensive research and development agenda that would incorporate the design of a context-specific IBLI contract,



Source: McPeak et al. 2010b

Figure 1: Income sources by livelihood grouping

examine the risk profile of the target population, explain the contract and coverage terms, elicit willingness-to-pay, and create the environment necessary for a successful pilot. The following section highlights some of the key activities undertaken within this agenda.

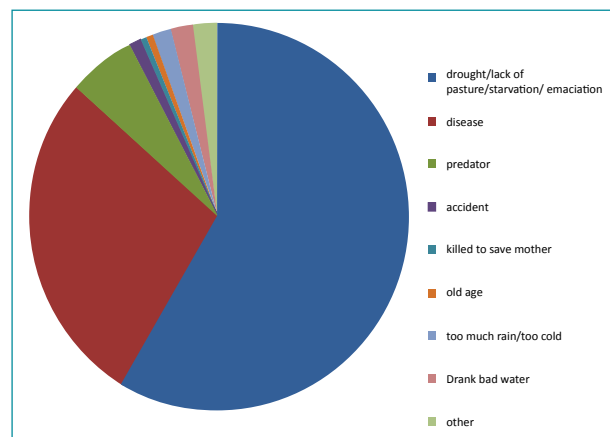
Developing IBLI for northern Kenya

Overview of the livestock economy in Marsabit District

The value of an IBLI contract for underwriting risks depends on the role that risk plays within the target economy and how amenable it is to indexing. In other words, is it a risk that is largely covariate in nature, impacts a substantial number of the insurable population over a sufficiently wide spatial area, and is highly correlated to a readily observable and cheaply available

non-manipulatable variable that can serve as the index? These characteristics, which we sought as a precondition for a suitable pilot location, are found in the livestock economy of Marsabit District in northern Kenya.

Northern Kenya's climate is generally characterized by bimodal rainfall with short rains falling from October through December, followed by a short dry period from January-February, and long rains in March-May, followed by a long dry season from June-September. Pastoralists rely on both rains for water and pasture for their animals, as well as occasional dryland cropping. Pastoralism in the arid and semiarid areas of northern Kenya is nomadic in nature, where herders commonly adapt to spatiotemporal variability in forage and water availability through herd migration.



Source: McPeak et al. 2010b

Figure 2: Causes of livestock mortality

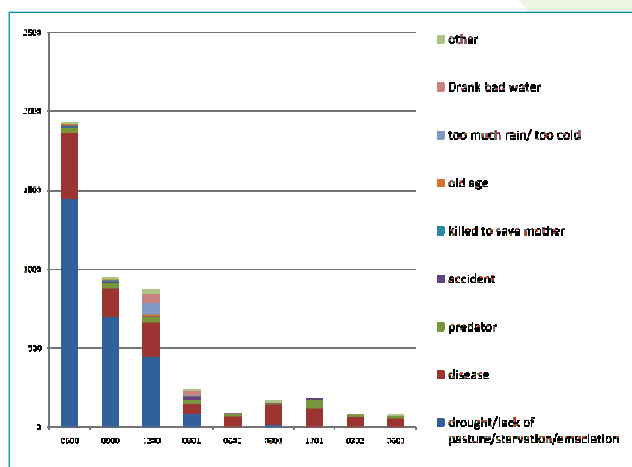


Figure 3: Causes and relative number of livestock losses by season

Livestock represent the key source of livelihood across most ASAL households. As Figure 1 shows, when households are split across four categories – high and low cash income and high and low livestock holdings (where the threshold for high/low is determined by the median value), only the low-livestock, high-cash households obtain less than 50% of their income from livestock.

The danger is that livestock face considerable mortality risk, rendering pastoralist households vulnerable to herd mortality shocks. Among these, drought is by far the greatest cause of mortality (Figure 2) and drought-related deaths largely occur during severe shocks, as during the rain failure of 2000 (Figure 3). IBLI is designed for precisely these instances of considerable loss. During times of relative normalcy, mortality arises relatively randomly due to non-drought related mortality causes such as diseases and predators. Such losses can be self-insured. IBLI is designed to cover those more severe shocks that pose a greater threat to livelihoods.

Design of the IBLI contract

To design and appropriately price the IBLI contract itself, we had to find a measure that is (i) highly correlated with local livestock mortality; (ii) reliably and cheaply available for a wide range of locations; and, (iii) historically available to allow pricing of product. The Normalized Difference Vegetation Index (NDVI) meets these conditions. Constructed from data remotely sensed from satellites, NDVI is an indicator of the level of photosynthetic activity in the vegetation observed in a given location. As livestock in pastoral production systems depend almost entirely on available forage for nutrition, NDVI serves as a strong indicator of the vegetation available for livestock to consume. Since the late 1980s, the United States' NASA and NOAA have used AVHRR data⁸ to produce decadal (10-day) composite NDVI images of Africa at a resolution of 8.0 x 8.0 km a day, and have built a valuable archive of these data from June 1981 to present, which are available in real time and free of charge.⁹

While NDVI has properties that make it reliable as the basis for an insurable index, it must also have value for the insured. In other words, NDVI data has to predict livestock mortality rates reasonably well. We used household-level livestock mortality

data collected monthly since 2000 in various communities in Kenya's ASAL districts by the Government of Kenya's Arid Lands Resource Management Project (ALRMP) to statistically estimate the relationship between NDVI measures and observed livestock mortality. To improve the contract and minimize the expected incidence of basis risk, we used panel data collected by the USAID-funded Pastoral Risk Management (PARIMA) Project quarterly from 2000 to 2002 (See Chantarat et al., 2009a for more details on data and product design).

Our current contract is based on Marsabit District, the pilot area. We combined herd history data to create an optimal insurance index defined as the function of the NDVI data that is simple, replicable, commercially implementable and highly correlated with the herd mortality data so that it provides the maximum possible insurance value to the pastoralist population.

The key feature of the contract we designed is a statistical predictive relationship between average livestock mortality within a specific area and the satellite-based indicator of forage availability NDVI. Equation (1) presents a simplified version of the regression model we estimate to generate the key relationship underlying the IBLI contract¹⁰. The area average livestock mortality rate, M_k , can be decomposed into the systematic risk associated with the vegetation index and the risk driven by other factors:

$$(1) M_{ks} = M(X(ndvi_{ls})) + \epsilon_{ls}$$

where $ndvi_{ls}$ represents various transformations of the average NDVI observed over season s in location l . These transformations include standardized NDVI that presents deviations from the long-term average and also include cumulative standardized NDVI summed across various periods across the seasons prior to coverage. These transformations are intended to capture the unique dynamics of the pastoral production system whereby the nutritional health of livestock is not only dependent on current forage conditions but also the state of forage over the past couple of seasons. $M(\cdot)$ represents the statistically predicted relationship between $X(ndvi_k)$ and M_k , and $E(\cdot)$ is the mean zero, serially uncorrelated idiosyncratic component of area average mortality that is not explained by $X(ndvi_k)$ – i.e.,

⁸The NDVI data we use is derived from data collected by National Oceanic and Atmospheric Administration (NOAA) satellites, and processed by the Global Inventory Monitoring and Modeling Studies group (GIMMS) at the National Aeronautical and Space Administration (NASA). The NOAA-Advanced Very High Resolution Radiometer (AVHRR) collects the data used to produce NDVI. Values of NDVI for vegetated land generally range from about 0.1 to 0.7, with values greater than 0.5 indicating dense vegetation.

⁹Further details about NDVI are available at <http://earlywarning.usgs.gov/adds/readme.php?symbol=nd>.

¹⁰We present the modeled contract in simplified form and do not delve deeply into the key design issues. For a more detailed technical description and analysis, please see Chantarat et al. (2009a).

Table 1: Insurance contract performance

Cluster	Strike	Correct trigger decision	Incorrect decision	
			Type 1 error	Type 2 error
Chalbi	10%	0.71	0.13	0.17
	15%	0.81	0.06	0.13
	20%	0.88	0.04	0.08
	25%	0.85	0.10	0.04
	30%	0.94	0.04	0.02
Laisamis	10%	0.80	0.09	0.11
	15%	0.88	0.03	0.09
	20%	0.84	0.09	0.06
	25%	0.81	0.14	0.05
	30%	0.84	0.13	0.03

location-specific basis risk. We predict area average mortality from observations of $ndvi_k$, specific to each location l and season s , as:

$$(2) \quad \hat{M}_k = M(X(ndvi_k))$$

The response function represented by Equation (2) serves as the underlying index for the insurance contract.

As livestock mortality response to forage can vary due to different factors, it was necessary to divide Marsabit District into two clusters, each distinguished by its own response function, in order to improve precision of contracts. The two distinct geographic zones (Figure 4), which we term the Laisamis Cluster and the Chalbi Cluster were divided based on statistical cluster analysis, which bundles locations with similar characteristics, such as distribution of species within a herd, mortality rates and variables that may influence the predictive relationship between livestock mortality and NDVI. The Chalbi cluster is drier and its herds have a higher fraction of camels and smallstock while in Laisamis cattle dominate.

The performance of the contracts can be analyzed by looking at how well the predicted mortality index corresponds to the actual area-averaged mortality in the target area. We present these results for both clusters and various insurance triggers in Table 1. Predictive relationships for both clusters maintain a high probability of correct trigger decisions. We define a correct decision as occurring when the model predicts mortality rates above the trigger and actual data shows that indeed mortality rates were above the trigger level. Correct decisions are also made when the model fails to trigger and actual mortality also

did not register above the trigger. Where errors occur, they are quite well distributed between Type 1 (when beyond-strike loss is experienced but no payout is triggered) and Type 2 (payout is triggered when experienced loss is below the relevant strike) errors – the two components of basis risk. It is clear, however that contract performance generally improves the higher the strike. A balance must therefore be made between contracts that optimize performance and ones that covers a wider range of risk.

With the response function estimated, we then estimate the actuarially fair premium rate per season per value of Tropical Livestock Unit (TLU) livestock insured for location l in season s covering the loss event that the predicted area averaged mortality index $\hat{M}_k$ is beyond the mortality strike of M_l^* can be written as:

$$(3) \quad p_k(M_l^*) = E(\text{Max}(\hat{M}_k - M_l^*, 0))$$

where $E(\cdot)$ is the expectation operator over a distribution of NDVI based mortality index. The mortality strike M_l^* is the mortality level for location l , additional losses beyond which the contract will compensate for. The simplified pricing equation presented in Equation (3) above is the actuarially fair premium rate (%) per value of aggregate livestock insured. Table 2 reports the actuarially fair premium rates for contracts with various strikes across both clusters. Because the incidence of widespread mortality is higher in Chalbi than Laisamis, the fair premium rates are likewise higher there. As expected, the lower the strike level beyond which indemnity payments are triggered, the higher is the premium as compensation is more likely to occur.

Table 2: Annual actuarially fair premiums for selected strike points across premiums

Cluster/Contract	Premium Rate (% of insured value)			
	10% Strike point	15% Strike Point	20% Strike Point	25% Point
Chalbi Cluster	9%	5%	3%	1%
Laisamis Cluster	5%	3%	1%	1%

Uncovering client interest and demand for IBLI

In order to appropriately understand the target clients' attitudes toward risk, to study their demand for insurance and conduct ex-ante impact assessments, we conducted in-depth community and household-level surveys among pastoralists in five communities in Marsabit District (Dirib Gombo, Karare, Logologo, Kargi and North Horr) chosen purposively to vary in terms of pastoral production system, market access and agroecology. The main objectives of the surveys were to (i) have full understanding of pastoralists' nature of livestock losses, their perceptions about risk of livestock loss and climate; (ii) introduce potential clients to the concept of IBLI; and (iii) investigate patterns and determinants of demand and willingness to pay for IBLI.

After an initial introductory focus group discussion with approximately 15-20 community members, we fielded a household survey in each location in which 42 households per location were randomly drawn using stratified sampling by wealth class. The household survey collected household-level information, production data, risk profiles, the history of herd dynamics, perceptions about risk of livestock loss and other relevant information.

The IBLI experimental game

These households were later brought together to take part in an experimental game designed to replicate existing pastoral production systems, which we used to illustrate how index insurance would work and how it could be beneficial (Lybbert et al., 2010; McPeak et al., 2010a). Experience with other index insurance pilots has shown that a carefully designed program of extension to appropriately educate potential clients is a necessary precondition to both initial uptake and continued engagement with insurance (Gine et al., 2007; Sarris et al., 2006). A prerequisite to generating demand and ensuring that the risk-management benefits of insurance effectively serve the client is for them to clearly understand the value of insurance and, in particular, how an index insurance product works.

In order to design an extension tool that adequately captures the complexities of the IBLI product and relays the key features and

terms of the contract, we took a cue from the growing field of experimental economics. Experimental games offer a method by which complex concepts can be distilled and taught in a relatively simple manner, and dynamic decisions or processes can be easily repeated during game play to mirror the outcomes and elicit the behavioral response that could otherwise take years to understand.

A good experimental game that can impart important insights and lessons onto its "players" needs to ensure that the simplified, abstract game mirrors the real world (in this case the actual features of IBLI contracts and their interaction with the pastoral production system) as much as possible. As such, we designed our IBLI educational game to replicate the nonlinear herd dynamics that livestock keepers in the rangelands face, as well as the basis risk intrinsic to IBLI and state-conditional indemnity payments only when an insurance premium was paid before the season began.

Soliciting willingness-to-pay

The games were very well received and in both their responses and questions in a sessions conducted after the games it was clear that the key intended lessons had been grasped:

- 1) One had to pay for insurance within the period of coverage to qualify for indemnity payments;
- 2) If premiums were paid but the strike to activate insurance was not attained, you were not entitled to your premiums back;
- 3) Payments were a function of area average loss and not individual loss; and
- 4) Loss was determined by forage estimates derived from satellite-generated information.

Nonetheless, while the games are arguably the most effective way to educate clients on the workings on an IBLI contract, they are also expensive to run and may not be cost-effective on a large commercial scale.

Table 3: Percentage of respondents willing to pay at least the stated amount for ILBI by location

Location	10% Strike		30% Strike	
	Fair	Fair +20%	Fair	Fair +20%
Overall	50%	34%	69%	69%
Dirib Gombo	71%	41%	78%	78%
Kargi	46%	32%	50%	50%
Karare	81%	75%	100%	100%
Logologo	30%	14%	57%	57%
North Horr	35%	22%	71%	71%

Table 3 presents the percentage of sampled respondents across locations who had a willingness to pay for IBLI at or above the quoted prices. Two prices were quoted, the actuarially fair price and the fair price with a 20% loading to account for possible mark-up and other business costs that may be associated with commercial provision. On average more than one third of the sample indicated a willingness to pay at least 20% above the fair price for the 10% strike contract, a figure that jumped to almost 70% for a 30% strike contract. One reason the 30% strike contract is likely to be more popular is because it is much cheaper. This also explains the lack of variation between the fair and fair + 20% contracts. At such low costs, an additional 20% is often times trivial.

Commercial contract features and terms - Having established a strong potential demand for IBLI at commercially sustainable prices what remains is to pilot the product. To launch the IBLI

contract on the market five key contract parameters must be clearly set out:

- 1) The geographical area that the contract covers;
- 2) The “premium” or the price paid for insurance coverage;
- 3) The “strike point,” meaning the index level at which the insurance is activated and payouts begin;
- 4) The value that will be paid for each livestock unit that is later estimated to have been lost; and
- 5) The length of time for which paid coverage lasts.

Geographical coverage of contract: Marsabit District will be covered by the two different response functions previously described above (Figure 4). The Chalbi response function underlies the Upper Marsabit contract consisting of Maikona

Figure 4. Chalbi and Laisamis contract coverage clusters

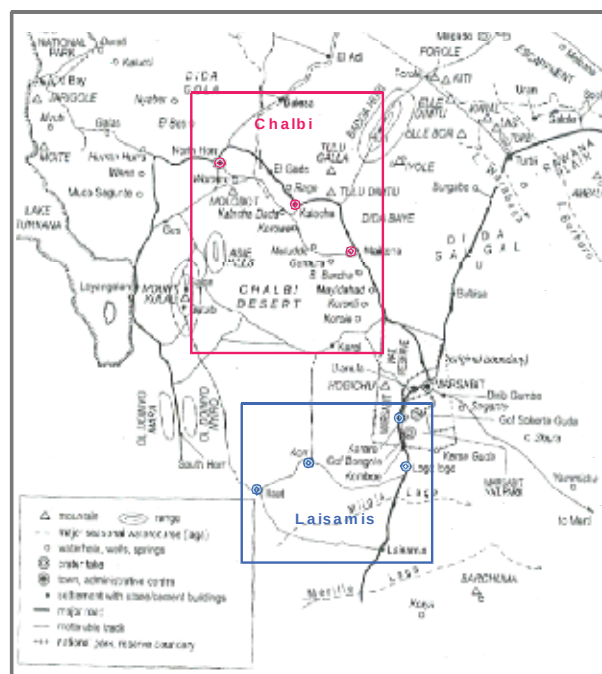


Figure 5. Contract spatial coverage



and North Horr divisions, and the Lower Marsabit contract consisting of Central, Gadamoji, Laisamis, and Loiyangalani divisions is based on the Laisamis response function (Figure 5). The boundaries were chosen due to clear agro-ecological and pastoral production system differences, as well as differences in risk. Upper Marsabit has a higher fraction of camels and smallstock in their herds than does Lower Marsabit. While the two contract clusters imply two different prices, premium payouts will be division-specific. Therefore, in the Lower Marsabit cluster for example, there will be three different division-specific livestock mortality predictions for the index upon which premium payouts will be determined.

Annual contract premiums and strike point: For the Marsabit Pilot launched in January of 2010, the relevant premiums as established by the commercial partners are presented in Table 4. These prices are specified for a contract with a strike point at 15%, the chosen trigger level. Fifteen percent was chosen after a process of negotiation among the commercial and technical partners that involved a tradeoff between a lower strike, which

Table 4: IBLI premiums for 15% strike contracts in Marsabit

Contract Cluster	Consumer Price	Total Market Price
Upper Marsabit	5.5%	9.2%
Lower Marsabit	3.25%	5.4%

would provide greater risk coverage but cost more, and a higher strike which, while cheaper, covers a lower portion of the risk. One can think of the strike point as a deductible. Individuals will cover any losses up to 15% predicted mortality and insurance will compensate for any losses above that. The consumer price is the amount the clients in the specified coverage area paid for.¹¹ The actual market price, however, includes the full costs of commercial partner commissions and the relevant taxes. The difference is currently being subsidized by donors. The expectation is that, as the novelty of the product wears off and late-adopters enter the market, increased competition and the market, coupled with greater capacity in the industry, will bring the actual price down to a consumer price that represents a 30% loading on the fair premium on average.

Insurable livestock unit and value of herd: The standard livestock types for a pastoral herd will be covered. These are camel, cattle, sheep and goats. To arrive at a value for the insured herd, the four livestock types will be transformed into a standard livestock unit known as a Tropical Livestock Unit (TLU), where: 1 TLU = 1 cow, 1 TLU = 0.7 camel, 1 TLU = 10 goats and 1 TLU = 10 sheep. Using average prices for livestock across Marsabit and discussion with key traders and stakeholders, we have arrived at a set price per TLU insured of Ksh 15,000.¹²

¹⁴Clients do not have to be living in the area for which they purchase coverage. They only have to state that the herd they are insuring largely resides in the coverage area. Nevertheless, for the pilot, clients did not have to provide proof of livestock ownership.

¹² While in theory clients can simply state their subjective valuation of the herd they want to insure, we opted for a standard price for ease of administration. The standard price was derived as a function of household-level livestock sale price data (Chantarat, 2009a).

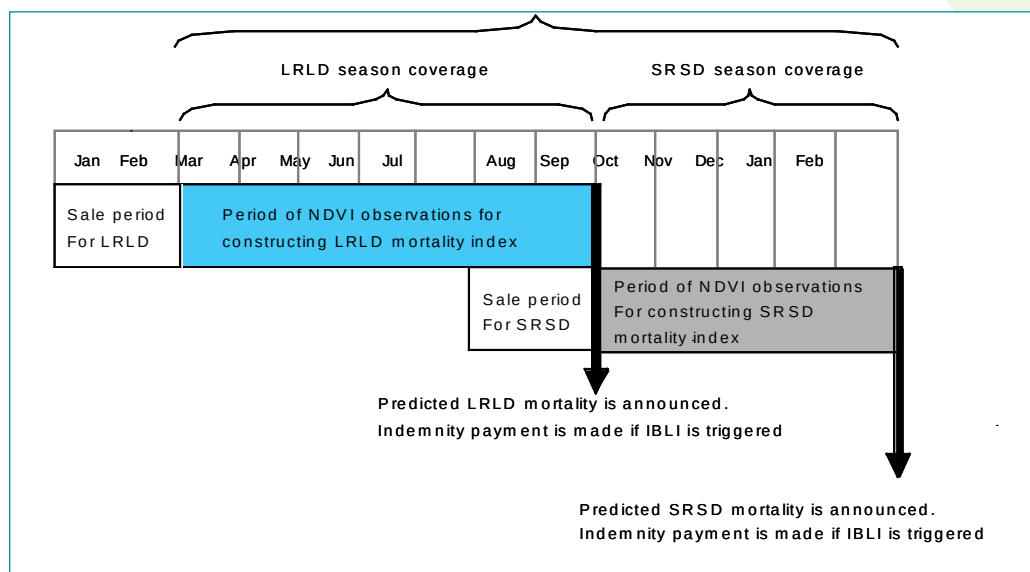
Temporal structure of contract: Figure 6 presents the time coverage of the IBLI contract being piloted. The contract is an annual one whose coverage spans from March 2010 to February 2011. IBLI contracts (and other Index-based Insurance contracts) can only be purchased within a specific time window, which in this case is in January and February 2010 (and August/September 2010 for contracts spanning October 2010 to September 2011). Contracts must be sold within this time frame as the rainy season beginning right after that may give the potential buyer information about the likely conditions of the season to come that would unfairly affect his purchase decision. This annual contract has two potential payout periods: (i) at the end of the long dry season in September and (ii) at the end of the short dry season in February. At these points in time, if the index reads greater than 15%, insurance will pay clients.

How does IBLI work?: As an example, let us consider the Gudere family in Kargi who purchase 10 tropical livestock units of IBLI insurance for the period covering March 2010 to February 2011. At Ksh 15,000 per TLU, Gudere's herd would be valued at Ksh 150,000 (=15,000 x 10). As Kargi is located in Lower Marsabit, Gudere would pay an annual premium of Ksh 4,875 (which is 3.25% of Ksh 150,000) to cover his entire herd for the annual coverage period. Put in perspective, this is about the value of just over 3 goats to insure 10 cows over the space of a year.

Once Gudere has purchased insurance, he will now wait to see if he receives any compensation. At the end of September, we would obtain the 2010 long rain/long dry NDVI data for the Laisamis division that Kargi is in and feed those data into the Laisamis response function, generating the predicted mortality index. Suppose the predicted mortality rate is 13%. Gudere would not receive any compensation. However, let us imagine that at the next possible payout period, in February 2011, the predicted mortality for Laisamis at that time is 25%. This 25% mortality index is then compared to the contractually stipulated strike point of 15%. In this example, the Gudere family would receive compensation for 10% (=25%-15%) of their covered herd of 10 livestock units. They would thus receive a payment of KSh 15,000 (= 10% of Ksh 150,000, the insured herd value). All the Gudere's insured neighbors in Laisamis would receive compensation at the same predicted rate of 10% of their insured herds. Those who bought no insurance would receive no indemnity payment.

Launching the IBLI pilot

Critical to the objective of launching a commercially sustainable product was convincing commercial partners to take up the product and offer it through the market. Through a process of broad engagement with potential partners, a tripartite of interested parties collaborated with the International Livestock Research Institute (ILRI) to launch the pilot in Marsabit. UAP



Source: Chantarat et al. 2009.

Figure 6. Temporal structure of IBLI contract

Insurance Company of Kenya (UAP), re-insured by Swiss Re together underwrites the risk while Equity Insurance Agency (EIA), provides the agency services taking care of extension, publicity and sales. ILRI and her research partners (Cornell University, Syracuse University and the University of California-Davis) offer the technical support and provide the evaluation and impact assessment services.

The delivery channel

Marsabit is a remote, sparsely populated and relatively infrastructure deficient area. As such, in thinking through product implementation, one cannot ignore the hardships that may arise in targeting clients, accepting premiums, and making indemnity payments within a system that generates enough confidence to allow for active market mediation. UAP and particularly EIA would need to develop an administrative infrastructure that can cost-effectively contract transactions.

Fortunately, a substantial social protection program, dubbed the Hunger Safety Net Program (HSNP) – funded by the UK Department for International Development (DfID) – began rolling out in four of Kenya’s poorest districts in 2009. Within a year, and for the first four-year phase of its ten-year expected duration, the HSNP plans to deliver regular cash transfers to 60,000 households spread across Mandera, Marsabit, Turkana and Wajir. This is a huge task for which a well-designed delivery channel with a wide network across these regions is required.

The Financial Sector Deepening Trust (FSD), in conjunction with Kenya’s Equity Bank (EIA’s parent firm), has been working on just such a delivery channel and had the responsibility of creating the necessary Information and Communication Technology (ICT) and financial infrastructure needed to support the HSNP program.

Equity Bank was contracted to open over 150 new Points of Sale (PoS) across these regions that will be able to facilitate and provide the HSNP cash transfer to recipient households. Using new hi-tech portable devices within a sophisticated computing system, these PoS devices can be easily configured to accept premiums for certain insurance contracts and register indemnity payments when necessary. EIA will use this delivery infrastructure to offer IBLI contracts. Where EIA wants to offer the product in Marsabit communities not selected to receive HSNP cash transfers, it would be easy to extend the network to these areas.

Preparing to launch

An entirely new product requires several layers of preparation for it to be successfully launched into the market. First, any required regulatory authorization must be secured. The partners attained regulatory approval to proceed from the Insurance Regulatory Agency (IRA) of Kenya. The IRA’s main concern was the question of “insurable-risk” whereby the insured party’s covered risk is very clear. We argued that one of the key benefits of an index insurance product that drastically reduces transactions costs was that there was no need for insurance companies to verify actual livestock losses because payments were entirely a function of the index. As such, we recommended that insurance be sold without requiring the agent to verify if the client actually owns all the livestock that they intend to insure. While this means there is no real way to ensure that the client will indeed face the risk that he is insuring against (drought-related livestock mortality), the IRA finally agreed with the caveat that they would further review the issue should the success of the pilot result in more comprehensive scale-out across the country.

The next step was to publicize the product and prepare the extension effort. In an environment such as Marsabit, it is critically important to receive blessings from influential members of the community. As such, we called a workshop of key stakeholders ranging from Government line ministries and NGOs, to local government representatives, community elders and traders, to carefully explain the product features to them, the pilot strategy and the on-going evaluation efforts. Many were already familiar with the product given the earlier research effort in which we had engaged them.

Given the characteristics of the region, publicity is best received by word of mouth and our key client engagement strategy was through interaction with trained extension agents. As such, we held a weeklong training of close to 20 Master Trainers (MTs) selected from among professionals working in relevant capacities or previously associated with the IBLI research process. This was followed by another weeklong training, run together with the MTs, of Village Insurance Promoters (VIPs) who were recruited from the target villages. In addition to supervising the VIPs, MTs were expected to be able to answer any questions relating to the product’s features and the implementation process not only

from clients but also interested partners and institutions. VIPs on the other hand provided the key grassroots extension effort directed at potential clients.

With all this in place, the IBLI product was launched on January 22, 2010 in a colorful ceremony in Marsabit town. The launch was presided over by the CEO of Equity bank and brought together high-ranking officials, including the Minister for Livestock and the local Member of Parliament, as well as the Secretary General of the Supreme Council of Kenyan Muslims who came in to endorse the product. The high-profile event generated significant buzz that travelled by word of mouth to various corners of the district; the launch also attracted the attention of reputable national and international media houses. For the next six weeks, until the end of February when the selling window closed, the MTs and VIPs fanned out to offer their extension services, and sales agents began, for the first time, to sell IBLI to clients across Marsabit District.

Sales and lessons learned

Results from the first IBLI sales in Marsabit went beyond most expectations. In the six weeks of sales after the launch, a total of 1,979 individuals purchased insurance contracts to cover a total of 3908 cattle, 15,826 sheep and goats, and 339 camels. Total premiums collected came up to US\$ 46,597. Table 5 presents the relevant sales statistics by cluster (Upper and Lower Marsabit).

By highlighting the promise and potential of IBLI in the area, this result has reinvigorated the commercial partners who are already beginning to think of scaling-up the pilot beyond Marsabit District. It is instructive to note that underlying the high level of sales was an often sub-par implementation effort, discussed in some detail below, that was fraught with challenges. Indeed, had the sales delivery process gone as planned, we estimate that we could have sold, at the very least, twice as many contract as we did.

After the sales window ended on February 28, the project team returned to Marsabit in mid-March and brought together various key stakeholders, ranging from a select group of Master Trainers and Village Insurance Promoters, some of the clients that had purchased insurance, village-level government representatives, as well as officials of Government line ministries and heads of local NGOs. The objective was to reflect on the successes and failures of the implementation process, gather perceptions on the product and solicit information to help improve the extension and sales effort for the subsequent sales period. The workshop was held against the backdrop of heavy rains that occurred in the first two weeks of March, resulting in vigorous vegetation response and reducing the likelihood of an insurance payout in September.

The workshop was extremely insightful, generating helpful discussion and highlighting both the key opportunities that must be tapped and the challenges that need to be addressed. Some of the more important issues raised include:

- **A flawed sales process:** The major concern, largely voiced by the Master Trainers and Village Insurance Promoters, was that a failure in the sales delivery system dampened sales and left many interested clients frustrated. As it happened, the software needed to allow the PoS terminals to transact sales of IBLI was not ready on time and thus sales had to be done manually, with agents being driven from town to town to carry out the transactions. With the poor roads and communications infrastructure in Marsabit District and the long distances that had to be covered, this proved to be a real challenge. Some towns could be visited only once or twice during the six-week sales window, often coming in unannounced before the VIPs could rally together interested clients. Consequently, there were many clients who expressed strong interest but were unable to be served, at certain points even getting frustrated and losing confidence in the product. Fortunately the software will be ready in time

Table 5. IBLI Contract Sales Figures for Jan/Feb 2010

	Premium rate	Contracts sold	Cattle no. insured	Sheep/ goats no. insured	Camels no. insured	Total value of insured livestock (USD)	Total value of collected premiums (USD)
Upper	5.5%	556	371	11,081	185	347,620	19,119
Lower	3.25%	1,423	3537	4,745	154	845,460	27,477
Total		1,979	3908	15,826	339	1,193,080	46,597

for the next selling period in September. However, as the PoS terminals may not completely cover the whole District, a clear logistical plan to ensure that all interested clients are served in a cost-effective manner will need to be put in place.

- **Publicity should be improved:** It was noted that, in certain places, individuals were not aware of the product and that the best way to improve awareness and knowledge of the program was by ensuring that the area chief was informed. Radio programming on vernacular stations was also encouraged.
- **Payout trigger too high:** There was also the feeling that a 15% payout trigger level was too high and that it should be lowered to 10% where payments would be made more frequently and cover more of the loss. There was no real conclusion when it was made clear that a reduced trigger level would mean higher prices. However, it is an important issue to consider, as relatively minute indemnity payments made infrequently may begin to erode confidence in the product.
- **Lack of payout may affect demand:** Indications, due to the heavy rains, that the contract would not payout in September left several worried that without a payout in the near future, demand for the product would be severely affected. While this may be true, there were also several among those who had purchased contracts who were relieved that there was rain but recognized that, as drought was inevitable, IBLI would continue to have value. Nevertheless, what the actual impact of continued non-payout will be remains to be seen. However, it is clear that ensuring clients have a solid understanding of how the IBLI product works is critical. The extension message needs to be tweaked to emphasize the downside risk-protection role that IBLI pays.

Conclusion

The effort to design and pilot IBLI as a commercially sustainable tool to help the pastoralists of northern Kenya insure themselves against drought-related livestock mortality has largely been a success. It was a process that began with the identification of the key source of vulnerability plaguing pastoralists and the recognition that IBLI may be a promising intervention to

help manage the main source of risk they face – widespread livestock losses due to drought. What followed was an effort to investigate the feasibility of developing an IBLI product. Marsabit District, where the first IBLI contracts were sold, met all the necessary prerequisites for development: the data needed to model IBLI were available, harsh droughts were established as the leading cause of livestock mortality in an area where livestock formed the backbone of livelihoods, research identified the likelihood of demand capable of supporting a market mediated product, and the delivery infrastructure for the provision of the contracts was already in place.

The relatively high sales generated from the first sale window are a promising sign, but it is still too early to reach a definitive verdict and there are several challenges still to surmount. Nevertheless the train has left the station and is moving fast. Growing interest from both commercial and development partners demands that we aim to rapidly scale up the project to other ASAL districts in Kenya and investigate the feasibility and applicability of IBLI in similar contexts in other countries and regions. We do, however, need to firmly ensure that we can walk before we run. A careful effort evaluating the process and product and rigorously assessing its impacts across various welfare indicators is critical. To this end a comprehensive baseline survey of over 900 households across 16 Marsabit communities was undertaken in September and October 2009. These households will be revisited annually over three years, generating information needed to understand just how well IBLI works as a risk-management tool, as well as the indirect effects it has on household wealth and welfare.

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Smallholder based market information and linkage system: The case of Kenya Agricultural Commodity Exchange – impacts, lessons and challenges

A.W. Mukhebi¹, J. Kundu², A. Okolla² and W. Ochieng²

Abstract

This paper describes a market information and linkage system (MILS) developed by the Kenya Agricultural Commodity Exchange Limited (KACE) designed to provide reliable and timely market information targeting smallholder farmers and to link the farmers to better input and output markets. The MILS involves harnessing modern information and communication technologies (ICTs) to enhance the bargaining power of the farmer for a better price in the market place.

The components of the KACE MILS, which are platforms for market information delivery and market linkage, are: Market Resource Centers (MRCs), which are information kiosks in rural markets; Mobile Phone Short Messaging Service (SMS); Interactive Voice Response Service (IVRS), which uses voice mail; an Internet Database System (IDS), which disseminates market information through email messages and a website; National and Rural FM Radio; and the KACE Headquarters Central Hub (KHCH) in Nairobi, which provides system coordination.

A recent study of the impact of the KACE MILS concluded that the proportion of farmers and traders that say their incomes have increased and their bargaining positions have improved is very high (75% farmers and 60% commodity traders). This is attributed to improved bargaining power by farmers for better prices, as well as linkages to better markets. Furthermore, the study concluded that it was clear that, during the years in which the KACE MILS has been operational, market integration improved as evidenced by the narrowing of spatial and temporal price differences among markets for two commodities studied (maize and beans).

KACE has learned a number of lessons from the experience of developing and applying the MILS. These include the observation that farmers and agribusinesses in rural areas are willing and able to pay for additional marketing services beyond market information for more effective linkage to input and output markets. This influenced KACE's decision to pilot the franchise model for MRCs to offer a wider range of demand-driven services, beyond just market information. Another main lesson is that ICTs have a critical role to play in enabling poor

smallholder farmers in remote rural areas to access input and output markets. This is shown by a research study finding that 75% of farmers that used KACE MILS reported that their incomes and bargaining positions had improved.

Some of the challenges KACE has faced include: relatively high costs of mobile phone calls, SMS and IVRS to users; ICT illiteracy among smallholder farmers; small quantities of produce of varying quality offered by smallholder farmers (lack of bulking); and limited KACE human and financial capacity to scale-out and scale-up the MILS. These challenges limit ICT use and market access by farmers or greatly increase their transaction costs.

KACE's future plans include scaling up and out the MILS through the franchise model, and forging alliances with other emerging commodity exchanges in eastern and southern Africa to exchange market information and facilitate regional agricultural trade. These activities will significantly expand market access for smallholder farmers, while at the same time help to improve revenue generation for long-term financial sustainability of the MILS.

Background

Agricultural markets in Kenya – and indeed in Africa – do not work efficiently for poor smallholder farmers (Adesina, 2004). Following the market liberalization reforms undertaken by the Government of Kenya in the late 1980s and early 1990s, agricultural markets are characterized by the following constraints, among others:

- Long chains of transaction between the farmer and the consumer;
- Poor access to reliable and timely market information;
- Small volumes of products of highly varied quality offered by individual smallholder farmers; and
- Poorly structured and inefficient markets.

The lack of market information represents a significant impediment to market access especially for smallholder poor farmers; it substantially increases transaction costs and reduces market efficiency. For any one commodity, the value chain consists of multiple actors, each taking a margin at every stage of

¹KACE Founder and Chairman. Corresponding author (amukhebi@kacekenya.co.ke).

²Kenya Agricultural Commodity Exchange Limited, Brick Court Building, 2nd Floor, Mpaka Road, Westlands, P.O. Box 59142-00200, Nairobi, Kenya. Email: kace@kacekenya.co.ke; Website: www.kacekenya.co.ke

the chain, and price variations in space and time are often large and erratic (Adesina, 2004).

Liberalization of agricultural markets has introduced new challenges to farmers, especially poor smallholder farmers. Government marketing boards have either collapsed or can no longer guarantee the farmer a market for his produce. Equally, buyers of commodities from farmers (traders, processors or consumers) do not have sufficient information about commodity sources and prices.

Farmers, especially smallholders, are disadvantaged in the market place without adequate market information. They are vulnerable to exploitation by those who buy their produce, such as traders, who are often better informed about the market.

The objective of this paper is to describe a market information and linkage system (MILS) developed by the Kenya Agricultural Commodity Exchange Limited (KACE) (www.kacekenya.co.ke), and highlight its impacts, lessons and challenges. The aim of MILS is to reduce the market information asymmetry between farmers and those who buy produce from them. This should enhance the bargaining power of the farmer for better prices in the market place.

The KACE market information and linkage system

KACE has developed its MILS since 1997. Through this MILS, KACE collects, updates and provides market information on various crop and livestock products targeting smallholder farmers. Currently, information is collected on 42 commodities, which are classified into cereals, pulses, tubers, vegetables, fruits and livestock; information on farm inputs is also collected. The markets covered are Nairobi, Mombasa, Nakuru, Eldoret, Bungoma, Machakos, Kitale and Chwele, which are the main agricultural commodity wholesale markets in the country.

The market information collected includes daily wholesale buying prices, as well as commodity offers to sell and bids to buy. KACE also links farmers to markets through matching commodity offers and bids. Market information enhances the bargaining power of the farmer for a better price in the market place, and helps to link the farmer to markets more efficiently.

Components of the KACE MILS

The KACE MILS involves harnessing the power and advantages of modern information and communication technologies (ICTs) for information collection, processing and delivery. The components or platforms of the KACE MILS are:

- Market Resource Centres (MRCs)³;
- Mobile Phone Short Messaging Service (SMS);
- Interactive Voice Response Service (IVRS);
- An Internet Database System (IDS);
- National radio;
- Rural FM radio; and
- The KACE Headquarters Central Hub (KHCH) in Nairobi.

KACE Market Resource Centres – MRCs are information kiosks owned by KACE. They are located in rural markets and serve as sources of KACE market information. They also provide market linkage through matching commodity offers and bids. There are eight MRCs located in the Western, Rift Valley and Eastern Provinces of Kenya.

These MRCs were established by KACE between 1997 and 1999. A typical MRC is a simple one- or two-room leased facility, manned by two KACE staff – a manager and an assistant. It is often equipped with a computer with Internet connectivity, mobile phones, a weighing scale, a moisture meter, and bulletin boards for market information display.

Every morning between 5:00 and 7:00, when wholesale markets are most active, MRC staff visit the wholesale market in their location to collect wholesale buying price data for commodities being traded in the market on that particular day, using a standard procedure agreed upon by all MRCs and KACE Headquarters. Each MRC sends the data to the KACE Central Hub by mobile phone SMS or email, where it is verified and summarized before it is disseminated using the MILS platforms.

The MRC staff use Internet to download summarized information from the Central Hub in Nairobi to display on bulletin boards. They use mobile phones to communicate market information to the KACE headquarters, and also to train farmers on how to

³MRCs were formerly known as rural based Market Information Points (MIPs) and district based Market Information Centres (MICs). MRCs offer a wider range of marketing services beyond agricultural market information, such as storage, weighing, quality testing, etc.

use mobile phones to access KACE market information. Farmers and traders alike use the weighing scales to ascertain produce weights, and the moisture meters to ascertain grain moisture content, both at a small fee to the MRC.

MRC users, mostly farmers and commodity traders, visit to obtain market information and other services at small fees. To obtain commodity market prices placed on bulletin boards is free. However, to place an offer or a bid on a bulletin or trading board for matching costs, a modest placement fee of KSh 100 (~US\$ 1.33) is charged; a further commission is negotiated on successful transactions (usually between 0.5% and 5% of the value of the transaction). The MRC staff charge modest variable fees for weighing, moisture testing and other services that the MRC may offer to clients.

For long-term financial sustainability, KACE is piloting a franchising model for the MRCs, where they can develop and broker a wider range of demand driven services, e.g., transport, storage, input supply, product bulking and quality control. Four MRCs were franchised in 2007. However, three of them were seriously vandalized during the post-national election violence in 2008. The one that survived, located in Chwele Market in Bungoma Central District, western Kenya, continues to thrive and is currently financially self-sustaining; its revenues more than cover its total operational costs.

KACE Short Messaging Service – KACE uses SMS for delivery of market information, especially price information. The SMS is provided in partnership with both Safaricom Limited and Zain Network, the two leading mobile phone service operators in Kenya. The SMS with Safaricom was developed in 2003, with only five commodities covered: maize, beans, cabbages, tomatoes and potatoes. However, with effect from 1 October 2009, the SMS platform was reprogrammed to increase the number of commodities covered – up from 5 to 20 – and was also introduced on Zain Network. The 20 commodities are categorized as follows: **cereals:** maize, rice, sorghum and millet; **pulses:** beans, soybeans, red grounds and green grams; **fresh produce:** cabbages, tomatoes, potatoes and bananas; **livestock:** beef steer, goat, chicken-broilers and eggs; and **farm inputs:** DAP fertilizer, CAN fertilizer, urea fertilizer and maize seeds.

The KACE Central Hub uploads the current information onto the mobile phone networks daily, and subscribers use their handsets to download the information as SMS messages. The charge to

the user per SMS is KSh 7 by Safaricom and KSh 10 by Zain. Both Safaricom and Zain track the number of SMS messages on a monthly basis, and pay KACE an agreed percentage of the net value per SMS message. Currently, the average number of SMS messages per month is about 40,000 for Safaricom and 10,000 for Zain (a newer service).

KACE Interactive Voice Response Service – KACE uses the IVRS to deliver market information on the 20 commodities also covered by the SMS. As with the SMS, the initial IVRS in 2003 covered only 5 commodities, but has now been reprogrammed in March 2010 to cover all 20. KACE submits updated market information daily to the IVRS service provider, the Adtel Phone Company Limited in Nairobi. The company translates the information into voice mail. A user dials a dedicated phone number to access the information through simple menu steps, with a choice of language (Kiswahili or English).

Any mobile phone regardless of network can be used to dial the special number to access the information. Each IVRS phone call is charged a premium rate of KSh 10. Adtel tracks the number of IVRS calls in a month, and pays KACE an agreed percentage of the net value of each call. This IVRS service with Adtel is fairly new and has yet to be promoted for widespread use. The initial 2003 IVRS was with a different service provider who used to charge KSh 20 per call. Due to its relatively high cost per call, the average number of IVRS calls per month was only about 1,000. It is expected that, when promoted, the current expanded and lower cost IVRS will attract more calls.

KACE Internet Database System – KACE disseminates updated market price information through an Internet-based electronic database (RECOTIS) and website (www.kacekenya.co.ke). User email contact addresses are in an electronic database. Updated market information is sent daily to recipients in the database as email messages in an Excel worksheet attachment. Information on 42 crop and livestock commodities is sent. There are currently about six hundred recipients in the database from 26 countries, most of them in Africa. Recipients pay KACE a subscription fee of US\$ 65 for six months or US\$ 125 for 12 months.

National radio – Since 1997, KACE has been submitting updated price information daily to the Kenya Broadcasting Corporation (KBC) Radio (the national radio service) for dissemination. KBC broadcasts the information twice each day – once in the morning and once in the evening – and acknowledges KACE in

the broadcast as the source. However, due to the time constraint on the radio, KBC broadcasts prices for only a few main commodities, usually four to five. The KBC radio network covers the whole country, including remote rural areas, and is therefore widely listened to by the public. KBC estimates that about 5 million people listen to KACE price information broadcast daily. KACE does not receive any revenue from this service, which it contributes as a public good.

Rural FM radio – In 2006, KACE, in collaboration with West Media Limited (WML), proprietors of the West FM Radio Station located in Bungoma town in Western Province of Kenya, established an interactive radio program branded Soko Hewani (“The Supermarket On Air”). Soko Hewani is in effect a virtual trading floor, with KACE using WML’s West FM Radio to match commodity offers and bids made by farmers as well as other commodity sellers and buyers. KACE provides the content of the radio program (verified offers, bids and prices), while WML provides the radio platform, and the design, production and management of the program. Soko Hewani is broadcasted once a week on Tuesday evenings, at a time recommended by WML as a prime time for farmer listeners in the broadcast catchment zone. The catchment zone, with a radius of 200 km, covers Western, parts of Nyanza and parts of Rift Valley Provinces of Kenya and eastern Uganda, a region of an estimated 5 million inhabitants, most of whom are smallholder farmers.

KACE MRCs act as agents to trade through Soko Hewani on their own account or on the account of clients who are mostly smallholder farmers and small-scale commodity traders in accordance with rules and regulations established by KACE. Clients visit MRCs to make offers to sell or bids to buy commodities, by providing information about the quantity of the product for sale or required for purchase, quality, expected price, where the commodity is available or required, the validity period, and the contact address of the client. The MRCs verify offers or bids with respect to the availability, location, quantity and quality of commodities, often by making a physical visit to the client’s premises in case of offers. The MRCs submit verified offers and bids to the KACE Soko Hewani program manager via phone, fax, SMS or email.

The KACE Soko Hewani program manager further verifies, compiles and registers the offers and bids for trading through Soko Hewani. The manager then goes to the West FM Radio studio with the registered offers and bids for trading.

The offers and bids are announced on Soko Hewani. Listeners are given an opportunity to phone or send SMS messages into the radio program and bid on the offers, or offer on the bids. The KACE radio program staff who are on standby during the Soko Hewani broadcast then match the offers and bids, using mobile phone calls and SMSs, or reference back to the specific MRC which submitted the offer or bid for further negotiation and conclusion of deals.

KACE charges a placement fee per initial offer or bid (US\$ 1.50 to US\$ 15, depending on volume), and a modest commission (between 0.5% and 5% of the value of the transaction) on successful transactions concluded through Soko Hewani. The KACE Soko Hewani program standby staff provide listeners with further information about the offers and bids, e.g., the location of buyer/seller, contact information, price negotiation, transport availability, payment terms, etc. MRCs broker (for a negotiable fee) complementary services to facilitate sales transactions, such as quality testing/control, packaging, storage and transportation.

The KACE Headquarter Central Hub – The Central Hub at the KACE Headquarters in Nairobi serves as the nerve center of the MILS. The Hub receives, processes, manages, updates, disseminates and coordinates market information services through the MILS, using the platforms described above: MRCs, SMS, IVR, Internet and radio.

The Hub consists of a Server, wireless Internet connectivity, and several PCs linked in a LAN for fast and timely receipt, processing and dissemination of market information by the KACE information technology staff.

In addition, the KACE Hub undertakes activities aimed at building the capacity of farmers and agribusinesses to access and use MILS services more effectively. These include organizing, often in conjunction with other local service providers, training workshops, exhibitions, field days and promotional road shows. The Hub also promotes the MILS through such activities as publication and distribution of brochures and fliers, participation in agricultural shows and trade fairs, and radio programs.

Sustainability of the KACE MILS

KACE has adopted a business approach to the provision of its services for long-term financial sustainability: clients pay moderate fees for the services received. When the services have been scaled out across the country and many more clients

are accessing and using them, it is projected that the revenues generated will more than cover the costs of providing them.

A summary of KACE's revenue sources described above:

- SMS revenue share from the Safaricom Limited and Zain Network;
- IVRS revenue share from the Adtel Phone Company;
- Placement fees for offers and bids;
- Negotiated commissions from trade linkages; and
- Subscription fees for information through the Internet.

Negotiated commissions on successful offer/bid matches generate the bulk (94%) of KACE's revenue.

KACE MILS impacts, lessons and challenges

Impacts

By providing reliable and timely market information and market linkage services targeted at smallholder farmers, the KACE MILS is expected to improve the efficiency of agricultural markets, and enhance the bargaining power of smallholder farmers in the market place for better prices, resulting in higher farm-gate prices and farm incomes. With higher incomes, farmers will be able to invest in modern technologies to increase productivity. With higher productivity at better prices, smallholder farmers will further increase their incomes, thus experiencing a spiral of wealth creation and escaping the vicious cycle of poverty in which they currently find themselves trapped. This hypothesis and outcome have yet to be tested and assessed, and will take time to occur.

Meuleman (2007), in a study of the impact of the KACE market information system, concluded that the proportion of farmers and traders who have used the system that say their incomes have increased and their bargaining positions have improved is very high (75% farmers and 60% commodity traders). Furthermore, Meuleman concluded it was clear that, during the years in which the KACE MILS has been operational, market integration has improved for the two commodities studied (maize and beans).

Some KACE activities in farmer capacity building for market access have been institutionalized into the Agribusiness Training Centre at the Cooperative College of Kenya, with KACE as one of

the founding members. In addition, KACE is one of the founders of the Eastern Africa Grain Council (www.eagc.org), established to develop and promote a more structured system of marketing cereal grains in the East African Community (EAC).

KACE accepts students taking agricultural marketing courses for short-term field attachment and graduate thesis research from training colleges and universities in Kenya and elsewhere. Furthermore, KACE is a source of time series data on commodity prices in Kenya, required for research and agricultural policy analysis.

One of the important impacts of KACE is that clients in other countries in eastern (e.g., Uganda and Ethiopia), southern (e.g., Malawi) and western (e.g., Ghana and Nigeria) Africa have successfully adapted or adopted the KACE MILS model. The Uganda Commodity Exchange (UCE) (www.uce.co.ug), Ethiopia Commodity Exchange (ECX) (www.ecx.com.et), Malawi Agricultural Commodity Exchange (MACE) (www.ideaasms.com), Abuja Securities and Commodity Exchange (ASCE) (www.abujacomex.com), and the Network of Market Information Systems for West African States (MISTOWA) (www.mistowa.org) based in Ghana, have all come about with the help of consultancies, visits and learning from KACE.

The social entrepreneurship work of KACE in addressing the plight of poor smallholder farmers for better market access has been recognized globally and continentally by the awarding of the Ashoka Fellowship (www.ashoka.org) in 2005 and the African Association of Agricultural Economists' Fellowship in 2007 to KACE's Founder and Chairman, Dr. Adrian Mukhebi.

Lessons

KACE has learned a number of lessons from the experience of developing and applying its MILS, including:

- In a study of MRCs, Asaba et al. (2005) found that farmers and agribusinesses in rural areas are willing and able to pay for additional marketing services beyond market information for more effective linkage to input and output markets. These services include commodity grading, storage, transportation, short-term credit (for example to hire transport to market), timely access to inputs (and at affordable prices), document preparation and such e-services as email. This influenced KACE's decision to pilot the franchise model for MRCs to develop and offer a wider range of demand-driven services beyond just

market information. The successful franchised MRC at Chwele Market in Bungoma Central District, western Kenya, is demonstrating that franchising holds the potential to develop and offer information and other marketing services in a financially sustainable way.

- ICTs have a critical role to play in enabling poor smallholder farmers in remote rural areas to access input and output markets; however, they must be affordable. The IVRS would seem to be more appropriate than SMS for rural users who may be illiterate, but because the IVRS call (at Ksh 20) costs much more than an SMS (at Ksh 7), the IVRS attracts fewer users per month compared to SMS.
- In a review of KACE in 2005, Tollens (2006) notes that “most market information services in Africa limit themselves to market price information. This is the essence of an MIS. But KACE also has a commodity exchange service through matching offers and bids, which are prominently displayed on blackboards at MRCs, and which are disseminated via SMS and the Internet. This is a big institutional innovation, unheard of until now, and it could really be a major institutional breakthrough in the reform of agricultural markets in Africa.”

Challenges

Some of the challenges KACE has faced include: relatively high costs to users of mobile phone calls, SMS and IVRS; ICT illiteracy among smallholder farmers; small quantities of produce of varying quality offered by smallholder farmers (lack of bulking); limited KACE resource capacity (human and financial) to scale-out and scale-up the KACE MILS; and unfriendly government policies that distort agricultural markets and a plethora of non-tariff barriers that reduce farmers’ interest in marketing agricultural commodities and thus using MILS in the East African Community (EAC) region (World Bank, 2008; EAC Secretariat, 2008). These challenges limit ICT use and market access by farmers, or greatly increase their transaction costs.

Future plans

KACE’s future plans include the following: first, scaling up the Soko Hewani and franchised MRCs from western Kenya to cover other farming areas in the country to enable more smallholder farmers to benefit from the system. Second, actively participating in the bulking of farm inputs and products (including value addition) for farmers in order to access large volume buyers

in domestic and regional markets. Third, forging alliances with other emerging commodity exchanges in eastern and southern Africa, such as the: Ethiopian Commodity Exchange; Uganda Commodity Exchange; Malawi Agricultural Commodity Exchange; African Commodity Exchange (in Malawi); and the Zambia Agricultural Commodity Exchange, in order to exchange market information and facilitate regional agricultural trade. These activities will significantly expand smallholder access to input and output markets, while at the same time help to improve revenue generation for long-term financial sustainability of MILS services. Fourth and finally, KACE would be willing to partner with research or other parties interested in a comprehensive assessment of the impact of its MILS.

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Links:

<http://www.cck.go.ke/html/child.asp?childcontid> = Communications Commission of Kenya information on mobile phone growth in Kenya.

<http://www.kenyaimagine.com/Business-Technology/The-Digital-Village-project.html> = Ministry of Information and Communications Digital Village Project information.

www.abujacomex.com = Abuja Securities and Commodity Exchange website.

www.eagc.org = Eastern Africa Grain Council website.

www.ecx.com.et = Ethiopia Commodity Exchange website.

www.ideaamis.com = Malawi Agricultural Commodity Exchange website.

www.kacekenya.com = Kenya Agricultural Commodity Exchange Limited website.

www.mistowa.org = Network of Market Information Systems for West African States website.

www.uce.co.ug = Uganda Commodity Exchange website.



Market information systems' role in agriculture marketing: The case of Malawi Agriculture Commodity Exchange

Elizabeth Manda¹,

Abstract

Market information systems emerged in the context of market liberalisation of the 1980s. This paper presents Malawi Agriculture Commodity Exchange (MACE) market information system (MIS) experiences and the views of MACE MIS participants on the value of existing price and market information data that is available to them and improvements that they would wish to see.

The experience of MACE MIS to date, show that pure price information services can play a valuable role in facilitating the efficient working of agricultural commodity markets in Malawi. The provision of pure price information must, however, be seen as a public good freely available to all users. Experience also shows that delivery methods for this service need to be low-cost to access from the users' point of view, and in this regard, radio and SMS messaging have proved a powerful way of delivering price information. From an equity point of view, a regular radio slot is very attractive as it is like talking to millions of listeners. SMS is of increasing importance, and suggests that future priorities in the development of MACE MIS should focus in part on the access of poorer farmers and traders to mobile telephony.

There are also a number of encouraging developments over the past 3-4 years – the success of MACE franchisees and farmer groups' services, the use of SMS to conduct trade transactions via MACE and partnerships for efficient service delivery.

Introduction

Malawi Agriculture Commodity Exchange (MACE) began implementing an agricultural marketing information system (MIS) in 2004 as a project of the Initiative for Development and Equity in African Agriculture (IDEAA), funded by the Rockefeller Foundation through the University of Malawi and co-financed by the Government of Malawi through the Ministry of Agriculture and Food Security. The project objective is to improve access of smallholder farmers to price and market information. This paper presents the achievements and lessons of MACE MIS, including the views of market participants on the value of existing price

and market information data that are available to them and improvements that they would wish to see.

Background of market information systems

The literature shows that formal market information systems (MIS) in Sub-Saharan Africa (SSA) came in the context of market liberalization policies aimed at overcoming knowledge deficits and imperfect information created as a result of state withdrawal from markets when most SSA countries embarked on structural adjustment policies. In market-oriented economies, the key variable in the food market system has traditionally been price of the commodity, though non-price factors are also gaining importance. Due to the important role of prices in resource allocations and as a key variable in the agricultural market liberalization reforms, price has also been a key variable in market information systems (Goetz et al., 1986). From the experience of market information services in Mali, Mozambique, Zambia, Kenya and Malawi (Weber et al., 2005; Tollens, 2005) six factors have been considered necessary for a successful MIS. These are: (i) political commitment to serving both public and private sector market participants so that information is made freely available to all; (ii) sustainable funding through cost recovery mechanisms, such as membership and commissions by users (national and international donor financial assistance is needed, but should be supported by cost-recovery mechanisms); (iii) constant targeting, reassessment of user needs, feedback from users and analysis to ensure that the information generated and disseminated meets the needs of the users; (iv) strong local capacity to acquire and use market information (if the market information generated is not used locally, the effort constitutes a waste of resources); (v) strong human resources for managing and running a results-oriented MIS to ensure that the information generated has value; and (vi) an effective institution that can maintain and provide timely services.

Various types of MIS

Several types of systems have been piloted in SSA, including the Technical Center for Agricultural and Rural Cooperation EU-ACP (CTA), the Market Information Systems and Traders Organizations in West Africa (MISTOWA), the Regional Agricultural Trade Expansion Support Program (RATES), the Regional Agricultural Trade Intelligence Network (RATIN), and the Agricultural Market Information System of Uganda (Foodnet). Advancements in digital communication systems such as radio, mobile phones,

¹Director, IDEAA-Malawi, P/Bag B345, Lilongwe, Malawi. Corresponding author (emandas2000@yahoo.com)

the Internet and satellites, have contributed tremendously to the timely dissemination of information (Tollens, 2005). MIS help in facilitating the interaction of private-sector buyers and sellers in agricultural marketing (Weber et al., 2005). However, questions emerge as to how far MIS services should go in terms of involvement in linking farmers to markets (Poulton, 2006). The Kenya Agriculture Commodity Exchange (KACE) and the Malawi Agriculture Commodity Exchange (MACE) combine price information with trade facilitation services (Tollens, 2005). These services involve linking farmers or sellers with buyers of agricultural commodities. Putting into place sustainable market information systems to provide timely information that is easily accessible to everyone is not an easy task because of a lack of mechanisms for users to pay for the service (Weber et al., 2005). One feature of MIS in SSA is that no real impact evaluation had been done, thus it has been impossible to determine whether MIS services have contributed to improved efficiency of agricultural markets (Tollens, 2005). This paper examines the achievements, impacts and lessons of MACE MIS in providing price information and trade facilitation services to smallholder farmers in Malawi.

Malawi Ministry of Agriculture and Food Security MIS services

Organizations providing marketing information services in Malawi include the Ministry of Agriculture and Food Security (MOAFS) and MACE. The MOAFS collects retail prices, farm gate prices, and livestock and horticulture prices from over 80 markets scattered across the country on a weekly basis. The information is disseminated on a weekly basis through emails to various institutions and sometimes once a month through the weekly newspapers and the mobile phone short messaging service provided in partnership with the MACE MIS. The information generated lacks trade facilitation information.

MACE MIS

MACE was launched in January 2005. Its mandate is to provide price and market information services to buyers and sellers of commodities by establishing and operating a commodity exchange of the highest integrity, available to Malawian, as well as regional and international, buyers and sellers based upon an open and free market system for the mutual benefit of participating sellers and buyers.

The overall objective of the MACE MIS is to make markets work better for smallholder farmers and lower the risks and

transaction costs that hinder market development in Malawi. Specific objectives include: facilitating linkages between sellers and buyers of agricultural commodities; empowering farmers, traders, processors and other market participants with relevant and timely market price information and intelligence that enhances their bargaining power and competitiveness in the market place; providing a transparent and competitive price discovery mechanism through the operations of the exchange trading floor; and harnessing and applying the power of information and communication technology (ICT) as a strategic tool for rural value addition and empowerment.

The MACE MIS has several components. The MIS is built on two pillars: a price information service (daily prices) and trade facilitation services (matching bids with offers). The market price service covers cereals, pulses, vegetables, tubers, fruits, spices, livestock and fertilizer. It started with three markets in 2005 and expanded to 13 markets by 2006. In addition, retail market prices from 38 markets collected by MOAFS enumerators are transmitted by SMS through MACE. Trade facilitation services involve receiving offers to sell and bids to buy from farmers and clients. Through receipt of bids and offers the following trade information is collected for various commodities: types, quantities, quality and prices of commodities offered for sale (supply) and bids to purchase (demand), where (different places/markets), when, and by whom (seller/buyer contact addresses/phones). The information is collected, updated, and disseminated daily. The system generates internal reports of daily prices and bids to buy (demand) and offers to sell (supply), which feed into trade transactions linking buyers and sellers.

The system has the following implementation structures: a central hub based in Lilongwe, Malawi, which is responsible for receiving and processing the information and sending it out daily using various channels; three Market Information Centers (MICs) in Lilongwe, Mzuzu and Limbe, and ten franchised market resource centers in Karonga, Jenda, Rumphi, Kasungu, Mitundu, Lobi, Lizulu, Liwonde, Mwanza, and Muloza, which are also responsible for collecting information in the field and sending it to the hub. Franchising is a business relationship between MACE, as the franchisor and owner of business rights, and the franchisees (operators of businesses) who work in a framework coordinated by the MACE hub. The operator owns the business generated from trade facilitation and is also responsible for price information collection, while the MACE hub is responsible

for coaching and developing partnerships in support of the franchisees in return for “a consideration”. The other tools used by MACE are farmer-managed market information centers, black chalk boards for displaying offers to sell and bids to buy, a mobile phone SMS with Telekom Networks Malawi, a website (www.ideaamis.com) and email, and a weekly radio program in order to reach out to various categories of MIS users. MACE also works with the MOAFS Joint Technical Secretariat for dissemination of information to NGOs.

Methodology

MACE target beneficiaries and implementation principles

MACE is a development initiative that seeks to bring about development change, but with a business approach for long-term financial sustainability. In this respect, MACE seeks to mobilize smallholder farmers organized in groups, associations, or cooperatives to improve their capacity for competitiveness in the market place through provision of reliable and timely market information and related services. In addition, MACE is built on the principles of cost recovery for financial sustainability beyond the initial period of donor funding, i.e., users of services should pay for them, albeit after an introductory period. This has been achieved, with the introduction of commissions on successful trade transactions linked through MACE services. The revenue generated is ploughed back into improving and providing services on a financially sustainable basis. However, in view of the fact that the target beneficiaries are smallholder farmers, the majority of whom cannot pay for the full cost of the service, MACE is implemented as a public/private initiative. For this reason MACE has strived to develop various partnerships and attract public funding. MACE also strives to ensure that farmers have access to MIS services for all their agricultural produce (they often grow more than one crop). For economies of scale and geographical spread, MACE is implemented as a commodity neutral market information system. This means that MACE aims to make information available on all agricultural commodities that are important to farmers.

The target beneficiaries of MACE are smallholder farmers who benefit through increased market access from trade facilitation and access to price information. Other indirect beneficiaries are small-scale entrepreneurs; private-sector buyers, including processors, through access to produce; and government, through taxes from the increased incomes of smallholder farmers who are able to better access markets.

Data gathering for the paper

To generate the information presented in this paper, two kinds of data gathering methods were used: desk research using data already available within MACE, and surveying MACE MIS users. The survey was carried out from April to June 2008, with the aim of discovering a range of information concerning the users of MACE MIS services. What was working and not working and why? How did users rate the usefulness of the service, and what were the key food marketing problems they faced and the means to overcome them. Forty-one respondents were selected randomly from MACE users, by the type of MACE tool used to access MACE MIS. The selection breakdown was as follows: 13 SMS users were selected from among 1,398 SMS cell phone numbers; 2 random email addresses were selected from 370; 15 office visitors were selected from among 82 visitors; 4 workshop participants were selected from 82 participants in MACE annual stakeholder meetings; and 7 individuals were selected from among 54 radio listeners. The radio listeners sample population was based on listeners registered from February 2008 to March 2008, because this is the period during which MACE had started documenting listeners who call and give their phone number contacts (previous radio programs did not have the means for recording listeners as the program used to air pre-recorded information). The sample population for other tools was based on users who had been involved from January 2007 to January 2008.

A structured questionnaire was used to collect the data. Participation in the survey was voluntary and each respondent signed a consent form. The respondents were interviewed through a combination of face-to-face surveys, and by returning the questionnaires to MACE using a pre-stamped envelope. Many survey forms were not returned. Possible reasons for this include not receiving the letter, change of address, posting system inefficiency, or just not wanting to respond.

Achievements and results

The following section presents an analysis of data of MACE MIS already available which is later used with the findings from MACE MIS users survey to interpret the achievements and lessons of MIS in agriculture marketing.

Examination of MACE MIS data

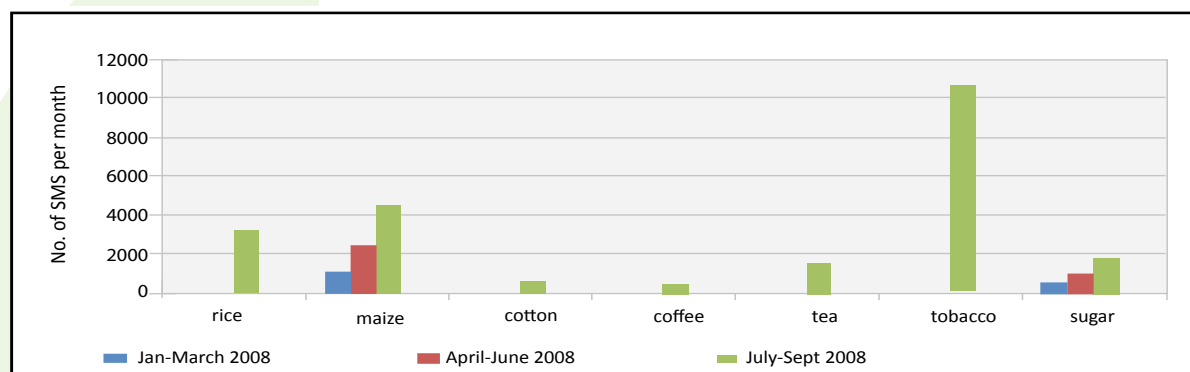
Short Messaging Service – MACE uses two private mobile phone companies, TNM and Zain Malawi, for dissemination

of agricultural prices, though under different arrangements whereby TNM is contracted directly and Zain is contracted through a third party. The advantage of the TNM system is that it can be used not only to access prices in real time, but also to sell or buy agricultural commodities. The Zain system is only for accessing price information. With the Zain service, which started in February 2008, total SMS usage for accessing price information from February 2008 to September 2008 was 27,675 messages. This gives an average of 3,075 SMSs per month, which is comparable with TNM whose average is 2,000 to 3,000 SMSs per month since 2005. However, the dissemination of agricultural prices through Zain has been accelerating every quarter, with the largest growth from July to September 2008 (22,721 messages were sent in 3 months, giving a monthly average of 7,573 per month). The reason for this is that in the Zain system the price service is available on the menu of the SIM card, which makes it easy for customers to access the information. By contrast, a TNM customer has to enter a sequence of instructions manually in order to access prices. Tobacco prices were the most frequently accessed, followed by maize (Figure 1). These are the two most important crops in Malawi.

Tobacco is the main cash earner and export crop for Malawi, while maize is the main staple food crop, hence more users are interested in their prices. SMS is potentially an extraordinarily

According to statistics on the TNM website, the two mobile phone companies have a combined total customer base of 1,425,814 subscribers, comprising 461,814 TNM subscribers (August 2008) and 964,000 Zain Malawi subscribers (June 2008). This means that for MIS services the SMS customer base that MACE MIS should strive to reach is over one million subscribers.

Websites and email – MACE uses the www.ideaamis.com website as one among several methods for dissemination of agricultural marketing information. At present the outreach of this service is extremely limited, due to the absence of the required infrastructure and access to the Internet in most rural areas. Moreover, only 2% of rural Malawians have access to electricity (GoM-HIS, 2005). For these reasons, usage of the Internet service has ranged between 50 and 300 hits per month. Related to the website is email, a tool that is mostly used for dissemination of daily price and market information. Occasionally the services provided by MACE email have been used to receive offers for sale or bids to buy. The MACE website and email services hold considerable commodity exchange potential in Malawi. However, there is an important risk that a digital divide will open up between the few who can access and make full use of these services, and the many that are not able to do so due to infrastructural, hardware and cost constraints.



Source: Author, derived from MACE data

Figure 1: SMS agricultural prices usage statistics 2008 through ZAIN Malawi

cost-effective means of trading in crops when it is considered that one SMS costs 0.10 USD, as compared to the amount of money and time that would be spent by a farmer or trader travelling to a physical market. Currently TNM and Zain are the only operators involved, but the other two mobile phone companies operating in Malawi have recently been granted licenses to operate.

Future development of these services clearly needs to devise and prioritize ways of avoiding this outcome.

Through email, an electronic mailing list of 360 addresses receives daily prices. These include mostly NGOs, donors, and farmer associations, and relatively few individuals.

Radio – The use of the radio for dissemination of agricultural marketing information started in January 2004. The program was run weekly with pre-recorded information, first for 15 minutes, and then later for 30 minutes, at 6:00 pm. The 6:00 pm time was selected because it was a prime time. Most radio listeners, especially farmers, would be available to tune into the program after spending their day on the farm or on other activities. The program was run in partnership with various international institutions, such as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), who contributed from 2004 to 2006, Sasakawa Global 2000, and the International Centre for Soil Fertility and Agriculture Development (IFDC), which joined in 2006 for a few months. The content and format of the program had to some extent reflect the interests of these partners, and for this reason had included maize, groundnut and fertilizer

extension messages, in addition to price and trade opportunity information. These were the interests of SG2000, ICRISAT, IFDC and MACE, respectively.

The program became interactive in January 2008 when it changed from broadcasting pre-recorded market information to a live phone-in program, which allows listeners to place offers for sale or bids to buy commodities, thus permitting two-way real time exchange. The live radio phone-in program has resulted in the generation of bids and offers, and finalization of exchange transactions on air. The program is now run in collaboration with MOAFS and the Agriculture Rural Development Program (ARDEP) Market Access Project. Partnerships in the running of the radio program have been an important element because buying airtime to run the program is not cheap. It costs Mk 32,000 (~US\$ 230) per program. However, the use of radio is a promising

Table 1. Spatial distribution of sellers seeking trade linkage services at the MACE hub in 2008, in the form of offers to sell

District	%	Frequency distribution of sellers by source of request	
Blantyre	7.5	75	Blantyre (21), Chileka (3), Kachere (1), Limbe (42), Lunzu (7), Machinjiri (2), Michiru (2), Zalewa (1)
Dedza	5.7	57	Lobi (32), Dedza (17), Bembeke (1), Chimbiya (1), Mtendere (3), Thete (3)
Kasungu	8.1	81	Chamama (2), Chatoloma (1), Kasungu (66), Nkhamenya (7), Santhe (4), Chulu (1)
Lilongwe	12.5	125	Various areas (14), Chiseka (1), Chitedze (3), Chitipi (2), Kalumbu (1), Likuni (1), Lilongwe (93), Lumbadzi (1), Malingunde (2), Mitundu (6), Mpingi (1), Nathenje (4), Njewa (2)
Mangochi	1.5	15	Monkey bay (9), Mangochi (1), Namwera (2), Ulongwe (3)
Mchinji	1.6	16	Namitete (3), Njala (1), Mchnji (12)
Mzimba	8.4	84	Kanjuchi (41), Mzimba (7), Ekwendeni (1), Emfeni (17), Jenda (15), Luwerezhi (1), Mafundeya (2),
Mzuzu	2.4	24	Mzuzu (24)
Ntcheu	12.0	120	Ntcheu (3), Balaka market (40), Manjawira (1), Lizulu (23), Ntonda (52), Kampepuza (1)
Others	13.0	130	Balaka (Balaka, Mdeka), Chikwawa (Chikwawa, Nchalo, Ngabu), Chiradzulu, Dowa (Dowa, Mponela), Karonga (Kaporo, Kyungu), Liwonde; Machinga (Machinga, Ntaja), Mozambique Mitundu, Mulanje (Mulanje, Muloza, Luchenza, Juma), Mwanza, Nkhatabay (Chintheche, Nkhatabay), Nkhotakota (Dwangwa), Nsanje; Ntchisi (Ntchisi, Mawira), Phalombe; Salima (Salima, Chipoka), Thyolo (Bvumbwe, Thyolo), Zomba (Chingale, Zomba, Thondwe)
Phone	27.4	274	Only contact phone numbers were provided so difficult to tell their geographical spread
Total	100	1001	

Source: MACE data

tool for dissemination of information as it has the potential of reaching the whole population of Malawi (over 13 million people) with key messages.

Users of MIS

Spatial distribution of MIS users and type of users – Users of MACE MIS services for trade facilitation services, according to 2008 data, are spatially dispersed across the country, with some users even from neighboring country's border areas with Malawi, like Mozambique (Tables 1 and 2). The demand for services through offers was received from 27 of the 28 districts of Malawi with the exception of Likoma (Table 1).

MACE has physical offices in only 12 districts. This means that the majority of the districts were reached through the radio program, and in association with other activities such as market shows, training of farmers in MIS use, participation of MACE in trade fairs and partnership with other NGOs and projects. These included the World Agroforestry Center (ICRAF), the National Smallholder Farmers Association of Malawi (NASFAM), and Concern Universal Microfinance Organization. The increased demand for trade linkage services in Ntcheu and Mzimba is mainly due to farmer empowerment activities. These were done through the Agricultural Research and Development Program (ARDEP) Food Security through Market Access Project for two

groups in Ntcheu and two groups in Mzimba, which made the groups appreciate the importance of market information services to their communities.

Demand for services in the form of bids to buy also came from a diversity of locations not only in towns or areas where MACE has offices but also in rural areas where MACE does not have offices. However, most rural places where MACE does not have offices registered low demand for services. The majority of buyers looking for information on produce supply are concentrated in Blantyre city, followed by Lilongwe city. Blantyre city (population 661,444) is the commercial center of Malawi with a lot of food and animal feed processing industries, while Lilongwe (population 669,021) is the capital city with a large proportion of people having high purchasing power. Thus far, these two cities form the large markets for agricultural produce and trading activities concentration in Malawi. Again, the buyers who have sought market linkage services are spread across 18 of the 28 districts of Malawi, with those not registering high demand being clustered as 'other areas' (Table 2). Some of the buyers of produce are also farmers, most of whom are based in remote rural areas. MACE has no restrictions on who should access its information and trade.

Table 2. Spatial distribution of buyers voluntarily looking for trade linkage services at MACE hub in 2008 in the form of bids to buy

District	%	Frequency of buyers by source of request	
Blantyre	24	45	Blantyre (17), Chileka (1), Limbe (25), Lirangwe (1), Nkula Trading (1)
Kasungu	7	14	Kasungu (12), Nkhamenya (1), Santhe (1)
Lilongwe	23	43	Chinsapo (1), Area 49 & Area 3 (4), Chitipi (2), Lilongwe (34), Mitundu (2)
Mzimba	9	16	Ekwendeni (1), Mabilabo (1), Kanjuchi (11), Mtwalo (1), Mzimba (1), Chamama (1)
Mzuzu	7	14	Mzuzu (14)
Ntcheu	5	10	Balaka (5), Lizulu (4), Ntonda (1)
Phone	9	17	Phone (17)
Other areas (1-3% contribution)	16	30	Dedza (Lobi), Dowa (Dowa, Mponela); Karonga; Mchinji; Mulanje (Luchenza, Muloza); Mwanza; Nchalo; Nkhotakota (Dwangwa); Rumphi (Nchenachena, Betere, Rumphi); Salima; Thyolo; Zomba (Domasi)
Total	100	189	

Source: MACE Hub Data

It should, however, be noted that of the 12 MACE offices in 12 districts, six were franchised in April 2008. The franchisees have the capacity to meet most of the trade demand within their areas on their own, hence do not report most of those demands to the MACE hub. Instead, they report only those that need MACE network support. This therefore contributes to apparently low trade facilitation demand from Karonga, Jenda, Mitundu, Liwonde, Mwanza and Muloza. The results presented in Tables 1 and 2 are therefore mainly MACE figures, with a few coming from the franchised offices. Most of the franchised offices have registered very high demand for MIS services in trade and market linkage services, estimated at 10,000 users from March-December 2008. The increased demand for services in franchised operations came because of diversified marketing services that franchisees are able to offer with the backing of a credit facility, which was made available to them through the facilitation of MACE. With resources from the Rockefeller Foundation, MACE guaranteed franchisees access to loans from a commercial bank, which would not have offered the loan without the credit guarantee facility. The credit facility provided an important boost towards bulking of produce, as farmers require upfront payment for their sales and most public institutions in markets take up to 6 months to pay for purchases.

The franchisees are essentially running the services as independent brokers. MACE decided to start piloting the franchising innovation with six of its rural offices as a way of ensuring full utilization of capacity of the offices in service delivery in an efficient and cost effective manner. The selection process of franchising involved advertising and interviews, but the key variable was the interest of the franchisees to serve smallholder farmers. To date, the franchisees have been made up of 50% former MACE staff and 50% non-MACE staff. The major conclusion is that demand for MIS trade and market linkage services by sellers is there. The next section of this paper addresses the question: what is the size of the buyers and sellers that seek such, and how much of the demand has been satisfied? This will be examined by looking at the size of sellers and buyers who have sought trade facilitation services, and the trade volumes concluded from 2005 to 2008.

Annually, there are many sellers seeking trade facilitation, as shown in Tables 1 and 2. The majority of sellers who seek trade linkage services are small-scale sellers or traders wanting to sell from less than a bag up to 5000 bags (250 tons of a crop) (Table

3). In general, few large buyers must be matched with the small volumes of goods offered for sale from many sellers. Some offers for sale and bids to buy have not been satisfied due to failure to reach agreement on the price between the buyer and seller, or because of the need for immediate payment upon delivery by farmers or sellers when public institution buyers take time to pay, or because of the often small and fragmented volumes for sale.

Trade volumes of between US\$ 215,000 and US\$ 1,500,000 took place annually between 2005 and 2008. Trade volumes picked up rapidly in 2007, with a 60% growth over the previous year, while 2008 registered a trade volume growth of over 500% above 2007. The main reasons for this large growth in 2008 was the introduction of innovations that included: the live radio phone-in program called “Supermarket in the Air” for the trading of agricultural produce; the franchising of six field offices into Market Resource Centers; and the establishment of farmer-managed market information services.

Of the Mk 212 million trade volume registered in 2008, these innovations contributed as follows: MACE franchisees, Mk 90.5 million; farmer-managed market information services, Mk 10.0 million; the radio program, Mk 36.2 million, and the remaining Mk 75.2 million by MACE directly. It is anticipated that, as the business of the franchisees grows, MACE trade volume will decline, and MACE will assume a greater role as central coordinator. One example in which the coordinated development of partnerships was done by MACE occurred during the 2008/09 crop season. Government subsidized maize seed production and MACE entered into partnership with seed companies, such as Seed Co and Monsanto. These partnerships involved 6 franchisees, 3 farmer-managed MIS centers, and MACE subscribers, all of whom participated in selling seed without each one having to individually negotiate the deals.

Four market information system centers managed by farmers have been set up – two in Ntonda and Balaka, in Ntcheu district; and two in Emfeni and Kanjuchi, in Mzimba district – following a similar model developed by MACE which allows a committee of ten members in each center to receive offers for sale and bids to buy from farmers within their communities and be able to facilitate trades. To ensure that the wider society becomes aware of the goods on offer and demanded at their centers, the communities send their offers and bids to the MACE hub for airing on the live phone-in radio program. Through this process, farmer committees have been able to conclude sales, thereby

contributing to their market access both locally and nationally. They generate their revenues through savings mobilization and commissions, but most of them have offered the services for free because they are only one year old and wanted to interest the communities first.

The live radio program started in January 2008. It runs weekly every Friday for one hour from 5:00 pm on the Malawi Broadcasting Corporation (MBC) national radio station. Sellers and buyers phone in to trade while MACE staff attend to the calls as they come in, and one staff member presents the program using current data on offers to sell and bids to buy received during the week. A total trade volume of Mk 36.2 million was realized in 2008, with Mk 21.8 million in trades taking place between buyers and sellers who contacted each other independently after listening to the radio. About Mk 15.0 million in trades took place with the facilitation of MACE, which matched buyers and sellers to complete the trades.

Major markets for concluding trade transactions have varied. From 2004 to 2006, the major ones were spot markets, but this

changed greatly in 2008 with the capacity-building efforts of the franchisees that started serving most of the spot markets from the private sector. MACE began concentrating on tender markets from public institutions, which are difficult markets for small-scale farmers and entrepreneurs to access on their own, as they have complicated tendering procedures with strict delivery deadline requirements. More generally, an increasing proportion of urban and institutional markets require high quality products, timely and regular deliveries, and economies of scale that the majority of small farmers may find difficult to meet (WDR, 2007). MACE has had physical trading floors operating in Lilongwe and Blantyre once a week for 3 hours, but the floors have not been very effective in attracting active sellers and buyers on specific days and time. What has been happening has mostly been spot trading, in which MACE receives offers to sell and bids to buy at different times, using various means described earlier. MACE's job has been to match these orders as they come. There is, however, a need to revive the trading floor system, because this promotes transparency and fair price discovery.

Table 3: Size of sellers and buyers seeking trade linkage services

	2005		2006		2007		2008	
Quantities	Sellers	Buyers	Sellers	Buyers	Sellers	Buyers	Sellers	Buyers
1-10 bags	85	27	78	26	80	28	281	56
11 -50 bags	60	7	121	13	84	4	131	24
51- 100 bags	78	7	59	8	50	0	45	15
101-500 bags	77	10	84	23	84	9	67	10
501 - 1000 bags	22	15	38	6	22	3	11	4
1001-5000 bags	26	11	24	17	14	6	16	13
5001-10000 bags	4	2	3	2	3	4	0	6
10001-20000 bags	1	2	1	1	0	1	0	2
20001-49999 bags	1	0	0	1	4	0	1	0
50000 bags	0	3	1	2	4	0	0	0
Over 50,000 bags	57	40	66	28	90	23	218	81
Did not indicate	10	7	11	12	3	1	26	0
Total or <i>n</i>	421	131	486	139	438	79	796	211
Total sellers & buyers	552		625		517		1007	
Concluded trade volume (US\$)	215,124		197,582		362865		1493024.47	
Trade vol. annual growth %			-4		60		502	

Source: MACE data

Price discovery mechanisms and commodities traded

One of the objectives of MACE has been to facilitate price discovery by both the seller and the buyer. Usually the seller offers to sell his/her commodity at a different price from the price that the buyer offers, with, in most cases, the seller offering to sell at a higher price than what the buyer is prepared to pay. The price at which trade takes place is therefore negotiated until a price that is agreeable to both the buyer and seller is reached. Two crops, beans and maize, are used here to demonstrate what happens between offer price to sell and bid price to buy, drawn from actual 2008 offers and bids. Buyers tend to under-price while sellers tend to over-price, with a few cases in which prices fairly overlap, as shown in Table 4. Through negotiation between the buyer and the seller, an agreed price at which the transaction takes place is derived. The negotiated prices are used for sales of commodities, which sellers and buyers freely choose to trade.

of samples from the buyer or seller and also physical verification of the whole consignment. Thus price, while clearly being at the center of exchange negotiations, is ultimately arrived at in the context of many other factors that are taken into account by buyers and sellers. The type of price used for trading at MACE in most cases is the wholesale price, but this varies depending on the volume of trade, with most buyers willing to pay slightly more for large volumes.

Commodity prices are set through negotiation at the time of sale based on the current market demand and supply, which in some cases has created a challenge for contract tender markets, especially with government institutions. The challenge comes when the commodity starts going off-season and becomes expensive, but tender prices are fixed. However, negotiations with buyers have resulted in upward price adjustments. The main commodities traded cut across cereals, fresh foods, and legumes.

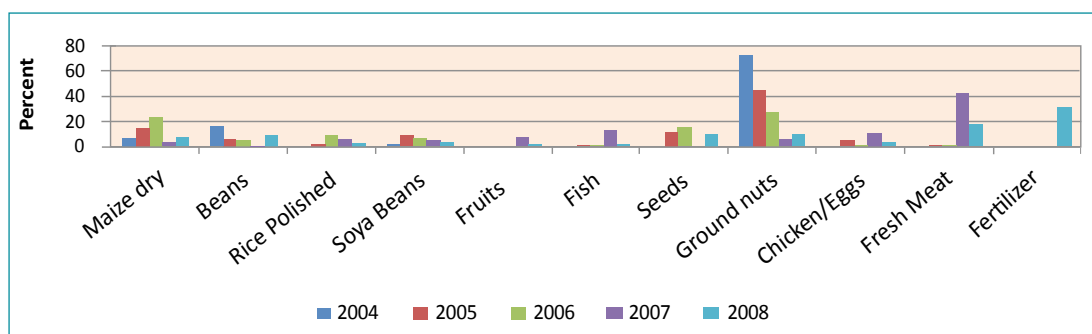
Table 4: Price Discovery

Months	Beans		Maize	
	Offer Price Mk/kg	Bid Price Mk/kg	Offer Price Mk/kg	Bid Price Mk/kg
January	120	*	*	*
February	80-90	*	28	20, negotiable
March	120, negotiable	90, negotiable	negotiable	negotiable
April	85-120	180, negotiable	24-40	45, negotiable
May	100-140	100	40, negotiable	20-40, negotiable
June	110-300	negotiable	negotiable	26-38, negotiable
July	140-180	140, negotiable	45-60	45-55, negotiable
August	50-200	*	55-79	50-55, negotiable
September	170-250	*	negotiable	
October	210-230	110		
November	170, negotiable	*		
December	194			

Source: MACE Data

The MACE hub acts as a facilitating mechanism for the exchange of information that results in an agreed price and other conditions for a transaction to take place. This additional information includes such factors as whether the buyer collects or the seller delivers, where the commodity is physically located, the quantity and quality of the commodity available for sale, and so on. Quality of produce is usually based on visual observation

Fresh foods, especially beef, grew strongly from 2007 (Figure 2) mainly because of the tender markets with public institutions, which most smallholder farmers cannot access on their own because of the complicated bidding procedure and requirements for regular deliveries. These are roles where MACE has particular strengths for improving the access of small farmers to market opportunities, in this instance due to MACE's familiarity with the state tendering process.



Source: MACE Data

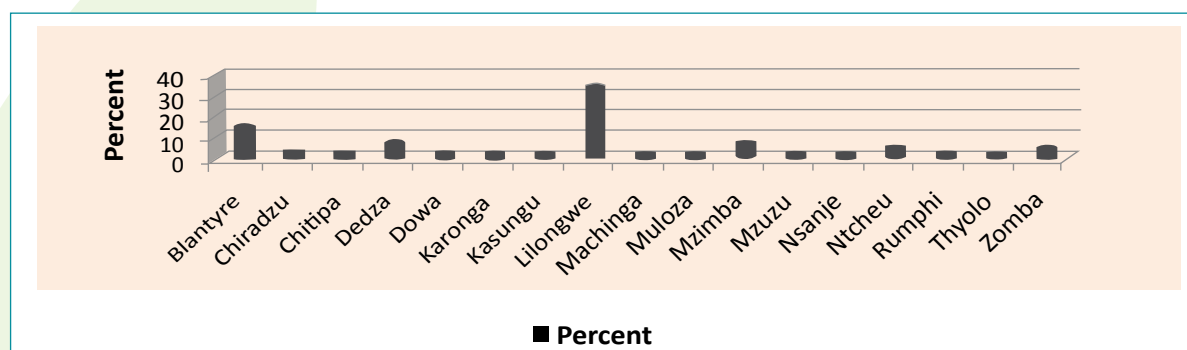
Figure 2. Main commodities traded 2004-2008 in percentage terms annually

Results of the MIS user survey

Having described the operation of MIS services already available at MACE, this section provides empirical evidence from the results of a MACE MIS users' survey, which was carried out with the aim of capturing the perceptions of MIS users on the usefulness the services offered, and identifying areas requiring improvement. Important parameters covered in this section include a description of users of MIS, the type of MIS services accessed, the usefulness of MIS services in decision-making, the uses of MIS, additional types of MIS services not currently provided but requested, and areas requiring improvement. Fieldwork with MIS users was conducted by the author in March-June 2008.

the site of the MACE office, and is where most large commodity traders in Malawi have their head offices. Moreover, Lilongwe has the highest density of mobile phone and Internet users in the country.

In terms of the profession or occupation of MIS users, the majority are small-scale businesspersons, followed by farmers, then government and private companies (Figure 4). NGOs, MACE staff, and MOAFS enumerators are also significant users, as facilitators to assist farmers and businesspersons to access MIS services.



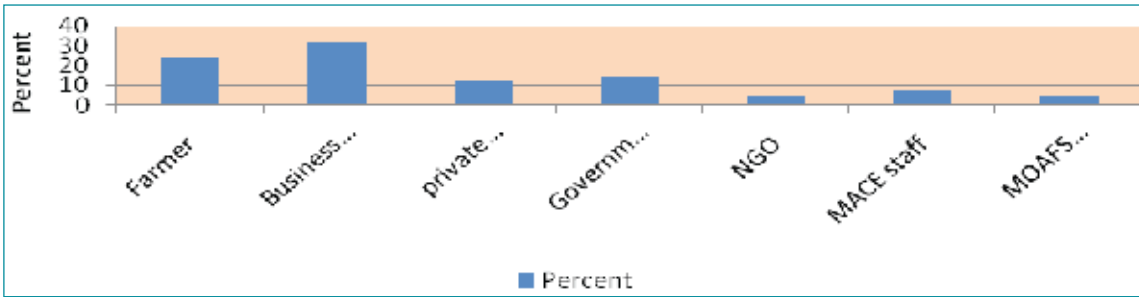
Source: Fieldwork of MIS users conducted by the author March-June 2008

Figure 3: Spread of MIS users by district in percentage terms

Description of MIS users

The MIS survey interviewed 41 users who access price information or trade facilitation services. The largest proportion of MIS users are located in the capital city, Lilongwe (34.1%), followed by Blantyre (14.6%), then Dedza (7.3%), Mzimba (7.3%), Ntcheu (4.9%) and Zomba (4.9%). The remaining districts taken together correspond to only 2.4% of users (Figure 3). The position of Lilongwe in MIS use is perhaps not surprising. This is

In terms of gender, 80.5% of MIS users to date have been men, while only 19.5% have been women. This reflects in part the lead that males in farming households take in marketing crops, even when it is women who conduct most of the physical operations of farm production. For MIS services to reach out to distant potential users there is need for support from facilitating organizations working with farmers and businesspersons to help create awareness of the availability of the services and



Source: Fieldwork of MIS users conducted by the author March-June 2008, N = 41

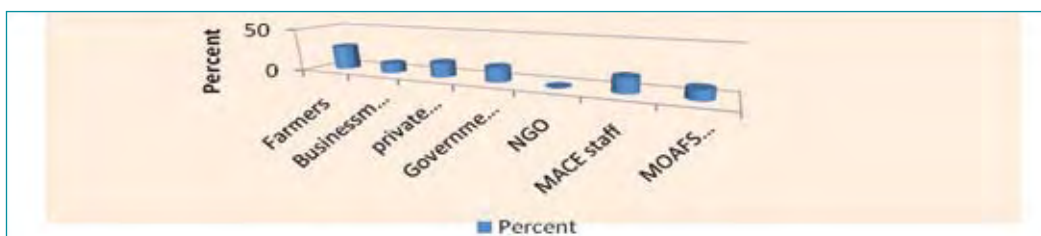
Figure 4: MIS users by category of organisation in percentage terms

the benefits that can result from taking advantage of their existence. In its four years of operation, MACE MIS has had partnerships with NGOs (Concern Universal Micro-Finance Organization (CUMO), Sasakawa Global 2000, and Land 'O Lakes Malawi), ICRISAT Malawi, and the Common Market for Eastern and Southern Africa (COMESA) with the aim of reaching out to small farmers and traders with MIS services. ICRISAT in Malawi promotes various crops but their interest in MIS centered on the groundnuts market. By contrast, Sasakawa Global 2000 was primarily interested in the value of MIS for the maize market. Both these organizations collaborated with MACE MIS on dissemination of production and market information over the radio in 2005 to 2006. Land 'O Lakes interest in MIS concerned the dissemination of price information through SMS in 2006 for dairy animals and milk products. The COMESA partnership was aimed at building the capacity of farmers and MACE staff in accessing and using MIS services, and building value chain analysis skills for MACE staff and franchisees. Thus MACE MIS services, apart from covering existing price and market information, had to add tailor-made services to suit various partners.

The major method by which users access MIS is through SMS (43.9%), while over 50% access the services through: office visits (34.1%), radio (19.5%), and email (2.4%). Access through the radio was expected to have scored higher, but the low number of people who listened to the live phone-in radio

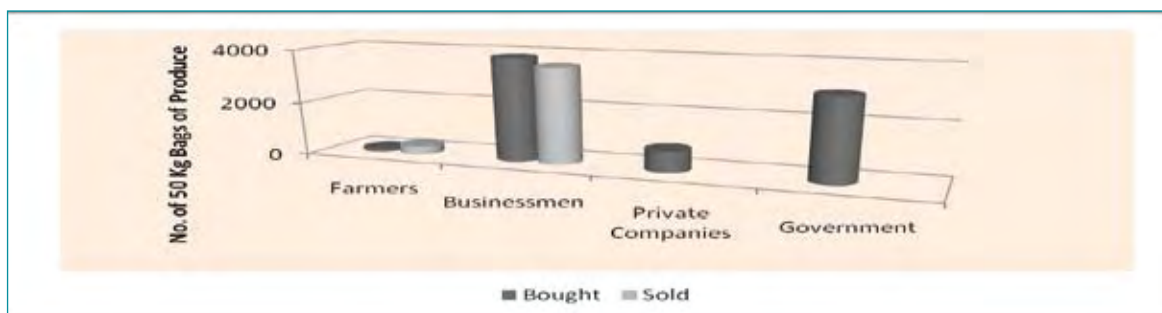
program in February to March 2008 was due to the program just commencing in mid-January 2008. Access to MIS through SMS increased, as a proportion of all means of access, compared to the MACE baseline survey of 2006, which recorded access rates of 36.3% through SMS, 61.1% through radio, 2.1% via the Internet, and 23.2% from black boards (Phiri, 2006).

It is important to note that the radio program started in 2004 broadcasting pre-recorded market information messages, but from mid-January 2008 the program changed to a live phone-in radio show. This is a more interactive program, which allows users to phone in and make trades on the radio. The blackboard as a means for information dissemination is still an important tool for users who visit MACE offices. SMS seems to be a preferred option because it is cost effective compared to office visits. With SMS, one can access information 24 hours/day as long as there is electricity. Obviously, this is not the case with office visits during working hours or over the radio on a weekly basis. Email for access to MIS services is the least used, and the reasons include lack of access to the required hardware and infrastructure, as well as cost. However, email is the most important means of disseminating daily prices to NGOs and donors in Lilongwe. The majority of SMS users are farmers (28%), followed by government officials, private sector companies, and MACE staff, all at around 17% each. Among this group, small-scale businesspersons use the services less than others (Figure 5).



Source: Fieldwork of MIS Users conducted by the author March-June 2008, N=41

Figure 5: SMS users by category of users in percentage terms



Source: Fieldwork of MIS users conducted by the author March-June 2008

Figure 6: Mean quantities of produce bought and sold in the 2008 season at the time of survey

The type of sellers who use MIS services to sell their produce are small-scale farmers and traders, and their mean quantity of produce sold per day is 3.6 and 38.3 bags, respectively, during the peak marketing season. Large private companies that seek MIS services were, at the time of the survey, not engaged in selling, as this was a period when previous purchases were being moved to storage (Figure 6). Small-scale traders dispose of (sell) the produce they purchase as soon as they buy it. Storage of produce, especially cereals, is very important for Malawi because the country relies on rainfall for its production and the rains come only once per year and for only a few months. Storage therefore ensures availability of commodities throughout the year to meet consumption needs. Evidence shows that margins for most agricultural produce increase with storage, hence storage is an area of keen interest for MACE to ensure the supply of commodities to be traded on the exchange and also for farmers and small-scale entrepreneurs who benefit from better prices during off-season periods. MACE currently does not store produce. This may change in the future if it can develop warehouse services to be used by sellers and franchisees as they wait to trade their commodities on the exchange. Such a service would also boost MACE work, as it would provide guaranteed stock when a bid to buy is registered.

Type of market information services accessed and usefulness of the services

Close to 50% of MIS users accessed price information only, 35% accessed trade facilitation services and 15% received both price and trade facilitation services. Over 90% of MIS users indicated that the information they accessed was helpful to their decision-making. In terms of usefulness, we looked at how well MACE was

delivering its services and whether they met users' expectations. Users ranked highest the timeliness of the MIS services, followed by their accuracy. The least important factor was inconsistency, meaning that users were less concerned that the same type of information was provided on a regular basis (Table 5).

Table 5: Ranking of usefulness² and uses of MIS services

Ranking	Scores	Usefulness
1	110	timeliness
2	127	accuracy
3	142	relevance
4	147	precision
5	200	inconsistence

Source: Fieldwork of MIS users conducted by the author March-June 2008

In terms of what MACE users do with the information they receive, finding buyers was ranked as the most important use of MIS, followed by assessing demand for commodities and, interestingly, the least important use was to find out where better prices were on offer (Table 6).

Table 6: Ranking of uses³ of MIS services

Ranking	Scores	Uses
1	120	finding buyers
2	122	assessing demand
3	142	knowing consumer preferences/market requirements
4	150	improves price bargaining
5	204	knowing where better prices are offered

Source: Fieldwork of MIS users conducted by the author March-June 2008

²MIS users were asked to rank "usefulness" of MIS services on a scale of 1 to 5 with the most important being allocated a score of one and least important 5 (or 6 where the question was not answered). The variable with the lowest scores was therefore the most important.

³Uses of MIS were ranked on a scale of 1 to 5 with the most important being allocated a score of one and least important 5 (or 6 where the question was not answered). The variable with lowest scores was most important.

This may reflect the relative immobility of farmer sellers compared to the traders to whom they sell. Nevertheless, it is considered that farmers' use of MIS services can potentially play a major role in strengthening the hand of farmers in their price negotiations with traders. Finally, users were asked to rank the additional types of information that they thought would add value to MIS services in the future. The results of this question are summarized in Table 7 and are quite interesting. The highest score was obtained for a question on transport brokerage information. In other words, MIS users would find it particularly useful to have regular information on the costs of moving produce available from different suppliers of transport services. This makes sense, especially for small- and medium-sized traders, who probably lack an overall view of the competitive cost of transport.

Table 7: Additional types of market information

Ranking	Scores	Additional types of market information required
1	198	Transport brokerage
2	220	Crop production guidance
3	221	Seed sources
4	229	Variety specification
5	241	Imports and export regulations
6	247	Grade and standards specification
7	258	Post harvest handling advice
8	260	Storage

Source: Fieldwork of MIS users conducted by the author March-June 2008

Other services prioritized were guidance on crop production, sources of seeds, and information on alternative crop varieties. However, these services stray into areas more typically considered in the province of agricultural extension. Therefore, some careful thought would be required concerning boundaries of competence regarding how far MIS should go to provide this kind of information.

Limitations of MIS in contributing to efficient agricultural markets

As part of the MIS user survey, respondents were asked to prioritize from a long list of well-known marketing problems that are encountered in Malawi. This list was drawn up after consultation with marketing specialists, as well as from the frequency of their mention in numerous reports and documents on agricultural marketing in the country. It is notable that finding

buyers is accorded the top priority (Table 8), suggesting that MIS users lack a choice of buyers for the produce that they have for sale at a given point in time. Small traders are the ones who buy produce directly from farmers in rural areas. The majority of these traders buy produce on their own account, and once they have made their purchases, they start looking for markets to sell it (as demonstrated in Figure 6, which shows that small-scale traders do not engage in storage and that they sell the produce as soon as they have bought it).

Table 8: Marketing problems

Rank	Scores	Marketing problems
1	197	Finding buyers
2	205	Transportation of produce from the farm to the point of sale
3	213	Poor rural roads
4	227	Lack of credit
5	252	Finding out selling prices
6	290	Storage costs
7	313	Loss of crops in storage
8	330	Use of inaccurate weighing scales
9	337	Poor quality of crops purchased from farmers
10	356	Theft
11	370	Failure by farmers to honour contracts
12	496	Lack of farm inputs
13	499	Lack of extension services

Source: Fieldwork of MIS users conducted by the author March-June 2008

This means that both farmers and traders face similar problems in finding buyers for their produce. MACE target clientele are smallholder farmers. However, a key limitation they face is the volume of commodities smallholders can offer for sale (when selling individually). Only a very small proportion of them belong to associations, hence there is a significant challenge in assembling (bulking) produce to facilitate trading. Traders are currently doing this in ad hoc ways, which blurs the distinction between wholesalers and retailers in working with various clients to achieve the overall objective of improving market access of smallholders.

Many of the other problems relate to rural infrastructure (poor rural roads and lack of transport), while others relate to adverse trader behavior (for example, inaccurate scales), or adverse farmer behavior (poor quality crops for sale). Lack of credit is an important factor for traders, who must finance purchases before

they realize an income from sales. Some of these problems can be improved through the use of MIS services (especially those related to bringing buyers and sellers together, and better price knowledge), while others relate to broader problems in the transaction costs of markets that cannot easily be tackled by improvements in MIS alone.

Lessons and conclusions

The major findings regarding MIS services in Malawi point to the fact that MIS services have a role in providing pure price information services, non-price information and trade facilitation activities in order to improve market efficiency. The experience of MIS to date, and our user survey, show that pure price information services can play a valuable role in facilitating the efficient working of agricultural commodity markets in the country. However, price information provision must be seen as a public good freely available to all users, otherwise it would merely advantage those users prepared to pay for the service over those users unable to pay (if MACE MIS was to charge for provision of price information). Facilitating trade exchanges is, however, an area in which MACE MIS can reasonably charge users for the service provided. Both sellers (farmers) and buyers – who in some case are also farmers – require MIS services as demonstrated by voluntary demand coming from all over the country. Those who have accessed the MIS services have found the services useful in their marketing decision-making. With price information services, both farmers and buyers are able to know the best price without expending a lot of resources to contact many different buyers or sellers. A commodity neutral information system is of greater benefit to the majority of smallholder farmers, as the same farmers usually grow more than one crop. The majority of buyers accessing MIS services are small-scale businessmen who also buy produce directly from farmers. The policy implication of this fact for MIS is that, if MIS services are to benefit smallholder farmers, it is important for those services to both target smallholder farmers and small-scale traders or entrepreneurs. Non-price information poses issues concerning the boundaries of MIS relative to the competence of other bodies that provide farmers with information. Advice on agricultural practices or seeds certainly falls into other spheres of public services, such as agricultural extension, but transport is an activity related to MIS.

Experience also shows that delivery methods for this service need to be low cost from the user's point of view. In this

regard, radio and SMS messaging have proved a powerful way of delivering price information. From an equity point of view, a regular radio slot is very attractive, since in every community quite a few people will have radios, and information given out by radio is probably disseminated widely by word of mouth. SMS is of increasing importance, and suggests that future priorities in the development of MACE MIS should focus in part on the access of poorer farmers and traders to mobile telephones.

Farmers are empowered by MIS services that combine pure price information and trade facilitation services. Such services could extend the reach of farmers to buyers not only in Malawi, but also in regional and international markets as this capacity develops. There are also a number of encouraging developments over the past 3-4 years – the success of MACE franchisees and farmer groups' services, the use of SMS to conduct market transactions via MACE, and partnerships in service delivery. MACE franchisees have benefited from the innovation by entering into a business they would not have done on their own, and the same is true for farmer-managed MIS. The fact that they are working under the MACE framework improves their status. This has helped them to attract other programs. For example, the Liwonde MRC MACE franchisee has attracted the BUGs program that is funded by the EU, and it has also linked with Opportunity International Bank. The Karonga MRC MACE franchisee has benefited from a CNFA grant, while the Kanjuchi farmer MIS has been selected by MOAFS for the mini-silos program, among other benefits.

Franchising of MIS services and farmer empowerment are long-term, cost-effective means for MIS. They are able to deliver services well and efficiently. The franchising innovation has been a success mainly because of the diversified marketing services they offer, but also because of the credit facility which made it possible for them to pre-finance and bulk produce from farmers for sale, both locally and to distant markets independently or through the MACE network. MACE plans to continue franchising the remaining four MIPs, but without a credit guarantee fund it is very difficult to franchise as banks are not willing to lend to young energetic men and women without collateral. Franchising is, however, contributing to the creation of a young generation of entrepreneurs, which is important for the development of agricultural markets in Malawi.

Farmer-managed market information systems (FAMIS) is a promising innovation, but requires a lot of resources for capacity

building of farmers managing the system and awareness creation of farmers in the surrounding communities who are meant to be the users and beneficiaries. The system also results in reduced trade transaction costs, as the communities are able to bulk the produce locally for sale to distant markets. Partnerships are also important for leveraging cost and efficiency in service delivery. MACE has demonstrated this by its use of radio and SMS in collaboration with NGOs and mobile phone short messaging service providers.

The finding that only 19.5% of MACE users are women means that there is need for deliberate efforts by MIS providers to ensure that women access their services. Awareness activities on MIS services are therefore important in order for MIS to reach out to all potential beneficiaries, especially smallholder farmers. Another finding is that small-scale buyers do not engage in produce storage (Figure 6). If markets are to develop to the benefit of smallholder farmers and small-scale buyers, there is need for investment in storage services at the local level. Storage support facilities for bulking services for use by small-scale buyers or other produce bulking players at the local level are therefore important.

Sustainable funding for MIS is a challenge. Price information is a public good, while willingness by users to pay for services – especially those who trade through the radio – is limited. This therefore calls for a combination of donor and government funding to be supplemented by user charges as a long-term strategy for provision of services until such a point that the MIS can generate enough resources from trade facilitation and other revenue generation mechanisms.

The results presented in this paper reflect a national-level aggregation. It would be interesting to have more detailed research on the impact of activities of MACE, especially in the various sites where it has franchised offices and market information centers.

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Role of ICT-based MIS in enhancing smallholder producers' incomes: The case of MISTOWA in West Africa

Kofi Debrah¹

Abstract

The introduction of yield-enhancing technologies to farmers without accompanying efforts to link production to reliable marketing outlets is not likely to succeed because of the negative effects on prices and incentives. The USAID-funded project, "Strengthening Regional Networks of Market Information Systems for Traders' Organizations in West Africa (MISTOWA)" sought to improve farmers' access to domestic, sub-regional and global markets through a private-public partnership to develop and deploy an ICT-based market information system. After 3 years of implementation, approximately 12,500 beneficiaries from 15 countries in West Africa participated in the project – 33% of them producers and 38% traders. The project beneficiaries reported approximately US\$ 51 million in trade deals, translating into US\$ 4,080 per beneficiary or US\$4.33 per dollar of donor funds invested. Even though the earlier than anticipated project termination made it impossible to assess the real impact of the ICT-based market information system on smallholder incomes, there is enough anecdotal evidence from the beneficiaries to suggest that access to real-time market information provides incentives for investments in agriculture by smallholder farmers.

Introduction

Smallholder farmers in Africa typically face two types of marketing problems. First, they sell marketable surpluses on an ad hoc basis because they have limited access to reliable marketing outlets to sell produce at remunerative prices. Second, their ability to respond to ready and assured market opportunities in a timely manner is limited by labor constraints, lack of access to credit, lack of market information, and poor post-harvest facilities.

As a result of these problems, farmers' incomes from agriculture are low and variable, making agriculture unattractive. As long as these problems exist, there will be little incentive for farmers to invest in yield-enhancing technologies to boost agriculture, the main engine of economic growth in developing countries. Low investments in agriculture translate into low productivity

and result in the inability of countries to produce enough food and raw materials to meet human and industrial demands. Under these circumstances, governments' dependence on imports increases, raw materials from domestic sources become inadequate, and agro-industries fail to perform to their potential, leading to loss of revenues and low employment generation. The low and variable incomes from agriculture increase the number of youth migrating from rural to urban areas, increase urban unemployment, and could potentially cause social unrest. The project "Strengthening Regional Networks of Market Information Systems for Traders' Organizations in West Africa" (MISTOWA) sought to address these issues, as well as to meet its own particular challenge of low intra-regional trade in agricultural produce in West Africa.

This paper seeks to contribute to the development of a framework for improving agricultural markets in support of the African Green Revolution by sharing the MISTOWA experience, lessons learned, and the potential to scale up the information and communication technology (ICT)-based market information platform for use by smallholder farmers in Africa.

Overview of the MISTOWA Project

Geographic coverage: West Africa, with focus on Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Niger, Nigeria, Senegal, the Gambia and Togo.

Duration: October 1, 2004–September 30, 2007, with funding from the United States Agency for International Development (USAID) and Agriterria; then October 2007–March 2008 under Hewlett Foundation funding.

Commodity coverage: Rice, maize, cassava, tomatoes, onions, cashew, shea nut/butter, fertilizer, cattle, red meat, cowpea, fish, mangoes and sesame.

Funding and funding sources

- US\$10,400,216 from USAID/West Africa (Economic Growth and Agriculture);
- US\$1,400,000 from Agriterria (the Netherlands) to support capacity building of producers and their organizations and to improve their access to markets; and
- US\$300,000 from the Hewlett Foundation (October 2007–March 2008).

¹Previously Chief of Party (MISTOWA Project) and currently IFDC Representative in Ghana and Regional Manager, Ghana MCA Project in the Northern Intervention Zone. Corresponding author (kdebrah@ifdc.org or kofidebrah@usa.net).

The MISTOWA project started with a 6-month pre-project assessment of needs

As a bid requirement, potential bidders were to conduct a 6-month assessment to identify stakeholders, their needs, and their expectations in order to factor these into the project implementation design. IFDC invested \$200,000 that was matched by USAID/West Africa. The period was used for a wide consultation during which discussions were held in six countries with producer groups, trader groups, market information service providers and others. These in-country consultations culminated in the holding of a regional workshop of stakeholders to agree on issues related to:

- Market information needs for selected commodities and inputs;
- Means of communication and possible sources and frequency of market information for selected commodities and inputs;
- Additional services; and
- Financial sustainability, particularly how the MISTOWA project could be packaged for sustainability.

Approximately 7,000 people were contacted and their views collated. These consultations confirmed that farmers and traders lack access to timely (real-time) information on prices, sources of supply and demand, transportation and market conditions, among other things. They trade little beyond their limited geographic area, let alone with other countries. It also became evident that, in addition to accessing market information, farmers and traders also needed capacity building in collective action to improve their ability to bargain effectively. It was also important that the trade environment be conducive to free trade without harassment at the check points within and between the countries of West Africa.

Project objective

MISTOWA's aim was to increase regional agricultural trade and food security by improving regional efforts to generate, disseminate, and make commercial use of market information.

MISTOWA sought to alleviate three key obstacles to agricultural trade among countries in West Africa: (i) lack of timely access to

information on prices and market opportunities; (ii) inadequate organizational and business skills of producers and traders, which hinder their ability to respond to production and market opportunities; and (iii) unfavorable trading environments, including non-tariff trade barriers such as border harassment.

Project activities were designed to address these obstacles and contribute to the achievement of three corresponding Project Intermediate Results (PIRs):

- **PIR 1:** Improved market information generation and dissemination. The goal was to provide producers and traders with access to real-time market information by reinforcing existing public sector market information systems and developing a new private sector ICT-based system to facilitate intra-regional trade.
- **PIR 2:** Improved trader and producer skills. The goal was to build the organizational, technical and agribusiness skills of producer and trader organizations so that they are better able to identify and respond to market opportunities.
- **PIR 3:** Improved West African trade environment. The goal was to build the skills of producer and trader organizations to better advocate for an improved trade policy environment.

Strategy

MISTOWA used a three-pronged approach to:

- 1) Develop, in partnership with Busylab's "TradeNet"² (www.tradenet.biz), an ICT-based market information service to provide real-time market intelligence;
- 2) Build the technical, organizational, advocacy and business skills of producers and traders to take advantage of market opportunities; and
- 3) Coach producer and trader associations in advocating for an improved trade environment, e.g., removal of non-tariff constraints.

In the market information component, MISTOWA provided grants worth US\$ 1.2 million to participating producer and trader associations to purchase computers and to procure Internet connectivity. It trained beneficiaries to use computers and cellular phones to upload content to TradeNet and to disseminate information from TradeNet to their members.

²Now rebranded as "Esoko" www.esoko.com

MISTOWA also helped the associations establish and run Agribusiness Information Points (ABIPs) in their markets and rural areas that served as meeting points, browsing centers, and training and business points; members can go to ABIPs to register their phones for alerts.

Some accomplishments and preliminary impacts

The project's scope was limited to increasing intra-regional trade in agricultural products. As a result, support was skewed toward traders – producers received limited direct support, especially

smallholder producers. Nevertheless, producers benefited from the project by participating in face-to-face events, such as trade fairs and training sessions that built their capacities to use cell phones to compare prices and seek buyers. They also received computers and Internet connectivity to establish and run ABIPs. Anecdotal evidence from MISTOWA beneficiaries suggests that access to real-time market intelligence information provides incentives for investments in agriculture by smallholder farmers (see Box 1).

Box 1:

Phoebe Usu “Madame Cassava”: Trader and Producer, DMDA, Kano, Nigeria*:

“I’m a widow, a mother of five with a BA degree and no job. Things were hard. Now, since I can do my business with modern communication tools through my involvement with MISTOWA, I’m better off taking care of my children. It depends on one’s capacity to understand and take good profit of what is offered.”

* “Madam Cassava” explaining the benefits she has reaped from the MISTOWA project at the official TradeNet launch in Accra, Ghana, May 12, 2005

Issa Keita, President of AMEPROC, Association of Malian Exporters in Agricultural Products, Bamako, Mali:

“Ever since we started using TradeNet services, particularly SMS alerts, our business has continued to grow. On February 28, 2006 our association concluded a trade for 20 tons of shea butter, valued at CFA 5,000,000 with Madame Aissata Bah of Senegal, and that is only one of several deals we have been able to conclude so far.” “AMEPROC has made good business from posting offers on TradeNet. In April 2006, we sold 150 tons of local maize valued at \$35,000 to a trader from Niger. In May we sold 80 tons of cashews valued at \$27,200 to a Senegalese trader. We recently sold 200 tons of shea nuts to a large Danish company, Aarhus Corporation and negotiating a memorandum of understanding for future supplies”.

By the end of the project:

- 12,500 beneficiaries³ from 15 countries in West Africa participated in MISTOWA events;
- Total donor investment of approximately US\$11,762,373 generated approximately US\$50,000 in agricultural trade value per beneficiary over the project period. Details are as follows.⁴
 - a. Total investment in the project (all sources)= US\$ 11,762,373
 - i. Staff salaries/benefits (25 project staff) = 15%
 - ii. In-country operations (6 countries) = 20%
 - iii. Direct project implementation cost= 43%
 - iv. Overhead= 22%
 - b. Total number of direct project beneficiaries= 12,500
 - c. Investment per beneficiary = US\$ 941
 - d. Total value of regional trade= US\$ 584,479,000
 - e. Total value of regional trade generated per beneficiary = US\$ 46,720
 - f. Total value of trade deals made and reported = US\$ 51,000,000
 - g. Total value of trade deals made per beneficiary= US\$ 4,080

³Composed of 33% producers, 38% traders and 29% others; 21% were women and 79% men.

⁴Funds contributed by all donors, from pre-design through implementation and closure, plus a 6-month bridge funding. Although one cannot attribute the value of agricultural trade per beneficiary solely to participating in the MISTOWA project, it nevertheless played a key role. Refer to the document of beneficiary testimonies.

The US\$ 51 million in trade deals (f) were reported voluntarily by beneficiaries. Considering that farmers and traders find it difficult to disclose their earnings for various reasons, it is impressive that this many reported. Even then, we estimate that for every deal reported, nine deals were unreported.

Accomplishments and preliminary impacts, including the results of telephone surveys about the impacts of the project, include:

- Support to BusyLab to further develop Tradenet.biz (now called “Esoko”). More functionalities and applications were added, and they were customized for user groups.
- More than 540,000 prices were uploaded, 406 markets set up, 3,109 users added, and 494 offers to sell or buy made online or with cellular phones. Not all the offer or bid alerts resulted in successful trade deals, as several deals were concluded at face-to-face events or through Internet contacts.
- More awareness of TradeNet/Esoko was created through the media, assessment missions, country visits, and presentations by project staff at different forums, which have generated interest in the use of the platform and could lead to scaling up across commodities and countries. These include:
 - A feature story on TradeNet and its use in Africa on CNN’s “Inside Africa” in March 2008.
 - Interest of the Government of Rwanda, through its Rwanda Information and Technology Authority (RITA), in the use of TradeNet following a presentation that MISTOWA staff made in January 2008.
 - Presenting TradeNet at the “Tech For Food” forum held in February 2008 in Paris, France.
- User surveys were carried out to assess and evaluate the impacts of the use of the platform. Major findings include:
 - More use of mobile phones: Producers and traders whose principal source of information was word of mouth now rely more on their mobile phones to receive market information.
 - Access to more useful and actionable information: Producers and traders interviewed cite real-time price

information, offers to buy and sell, and contacts of buyers and sellers as the most useful services provided through TradeNet/Esoko.

- Reduced transactions costs: Respondents who used TradeNet services, such as offers to sell or to buy or for comparing prices, reported that they had reduced the time it took to move a sack of maize from the farm gate to the retail market for the final consumer from an average of 42 days to 21 days (a 50% reduction).
- Increased proportion of the retail price for producers: Farmers who used TradeNet services, such as for offers to sell or to buy or for comparing prices, reported receiving 45% of the final retail price as compared with 22% for those who did not use TradeNet (a 100% increase).
- Increased business transactions: The use of TradeNet services to assess current prices, to send or receive price and offer alerts, and to contact buyers and sellers have all culminated in increased business for users. The survey indicated that 32% of producers and 22% of traders interviewed increased their business turnover by more than 50%.

Lessons learned

1) A thorough stakeholder consultation prior to project

development is essential. The USAID/West Africa requirement of a 6-month, 1-1 cost share pre-project design phase for the competing teams was critical for MISTOWA’s success. It enabled us to conduct a critical situation analysis to identify the major constraints, partners, and stakeholders and to find collective and workable solutions to basic problems based on technologies that were already in the hands of most beneficiaries. It was derived from the “win-win” approach to partnership in which all the partners saw mutual benefits.

2) It is important to review and adapt strategies in the early stages of implementation. Our earlier “top down” approach of trying to work through the sub-regional producer and trader associations was abandoned because of huge administrative obstacles. We therefore adopted a more “bottom up” approach by dealing directly with the producer and trader associations at the country and district levels.

3) A public-private partnership with well-defined roles is important for success. MISTOWA presents a perfect example of a multi-level public-private sector partnership for empowering farmers and traders to sell more and buy better through access to market information. The major donor, USAID/West Africa, funded the project; Agriterra from the Netherlands bought in and provided additional funds to focus mainly on strengthening producer organizations and market access. The Hewlett Foundation provided funds to continue the project when the funding from USAID was interrupted. IFDC/MISTOWA partnered with a private software company, BusyLab, led by a British entrepreneur with a team of young African experts from Senegal, Benin, Togo and Ghana. BusyLab's role was to develop and refine the platform based on IFDC/MISTOWA feedback from users (farmers and traders). IFDC/MISTOWA used donor funds to train, equip and involve producers and traders from several countries to use the platform and also provide information from the field to populate the database. BusyLab and MISTOWA partnered with Global System for Mobile Communications (GSM) providers for mass dissemination of information by cellular phone, and are now in discussions with microfinance institutions to provide financing to registered users of TradeNet/Esoko.

4) Wider application – the approach is completely scalable.

TradeNet can be expanded to cover any number of commodities, countries and markets, provided the commodity associations and individuals are willing to provide content (prices, contacts, offers, news, etc.) to the platform. Scaling up of TradeNet and its wide use are possible and even helped by projections of the increasing use of cellular phones. The GSM Association projects that 85% of Sub-Saharan Africa's population will have GSM coverage by 2010. IFDC hopes to extend the application to provide business services and to link its supply side, enhancing projects with markets or demand-driven projects so that information is shared along the value chain and produce moves seamlessly from the farm gate to the markets.

5) Project duration was too short for any meaningful impacts, particularly on smallholder farmers. Given the current level of illiteracy and skills of producers and traders in Africa, the project duration (48 months from pre-design to closure)⁵ was too short to build the capacities of users and to promote the platform to

reach a level of sustainability. A project of this nature will require donor support for an uninterrupted period of 5–10 years to be sustainable.

6) With direct coaching and mentoring, trade associations added value to the training and ICT tools that the project put at their disposal to develop the ABIPs. IFDC/MISTOWA provided computers and Internet connectivity to trade and producer associations to train their members to use ICT tools for market access through the ABIPs. Project staff carefully monitored incomes and expenditures from the ABIPs and found a few of them, e.g., the Lagos Mile 12 Market Association, breaking even after only 6 months.

7) Smallholder farmers are most likely to benefit from the MISTOWA-type intervention if it focuses directly on them. The project was an intra-regional trade project and therefore skewed more toward traders. In the instances in which smallholder producers were directly supported to use the TradeNet platform to market their products, the results were excellent (they instantly found markets for their rice). Refer to the accompanying case study story "Mobile Phone Gives Lifeline to Vedenú Rice Farmers' Cooperative" (Box 2). In a post-project survey of beneficiary farmers, those who used TradeNet services, such as for offers to sell or to buy or for comparing prices, reported receiving 45% of the final retail price as compared with 22% for those who did not use TradeNet.

8) The MISTOWA intervention generated good value for donor investments. Project beneficiaries reported trade deals of US\$ 51,000,000 concluded as a direct result of MISTOWA. This translates into US\$ 4,080 per beneficiary or US\$ 4.33 for each dollar invested in the MISTOWA project.

Current applications and perspectives

IFDC continues to collaborate with BusyLab to refine TradeNet (rebranded as Esoko) and extend its application and business services to interested groups. IFDC is currently using the platform as a business communication tool among the various actors in the value chains of existing projects. For example, in the Agricultural Component of Ghana's Millennium Challenge Compact, which IFDC is implementing in the northern

⁵6-month pre-design phase funded for \$400,000 by IFDC and USAID, 36-month implementation phase funded for \$11,762,373 by USAID and Agriterra, and 6-month bridge funding for \$300,000 by Hewlett Foundation.

intervention zone, all 15,000 participating smallholder farmers that are being trained to increase productivity and entrepreneurship will be linked to input suppliers and marketing companies. Under the Ghana Agro-Dealer Development (GADD) project funded by AGRA and implemented by IFDC, more than 2,000 agro-dealers are being surveyed and their locations mapped by global positioning system. When farmer organizations and agro-dealers register their profiles on Esoko, they are better able to meet each other's business needs. For example, farmers will use the Esoko platform to communicate their input requirements to input suppliers before the season, receive extension and technical advice on their cell phones throughout the growing period, and communicate their product availability to marketing companies prior to harvesting.

In the "Linking Farmers to Markets (FTM)" project proposal that IFDC submitted to AGRA for funding, the Esoko platform will be the main market information system (MIS) platform, not only to provide traditional market information, but also to be used as a toolset to manage suppliers, buyers, transporters and others in the value chain. The project, with its marketing and market information platform, is also of interest to the project's partners and the AGRA-funded initiatives in Ghana (see Figure). For example, Savanna Seed Services Company Ltd. (SASSEC), a private seed-producing project, will produce high-quality

improved seeds for farmers in the three northern regions that will be tested along with best-bet soil fertility management practices disseminated by Savanna Agricultural Research Institute (SARI) in the implementation of the Integrated Soil Fertility Management (ISFM) project. Other productivity enhancing agricultural inputs will be made available to farmers through the AGRA-funded GADD project. The seeds, improved soil fertility management practices, and availability of other inputs from these initiatives will increase marketable volumes, which the FTM will help farmers market. This will provide an excellent example of AGRA program partnership in northern Ghana.

MISTOWA's implementing partners

MISTOWA's implementing partners include regional producer organizations (ROPPA and RECAO) and their national affiliates; regional trade associations and national affiliates in the agricultural subsector (ROESAO and FACIA); regional networks of MIS in the public sector (RESIMAO); technical partners (BusyLab, Geekcorps, CILSS and Agriterra); sub-regional economic and policy institutions (ECOWAS and UEMOA); and NGO organizations such as Afrique Verte.





USAID
FROM THE AMERICAN PEOPLE

WEST AFRICA

CASE STUDY

Mobile phone gives lifeline to Vedenu rice farmers' cooperative

Tradenet platform (www.tradenet.biz) opens wider market opportunities for farmers and traders in West Africa



"Until I attended the training, I never realized my cellular phone could be an important and low-cost business tool in my pocket. The cell phone has indeed given us a lifeline and negotiating power as we face today's competition"

Gabby Awumee, Secretary, Vegbegbe Vedenu Rice Farmers' Cooperative and member of Hohoe District Alliance of Farmer Based Organizations

Challenge

The lack of access to timely and reliable market information has been a perennial barrier to trade and food security. The Vegbegbe Vedenu rice farmers, like several other farmers and farmer groups in developing countries, face a problem of finding markets for their produce: they produce without knowing where, to whom, and at what price to sell to make reasonable returns on their labor.

Initiative

A USAID/WA-funded MISTOWA project helped to pilot "TradeNet", an internet application that allows users to access information on market prices, and contacts of buyers and sellers via the web, email and mobile phones. Tradenet was developed in partnership with BusyLab, a private Ghana-based software company. The project trained over 6,000 producers and traders from 90 organizations in West Africa to use the mobile phone to request prices and to post offers to sell or buy produce and inputs. Associations can also create their own web sites, "profiles" within the TradeNet site which they can use for information exchange. During one such training session in the Hohoe District of the Volta Region, the association secretary Gabby Awumee created a profile for the Vegbegbe Vedenu Rice Farmers' Cooperative and posted an offer by mobile phone to sell 120 tons of paddy rice on behalf of the cooperative.

Results

Within hours of posting the offer, Mr Awumee received 26 phone enquiries from Ghana, Burkina Faso and Togo. The deal was finally concluded with a local milling company, Marsello & Co, from Kpong in the Eastern region of Ghana, whose representatives traveled to Hohoe to buy 100 tons of paddy rice, estimated at \$36,000. Other producer organizations and individual farmers have reported similar successes after receiving training. Through SMS alerts received on their cell phones, a producer association in Kara (northern Togo) found a soybean buyer in Lome, and concluded a deal worth \$8,029. A tomatoe producer in Togo found a buyer in Cotonou, Benin, and concluded a deal worth \$1,488, and an African entrepreneur in Paris, France responded to a shea butter sales offer posted by a Malian producer association AMEPROC and concluded a deal worth \$624,264. These successes have sparked interest among farmers and farmer groups. To meet this demand, BusyLab and IFDC have begun piloting a "TradePoint" concept where several "TradeAgents" are posted in different markets and rural areas to provide direct services using their cell phones.



Section 4

High-Value Commodities and Agroprocessing

Modernizing Africa's fresh produce supply chains without rapid supermarket takeover: Towards a definition of research and investment priorities

David Tschirley¹, Miltone Ayieko², Munguzwe Hichaambwa³, Joey Goeb⁴ and Wayne Loesch⁵

Abstract

After a burst of enthusiasm through the middle part of this decade regarding the “supermarket revolution”, there now exists a broad consensus that this phenomenon is likely to proceed much more slowly than once thought in Sub-Saharan Africa. This is especially true in fresh produce supply chains, where both the promise and the perils of supermarket expansion have received greatest attention. In nearly the entire continent, the so-called “traditional” marketing sector – primarily open air markets and dispersed informal vendors – is expected to play a dominant role in fresh produce marketing for several decades. If true, this finding has profound policy implications. Specifically, it suggests that private investment in modern, integrated supply chains cannot be relied upon to solve the multitude of problems that increasingly plague these traditional production and marketing systems over a time frame acceptable to most policy makers and donors. Public engagement, preferably through meaningful public/private partnerships and an accompanying re-definition of public and private roles, will be central to improving these systems. This paper first reviews the evolution of thinking on the supermarket revolution in Africa and presents empirical evidence from Kenya and Zambia. It then lays out a set of stylized facts and key gaps in knowledge regarding traditional fresh produce production and marketing sectors on the continent, and closes by outlining priorities for research and for public and private investment to modernize these systems in the absence of rapid supermarket takeover.

Introduction

Strengthened supply chains for fresh produce can improve lives in developing countries in several ways. First, because yields per unit land area can be very high, many of these crops provide the possibility for land-constrained farmers to become more commercialized in their farm operations, which a robust

empirical literature shows has positive effects on incomes (Larkins et al., 2008; CGIAR, 2005). Second, fresh produce crops provide a wide array of opportunities to add value through packaging, canning, slicing and dicing, and production of juice, sauces, preserves and inputs to other food processing activities. Such value addition creates off-farm employment, a major channel through which rural households escape poverty. Finally, the nutrients in horticultural crops (particularly micronutrients, vitamins, and trace elements) can make a critical contribution to improving diets in the developing world (Willett, 2001; Flores and Gillespie, 2001).

Table 1 encapsulates the magnitude of the opportunities and challenges facing fresh produce sectors in Sub-Saharan Africa (SSA)⁶. Annual growth in the worldwide per capita supply of fresh produce was four times higher than for cereals between 1970 and 2000. This growth was led by China, where investments in improved technical and market information, fertilizer availability, solar greenhouses, and plastic greenhouses (FAOSTAT and Chinese Academy of Agricultural Sciences Statistics, 2008), all in response to a vast opening to market incentives and very rapid income growth, led to a tripling of per capita supplies since 1970. Yet impressive growth was not limited to China: in South Asia, East and Southeast Asia, and Latin America, growth in fresh produce supply was 2.5 to 4 times greater than growth in the supply of cereals. This pattern is consistent with the high income elasticity of demand for fresh produce.

Africa alone among the major continents saw negative growth in per capita supplies throughout this period. Yet positive income growth on the continent since 2000 suggests that growth in fresh produce supply since that time has likely also been positive, and the experience of the rest of the world suggests that, if income continues to grow in Africa and proper investments are made, fresh produce can be a major source of growth for the rural sector.

The objective of this paper is to begin forging a consensus regarding priorities for applied research and programmatic investment in SSA's fresh produce supply chains over the next two to three decades. We start with an overview of these

¹Professor, International Development in the Department of Agricultural, Food, and Resource Economics (AFRE), Michigan State University. Corresponding author (tschirle@msu.edu)

²Graduate Research Assistant, AFRE/MSU and Research Fellow, Tegemeo Institute, Egerton University

³Research Fellow, Food Security Research Project, Lusaka, Zambia

⁴Graduate Research Assistant, AFRE/MSU

⁵Professor, Department Horticulture, Michigan State University

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⁶Unless specifically stated otherwise, reference to “SSA” and “Africa” does not include South Africa, given the vastly more developed state of its economy compared to other SSA countries.

Table 1. Average annual growth rates (%) in fruit and vegetable and cereal supply (per capita)

Country/Area	Fruits and Vegetables				Cereals
	1971-80	1981-90	1991-00	1971-00	1971-00
China	1.5	7.5	9	6.2	0.8
South Asia	0.7	0.8	2.5	1.2	0.5
East and Southeast Asia	3.4	0.5	1.1	1.2	0.5
Latin America and Caribbean	0.2	1.6	1.4	0.9	0.2
Sub-Saharan Africa	-0.6	-0.4	-0.1	-0.3	0.4
World	0.9	1.6	3	1.6	0.4

Source: FAOSTAT data (2004) and USAID (2005)

chains' current status and directions of change. Because the supermarket revolution has received wide attention in the professional and popular press since the early 2000s, we first review the evolution of thinking regarding this phenomenon. The review shows that expectations regarding supermarket growth in Africa have cooled considerably since the initial enthusiasm. We then show that empirical evidence from Kenya and Zambia is consistent with this changed thinking. Next, we suggest a set of stylized facts – along with important gaps in knowledge – regarding the current status and drivers of change in the continent's traditional production and marketing systems, and close by outlining priorities for research and for public and private investment to modernize these systems in the absence of rapid supermarket takeover.

The evolution of thinking regarding supermarkets in African fresh produce systems

Retail modernization in developing countries and its effect on the broader food system has been an important issue since the early 1960s (Harrison et al., 1974; Goldman, 1974; Riley et al., 1970), and became a major new focus of research starting in the early 2000s. The most visible banner for this new work has been the supermarket revolution. Supermarkets existed in Latin America from at least the 1960s⁷, but began to grow much more rapidly in that region during the economic boom and opening to Foreign Direct Investment (FDI) of the 1990s. Growth began later in East/Southeast Asia and Central Europe, followed by selected countries of Africa (Reardon et al., 2004). This growth, together

with new procurement practices that the firms tried to apply, led to a rush of studies attempting to document and anticipate the impacts of these firms on existing actors in the food system, and to draw policy implications for governments and donors.⁸

Early expectations of supermarket takeover

Though distinctions are made between countries, regions, and types of food products, recurring themes in the supermarket revolution literature have been the “rapid rise” of supermarkets, the difficulty of smaller retailers to compete with them, the difficulty of small processors to compete with large processors for the new “supermarket market”, and the urgent need to deal with the exclusion of smallholder farmers from the supermarket channel. Until recently, conditions for supermarket expansion in Africa were seen to lag, but not to differ fundamentally from those in other regions of the developing world; Africa was portrayed as a later “wave” in the surge of supermarket expansion, with “take-off” having already occurred in East and Southern Africa and beginning in West Africa (Reardon et al., 2004). The following quote encapsulates this view:

“Our premise is that supermarkets will continue to spread over the (African) region...and thus their requirements will either gradually or rapidly, depending on the country, become those faced by the majority of farmers...Understanding those procurement systems...is thus a way of predicting what will be the challenges and opportunities facing farmers...in the next 5-10 years” (Weatherspoon and Reardon, 2003; parentheses added).

⁷See Schwentesius and Gomez (2002) for data on Mexico. See Harrison et al. (1974) for very early data on Brazil, Colombia, Bolivia, and Puerto Rico.

⁸For early studies on Latin America, see Reardon and Berdegue (2002) for a summary, and Alvarado and Charnel (2002), Schwentesius and Gomez (2002), Faiguenbaum et al. (2002), Farina (2002), and Ghezán et al. (2002) for country studies. See also Reardon et al. (2004). For Asia, see Reardon et al. (2003a), Reardon et al. (2003b), Hu et al. (2004), and Coe and Hess (2005). For Africa, see Weatherspoon and Reardon (2003), Neven and Reardon (2004) and Neven et al. (2005).

More cautious voices

More cautious views regarding the likely rate of supermarket expansion were expressed early in Asia, and more frequently over the past three years in Asia, Africa, and even Latin America. Goldman et al. (1999) identified the “persistent continued strength of “wet markets” in Hong Kong”⁹ despite that city’s developed economy; they attribute this strength to these traditional markets’ adaptation to consumer shopping habits. Goldman (2000) was one of the first to identify consumers’ “selective adoption” of supermarkets, whereby “consumers who regularly shop in supermarkets continue to purchase fresh food in traditional outlets”; these findings echo those of others showing continued retail diversity even where supermarkets have expanded most. In Vietnam, Cadilhon et al. (2006) anticipate strong growth of supermarkets (from a base of only 2%) but suggest that “policy makers should not promote the ‘modernization’ of food systems at the expense of traditional channels, which meet important consumer needs”. Maruyama et al. (2007) also see strong growth, but cite serious challenges for supermarkets in lowering their prices and enhancing their locational convenience, both of which are key factors for the great mass of consumers in Africa and Asia.

Patterns in Latin America are relevant as a potential indicator of future patterns elsewhere. Booz-Allen Hamilton (2003) noted that “emerging consumers infrequently shop – if at all – at large supermarkets” in Brazil, despite the heavy market penetration of such outlets in that country. They refer to “the myth (that) it’s just a matter of money and time until emerging consumers flock to large supermarkets”, and conclude in general for Latin America that “small retailers have a sustainable business model”. Farina and Nunez (2005) echo this conclusion in Brazil, noting the persistent diversity of retail outlets, and that “the number of independent supermarkets (as opposed to large chains) and traditional retailers has grown, and their share in food sales has increased (in recent years)”.

Reviewing literature on supermarkets in Africa, Humphrey (2007) concludes that “the extent of transformation of retailing...as a consequence of (supermarket expansion) is overestimated”. In Kenya, where supermarkets had penetrated more than in any SSA country outside South Africa and perhaps Zambia, Tschirley et al. (2004a) and Tschirley et al. (2004b) estimate that supermarket chains held less than 2% of the national urban fresh

produce market in late 2003, and that nearly all fresh produce purchases in these supermarkets were made by consumers in the top 20% of the income distribution. They calculate that, to reach a 10% market share in 10 years, supermarket sales of fresh produce would have to grow 22% per year in real terms. In a cross-country econometric analysis, Traill (2006) estimates that Kenyan supermarkets will hold at most a 16% share of total food sales by 2013; this would correspond to a 4-5% share of fresh produce. Ayieko et al. (2006) echo findings elsewhere of diverse shopping habits among consumers, noting that 94% of Nairobi consumers frequented at least three different types of food retail outlets in the previous month. By 2007, Reardon and Timmer (2007) had noted the very small market shares of supermarkets in nearly all of SSA. They suggested “considerable uncertainty about the rate at which the supermarket sector will grow” even in Kenya and Zambia; in most of the rest of SSA, they deemed it “unlikely that...we will see supermarket growth for several decades.” Echoing this, Reardon and Gulati (2008) do not include SSA outside South Africa in their table of “waves” of global supermarket expansion. In the most recent study, in Madagascar, Minten (2008) shows the very small market shares of supermarkets, notes that none of the global retailers have expansion plans, and suggests that “agriculture for local consumption in poor countries will be largely bypassed by the global food retail revolution.”

In India, market reform and opening to FDI, along with prospects for 7% yearly growth in retail sales in a market of 1.2 billion people, have generated billions of dollars of current and planned investment in supermarkets by local and multi-national firms, including Wal-Mart and Carrefour. Yet supermarket shares in India are currently very low (around 2%), due to the country’s massive and complex small retail sector. Supermarkets there face the 20/20/20 challenge: they must grow their food sales by 20% a year for 20 years just to reach a 20% market share, still leaving 80% to more traditional channels.

Supermarkets and the exclusion of small farmers

Concern about exclusion of smallholder farmers from supermarket supply channels was most acute in fresh produce, since farmers can market it directly to supermarkets. Concerns are based on the efforts of fresh produce procurement managers in supermarket chains to provide consumers with a stable, year-round supply of safe, high-quality produce at competitive prices.

⁹“Wet markets” refer to traditional open-air markets.

Farmers that cannot meet these criteria, especially the need for fixed quantities every week of the year, fall off the supermarkets' "preferred supplier" lists. Smallholder farmers are especially challenged in this regard, and evidence is mounting that all but a tiny minority, whether independent or in farmer groups, are unable to remain on preferred supplier lists on a sustained basis¹⁰. As a result, medium- and large-scale farmers supply the overwhelming majority of fresh produce moving through preferred supplier programs in Africa.

Yet these programs carry a tiny fraction of the food trade in African countries. For example, in Kenya in late 2003, this share was less than two-tenths of one percent of all food purchased in urban areas¹¹. Thus, while smallholder exclusion from large supermarket supply chains is a reality, it cannot now be considered among the top tier of rural policy concerns in this area of the world; nor is it likely to become a top tier concern over the next 10-20 years in most countries, given projected supermarket shares over this time.

Evidence from Kenya and Zambia

Outside of South Africa, Zambia and Kenya are arguably the two countries in SSA with the greatest prospect of supermarket expansion. Each has a meaningful commercial farm sector, making the supply base potentially more able to respond to supermarket requirements; Zambia is the most urbanized country in the region, putting a larger share of the population within reach of supermarkets; and Kenya's economy is the most sophisticated in the region, allowing supermarket expansion to be fueled by local investment. Yet as this section will show, each country shows exceptionally low supermarket shares, especially for fresh produce, and continued reliance on high-income households to support those shares.

Data for this section come from two urban household surveys. In November 2003, Tegemeo Institute and Michigan State University carried out a survey of 560 randomly selected households throughout low, middle, and high income areas of Nairobi, obtaining recall data on food expenditures over the previous 30 days, along with data on incomes from salaries, own business, and urban farming. In August 2007 and February 2008, Michigan State University collaborated with Zambia's Central Statistical Office (CSO) in a two-round survey of 1,856

households in four cities of the country: Lusaka, Kitwe, Kasama, and Mansa. This survey used the same 30-day recall period as in Kenya, but used total expenditure rather than income as its measure of households' economic level. Lusaka and Kitwe are the two largest cities, each falling within the urbanized central arc of the country; Kasama and Mansa are smaller towns lying outside this area. Zambia's sample was designed to be representative of each city individually and of the four cities as a whole. Nairobi accounts for 43% of Kenya's population in towns and cities above 20,000 inhabitants; the four surveyed cities in Zambia account for 50% by this same measure.

Tables 2 and 3 show market shares of comparable retail channels in each country, broken down by food group. In each country we distinguish between chain supermarkets and typically smaller independent supermarkets. This distinction is based on the idea that corporate supermarket chains are in the best position to fund rapid expansion while implementing the procurement practices, described above, that have been the focus of concern regarding smallholder exclusion from these channels. The two dominant supermarket chains in Kenya are Nakumatt and Uchumi, with competition from Tuskys and Ukwala; all are Kenyan companies. Shoprite (South African) entered Zambia in 1997 and is the dominant chain, with the more recent entry of Spar (a Dutch corporation based on a franchise model), and some competition from Melissa, a local chain with three stores. The "ka sector" in Zambia ("ka" means "small" in Nyanja) encompasses a vast array of informal retailers operating small tables and rudimentary shops outside of marketplaces; kiosks in Kenya likewise lie outside of marketplaces but tend to be more substantial in their construction. "Dukas" in Kenya and "Grocers" in Zambia are both small shops with electricity and plumbing, distinguished from small supermarkets by personal service retailing in which the vendor selects items for the shopper; each are long-standing features of the retail landscape in these countries.

Four points emerge from these tables. First, traditional shops, open-air markets and the informal sector (kiosks in Kenya, the ka sector in Zambia) sell most of the food in each country: over 60% in Nairobi, and over 70% in Zambia's four cities. In both cases, supermarket chains have the second lowest overall food share of all channels. Second, in both countries the

¹⁰Regoverning Markets, 2004; personal interview with Mr. Willie Minnie, Procurement Manager for Freshmark Zambia (September 2005); Reardon and Berdegue, 2002; Reardon and Timmer, 2006.

¹¹Based on a 2% market share by supermarket chains in fresh produce, a 20% share of fresh produce in urban consumer food expenditure, and a 40% share of preferred supplier programs in supermarket chain fresh produce procurement (the rest being purchased in traditional wholesale markets; Neven and Reardon, 2004, for Kenya): $0.02 \times 0.2 \times 0.4 = .0016 = 0.16\%$.

market share of supermarket chains in fresh produce (fruit and vegetables) is one-third or less their share in staples and dairy; this finding is consistent with early themes in the supermarket literature, which acknowledge fresh produce as a lagging sector in supermarket penetration. Third, Kenya shows greater penetration of the modern sector than Zambia (despite its data being five years earlier), with small and chain supermarkets holding a combined overall food share of 16%, compared to 9% in Zambia. Finally, results from Zambia show that supermarket shares are much higher in fruit (11.1%) than in vegetables (1%). This finding is consistent with the fact that Shoprite popularized new fruits such as apples and suggests that some of their market

share may reflect an increase in the range of items and in overall consumer expenditure on fresh produce, rather than solely a capturing of share from other vendors.

Supermarkets in both countries remain heavily reliant on upper income consumers for their sales (Tables 4 and 5). In Zambia in 2007/08, two-thirds of all food sales in supermarket chains were to the top 20% of the income distribution, with the bottom 60% accounting for only 12% of sales. In both countries, even the top 20% of earners spend between twice as much (Kenya) and more than three times as much (Zambia) in traditional shops, markets, and informal locales as they do in supermarket chains.

Table 2. Market share of various retail channels by food group, Nairobi, 2003

Food Group	Market Outlet						
	Supermarket Chains	Small super-market	Duka/shop	Open Market	Kiosk	Butchery	Other minor outlets
----- % of total expenditure within the food group -----							
Staples	21.0	12.9	49.5	6.4	8.1	0.0	2.2
Dairy	13.9	2.1	55.4	0.0	10.8	0.0	17.8
Meat	3.9	0.4	8.9	11.5	3.9	68.4	3.1
Fresh Fruit & Veg.	4.4	0.3	0.7	56.4	35.7	0.0	2.6
Overall	11.5	4.8	28.7	18.7	14.3	16.7	5.4

Source: Tegemeo Institute/MSU Urban Household Survey, 2003

Table 3. Market share of various retail channels by food group, four cities of Zambia, 2007/08

Food Group	Market Outlet						
	Super-market Chains	Indep. Super-markets & Mini-marts	Grocers	Open Market	Ka Sector	Butchery	Other minor outlets
----- % of total expenditure within the food group -----							
Staples	8.8	2.2	43.8	17.7	22.0	0.2	5.3
Dairy	19.6	4.1	38.7	7.8	23.4	3.2	3.2
Meat	7.1	1.6	5.2	37.8	12.8	28.0	7.6
Fresh Vegetables	1.0	0.8	0.4	67.6	27.9	0.0	2.3
Fresh Fruit	11.1	1.9	0.9	55.7	28.1	0.0	2.2
Fresh Fruit & Veg	3.1	1.1	0.5	65.5	27.6	0.0	2.3
Pulses	3.2	1.2	5.3	74.6	13.7	0.0	2.0
Other	6.7	1.6	29.9	17.6	26.3	0.0	17.9
Overall	7.3	1.8	21.8	31.2	21.7	7.3	9.0

Source: Central Statistical Office/FSRP/MSU Urban Household Consumption Survey, 2007/08

Table 4. Overall food market share of various retail channels by quintile of per capita total income, Nairobi, November 2003

Per capita income quintile	Mean per capita income (USD)	Market Outlet						
		Super-market Chains	Small Super-markets	Duka/ shop	Open Mar-ket	Kiosk	Butchery	Other minor outlets
----- % of total expenditure over 40 food items -----								
1 (lowest)	96	2.5	4.0	33.9	20.6	19.6	12.0	7.4
2	249	6.4	5.0	33.0	17.4	15.0	16.2	7.0
3	436	2.8	5.7	34.7	21.6	13.4	15.9	6.0
4	774	9.0	4.3	30.0	19.8	15.0	18.3	3.8
5 (highest)	3,593	25.7	4.9	19.0	15.7	12.0	18.1	4.6
Overall	1,027	11.5	4.8	28.7	18.7	14.3	16.7	5.4

Source: Tegemeo Institute/MSU Urban Household Survey, 2003

Table 5. Overall food market share of various retail channels by quintile of per capita total expenditure, four cities of Zambia, 2007/08

Per capita expenditure quintile	Mean per capita expenditure (USD)	Market Outlet						
		Super-market Chains	Indep. Super-markets & Mini-marts	Grocers	Open Market	Ka Sector	Butchery	Other minor outlets
----- % of total expenditure over 80 food items -----								
1 (lowest)	256	0.8	0.1	21.7	36.6	29.9	3.2	7.7
2	437	1.3	0.3	23.4	35.7	26.5	6.2	6.6
3	638	2.7	0.6	23.5	36.2	21.7	7.2	8.1
4	974	6.4	1.9	22.8	30.0	21.0	8.2	9.6
5 (highest)	2,582	17.1	4.1	19.0	23.7	15.6	9.3	11.1
Overall	977	7.2	1.8	21.9	31.2	21.6	7.4	9.0

Source: Central Statistical Office/FSRP/MSU Urban Household Consumption Survey, 2007/08

Consistent with other literature on the topic, shares are substantially lower and reliance on high-income consumers is greater in fresh produce than in overall food (Tables 6 and 7). In both countries, open-air markets and informal vendors together hold about a 92% market share in fresh produce, with

supermarket chains at 3-4%. In Zambia, over 75% of all fresh produce sales by supermarket chains were to the upper 20% of the income distribution, while the bottom 60% accounted for 8%; in Kenya, nearly 100% of fresh produce sales by chains were to the upper fifth of the income distribution.

Table 6. Fresh produce market share of various retail channels by quintile of per capita total income, Nairobi, November 2003

Total Per capita income quintile	Mean per capita income (USD)	Market Outlet						
		Super-market Chains	Small Super-markets	Duka/shop	Open Market	Kiosk	Butchery	Other minor outlets
----- % of total expenditure over all FFV items -----								
1 (lowest)	96	0.0%	0.1%	0.2%	53.3%	42.9%	0.0%	3.6%
2	249	0.0%	0.4%	1.3%	56.7%	38.0%	0.0%	3.6%
3	436	0.0%	0.6%	0.0%	64.3%	33.9%	0.0%	1.1%
4	774	1.0%	0.1%	0.3%	59.3%	38.3%	0.0%	1.0%
5 (highest)	3,593	14.9%	0.1%	1.3%	48.9%	30.8%	0.0%	4.0%
Overall	1,027	4.4%	0.3%	0.7%	56.4%	35.7%	0.0%	2.6%

Source: Tegemeo Institute/MSU Urban Household Survey, 2003

Table 7. Fresh produce market share of various retail channels by quintile of per capita total expenditure, four cities of Zambia, 2007/08

Total per capita expenditure quintile	Mean total per capita expenditure (USD)	Market Outlet						
		Super-market Chains	Indep. Super-markets & Mini-marts	Grocers	Open Market	Ka Sector	Butchery	Other minor outlets
----- % of total expenditure over all FFV items -----								
1 (lowest)	256	0.4	0.0	0.2	67.8	29.0	0.0	2.6
2	437	0.2	0.0	0.1	69.4	27.3	0.0	2.9
3	638	0.7	0.0	0.6	72.6	23.9	0.0	2.2
4	974	2.2	1.1	0.4	63.4	30.6	0.0	2.3
5 (highest)	2,582	9.1	3.1	1.0	57.7	27.3	0.0	1.7
Overall	977	3.1	1.1	0.5	65.5	27.6	0.0	2.3

Source: Central Statistical Office/ FSRP/MSU Urban Household Consumption Survey, 2007/08

Regression analysis of the factors influencing the probability of purchasing an item in a supermarket chain delivers very similar results across the two countries and helps shed light on the reasons for the chains' low market shares. Controlling for household income, (which we expect to positively influence the likelihood of shopping in a supermarket chain), we expect the following:

- Owning motorized transport and a refrigerator will both increase the likelihood of such shopping due to the lesser locational convenience of supermarkets; each of these assets facilitates making fewer shopping trips and buying greater quantities each time;
- Because the vast majority of urban dwellers in Africa do not have their own motorized transport, distance to the various types of retail outlets will have an important influence on which outlets are chosen;
- More educated households will prefer supermarket chains due to greater cleanliness and convenience;
- Younger household heads will prefer supermarkets due to greater openness to new behaviors; and
- Processed food items are more likely to be purchased in supermarkets than unprocessed foods, one reason for which would be supermarkets' ability to negotiate attractive prices with large-scale processors.

We cannot form *a priori* expectations regarding female-headed households nor the size of the household. Female-headed households may prefer the cleanliness of supermarket chains, but may also put a greater premium on the locational convenience of markets and informal vendors, due to greater pressure on their time. Larger households may value the large purchases that can be made in supermarkets, but may also find it more difficult to accurately plan their needs and so value the locational convenience of the traditional sector. We also cannot form *a priori* expectations regarding the effect of city size (a variable we have in Zambia, because the survey was done in four cities). Larger cities can be expected to be the focus of most intense investment by supermarket chains and to have more high-income consumers to support them. Yet locational convenience might be greater in geographically smaller cities that have one or two outlets.

In each country, we run a probit model predicting whether a household purchased a specific food item primarily in a supermarket chain over the past 30 days, controlling for general food category and for the income, asset, demographic, and distance to market characteristics discussed above¹². We also control for city in Zambia. Meat other than chicken is the excluded food category in each country. We separate chicken from other meat because production of the former is industrialized earlier in the development process and so may lend itself more to marketing through supermarket chains. In Zambia, we distinguish between processed and unprocessed

¹²Results are very similar when the dependent variable is defined to include smaller independent supermarkets.

staples and dairy, under the expectation that processed items are more likely to be purchased in supermarkets than unprocessed items.

Marginal effects are presented in Table 8. Results show that, in both countries, income, owning a car, owning a refrigerator, and having a more educated household head all positively influence the likelihood of shopping in a supermarket chain. All these results were expected. Results in both countries also show that households headed by a female are more likely to use supermarket chains. Larger households are less likely to use a supermarket in Zambia, but this effect is insignificant in Kenya. The only statistically significant result that differs across the countries regards the age of the household head: families with younger heads are more likely (as hypothesized) to use a supermarket chain in Zambia, but less likely to do so in Kenya. Overall, these results generally agree with those of Neven et al. (2005) in Kenya, highlighting the importance of income, education, and the ability to shop less frequently as drivers of supermarkets use.¹³ This analysis also strengthens findings from earlier research by showing (in Zambia) that, for a given food category, processed items are more likely than unprocessed items to be purchased in a supermarket.

Two results from the Zambia analysis are new and potentially noteworthy. First, supermarket chains may have more difficulty gaining market share in large urban centers than in smaller towns. Lusaka is the largest city in the sample, followed in order by Kitwe, Kasama, and Mansa (the excluded dummy); each city dummy has a negative and significant marginal effect, with the absolute value of these effects monotonically increasing with city size. To our knowledge, this is a new finding, the robustness, drivers, and implications of which deserve further investigation.

Second, even after controlling for other factors, distance to various retail outlets in Zambia has an important influence on choice of outlet. Two findings are particularly important here. First, proximity to a supermarket chain is a more important determinant of shopping in such a chain than is proximity to other outlets in shopping in them; the marginal effect for distance to a supermarket chain is double that of the next largest outlet type. Second, the results highlight the key competitive advantage that informal vendors (the “ka sector” in Zambia) have in being able to locate close to buyers: the marginal effect for the ka sector, while half that of supermarket chains, is three

times that of distance to the main public market, and five times that of distance to small grocers. This is the first analysis of which we are aware that analytically demonstrates the importance of locational convenience in consumer shopping decisions.

Summarizing, results in Kenya and Zambia – the two SSA countries outside South Africa with the greatest supermarket penetration to date – strongly support the more cautious view outlined above regarding supermarket expansion on the continent. Overall food shares of supermarket chains remain relatively low, shares for fresh produce are even lower, sales depend heavily on upper income consumers, and motorized transport, access to refrigeration, and locational convenience are key determinants of use. While it is likely that supermarket shares will grow across the continent over time, and while this growth may at some point be rapid in selected countries, the overall rate of growth is likely to be much slower than was once expected in some circles; this is especially so for fresh produce, the food category where supermarkets’ transformational potential was most highly anticipated. This means that the so-called “traditional” marketing system is likely to remain the dominant center of fresh produce marketing across the continent for several decades.

This finding has profound policy implications. Specifically, it suggests that private investment in modern, integrated supply chains cannot be relied upon to solve the multitude of problems – logistical inefficiencies, deteriorating infrastructure, high product wastage, urban congestion and food safety concerns – that increasingly plague traditional production and marketing systems over a time frame acceptable to most policy makers and donors. Moreover, Africa’s high rate of urban population growth means that a rapidly rising share of the population will be subject to these problems over time (see the section, “Drivers of Change”, below). Public engagement (not to say full public funding) will be central to any improvement in these areas. This public engagement must be based on a solid understanding of these systems, including the broad similarities they share and, crucially, the differences among them that can be the source of learning to improve performance. We now turn to an assessment of what is known about these systems, an identification of key knowledge gaps and, finally, an outline of a research and investment agenda to address the festering problems in these traditional marketing systems.

¹³Neven finds car ownership insignificant, unlike our results.

Table 8. Marginal effects from probit predicting purchase of specific food items in supermarket chains in Kenya and Zambia

	Zambia					Kenya			
	(N=128,640; Pseudo Rsq=0.24)					(N=9,381, Pseudo Rsq=0.36)			
Variable	dy/dx	Std. Err.	P>z			dy/dx	Std. Err.	P>z	
HH per capita income	0.0004	0.0001	0.00	***		0.0006	0.0001	0.00	***
HH Demographics									
HH size	-0.0013	0.0002	0.00	***		-0.0004	0.0005	0.39	
Education of HH head	0.0028	0.0002	0.00	***		0.0013	0.0003	0.00	***
Age of HH head	-0.0001	0.0001	0.26			0.0003	0.0001	0.04	*
HH is female headed	0.0119	0.0013	0.00	***		0.0301	0.0057	0.00	***
HH Assets									
HH owns a bicycle	0.0004	0.0009	0.66			-----	-----	-----	
HH owns a motorcycle	0.0007	0.0030	0.44			-----	-----	-----	
HH owns a car	0.0232	0.0018	0.00	***		0.0448	0.0080	0.00	***
HH owns a refrigerator	0.0247	0.0014	0.00	***		0.0549	0.0085	0.00	***
Food Categories									
Processed staples	0.0313	0.0032	0.00	***		0.1497	0.0177	0.00	***
Processed dairy	0.1287	0.0111	0.00	***		0.1068	0.0238	0.00	***
Chicken	0.0179	0.0043	0.00	***		0.0252	0.0211	0.23	
Irish Potato	0.0099	0.0064	0.12			-0.0122	0.0051	0.02	**
Vegetables	-0.0182	0.0010	0.00	***		0.0064	0.0063	0.31	
Fruit	0.0067	0.0021	0.00	***		0.0063	0.0072	0.38	
Pulses	-0.0040	0.0017	0.02	**		-----	-----	-----	
Other processed food items	0.0180	0.0019	0.00	***		-----	-----	-----	
Other food items	-0.0121	0.0014	0.00	***		-----	-----	-----	
Distance to Markets									
Distance to main public market	0.0003	0.0001	0.01	***		-----	-----	-----	
Distance to informal vendors (ka)	0.0010	0.0004	0.02	**		-----	-----	-----	
Distance to small grocers	0.0002	0.0001	0.10	*		-----	-----	-----	
Distance to supermarket chain	-0.0021	0.0002	0.00	***		-----	-----	-----	
Distance to other market outlets	-0.0001	0.0000	0.17			-----	-----	-----	
City Sizes									
Lusaka (largest city)	-0.0326	0.0017	0.00	***		-----	-----	-----	
Kitwe	-0.0103	0.0008	0.00	***		-----	-----	-----	
Kasama	-0.0055	0.0007	0.00	***		-----	-----	-----	
Mansa (smallest city; excluded)	-----	-----	-----			-----	-----	-----	
*** significant at 0.01; ** significant at 0.05; * significant at 0.10									
Dependent variable: 1=item was purchased in a supermarket chain, 0=item was purchased in a different channel									

Current status of horticultural systems in sub-Saharan Africa

Horticulture is an exceptionally broad topic. Yet if we focus on the production and marketing of fresh produce in SSA, strong common patterns emerge out of this diversity. Smallholder farmers dominate production and marketing in most countries, but a very small share of these farmers account for the vast majority of marketed output. Data in Zambia and Kenya show that well under 10% of farmers provide upwards of 80% of all marketed fresh produce; this pattern is almost certainly repeated throughout the continent.

Production by these smallholder farmers is heavily dependent on purchased seeds, fertilizers, crop protection chemicals, and irrigation. Yet availability, cost and knowledge of how to use these inputs constitute major barriers to participation by most farmers; these constraints also limit the yields and profits earned by those that do participate. Credit constraints to access inputs and equipment are a special problem for smallholders. Public sector research and extension capacity is exceptionally limited in most countries and so has made minimal contributions to improved farmer cultural practices that could increase yields and quality. Indeed, yield improvements in fruits and vegetables have been lower than in cereals, and productivity growth has been particularly low in SSA, where yields in vegetables have grown at an average annual rate of 0.6% compared to 0.7% for cereals and the world average of 1.4% between 1961 and 2004 (Weinberger and Lumpkin, 2005).

Uneven genetic quality and poor phytosanitary status of seeds is a fundamental limit to yield growth and stability in these regions. Most countries see very limited adaptive research to produce or select varieties suitable for the agro-climatic and input-limited production environments found in most of SSA. Due to deficiencies in seed production, processing technology, quality assurance, or management supervision, locally produced seeds (of both indigenous and exotic crops) are often contaminated by seed-transmitted pests and diseases, and are genetically diverse. The lack of proper storage facilities often leads to low or uncertain seed viability and vigor.

Production and marketing risks, driven by the production constraints identified above, the perishability of many of these crops, and inadequacies in post-harvest management (see below) also hinder participation by many farmers. Heavy and unpredictable pest pressure, unreliable rainfall, the possibility of

substantial post-harvest losses, and enormous price variability (linked to poor information flows and lack of coordination along the supply chain) create opportunities for high returns to farmers who are able to control their production environment and provide steady supplies to the market – and for large losses for those unable to do so.

As discussed above, modern wholesale and retail sectors are growing in the region, but the so-called “traditional” marketing sector, especially open-air (wholesale and retail) markets and an array of informal retail vendors outside of marketplaces, continues to carry more than 90% of domestically marketed fresh produce in nearly all countries. Like India, the modern retail sector in most countries of the region faces the 20/20/20 challenge: retail sales through these channels will have to grow 20% per year in real terms for 20 years for these modern sectors to reach a 20% market share. As a result, for several decades in most countries, and longer in the poorest countries, improved performance in the traditional production and marketing system will remain tremendously important for income growth and equity objectives.

With some exceptions, the public marketplaces at the center of these traditional marketing systems have become physically overwhelmed and managerially dysfunctional over the past 30 years. Physical capacity has not kept up with rapid urban population growth, resulting in unplanned and often chaotic decentralization of trade; wholesaling has often spread into existing retail markets without any new physical investment, while retailing has expanded into streets and informal marketplaces. As a result, traffic congestion and lack of sanitation have become major economic and public health concerns, and conflict with city authorities, residents and other businesses has escalated.

“Soft infrastructure” is also inadequate in these markets: formal market information and grades and standards are typically absent or nascent, and active coordination upstream with farmers to regulate the flow of produce to the market is the exception rather than the rule. These inadequacies lead to enormous day-to-day – and even within day – price swings, with unexpected price collapses being a special problem (Mwiinga, 2009). Meanwhile, the risky production environment discussed above, and the more limited geographical space over which markets can draw their supply (due to lack of cold chains and frequently poor roads) lead to sharp and less predictable patterns of seasonal price variability.

Ineffective public management of public markets has often been a key contributor to this decline. While new managerial approaches featuring greater collaboration between public and private sectors are emerging, these face major obstacles in the form of outdated laws that limit private sector involvement, rent seeking by city authorities loath to give up revenue from fees levied on traders, and pervasive mistrust between public officials and traders. Some also claim that “strong-arm” tactics by brokers and even organized criminal gangs also add costs to the system in some countries.

The modern horticultural export sector has grown substantially in some countries over the past two to three decades, but even where such growth has been the most impressive, the volume of produce flowing through domestic and regional markets far surpasses that in modern export channels. For example, the ratio of the farm gate value of fresh produce sold into domestic and regional markets in Kenya to fresh produce exported through modern channels was between five and six in 2003 (Tschirley et al., 2004a); in Zambia, which in the early 2000s had a growing export sector, the ratio is at least 20:1 (Hichaambwa and Tschirley, 2006). Even in Mexico, with one of the largest horticultural export sectors in the world, the domestic system is about twice as large (USAID, 2005). Furthermore, quality and health standards and demands for reliability of supply are substantially higher in western markets than in local and regional markets. As a result, and despite sometimes more than a decade of donor and government support for smallholder involvement, farm production for export is dominated by large commercial farmers to a much greater extent than is production for local and regional markets, where smallholders typically predominate (Diaz Rios and Jaffee, 2009; Asfaw, Mithofer and Waibel, 2009; Graffham and MacGregor, 2009; Graffham, Karehu and MacGregor, 2009; Humphrey, 2009).

Finally, government policy has substantial but mostly indirect effects on the sector. Direct government intervention in production, marketing or pricing is rare, unlike the widespread direct intervention seen in cereals markets. Key areas where government policy affects the fresh produce sector include (i) legal frameworks for the establishment and management of markets that often hinder active private sector engagement and contribute to the progressive decline of public marketplaces, (ii) land policies that make it difficult for potential private investors in marketplaces to obtain the land needed for such

investments, (iii) seed regulations that often emphasize policing over facilitation of innovation and thus inhibit the development and dissemination of new varieties through mechanisms such as Community Based Seed Production (Muendo and Tschirley, 2004), (iv) neglect of grades and standards that could raise quality over time and improve price predictability for farmers, (v) weak chemical regulations that allow internationally banned chemicals to be used by farmers frequently unaware of their negative environmental or health effects, and (vi) cumbersome procedures for the formalization of businesses, which contribute to the propagation of numerous small-scale informal food trading businesses.

Drivers of change

The conditions identified above are not static. We identify four trends that will have major effects on African economies over the next two decades and briefly highlight how they will affect fresh produce systems. First, urban population is growing rapidly. Africa has the highest urban growth rate of any developing area, currently 3.7% per year and projected to remain above 3% through 2030. Urban population will grow about 170% over the next 30 years, far outstripping rural growth and pushing the urban population share above 50% (World Urbanization Prospects, 2007). In the past, rapid urban growth has been associated with explosive growth of low-income urban settlements, which are served by the informal marketing sector. We see no reason to expect this pattern to change over the medium term. These patterns pose major challenges and also offer great opportunities to modernize African food systems. As perhaps the biggest users of public marketing infrastructure, fresh produce systems stand to be especially strongly affected by the type and effectiveness of public response to this trend.

A second trend is that SSA achieved GDP growth of 4.3% per year from 2000 to 2005, implying a per capita income growth rate of about 2%. Agricultural GDP grew faster in SSA, at 3.8%, than in any other developing area except the Middle East and North Africa. Because many fresh produce commodities have high income elasticities of demand and provide broad opportunities for value added (through processing or “ready to eat” packaging), continued per capita income growth, combined with rising populations, could fuel increases in demand for fresh produce of more than 5% per year on the continent; growth would be even higher in urban areas, due to the urbanization trends discussed above.

Third, the cost of communications is falling and its reach is improving dramatically. Africa has the highest rate of growth of cell phone ownership, with the number of phones growing from 15 million in 2000 to 160 million by the end of 2006 (ITU, 2007). Increasing competition among providers is leading to reduced calling costs, further broadening ownership and leading to the emergence of services such as mobile banking. SMS, because of its very low cost, is becoming an important channel for financial transactions and marketing information. These trends are not limited to urban areas: in Kenya, over half of a representative sample of rural smallholder farmers surveyed in 2007 owned at least one cell phone; one-quarter of all smallholder farm families in Zambia in 2008 owned a phone and an additional 44% had access to one; three-quarters of farmers selling fresh produce in Lusaka's main wholesale market in 2007 owned a cell phone and nearly 100% had access to one¹⁴. More recently, services such as M-pesa in Kenya have emerged that allow low-cost, secure, and instantaneous transfers of funds through SMS messaging. A farmer can communicate with a trader and receive payment for his product through an SMS, then go to one of the rapidly growing number of outlets at which he can convert the SMS message into cash. Growth rates in the use of these services are likely to be extremely high, especially among commercialized farmers and traders, promising further reductions in the cost of exchange.

These numbers make it clear that cell phones now present a huge, still growing, and largely unexploited opportunity to improve timely access to technical production and marketing information for farmers and directly facilitate trade, even in the poorest countries of the world [see Aker (2009) for evidence from Niger]. Such improvements will dramatically reduce search (including time) and other transactions costs for all farmers, regardless of the crop they grow, and the perishable nature of most fresh produce means that the payoff to farmers in this sector should be especially large.

Finally, the recent explosion in petroleum prices and their subsequent collapse in the face of the worldwide financial and economic crises may portend a period of substantially greater uncertainty regarding the price of petroleum. If this proves to be the case, it will likely be reflected in greater variability in the price and availability of inorganic fertilizers and pest control

chemicals; farmers operating in already weak input supply systems in developing countries may see their access to these items become even more uneven. Because fresh produce production is so reliant on fertilizer and chemicals, these trends could have especially negative effects in this sector. If energy prices begin to rise again, the scope for horticultural exports could be reduced and the relative competitiveness of air vs. sea freight would be affected, with associated implications for competitive advantage across countries in this market. All in all, the international export market looks to be an increasingly complex arena in which smallholder farmers have few competitive advantages.

Knowledge gaps

The discussion above highlights robust but very broad similarities in fresh produce production and marketing systems across the continent. These patterns are an important foundation for understanding these systems, but likely hide a great deal of variation across countries and across supply chains within countries. Quantifying that variation – developing a quantitative comparative assessment of the structure and performance of these systems across a representative set of countries and crops – holds one key to identifying investments that may improve performance. We identify below five areas where such quantitative benchmarking is needed.

Farm-level production and marketing patterns

We know a great deal about the structure of production and marketing of food staples like maize in SSA. For example, in Zambia large-scale commercial farmers account for approximately one-third of total production, but about half of the marketed surplus (Haggblade, Longabaugh and Tschirley, forthcoming). Within the smallholder sector, about 2% of farmers account for 50% of smallholder marketed production. Smallholders are more dominant in Mozambique, but patterns within that sector are similar to Zambia, with about 5% of farmers accounting for 70% of marketed production (Tschirley, Abdula and Weber, 2005).

Fresh produce is considered by many to hold great promise for land-constrained smallholder farmers to commercialize into higher value crops, due to the very high values that can be produced per unit area of land. Yet there are reasons to expect

¹⁴All calculations for Kenya and Zambia are by author from, respectively, the Tegemeo Institute/MSU panel data set in Kenya, the Central Statistical Office/MSU Supplemental Survey panel data set in Zambia, and from the MSU fresh produce wholesale price and quantity data set in Lusaka, Zambia.

that the structure of marketing of these crops may be even more concentrated than for food staples, due to high input costs, poor access to credit, high perishability, great price risk, and a resulting need for greater technical knowledge in order to be successful. For example, typical smallholder farmers producing vegetables for the market in Zambia may use 5-10 different crop protection chemicals and 4-6 different types of fertilizer on a field. Total costs for these chemicals and fertilizers on typical cropped areas can exceed US\$ 1,000. Additional costs include piecework labor, transport, fuel for running pumps, and amortization of pumps, irrigation pipes, animal traction equipment, and other needed equipment. These costs constitute a major barrier for many smallholder farmers.

The number of different chemicals and fertilizers used highlights the complexity of the production process and the need for solid technical knowledge. Meanwhile, the great majority of African governments provide almost no extension assistance for such crops, meaning that farmers have to piece together what knowledge they can from neighbors and input dealers. Documenting the impact of these characteristics on the actual structure of production and marketing of the major fresh produce crops in SSA is the starting point for devising approaches to enhance smallholder access to these potentially very profitable markets.

Price behavior and information flows throughout the supply chain

Comparison of price levels across countries, especially in relation to import and export parity prices, is a standard feature in the assessment of food staple systems. Examination of the level and trends in gross margins is also common. This kind of comparative knowledge is largely lacking in fresh produce systems. In part this discrepancy is due to the greater tradability and storability of food staples. Yet fresh produce is traded regionally in Africa, so that comparison of price levels and spatial margins across neighbors becomes important. Gross margin analysis for major crops across a range of countries would provide an important benchmark to then examine the reasons for differential performance. Price variability and predictability are also measurable performance dimensions that influence consumer and producer welfare and should be strongly correlated with the level of development of the production and marketing system (Mwiinga, 2009).

The behavior of these variables is strongly related to the adequacy and efficiency of information flows in the supply chain. A signal feature of effective fresh produce wholesale markets is that they are strongly linked backwards to the farm level and forwards to retailers through information flows. Traders or brokers in the market are in constant contact with farmers and buyers, packaging and quality standards are clear and adhered to, farmers have a good sense of what price they will receive when they take produce to the market (and of what they would receive in alternative markets), and traders/brokers have a good grasp of the quantities they are likely to receive on a given day and what they will be able to sell. Fluctuations in physical arrivals do occur and can drive sharp price adjustments, but extreme day-to-day price changes (e.g., of more than 20%) are the exception (Mwiinga, 2009).

While much of this communication takes place through private, informal communications, timely public availability of information on prices and quantities moving through markets is an important complement to these private communications. For example, brokers operating in South Africa's national network of fresh produce wholesale markets have access to real-time information on transacted quantities and prices throughout the day, and daily average prices and total quantities for all grades of all products are posted on the web at the end of each day. North of the Limpopo, this type of active coordination from market to farm appears to be much less developed, and real-time information on prices and quantities is nearly always lacking. Little is known about what information farmers and traders do have, about how level the information playing field is, and about what the payoff would be from improved, real-time marketing information.

Price determination, and especially the role of brokers, is another key issue in this area. Many wholesale markets feature brokered transactions rather than transfer of ownership between "first sellers"¹⁵ and wholesalers. This brokering activity frequently becomes a focus of suspicion among farmers and smaller traders, who often believe that brokers under-report their sales price, so that the actual cost to the first seller is greater than the official commission they pay to the broker. Impacted information is simultaneously a serious constraint to good research in this area and an indicator that such research is needed.

¹⁵By "first seller" we mean anyone arriving at the wholesale market with product to sell; typically these are farmers or rural assembly traders.

Wholesale market logistics

Wholesaling facilities for fresh produce on the continent range from South Africa's national system of modern wholesale markets with strong linkages down to the farm level, to more rudimentary but updated marketplaces, and from markets that were once adequate but have failed to keep pace with rising urban populations (e.g., Wakulima market in Nairobi), to woefully inadequate locations offering almost no hard or soft infrastructure to facilitate efficient and safe wholesale trade (e.g., Soweto market in Zambia). Assessing the benefits of upgrading existing facilities, building new facilities, and promoting coordination down to the farm level requires a range of system-wide information, but needs to start with a common set of metrics regarding the performance of these marketplaces. These include measures of time and other costs for sellers and buyers, gross throughput and value added per unit area (and per unit investment) in the market, product wastage (including the typical magnitude of price decline over the course of a day, required to find a market for poor quality produce), and gross margins within the wholesale markets themselves (in many cases this involves the difficult task of quantifying formal and informal brokerage fees within these markets).

Wholesale and retail market ownership and management

Though exceptions exist, formal wholesale and retail markets in Africa are most often owned and managed by municipal authorities, with oversight from ministries of local government. Too often, relationships between the traders using the markets and these public sector authorities are confrontational. Fee structures are often not well defined, fee collection is a source of conflict, use of the funds is not transparent, and there is often little if any evidence of meaningful investment of the funds into market improvements or even basic upkeep such as trash collection. As a result, many markets have become physically overwhelmed and sources of major concern about urban congestion and public health. Innovative efforts led by private investors to build new, formally recognized wholesale markets, such as the Kasarani effort outside Nairobi in which the City Council granted 100 acres of land to potential investors, have foundered on disagreements with municipal authorities about public and private roles in ownership and management.

Yet the unplanned decentralization of markets noted above in the section on horticultural systems driven by the dysfunction too often seen in formal marketplaces, has led to a greater

variety of ownership and management structures, typically with much more private sector control. Documenting what these structures are, how they emerged, and linking measurable performance indicators to them could begin to provide insights as to how this often chaotic decentralization of trade can be turned to advantage in institutionalizing more effective ownership and management structures.

Towards a research and investment agenda to improve fresh produce supply chains in Africa

This review has argued that production and marketing systems for fresh produce in Africa are unlikely to be transformed within an acceptable time frame by private investment in modern, integrated supply chains. Public engagement is crucial to prevent the severe problems in these systems from becoming much worse in the face of rapidly growing urban populations. Experience in the rest of the world suggests that the right public policies, by catalyzing collaborative investment by government, donors, and private sector, could turn fresh produce systems into major sources of rural growth through direct production and downstream linkages in value added. In this final section we outline several areas that present major opportunities, and highlight the constraints that will need to be overcome and the research that needs to be done in each area.

Improved information throughout the supply chain

The first opportunity stems from identifying ways to use the expanding ownership and falling costs of communication through mobile phones to bring a wide array of timely information to farmers and traders to improve supply chain performance. Recent research has demonstrated large improvements in market efficiency after the introduction of cell phones through their effect on reducing the cost of information needed for spatial arbitrage (Jensen, 2007; Aker, 2008). These improvements did not require public or donor investment: private cell phone providers invested in the systems and traders (few farmers in these cases) used the phones to search more widely and quickly for price information through their own private contacts. The challenge now, especially in light of the vast expansion of cell phone ownership among smallholder farmers over the past five years, is to find ways, when possible through public/private collaboration, to broaden the scope of information provided in this way. Examples abound:

- An SMS-based system in Zambia automatically provides callers with bid price and contact information for a range

of food staples in markets across the country – the system is low cost because buyers see it in their own interest to provide this information free of charge;

- An SMS system in Sri Lanka provides gherkin farmers with daily information on amount and reasons for rejection of produce in the market so that they can take immediate action on their own farms to avoid the problem [typically related to insect infestation (de Silva and Ratnadiwakara, 2005)]; and
- Another project in Sri Lanka aims to reduce information search costs throughout fresh produce supply chains through use of SMS, e-bulletin boards, price reporting screens in markets, and links with banks and extension services (de Silva and Ratnadiwakara, 2005).

Examples of additional information that could be provided include: input prices and availability (including seed, fertilizer, chemicals, credit, and irrigation and other equipment); early warning on pest outbreaks, including best response options; technical information on recommended seeds and inputs, with the latter being conditional on specific types of production problems (this would apply especially to pest control chemicals); and including health and environmental warnings on plant protection chemicals. The key constraints to exploiting this opportunity lay in conceiving the most useful information, generating it in a sustainable fashion, and packaging it in the most effective combination of SMS, bulletin board, radio, Internet and other dissemination channels. Literacy will also be a constraint in rural Africa. Work is underway by some NGOs to use SMS itself to promote functional literacy for these purposes (Jenny Aker, pers. comm.); learning from this and other initiatives for best approaches to scaling-up needs to be a top priority.

Two points should be kept in mind as efforts move ahead to capitalize on opportunities opened up by ICT. First, the spectrum of information available through SMS systems is likely to be substantially narrower than that on local and provincial radio. Second, despite their growing adoption, issues of literacy and cost mean that cell phones are not likely for some time to be able to reach as many farmers as local and provincial radio broadcast in the local language. For these reasons, Weber et al. (2006) stress that modern ICT tools should be used, but that radio is likely to remain for some time the most effective means of “providing broad-based unbiased information to help improve

the bargaining power of farmers...and in informing public decision makers about how markets function...”.

Improved production environments

Improving production environments starts with improved crop varieties that promise larger, more diverse and more reliable harvests. Realizing this promise then requires broader access to seed and other inputs, improved technical knowledge among farmers, and improved phytosanitary seed quality.

Improved germplasm – There is a critical need for genetic resources and quality seeds adapted to the developing world production environments where many inputs, including fertilizers and water, are limited (Chrispeels and Sadava, 2003). Simple screening of existing germplasm will be essential, both for performance under local conditions and management practices, and for potential under local conditions with (eventual) improved management. Yet there is also a need to develop new varieties, whether through traditional breeding or molecular techniques, both of which require considerable technical horticultural expertise.

The overwhelming importance of “exotic” species, such as tomato, onion, cabbage and kale, in African diets and production systems, and the very low yields of these crops compared to worldwide norms, means that improved yields in these crops will have the largest and most immediate positive effect on farmer incomes and consumer purchasing power. Yet indigenous vegetables such as African eggplant, amaranth, nightshades and others contribute to food and livelihood security for many resource-poor farmers (Cavendish, 2000; Weinberger and Msuya, 2004), have seen considerable recent growth in some countries (albeit from a very low base in terms of marketed output), and represent genetic resources and biodiversity that need to be assessed and conserved for the future (National Research Council, 2006; National Research Council, 2008).

Broader access to seeds and other inputs – Improved germplasm will do no good if farmers cannot reliably access it. It is also true that many varieties adapted to low input environments will do better with the application of fertilizers and plant protection chemicals. Post-harvest quality is also heavily influenced by farmers’ ability to control pests during the production process. Improving access to seeds and other inputs requires improved credit systems, policy reform to promote private input sector development, and innovative approaches

to seed propagation and dissemination, such as community based seed production and other small-scale seed supply micro-enterprises [learning from experience in Tanzania and elsewhere; see Muendo and Tschirley (2004)].

Improved information also has a crucial role to play in improved access to credit and physical inputs. Information systems that reduce the cost to farmers of determining availability and comparing prices of inputs will lead to greater input use and higher yields; SMS-based cell phone systems are one promising approach.

Improved technical knowledge among farmers – Use of ICT to improve information on price and availability of inputs would represent a small, albeit important extension of the more common emerging use of such technology to improve information on output prices and quantities. Using the full range of ICT, including mobile phones, to improve technical information for farmers will require substantially more innovative approaches. The potential payoff to such approaches is high, because most African governments do not now and will not in the near future have the human or financial resources to operate conventional extension systems for fresh produce. Action research linked to experimental programmatic initiatives in this area, conducted in collaboration with farmer and trader organizations and input dealers, should thus be accorded high priority in future research and programmatic initiatives.

Feeding these systems with reliable information requires developing new, situation-specific information on agro-ecologies, sustainable production, resource management and cropping systems, especially for environments where inputs are limited, soils are poor or existing production practices have degraded or compromised current and future crop productivity. In addition to integrated water and nutrient management, integrated pest management (IPM) is very desirable for two reasons: (i) the presence of pesticide residues has significant trade implications, and (ii) fruit and vegetable production activities are the largest users of plant protection products per hectare, and the smallholder farmers involved in this production (or poor laborers working on larger farms) rarely use protective clothing and have little knowledge of environmental risks (such as the killing crucial pollinators). Improved knowledge on proper water management approaches in dry areas is also a priority.

Improved hard infrastructure linked to better management models and improved coordination

Rising incomes and rapidly growing urban populations in Africa mean that the already deplorable state of many marketplaces on the continent will become even worse if the accumulated deficit in hard marketing infrastructure – primarily wholesale and some retail markets with associated improvements in roads – is not confronted with urgency. Yet the planning and construction of new markets, if not informed by solid supply chain research and carried out in a framework that ensures input from a broad range of farmers, traders and end-users, can result in expensive new facilities that are little used and thus do little to improve system performance.

Several points therefore need to be kept in mind as attempts are made to address the accumulated hard infrastructure deficit. First, the private sector needs to be actively engaged in the process. In some cases, private investors may be able to take the lead, with only ancillary contributions by government, e.g., making publically owned land available in a suitable location and undertaking related improvements in road access. Most often, efforts will need to proceed on the basis of public/private partnerships. Second, making a public/private partnership live up to its name will often require modifications to existing legal frameworks and accompanying attitudes. Legislation in Africa frequently gives primacy to municipal authorities in the ownership and management of marketplaces; over time, the revenues from market fees have become important for city budgets and also the focus of rent seeking by some city officials. Conflict has become endemic, funds have not been reinvested in the marketplaces, and the cleanliness and efficiency of marketplaces has suffered. Finding ways to break out of this dysfunctional managerial relationship is imperative. Learning from successful examples (e.g., South Africa's national system of fresh produce wholesale markets) should be one important element in this effort.

Third, improvements in services – primarily in the amount, quality, and flow of information throughout the system – need to be conceived jointly with the hard infrastructure. This starts with the provision of real-time information on transacted prices and quantities. Grades and standards developed in collaboration with the trade will improve the quality of this information and so deserve early attention. Traders often recognize differing qualities within some broad category of “standard quality”

produce, so capturing this (informally) recognized heterogeneity in the form of quality grades and incorporating them into reporting of market prices and quantities can be an effective way to make progress in this area. Moving beyond prices and quantities, real-time feedback to farmers on observed quality problems in the market (which can vary markedly over the season based on pest outbreaks on the farm) and technical solutions at the farm and post-harvest levels can be exceptionally useful. This kind of information properly originates in a wholesale market, which is where prices – and discounts for quality problems – are formed.

Finally, the public/private stakeholder groups that hopefully form the core of planning efforts in this area need to prioritize investment at the wholesale level. Typically retail markets receive most attention, due to their often chaotic expansion and replication in residential areas combined with the explosion in many cities of street vendors. These are legitimate and important issues, but cannot be resolved without improvements in the wholesale markets on which all these traders depend.

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Growth in high-value export markets in sub-Saharan Africa and its development implications

Miet Maertens¹

Abstract

During the past decades the global food system changed dramatically with increased trade in high-value food products, increased exports from developing countries, increased consolidation and dominance of large multinational food companies, and increased proliferation of public and private food standards. As a consequence, global food trade is increasingly organized around vertically coordinated supply chains rather than around spot market transactions. While there is consensus that these structural changes are profoundly changing the way food is produced and traded, there is no consensus on the overall welfare implications of increased high-value food exports and supply chain restructuring in poor countries. In this paper we discuss the income and poverty implications of expanded horticulture exports and changing supply chain structures for rural households in Sub-Saharan African exporting countries. We put together the economic arguments, distinguish different channels through which rural households are affected, provide evidence from three comparative case studies on high-value horticulture exports, and derive implications for policy makers, private investors, and the development aid community.

Introduction

During the past couple of decades the integration of poor countries in global agricultural markets accelerated with increased food exports originating from developing countries. At the same time, there have been important structural changes in global agri-food markets. The structure of world food trade, and especially of developing countries' exports, has changed dramatically with traditional tropical export products (such as coffee, cocoa, and tea) losing importance and non-traditional high-value commodities (such as horticulture and seafood products) gaining importance. In addition, food trade is increasingly consolidated with large multinational food companies (such as retail chains and processing companies) increasingly dominating global agri-food chains. Moreover, food standards (including, for example, food quality and safety standards) have been increasing very sharply and global agri-

food trade is increasingly regulated through public as well as private standards.

These structural changes have had important effects on the agri-food systems of developing countries, especially in dynamic high-value export sectors such as horticulture. High food standards and foreign investments in developing countries' food sectors have induced increasing levels of vertical coordination in the food chains of these countries, with important implications for smallholder farmers and rural households.

While there is consensus that the structural changes in global food supply chains are profoundly changing the way food is produced and traded in developing countries, there is no consensus on the overall welfare implications of these changes. Integration of developing countries in global markets is generally believed to stimulate economic growth in these countries but there is much less consensus on the impact of trade on income inequality and poverty (Dollar and Kraay, 2002 and 2004; Winters et al., 2004). There are different views on the effects of increased agri-food exports in terms of local-level development, rural income mobility and poverty reduction. On the one hand, stimulating agri-food exports, especially high-value exports, has been promoted as a pro-poor development strategy because of the direct link the sector has with the rural economy (e.g., Aksoy and Beghin, 2005; Anderson and Martin, 2005; Carter et al., 1996; World Bank, 2008). On the other hand increased globalization and the structural changes in global agri-food chains have been argued to be detrimental for global poverty reduction. The main concern is that because of increasing public and private food standards, increasing consolidation in global food markets and foreign direct investment (FDI) in the agri-food sectors of developing countries, smallholder farmers become increasingly marginalized in high-value export chains, either because they are excluded as primary producers in the chains or because they are exploited by large, often multinational, food companies (e.g., Weatherspoon et al., 2003; McCulloch and Ota, 2002; Dolan and Humphrey, 2000; Key and Runsten, 1999; Farina et al., 2005; Farina and Reardon, 2000; Reardon et al., 1999). The arguments are subject to debate and empirical studies – including case-studies from different sub-Saharan African (SSA) countries – have come to diverse conclusions about the effects of increased agri-food trade and structural changes in global agri-food markets on rural incomes and poverty.

¹Division of Agricultural and Food Economics, Department of Earth and Environmental Sciences, K. U. Leuven, Belgium. Corresponding author (Miet.Maertens@ees.kuleuven.be)

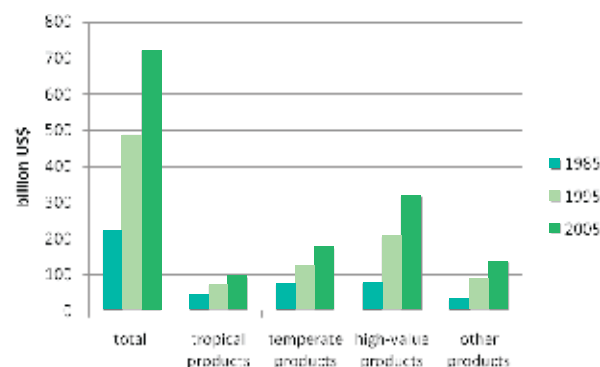
In this paper we put together the arguments and empirical case-study evidence on how developing countries' food systems have altered in response to the recent structural changes in global agri-food markets and what the implications have been for rural incomes and rural poverty reduction. The paper is structured as follows: In the next section we briefly discuss the recent structural changes that have been taking place in global agri-food markets. Following that we analyse in particular the developments in Sub-Saharan African export markets and discuss the implications for the governance structure of food supply chains. We then discuss the channels through which local households benefit from recent expansions in export markets and put together empirical case-study evidence that quantifies some of the effects. Finally, we draw some conclusions and discuss the implications of the findings in this paper for private investment priorities, donor strategies and government policies.

Structural changes in global agri-food markets

During the past couple of decades, global food and agricultural markets have experienced rapid structural changes. First, the structure of agri-food trade has changed significantly over the past couple of decades with non-traditional, high-value exports gaining importance and traditional tropical export products losing importance. Second, food multinationals increasingly dominate international food chains. Third, food standards have increased sharply since the mid-1990s. Fourth, these changes have had important implications for the way global food supply chains are governed. In this section we consecutively discuss each of these recent structural changes in global food markets.

Changing structure of world agri-food trade

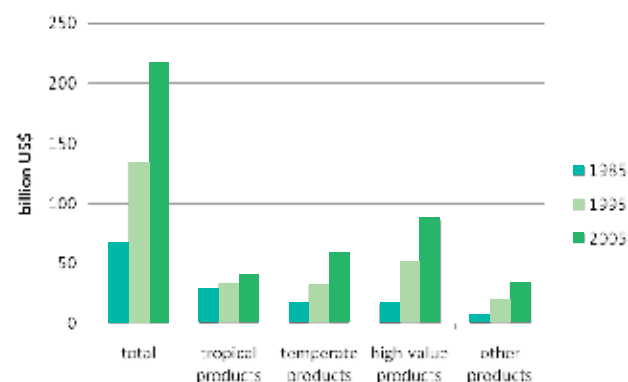
World trade in food and agricultural products is increasing and has more than tripled during the past two decades; from US\$ 220 billion in 1985 to US\$ 720 billion in 2005 (Figure 1). Exports of high-value products – defined here as including fruits, vegetables, fish, seafood, meat and dairy products with a relatively high per unit or per weight value as compared to more bulky primary such commodities as cereals, coffee and cocoa – have been increasing even more rapidly. Their importance in total global agri-food exports has increased by 10 points, from 34% in 1985 to 44% in 2005.



Source: calculations based on FAOstat statistics

Figure 1: Changes in world agri-food exports, 1985 - 2005

This shift towards high-value agricultural exports has been most dramatic in developing countries, where they increased more than fivefold over the period 1985-2005 (Figure 2). The share of high-value commodities in total developing countries' agri-food exports increased from 23% in 1985 to 40% in 2005. This has been accompanied by a significant decline in the importance of traditional tropical exports – defined here as including coffee, cocoa, tea, sugar, cotton, nuts and spices – for which the share in total exports decreased from 41% in 1985 to 18% in 2005. High-value commodities now actually constitute the main component of developing countries' agri-food exports.



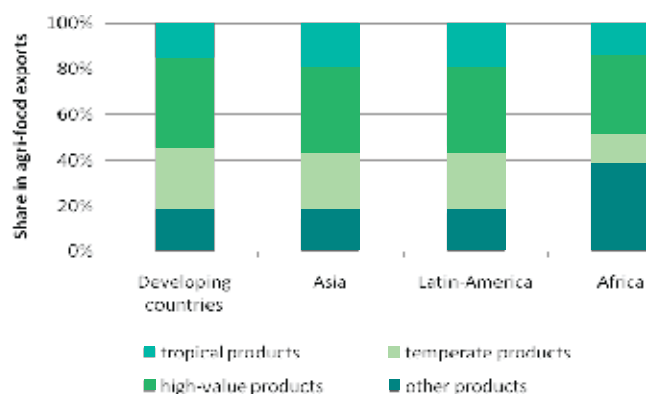
Source: calculations based on FAOSTAT statistics

Figure 2: Changes in developing countries¹ agri-food exports, 1985 - 2005

The shift from traditional tropical exports to non-traditional, high-value exports is apparent in all developing regions, but there are some slight differences across the regions. In Latin America and developing Asian countries, high-value products

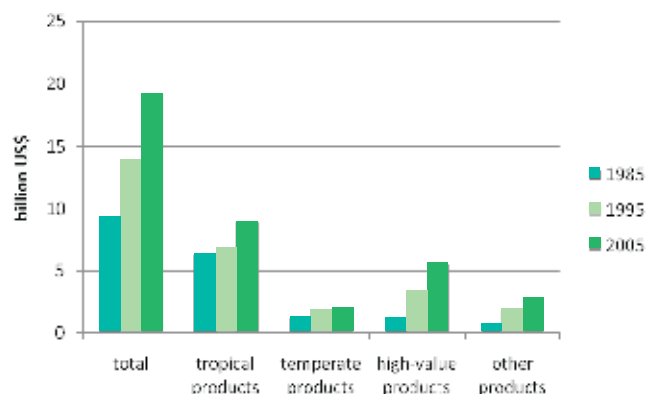
¹ Developing countries include all low- and middle-income countries in Africa, Central America, South America and the Caribbean; East Asia, South Asia, Southeast Asia and Central Asia.

have become the main export sector, constituting respectively 43% and 38% of total food exports from these regions (Figure 3). In Sub-Saharan Africa, the importance of high-value exports is slightly lower, constituting 30% of total exports, and traditional tropical exports still constitute the largest part of SSA agri-food exports. However, the shift towards high-value exports in the past decades has been most dramatic here. The importance of traditional tropical exports in total agri-food exports has decreased from 68% in 1985 to 46% in 2005, while the share of high-value exports more than doubled, from 14% in 1985 to 30.4% in 2005 (Figure 4). These are important changes for a region where many countries have for decades been heavily dependent on one or just a few export commodities.



Source: calculations based on FAOstat statistics

Figure 3: The structure of agri-food exports for different developing countries and regions, 2005



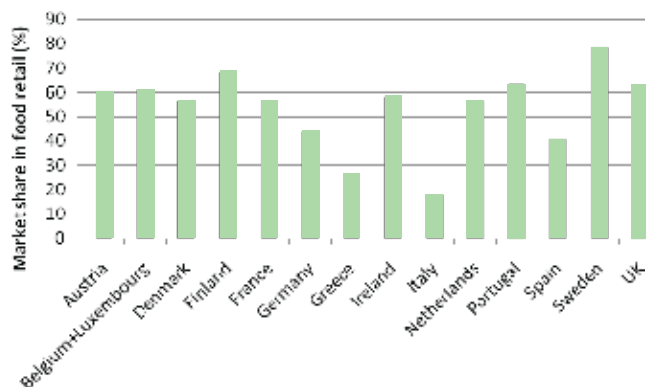
Source: calculations based on FAOstat statistics

Figure 4: Changes in sub-Saharan African countries' agri-food exports, 1985 - 2005

Increased consolidation in food processing and retail

In the past decades global food supply chains have become increasingly concentrated, with large food companies and multinational firms dominating the chains. This is most apparent at the level of food retailing. The so-called “supermarket

revolution” first emerged in industrial countries, where the food distribution sector is becoming increasingly concentrated around a few large super- and hypermarket chains. For example, in European countries the five-firm concentration ratio in food retail is particularly high, above 60% in many countries, reflecting the dominance of large retail chains (Figure 5).



Source: Dobson (2003) cited in Henson (2006)

Figure 5: The five-firm concentration ratio in food retail in selected EU countries, 1999

More recently, this supermarket revolution has taken off in developing countries. Supermarkets have spread rapidly in most of Latin America, East and Southeast Asia and are starting to emerge in Sub-Saharan Africa and South Asia (Gulati et al., 2005; Reardon and Berdegúe, 2002; Reardon et al., 2003; Weatherspoon and Reardon, 2003). For example, among Latin American countries, the share of food retailed through supermarkets has been estimated to range from 35% to 75% (Reardon and Berdegúe, 2002). Also in Africa, supermarkets have started to emerge and, initially at least, a rapid spread throughout Africa was expected (Weatherspoon and Reardon, 2003). However, recent studies show that the supermarket revolution in Africa is progressing much slower than anticipated in earlier studies and that traditional wet markets will remain dominant in food retail in Africa for many years to come (Humphrey, 2007; Minten, 2008; Tschirley, 2004 and 2011; Traill, 2006).

Food processing consolidation is also taking place. For example, in the case of coffee the share of the five largest processors rose from 21% to 58% between 1995 and 1998, and three multinational trading companies dominate the trading stage. In the case of cocoa, the number of grinders in Europe fell from about 40 in the 1990s to 9 in 2000, and the three largest grinders account for over 50% of the market, with even higher levels of concentration in chocolate manufacturing (UNCTAD, 2005).

Increasing food standards

During the past decade food standards, including public regulations as well as private corporate standards, have increased sharply. Fresh food exports to the EU, for example, have to satisfy a series of stringent public requirements, including marketing standards, labeling requirements, conditions concerning contamination in food, general hygiene rules and traceability requirements. In addition, private standards established by large food companies, supermarket chains and NGOs play an increasingly important role in agri-food trade (Jaffee and Henson, 2005). Such standards increasingly go beyond food quality and safety specifications and include ethical and environmental concerns as well. Although private standards are legally not mandatory, they have become de facto mandatory because a large number of buyers in international food markets now require compliance with, for example, GlobalGAP standards (Henson and Humphrey, 2008).

A number of factors contribute to explaining the increased importance of standards in global food trade. A series of major food safety hazards in high-income countries has increased consumer and public concern about food-borne health risks and created an increased demand of food safety. In addition, rising income levels and changing dietary habits have increased the demand for high quality food. Consumers are also increasingly (made) aware of ethical and environmental aspects related to food production and trade, which has increased the need for specific standards related to these aspects. But in addition the increased trade in fresh food products such as fruits, vegetables, fish, and meat – which are prone to food safety risks and subject to specific quality demands by consumers – have increased the need to regulate trade through standards. Moreover, the increased dominance of supermarkets in food chains also contributes to explaining the increased importance of food standards. Large retail chains put much emphasis on freshness, product quality and food safety as a product differentiation strategy or to reduce food safety risks and the costs related to the risk of selling unsafe food (Henson and Humphrey, 2008).

Governance of global food supply chains

Large multinational food companies increasingly dominate global food supply chains and trade is increasingly regulated through standards set by these private companies or by national, regional and international authorities. This has led to changes in the structure and organization of global food supply chains.

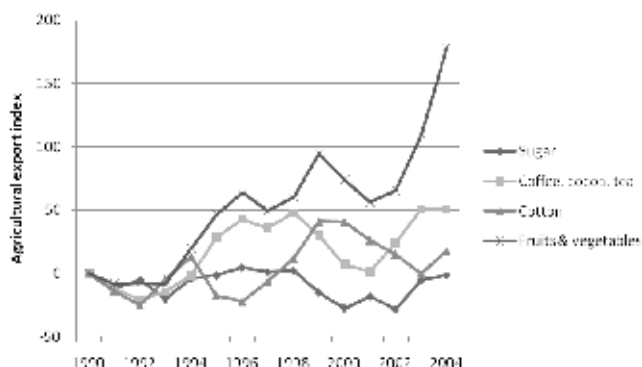
Rather than being based on spot market transactions high-standards food supply chains entail varying levels of vertical coordination at different nodes in the chains. This is apparent in the vertical relationships between supermarkets and their specialized suppliers or food importers. In addition, the changing governance systems in global supply chains result in increased vertical coordination between developing country producers on the one hand, and exporters, food processors and supermarkets in these countries on the other. This is most apparent in the form of contract farming between agro-industrial firms and local primary producers. In the most extreme case, primary production is completely vertically integrated with upstream processing and trading activities.

As we will document in the next sections, the governance system in global food supply chains is crucial in understanding the local welfare implications of increasing high-value and high-standards agri-food exports in developing countries.

High-value export markets in sub-Saharan Africa

Horticulture exports

Exports of high-value and high-quality agricultural produce have been growing rapidly in many developing countries over the past two decades. Horticulture products are playing an especially dominant role in this (Weinberger and Lumpkin, 2005). Also in SSA, the region lagging most in integration in international markets, horticulture exports to high-income regions have almost tripled during the past 15 years, from less than 2 million tons in 1990 to 6 million tons in 2005 (FAOSTAT, 2008). From the early 1990s onwards, horticulture exports from SSA grew sharply and continuously while the export growth of other, more traditional agricultural commodities, such as coffee, sugar and cotton, was much smaller and less persistent (Figure 6). Several SSA countries, including very poor countries such as Ethiopia, Burkina Faso, Cameroon, Kenya, Uganda and Senegal, have become important suppliers of fresh fruits and vegetables to EU markets.



Source: calculations based on FAOstat statistics

Figure 6: Index of agricultural exports from Sub-Saharan Africa, 1990 – 2005

Public and private food standards have often been mentioned as barriers for food exports from developing countries, but it is remarkable that many poor SSA countries experienced accelerated growth in fresh produce exports, mostly to the EU, exactly during a period of sharply increased EU food quality and safety standards. Private standards for horticulture products have been increasing especially sharply. Some private standard-setting bodies and certification schemes have initially focused on fruits and vegetables, for example the EurepGAP standards set by a group of European retailers.

Supply chain governance

The growth in high-value agri-food exports from SSA countries has been associated with the spread of so-called modern supply chains in these countries. This modernization in SSA horticulture sectors entails important shifts in production and trade. High-value horticulture supply chains differ substantially from traditional marketing channels in SSA countries. While traditional marketing channels are based on spot market transaction and often involve a large number of buyers and sellers, the high-value horticulture supply chains are largely based on vertical coordination and contract farming, or on complete ownership integration in the most extreme cases. This is important for understanding the overall welfare implications of increased high-value trade and increasing food standards.

Development impacts

The recent boom in African – and other developing regions' – horticulture exports has brought about a broad dispute among academics, policy-makers and the development aid community on the overall welfare impact. Especially in SSA, the region most

lagging in poverty reduction, the welfare implications of high-value horticulture trade are a pertinent issue. On the one hand, it is recognized that horticulture products entail an important potential for raising rural incomes and reducing poverty because of their high intrinsic value and labor-intensive production systems (Aksoy and Beghin, 2005; Anderson and Martin, 2005; World Bank, 2008). Many SSA countries therefore pursue the development of horticulture export supply chains as a specific poverty reduction strategy. Also, the World Bank and other international donors have invested heavily in increasing SSA countries' capacity in horticulture exports based on the belief that this would contribute to poverty reduction.

On the other hand, developing country horticulture exports have been thought to exacerbate existing inequalities while failing to create direct gains for the rural poor. This would be the case because smallholders, and especially the poorest farmers, are either excluded from these high-value supply chains or exploited by large multinational companies (Dolan and Humphrey, 2000; Reardon et al., 1999). Increasing standards are said to result in increased smallholder exclusion from profitable export opportunities because they face financial and other constraints to comply with increasing standards. Vertical coordination and contract farming lead to the exclusion of the poorest households because food companies strive to reduce transaction costs and thus prefer to contract with relatively larger farms. In addition, increased consolidation in food supply chains and the increased power of large supermarket chains and multinational food companies lead to the exploitation of poor farmers who face unequal bargaining power vis-à-vis these companies.

Empirical studies concerning the welfare implications of increasing standards and high-value agri-food trade have come to diverse conclusions (Swinnen, 2007). Some studies have shown positive effects including increased rural incomes and reduced poverty rates (Maertens and Swinnen, 2009; Minten et al., 2007). Other studies have documented lower product prices (Neilson, 2008) and the increased exclusion of smallholders with negative effects on rural incomes (Danielou and Ravry, 2005; Minot and Ngigi, 2004).

To draw general conclusions on the overall welfare implications of the growth in high-value exports, the increase in food standards and the restructuring of food supply chains for rural households in developing countries, it is necessary to distinguish between different types of effects. In fact the growth in high-

value export supply chains has affected rural households in developing countries in two direct ways: through product markets and through labor markets. We discuss these effects in turn.

Product market effects

Local farm-households are affected by high-value export growth and the emergence of high-standards supply chains through product markets; more specifically through the production and marketing of high-value produce in contract-farming schemes. There are efficiency and distributional consequences related to these product market effects.

First, the welfare implications of high-value contract-farming schemes depend on whether farmers engaged in these schemes benefit from this. Contract-farming schemes in high-value supply chains usually entail the provision of inputs, credit and farm assistance to farmers by the contractor company. This enhanced access to inputs and credit results in reduced production and marketing risks, improved technology and productivity, and ultimately higher incomes for farmers; which has been empirically demonstrated by various authors (Birthal et al., 2005; Gulati et al., 2007; Minten et al., 2006).

Second, the implications in terms of poverty reduction and rural inequality critically depend on the distributional consequences of contract-farming schemes and the inclusion of the poorest farmers. If the poorest farmers are increasingly excluded from high-value supply chains because of increasing standards and increased vertical integration, then rural inequalities might be aggravated. Many authors argue that this is indeed the case and that companies prefer to contract with larger suppliers because of high transactions costs, the inability of smallholders to produce consistent and large volumes, the constraints smallholders face in complying with increasing standards, etc.

The extent of smallholder exclusion from high-value supply chains is a contentious issue and mainly an empirical question. In horticulture supply chains in SSA countries there is a wide variation in the share of produce that is procured from smallholders. For example the pineapple and banana sectors in Côte d'Ivoire, the vegetable sector in Ghana and Madagascar and the fruit sector in Kenya are largely based on smallholder contract-farming while other sectors rely on procurement from large commercial farms of own integrated estate production (Table 1). Some studies have documented that the share of

Table 1: Smallholder procurement in sub-Saharan African export supply chains

Country	Commodity (group)	Year of survey	Share of export sourced from smallholders	Number of smallholder producers
Ghana	Fruits & vegetables			3,600
	Pineapples	2006	45%	300 - 400
	Papaya	2006	10-15%	
	Vegetables	2002	95%	
Côte d'Ivoire	Pineapple	1997	70%	
	Mango	2002	< 30%	
	Banana	2002	100%	
Senegal	French beans	2005	52%	600 - 900
	Tomatoes	2006	0%	0
Kenya	Fresh fruit & vegetables	2002	± 50%	12,000 - 80,000
Madagascar	Fresh vegetables	2004	90-100%	9,000
Zambia	Vegetables	2003		300
Zimbabwe	Fruits & vegetables	1998	6%	10

Source: Legge et al. (2006) and Millennium Challenge Account (2006) for Ghana; Rouge and N'Goan (1997) quoted in Minot and Ngigi (2004) for Pineapple in Côte d'Ivoire; Lambert (2002) for mango and banana in Côte d'Ivoire; own calculations from case-studies for Senegal; Jaffee (2003) and Asfaw et al. (2007) for Kenya; Minten et al. (2006) for Madagascar; Smith et al. (2004) for Zambia; and Dolan and Humphrey (2001) and Legge et al. (2006) for Zimbabwe.

smallholder contract-farming in high-value horticulture supply chains in SSA is decreasing as a result of increasing standards (Dolan and Humphrey, 2000; Danielou and Ravry, 2005). Other studies have shown that among the smallholders it is mainly farmers with more land and non-land assets that are involved in high-value contract-farming while the poorest are excluded (Legge et al., 2006; Maertens and Swinnen, 2008; McCulloch and Ota, 2002; Minot and Ngigi, 2004).

However, the effects of smallholder exclusion in high-standards horticulture supply chains cannot be interpreted without considering the second mechanisms through which rural households are affected; this is through labor markets.

Labor market effects

A second mechanism through which rural households are affected by increasing high-value exports is through labor markets. The growth in high-value agri-food exports has been associated with increased employment in agro-industrial firms. Where high-value export supply chains have moved from being based on smallholder contract farming towards agro-industrial estate production, additional employment has been created in the fields of these companies. Moreover, employment has been created in post-harvest processing and the handling of high-value produce as the increasing requirements for sorting, grading, washing, labeling, etc., incorporated in public regulations and private standards have increased the need for labor intensive post-harvest activities.

We document the importance of these labor market effects in the case of SSA horticulture exports in Table 2, showing figures on the number of employees in horticulture agro-industries in several subsectors and countries. The figures show that in many poor SSA countries, thousands of people are employed in the horticulture agro-industry. Part of this employment might concern urban jobs in processing units and packinghouses, but the lion's share is rural employment. Moreover, a major share of the thousands of employees in the SSA horticulture agro-industry is female.

These employment and labor market effects have received less attention in the empirical literature. Only a handful of studies have actually taken into account labor market effects in the analysis of the welfare implications of high-value export expansion in developing countries. For example, McCulloch and Ota (2002) show that employment in the Kenyan horticulture export industry is especially important for the poor. Barron and Rello (2000) find that the tomato agro-industry in Mexico provides jobs for the rural poor, thereby contributing to rising rural incomes in poverty-struck regions of the country. Weinberger and Lumpkin (2005) discuss the potential of horticulture production for poverty reduction, including effects that come through the creation of employment in these sectors. Also, our own case studies from Senegal, which are discussed in detail below, show the importance of labor market effects.

Table 2: Employment in sub-Saharan African export horticulture supply chains

Country	Commodity	Year of survey	Number of employees in the FFV agro-industry	Share of female employees
Cameroon	Banana	2003	10,000	
Côte d'Ivoire	Banana and Pineapple	2002	35,000	
Kenya	Flowers	2002	40,0000 -70,000	75%
	Fruits & vegetables		2,000,000	
Senegal	French beans	2005	12,000	90%
	Cherry tomatoes	2006	3,000	60%
Uganda	Flowers	1998	3,300	75%
Zambia	Vegetables	2002/3	7,500	65%
	Flowers	2002/3	2,500	35%
South Africa	Deciduous fruit	1994	283,000	53%

Source: Arias (2003) for Cameroon; Minot and Ngigi (2004) for Côte d'Ivoire; own calculations from case studies for Senegal; Smith et al. (2004) and Barrientos et al. (2001) for Zambia and flowers in Kenya; Jaffee (2003) and Lambert (2002) for fruits and vegetables in Kenya; Danson et al. (2004), and Barrientos et al. (2000) for South Africa.

Comparative case studies

In the remainder of this section we analyze and compare the insights from three original case studies on high-value horticulture exports in SSA countries: the vegetable export sector in Madagascar (from Minten et al., 2008), the bean export sector in Senegal (from Maertens and Swinnen, 2009 and Maertens, 2009), and the tomato export sector in Senegal (from Maertens et al., 2008). The combination of these case studies is particularly relevant because the three studies document the diversity in supply chain responses to increasing standards and the resulting varying levels of vertical coordination in the chains. The governance structure in the supply chains further determines the way rural households benefit from increased exports.

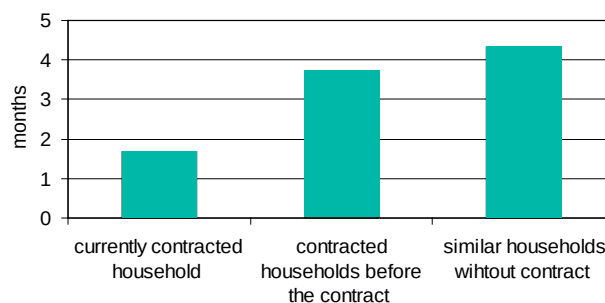
First, the vegetable export sector in Madagascar is dominated by one domestic exporting company that relies 100% on smallholder contracting for procurement of primary produce. In response to increasing standards in overseas markets the company has intensified its contract-farming schemes with smallholders. This has led to a vertical coordination scheme including almost 10,000 smallholders, often very small farms of less than 1 hectare, in the hillsides of Madagascar. The company relies on an intensive on-farm monitoring system including 300 company agents who regularly visit the contracted farms to provide extension services and technical advice, to monitor adherence to contractual agreements, and to avoid “side-selling”. Moreover, the company supplies inputs on credit at the beginning of the growing season.

Second, in the Senegalese bean export sector increasing standards have induced a shift from smallholder contract farming towards vertically integrated estate production by the exporting companies. It is estimated that smallholder procurement decreased from 95% in 1999 to 52% in 2005. The largest companies in particular changed their procurement systems and started their own integrated estate farms as part of a strategy to become EurepGAP certified.

Third, the Senegalese tomato export sector is dominated by one multinational company that was established and started exporting tomatoes from Senegal to the EU in 2003. The export supply chain are completely vertically integrated. There is no procurement from smallholders, and production, processing, trade and distribution are completely integrated within the subsidiaries of the multinational companies.

Despite the differences in supply chain structure and governance across the sectors, the results of the case studies show that in all three cases there have been positive welfare effects. Yet, the channel through which households benefit differs across the sectors: product market effects are important in the vegetable sector in Madagascar, where 100% of the produce is supplied by smallholders on a contract basis; labor market effects are important in the tomato sector in Senegal where the chain is completely integrated with no procurement from smallholders; and both effects are important in the bean sector in Senegal, where there is a mixed strategy of procurement from contracted smallholders and integrated estate farming.

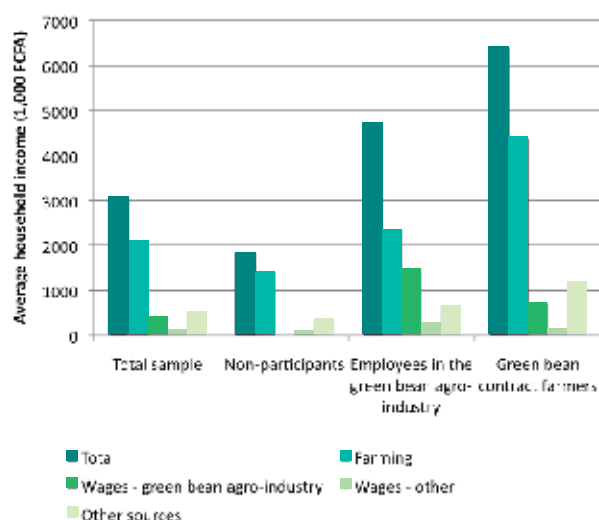
First, in the case of vegetable exports in Madagascar, rural households benefit substantially from contract farming with the export industry. The vegetables produced under contract contribute 47% of total household income. In addition, through technological spillovers from vegetable contract farming, rice productivity has increased some 64%. The overall result is an increase in rural incomes, an increase in the stability of rural incomes and a reduction in poverty, which is reflected in a reduced “hungry season” for households engaged in vegetable contract farming with the export industry (Figure 7).



Source: Maertens and Swinnen (2009)

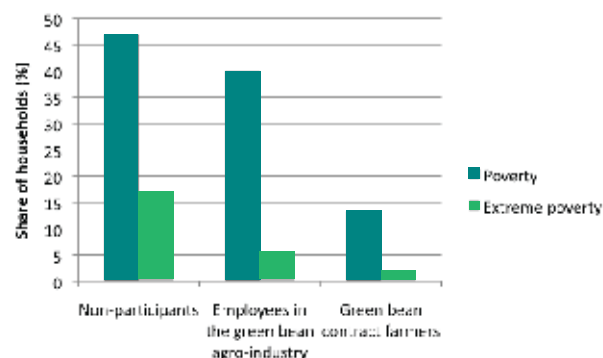
Figure 7: Impact of vegetable contract-farming on the length of the ‘hungry season’ in Madagascar

Second, the shift from smallholder contract farming towards integrated estate farming observed in the bean export sector in Senegal has also shifted the way local households benefit: increasingly through agro-industrial employment and labor market effects rather than through contract-farming and product market effects. Although both effects result in significantly higher incomes (Figure 8), the shift in supply chain governance has resulted in a stronger poverty alleviating effect of high-value horticulture exports (Figure 9). The case study results show that the poorest households mainly benefit through agro-industrial



Source: Maertens and Swinnen (2009)

Figure 8: Income effects of green bean exports in Senegal



Source: Maertens and Swinnen (2009)

Figure 9: Poverty effects of green bean exports in Senegal

employment, while contract farming is biased towards relatively better-off households with more land and non-land assets. Agro-industrial employment is found to benefit rural households directly through increased income from wages, and indirectly because these wages are partially invested in the households' own farm business, leading to higher outputs and farm incomes.

Third, in the tomato export sector in Senegal rural households only benefited through labor market effects, as there is zero procurement from smallholder farms. This case study also shows that it is mainly the poorest households who benefit from the labor market effects of increased high-value horticulture exports. Households employed in the tomato export industry, either in the fields or in the processing units of the company, have incomes that are more than double the incomes of other

households in the region. Initially, before the multinational company started to invest in tomato exports in 2003, they had lower land and non-land asset holdings (Figure 10). Increased tomato exports have resulted in increased employment, increased incomes and ultimately reduced rates of poverty and extreme poverty (Figure 11).

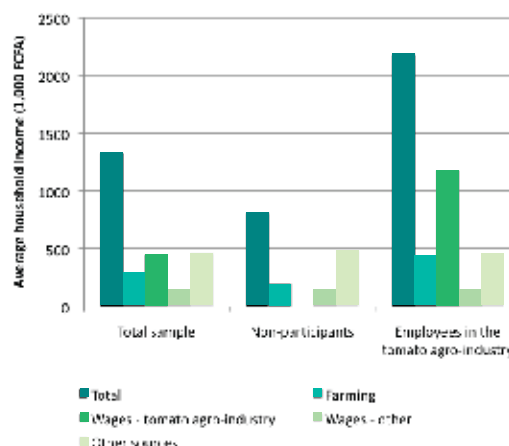
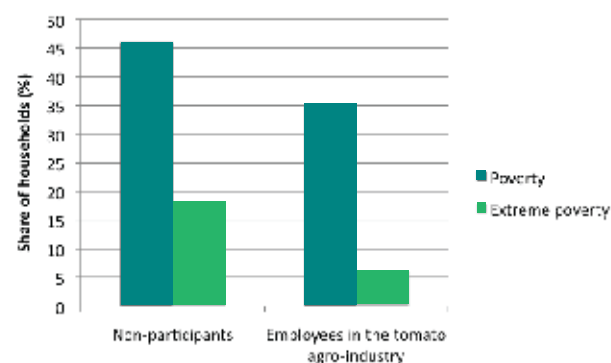


Figure 10: Income effects of tomato exports in Senegal

Source: Maertens, Colen and Swinnen (2008)



Source: Maertens, Colen and Swinnen (2008)

Figure 11: Poverty effects of tomato exports in Senegal

Conclusion and implications

The main conclusion of this paper is that increased high-value trade can bring about important positive effects for rural development and poverty reduction. Even with stringent standards, and consolidation and vertical coordination in supply chains, positive welfare implications can be found. Part of these effects comes through product markets, but employment and labor market effects are also important, particularly for the poorest rural households. This implies that strategies to improve the welfare effects of high-value trade need to include strategies

for creating inclusive food supply chains from which smallholders are not completely excluded, as well as strategies for the development and improved performance of rural labor markets.

There is a need to recognize the importance of private investment in agri-food supply chains, supply chain development and vertical coordination in agri-food chains, and for integrating these developments into policy thinking and program strategies. To stimulate the development of modern supply chains, to guarantee the participation of small farmers in the chain, and to assure an equitable distribution of rents in the chain, it is crucial to enable and encourage vertical coordination. In this respect some specific policy issues can be identified.

First, enabling and stimulating supply chain development and modernization of agri-food supply systems requires institutional changes to stimulate innovative vertical coordination schemes and to set the right juridical systems and supporting contract-enforcement mechanisms. Second, probably one of the most essential elements for the integration and development of high-value food supply chains, as well as vertical coordination in those chains, is to encourage private investment – domestic as well as foreign investment – in the agri-food industry through creating the right conditions for investment. Third, this involves ensuring macro-economic stability, attracting FDI in agro-industry, and so forth. In addition, enhancing efficiency and equity in high-value agricultural supply chains is a key point. Participation of poor farmers in the chains and an equitable distribution of the rents in the chains require several key elements. There is need for policies to focus on reducing transaction costs through, for example, investment in intermediary institutions, in infrastructure, and in farmers' associations. Better empowerment of farmers can also improve their bargaining position in vertically coordinated food supply chains.

The insights from this paper that the poorest households tend to benefit from export market development through labor markets rather than through product markets implies that pro-poor export development strategies should pay attention to labor market and employment conditions as well. These insights have largely been ignored and the analogy with insights from the Green Revolution of the 1960s could be drawn. The Green Revolution triggered major productivity growth and increases in rural incomes in Southeast Asian countries, but was at first believed to benefit richer farmers while marginalizing poorer farmers because of the specific constraints they face in accessing

and using Green Revolution inputs. However, David and Otsuka (1994) showed that poorer households did benefit from this technology-driven agricultural development because of labor market effects. The insights from this paper suggest that the same might hold for standards-driven (or supply chain-driven) agricultural development. At the same time, Carter et al. (1996) have argued for exports from Latin America, that poverty effects might strongly depend on the nature of the commodities, with poverty-reducing benefits more likely in labor-intensive rather than land-intensive production systems. Horticulture is generally a labor-intensive sector and the findings discussed in this paper validate the argument that labor-intensive export sectors strongly benefit poverty alleviation.

In this paper we have presented evidence from specific case studies related to success stories of high-value export market development in SSA. However, we need to mention that there is a large variation between countries in both integration in high-value international food markets and in progress relative to structural supply changes and modernization of food supply systems. Participation in high-value agri-food trade can be an engine of pro-poor growth for developing countries, but many countries face challenges in bringing about such export growth. Yet, international competition is moving beyond the capacity of supplying products at market prices. Agricultural products have to comply with food quality and safety requirements while many developing countries have substantial weaknesses in food safety capacity. Increasing the supply capacity for high quality and safe fresh food and creating the capacity to respond quickly to emerging food safety issues, changing legislation and a variety of private standards requires attention to key issues such as improvement in the administrative, technical and scientific capacity for food safety, public-private sector cooperation, farm and business assistance programs, attracting foreign direct investment, and demonstrating a capacity for producing high-standard food through labeling and certification.

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Value adding and marketing food and horticultural crops in sub-Saharan Africa: Importance, challenges and opportunities

Omo Ohiokpehai¹, Umezuruike Linus Opara², Henry Kinyua³, Kiringai Kamau⁴ and Lusike A. Wasilwa⁵

Abstract

The agricultural sector (including horticulture) plays a crucial role in the economy of sub-Saharan Africa. The development of agro-industries helps to reduce post-harvest food losses, adds value to products, creates employment opportunities and has many beneficial feedback effects on agriculture. This paper highlights the challenges and opportunities for agro-processing and marketing horticultural crops in the region. Case studies of value adding in sub-Saharan Africa agro-industry are presented using examples of agroprocessing activities in South Africa and Kenya. The agroprocessing and marketing value chain in the region presents a number of challenges and opportunities that can promote wealth creation and employment generation in rural areas. These case studies underscore the need to strengthen institutional support and infrastructure for marketing and value adding in Africa. The enabling policy issues which underpin successful agro-industrialization, including marketing and market infrastructure development, finance and access to micro-credit, enhancing the role of women, and sustainable capacity building are highlighted.

Introduction

The agricultural sector dominates most sub-Saharan African economies in terms of contribution to GDP, employment and income. The growth and development of this sub-sector is therefore essential for the overall process of socio-economic development in the region. The major challenge facing sub-Saharan African agriculture is to feed a population that is rapidly increasing. Von Braun (2008) reported that to bail out Africa from the factors impeding its development, three complementary policy actions must be taken: i) promote pro-poor agricultural growth, ii) reduce market volatility and iii) expand social protection and child nutrition. It is obvious that agriculture and agro-processing have a role to play in the second and third of these policy actions. The bailout of Africa can only be successful if transformation of food and horticultural

crops takes place because as agriculture moves away from semi-subsistence farming to a more commercial mode, market chains become longer and the demand for value-added products increases due to urbanization, income growth and need for convenience. Seasonality of production and the perishability of most agricultural products further signify the need for agro-processing in a market-oriented production system. With half of the population living on less than US\$1 a day, achieving the Millennium Development Goals (MDGs) will be difficult unless the poor in sub-Saharan Africa are targeted to benefit from the expanding market due to sustained economic growth of at least 6-8% in the next decade. The number of people receiving World Food Programme (WFP) food aid in the region more than doubled from 21.2 million in 1995 to over 43.04 million in 2005.

Agro-processing could be defined as a set of techno-economic activities carried out for conservation and handling of agricultural produce to make it usable as food, feed, fiber, fuel or industrial raw material. Hence, the scope of the agroprocessing industry encompasses all operations from harvest till the material reaches the end user in the desired form, packaging, quantity, quality and price (Figure 1).

A useful classification of agroprocessing industries is based on upstream and downstream industries. Upstream industries are engaged in the initial processing of agricultural commodities. Examples are rice and flour milling, leather tanning, cotton ginning, oil pressing, saw milling and fish canning. Downstream industries undertake further manufacturing operations on intermediate products made from agricultural materials. Examples are bread, biscuit and noodle making, textile spinning and weaving, paper production, clothing and footwear manufacturing, and rubber manufacturing. Agroprocessing plays a number of vital roles beyond income generation. It can reduce the food insecurity of the 1.3 billion people who do not have enough to eat by reducing food losses, increasing the range of food products and making food safe to eat.

The development of agro-industries also has many beneficial feedback effects on agriculture itself. The most direct one is the stimulus it provides for increased agricultural production through market expansion. Indeed, the establishment of

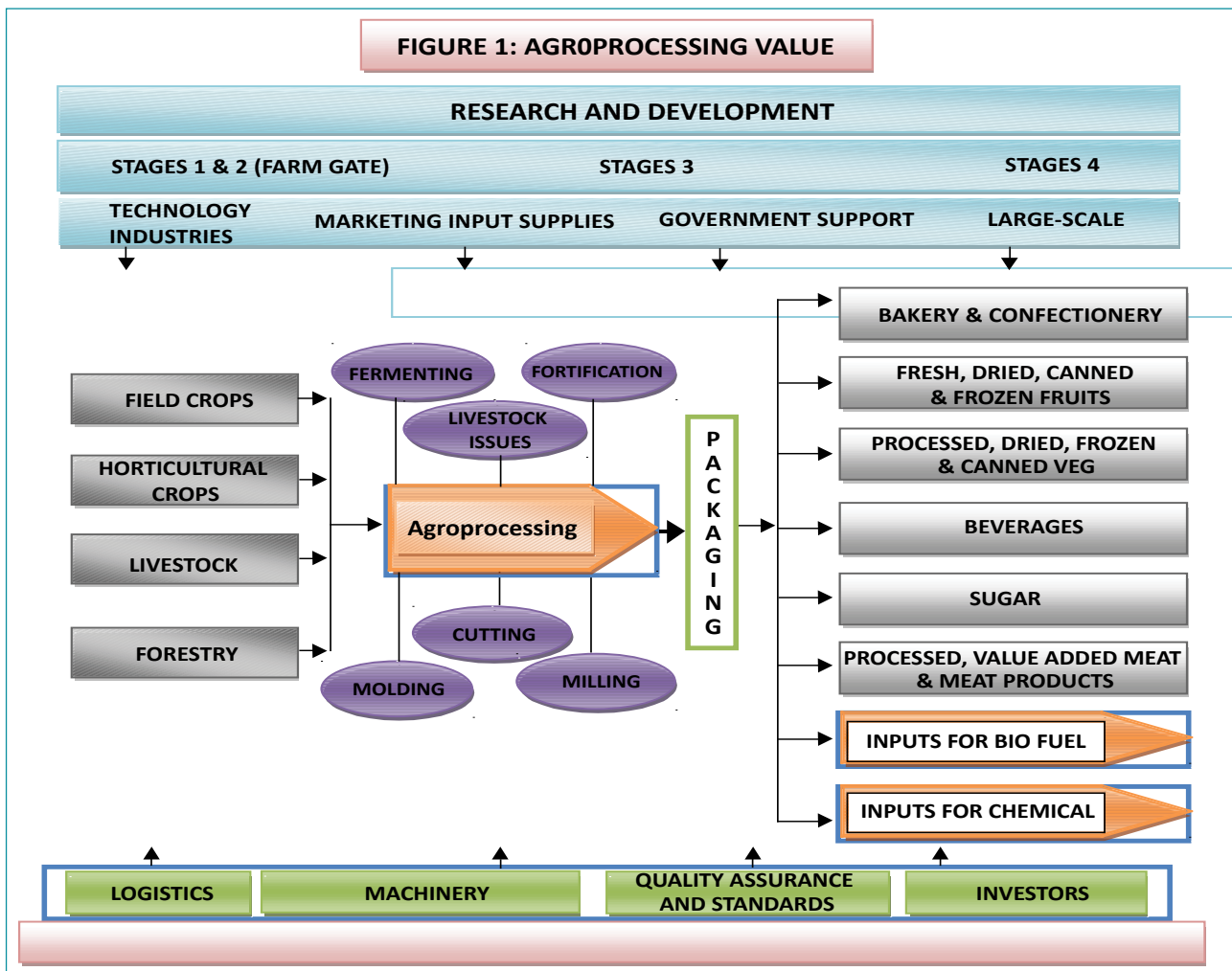
¹CEO, Center for Health and Nutrition Development (CEHEND), P. O. Box 9477, Garki, Abuja, Nigeria (e-mail: oohiokpehai@yahoo.com).

²Professor and South African Research Chair in Postharvest Technology, Faculty of Agri-Sciences, University of Stellenbosch, South Africa.

³Senior Business Manager, Horticulture, TechnoServe, Kenya

⁴Value Chain Analyst, VACID – Africa, Kenya

⁵Assistant Director, Horticulture and Industrial Crops, Kenya Agricultural Research Institute.



processing facilities is itself an essential first step towards stimulating both consumer demand for the processed product and as well as assuring adequate supply of the raw material. The provision of transport, power and other infrastructure required for agro-industries also benefits agricultural production. The development of these and other industries provides a more favorable atmosphere for technical progress and the acceptance of new ideas in farming itself.

Agroprocessing operations (such as sun-drying) can preserve food for longer than its fresh shelf life and can salvage waste food. For some basic foodstuffs (rice, for example), it is essential that before the food can be eaten it must be de-husked. It can help raise the nutritional value of poor people's diets and contributes to important cultural practices by providing foods with a more interesting taste than the daily staples. Today, however, it is becoming even more difficult to provide a precise demarcation of what should be considered an agro-industrial activity. The impact of innovation processes and new

technologies suggests a widening of the range of agro-industry inputs that could be considered, including biotechnological and synthetic products. Corresponding to this growing complexity of inputs is an increasing range of transformation processes, characterized by physical and chemical alteration aimed at improving the marketability of raw materials according to the final end use. All these factors – the growing complexity of inputs, the impact of innovation processes and new technologies, the sophistication and the growing range of the transformation processes – make it increasingly difficult to draw a clear distinction between what should be considered strictly industry in the broad sense and what can be classified as agro-industry.

Many poor people in sub-Saharan Africa depend on agriculture for a living and it is important that this sector is well funded to enable continuous growth. An assessment of Africa's productivity potential indicates that only 10% of the land is prime quality, 7% is of high potential and 28% is of medium to low potential.

The remaining land (55%) is unsuitable for production and is considered to be fragile, easily degraded because of bad management, and in general not productive or does not respond well to soil amendments. To improve food and nutrition security, the prevailing developmental view of agriculture in the region, which focuses mainly on production, must be expanded to include processing. The development of the agro-processing industry (Figure 1) is needed to improve fortification, nutrition and health through better diet. Furthermore, to harness the full potential of agroprocessing there must be a parallel growth of the other sub-sectors in the agribusiness system that includes the input, production, marketing and support sub-systems for maximum profit.

The traditional view in most African countries is for the government to focus first on the agricultural sector in terms of policies, programs and resources, and then shift its emphasis to the industrial sector later when the former has become more efficient. The Food and Agriculture Organization (FAO) considers agroprocessing as a subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector between harvesting and final use (Gallat, 2007; FAO, 1998). It is also a means to alleviate poverty and address food security. However, special attention must not only be given to policies (and their sustainability) that affect the prices of inputs and outputs to producers, processors and consumers – such as policies regarding taxation, subsidies, direct support and tariffs in the short and the long term – but also to policies that contribute to the creation of an environment suitable for business and investment growth. Access to appropriate technical processes, machinery and equipment, technical inputs and markets must be carefully developed and maintained. Furthermore, the “production chain” must be a continuum from the raw material producer through to the processor, distributor and buyer, with each link being strengthened and improved in the process through research and development (Figure 1). Cooperative production chains and their administration are a key component in the development of agroprocessing. Furthermore, enterprise and business must be at the heart of poverty eradication, not just aid, trade and debt (Shell Foundation, 2008).

The overall goal of this paper is to highlight the challenges and opportunities for agro-processing and marketing horticultural crops in Sub-Saharan Africa. In the preceding section, we have highlighted the scope for agroprocessing in the region. In the

following sections, we provide a general overview of processing as a value-adding in agro-industrial enterprise, and review case studies of value adding in Sub-Saharan Africa agro-industry. Finally, we outline some of the enabling policy issues which underpin successful agro-industrialization, including marketing and market infrastructure development, finance and access to micro-credit, enhancing the role of women in food and agro-industry, and sustainable capacity building.

Case studies of value-adding activities in sub-Saharan Africa agro-industry

Case study 1: Agroprocessing in South Africa

Agroprocessing is well developed in South Africa and contributes about 10% of South Africa's GDP and it is the third largest manufacturing sector. Agroprocessing is the second most labor-intensive sector and in 2006 provided exports valued at up to 23 billion Rand (~US\$ 2.5 billion) (Department of Trade and Industry-DTI, 2006). Fruit and wine are the largest export products by volume and value. There are many food-processing companies and the top 10 are responsible for about 70% of the industry's turnover. These top 10 companies include: Nestlé, National Brands, Premier Foods Nabisco, and Unifoods/Best Foods; five of these food companies are listed on the South Africa Stock Exchange – AVI Ltd., Tiger Brands, Illovo Sugar Ltd., Toongat-Hullet Group and All Joy Foods Ltd. There are also smaller food companies that show strong potential, which produce health beverages, indigenous teas, traditional and exotic meats, dried fruit products, nuts, fruit juices, etc. In the case of South Africa, all food companies receive support (incentives) from DTI.

Case study 2: Agroprocessing in Kenya

Various factors may constrain the ability of small-scale enterprises to effectively manufacture and market processed food products. On a macro level, many policies hinder the development of small-scale industries. At the firm level, limited access to credit, lack of appropriate technologies, unreliable supply of raw materials, poor managerial skills and poor quality control constrain the development of small-scale industries. Although crops may be produced throughout the year in Kenya, they tend to be available only part of the year (Muhammad and Kiilu, 2004). Moreover, they are perishable commodities whose shelf life depends on how they are handled after harvest. Technologies to extend shelf life (or storage) or processing to increase availability during the year will be beneficial (Wasilwa,

2003). Income from small-scale food processing improves livelihoods for the poor. Value addition technologies will expand marketing opportunities, increase shelf life, reduce seasonal crop losses, and increase the monetary value of crops. Adoption of improved and validated processing technologies that adhere to recommended food quality standards will empower small-scale horticultural producers to produce products that can be sold in the local and international markets. However, farmers have no marketing tools to allow them to source and access markets or negotiate price. They rely on spot markets instead of market information to sell their produce. Transport constraints contribute to losses, particularly of fresh produce. By processing some or the entire crop, producers have an alternative or additional means of marketing their produce, considering that post-harvest losses of horticultural commodities are from 30-40%. Small-scale agroprocessing activities will contribute to socio-economic development through increased incomes, employment, food availability, improved nutrition, and social and cultural well being.

In Kenya, smallholder farmers have proven to be effective suppliers of horticultural products such as French beans or avocado, when satisfactory contracting arrangements are established with an exporter or processing firm. Many more urban poor find full- or part-time employment in the packing houses, preparing and packaging produce for export. Working conditions vary but available evidence shows that these employees and farmers are better off than their peers outside the industry. Recently, the industry associations within the horticulture sector adopted employment guidelines that go beyond official government policy. Horticultural products – vegetables, fruits, and cut flowers – have grown steadily to become the single largest category in world agricultural trade, accounting for over 20% of such trade in recent years. The horticultural exports of Sub-Saharan Africa now exceed US\$ 2 billion, yet this is only 4% of the world's total and there is plenty of room to expand. Not surprisingly, this sector has attracted the attention of policymakers, the aid community, and the private sector in low-income countries where traditional exports are the norm. The Kenyan horticultural industry shows that, with reliable markets, smallholder producers can deliver the quality of produce required (Kenya, 2007).

Horticultural products account for two-thirds of all growth in agricultural exports and recently surpassed tea and coffee to

become the largest merchandise export. Kenya is the second largest horticultural exporter in the region (after South Africa) and the second largest developing country supplier of vegetables to the European Union (after Morocco). Approximately 135,000 people are now directly employed in the sector. Processing in Kenya is undertaken on a large scale by 23 horticultural processing factories or on a small scale at the community level (Mungai *et al.*, 2000). Most processed horticultural products in Kenya are targeted for the export market. Very few processors process food products for the local market, such as jams, juices and sauces. High post-harvest loss of fruit and vegetables is a problem, particularly during periods of glut (Muhammad and Kiilu, 2004). While it is important to process for the export market, it is also important to process for the local market (Mungai *et al.*, 2000). An example of a success story in the horticulture business is Sunripe Ltd. Founded by the Shah family and its partners in 1969 to market vegetables, Sunripe Ltd. is one of a half dozen family companies that have played a major role in Kenya's growing horticultural industry. It now supplies over 17 countries annually. Sales growth has averaged about 20% annually over the last 15 years, reaching US\$ 13 million in 2003. The company employs 1,200 full-time and 1,000 part-time workers. In addition to large farm suppliers, it buys from about 1,000 smallholders, including many women, predominantly through contract farming.

Horticultural processing – Horticulture contributes directly to the Kenyan GDP and indirectly through linkages with other sectors. It accounts for 50-80% of rural employment, and a significant amount of export earnings and annual government revenue. However, development of horticultural value addition has been hindered by several structural and institutional deficiencies in the Kenyan economy. Some of the challenges facing value addition initiatives include high and multiple taxes that have hindered the establishment of value addition ventures for primary commodities. This constrained entry, and the concomitant high cost of doing business, make products from Kenya uncompetitive in regional and international markets. The resultant high prices hinder expansion of local consumption that would support value addition. Factors that limit growth include poor infrastructure, such as roads, electricity, water and telecommunications.

The agricultural marketing information system (for prices and related to market entry requirements) is poorly organized, leading to cyclical supply of produce and territorial disparity in prices and availability of farm produce. The formal banking

system has not developed credit facilities suitable to small-scale agroprocessing enterprises. Due to frequent droughts (most crops are grown under rain-fed conditions), supply of primary commodities as raw material to agroprocessors is not stable. High costs of production are attributed to the high cost of transport, labor, energy, inputs and poor infrastructure. Often high costs of inputs constrain optimal utilization and encourage their adulteration for cheap sales, leading to reduced productivity. High costs thus reduce competitiveness of products produced in Kenya in regional and international markets.

Summary

The challenges facing the horticulture processing sub-sector include competition from other exporters, low yields and inaccessibility to new varieties, low quality produce, poor infrastructure, lack of development and investment, lack of adequate market promotion abroad, and regulatory constraints (local council fees and charges, export licenses, quality inspection and standards), duty/VAT remission scheme and cumbersome procedures of issuing necessary forms and other certificates of origin (Mungai et al., 2000). Manufacturing plants in Kenya that process horticultural produce are either small or micro-enterprises. Although many products could be processed from horticultural produce, only a few are processed in Kenya, which could be attributed to lack of demand for processed products in the local market. The majority of Kenyans prefer fresh horticultural produce. If demand for processed foods were high, entrepreneurs would source the appropriate technologies to process them. The lack of appropriate technologies for processing horticultural produce leads to the processing of inferior products that are also poorly packaged. Problems encountered by these enterprises include lack of markets for processed products in Kenya, poor adaptation of borrowed technology, poor infrastructure, poor storage facilities, lack of electricity, lack of skilled labor in processing, lack of technical support services (especially in quality control and marketing), and the lack of affordable credit.

Strategies recommended to improve this sector include: increasing the quality of production; market and product diversification/added value; judicious use of pesticides/protection of the environment; adhering to codes of conduct and practices; using alternative (cheaper) means of transport to reach a wider clientele; providing support to horticultural research; addressing adverse publicity, and providing support

to small-scale producers. The private sector (local processors) should be encouraged to invest in modern processing technologies for horticultural produce, particularly for fresh fruit juices. Locally fabricated modern equipment that cheaply preserves raw materials to avoid fluctuation in supply would be advantageous. To stimulate a vibrant processing industry, Kenya should encourage production in all areas of the country to meet food needs, export and create employment, and develop efficient rural production and marketing systems through the private sector and local authorities. There is an urgent need to encourage contracted local production and marketing arrangements to reduce waste and maintain a fair return to farmers, as well as encourage financial institutions to make credit available to farmers. Farmers need to be trained to improve yields by adopting appropriate technologies and maintaining quality. Steps need to be taken to ensure the protection of the environment and safe use of chemicals, encourage investments in modern technology through duty exemption on equipment and inputs (such as greenhouses, shed netting, PVC, cold storage and soluble fertilizers), and encourage sea-freighting of less perishable produce to widen clientele overseas.

Case study 3: Post-harvest handling of horticultural crops in Tanzania

The post-harvest sector in Tanzania is crucial to ensuring food security. A large part of the country's food supply is produced under rain-fed conditions, which means that there is one major harvest that has to meet the food needs of both the urban and rural areas throughout the year. Fruit and vegetables not only provide nutritional and healthy foods, but also generate considerable cash income for growers in Tanzania. Utilizing improved post-harvest practices often results in reduced fruit and vegetable losses, improved overall quality and safety, and higher profits for growers and retailers.

A wide range of fruits and vegetables are produced in Tanzania, including mangoes, bananas, oranges, avocados, peaches, papaya, passion fruit, lemon, pineapples, watermelon, plums, peas, tomatoes, cabbage, carrot, eggplant, okra, onions, amaranth and many others (Prof. Linus Opara, pers. comm.). Most of these crops are produced on small-scale farms and orchards, and in specific areas of the country. Anecdotal evidence suggests that post-harvest losses of fruits and vegetables can be very high during the peak season, and losses may occur at any point in the marketing process, from the initial harvest through assembly and distribution to the

final consumer. The lack of proper transportation and storage structures are considered to be major causes of post-harvest losses. Although there is no definitive data on the magnitude of losses in the agri-food sector, policy experts, consultants, farmers, and marketers in the country agree that the level of losses and quality degradation is unacceptably high at all links in the value chain. It is suggested, that “overcoming technological bottlenecks and sustaining the rural environment and biodiversity” and “investments in marketing infrastructure and storage” are essential (Tibaijuka, 1996). Sokoine University of Agriculture (SUA), the University of Dar es Salaam, and the Ministry of Agriculture in Tanzania have tried to reduce these bottlenecks under a development assistance project entitled: *“To increase the quality, supply, and profitability of the fresh fruit and vegetable industry in Tanzania by improving post-harvest handling practices for fresh fruit and vegetables.”* The approach was to introduce appropriate total quality management procedures and practices through the implementation of a series of in-country training programs, developed in collaboration with local agribusinesses, farmers and extension agents involved in the supply of fresh produce to local and international markets.

Improvements to post-harvest handling systems have the potential to i) improve the quality of produce available on the local market; ii) increase the opportunities for developing international markets; iii) reduce losses and thereby reduce urban organic waste disposal problems; iv) increase the quantity of edible products available to urban markets; v) increase the cash return/profit to growers/farmers; and vi) stimulate the development small and medium enterprises (SMEs) which provide such support services as packaging, storage, transport and logistics, printing and labeling, advertising, quality control, and information systems.

A survey of wholesalers and retailers at the Kariakor Central Market showed a high incidence of post-harvest losses in quantity (physical wastage) and quality downgrading affecting all major types of produce. The reported magnitude of physical losses ranged between 0-33% for fruits and 0.4-35% for vegetables, while quality loss (downgrading) affected 0.5-60% of the total quantity of vegetables and 5-80% of fruits traded. Most of the losses occurred during the peak harvest period.

A high incidence of post-harvest losses was also reported by supermarkets and street vendors. One supermarket (Shoppers' Plaza) reported fresh produce losses ranging from 16% for

onions, 20-30% for bananas and mangoes, 30-40% for oranges, and 50% for tomatoes. These losses were attributed mainly to inadequate cool chain management. Street vendors are important suppliers of fresh produce in selected middle class parts of Dar es Salaam, such as the suburbs where government ministries and staff residential quarters are located. The average amount of losses reported by these fruit and vegetable vendors ranged from 10-25% of the total quantity purchased from wholesalers. According to one experienced vendor, “If I buy 50 pineapples during the week, I usually dump about 10 fruits because they spoil before I can sell them”.

Observations at supermarkets and street vendors kiosks showed that the application of simple and innovative post-harvest handling and packaging technologies (such as grading and modified atmosphere packaging) appear to reduce losses as well as enable the traders to sell their products at much higher prices (and presumably profits!). For instance, shrink-wrapped lettuce was sold at a 25% higher price compared to that which was not shrink-wrapped, while the price of shrink-wrapped “English” cucumbers was about 180% higher than that of unwrapped local varieties.

Packaging is vital in successful post-harvest handling, processing and marketing of agri-foods and raw materials (Rossi and Ohiokpehai, 2006). The functions of packaging include:

- 1) Protection of the produce against physical damage and adverse environmental conditions, which may lead to contamination and spoilage;
- 2) Containment of the produce in desired units (small, medium, large) to facilitate handling;
- 3) Communication to inform, advertise and educate the end-user about the product; and
- 4) Retail display during marketing, for example, the use of retail display trays in fresh fruit marketing.

These functions highlight the importance of packaging as a value-adding activity in fresh horticultural produce supply chain management. For instance, communication through labeling allows the end-user to know the origin or source of the produce, and increasingly, many consumers are willing to pay a premium for fresh produce from certain geographical locations or that has been produced using specific methods, such as organic versus conventional. Similarly, packing produce in a wide range

of container sizes allows the marketer to meet the needs of a broader range of end-users such as individuals, families and restaurants.

Types of packaging commonly used in the horticultural supply chain include jute bags, cardboard boxes, and plastic or wooden crates. The use of new innovative and emerging packaging for fresh produce, such as modified atmosphere packaging (MAP) to extend shelf life and maintain quality, is practised in a few countries like South Africa for high-value, top-end markets. The selection of appropriate packaging depends on several factors, including type of produce, intended end-user, type of existing handling system, and cost.

Successful deployment of innovative packaging in horticultural produce marketing in sub-Saharan Africa is exemplified by the farmers' cooperative in Lushoto, Tanga (Tanzania). Over the years, farmers have primarily sold their produce to middlemen in the local markets at very low prices. When some farmers came together and formed a cooperative that was facilitated by the local government, one of the obstacles they faced when their produce arrived in Dar es Salaam was the high incidence of physical damage, which resulted in downgrading and lower prices. Fresh produce, such as tomatoes, cabbage, apples, pears, plums and oranges, were packed in big sacks (usually > 50 kg) and literally thrown into the back of trucks and transported to the Central Market in Dar es Salaam. When they used wooden or plastic containers, it cost the farmers a lot of money to return the re-usable containers to Lushoto. To reduce losses and improve their returns, the cooperative invested in "collapsible" plastic crates. During an in-country training workshop conducted by Dr Linus Opara and his colleagues, the farmers reported significant reductions in the incidence of physical damage and losses during transportation, as well as higher returns, in part due to reductions in total transport costs because the collapsible containers occupied less space on their way back from Dar es Salaam to Lushoto.

Case study 4: Cassava processing in Nigeria

Cassava (*Manihot esculenta*), is one of the most widely grown food crops in the tropics and provides livelihoods for over 500 million people. In the past three decades considerable progress has been made through research towards promoting increased cultivation of cassava. Today Nigeria is the world leader in the production of cassava (IFPRI, 2008), due to the intervention and interest of the government to promote this staple countrywide.

Cassava has great potential as a major food security crop for countries in sub-Saharan Africa, but this has been hampered by its poor nutritional and food safety quality. It is also a highly perishable root and can deteriorate within two or three days after harvesting. Sweet varieties of cassava may be consumed directly but bitter varieties, due to their toxicity, are traditionally processed into a wide variety of products with different local names. Cassava has very high starch content, typically 65-70% (Dziedzoave et al., 2007). Research shows it is an excellent raw material for various industries, including the manufacture of convenience food that can be sold to the urban middle class in supermarkets and restaurants. But the roots deteriorate quickly and the traditional processing methods often produce poor products. It was therefore not popular as an industrial raw material in eastern and southern Africa. This situation has now changed through adaptation of innovative techniques developed through research for the transformation of cassava into high-value and shelf-stable primary industrial raw materials that attract premium prices. The adaptive technology transfer project aimed at integrating high-quality cassava products like cassava flour and chips into the processing industry in Mozambique, Tanzania, Uganda and Zambia.

One of the technologies adapted to rural communities to improve farmers' livelihoods is the rapid conversion of freshly harvested cassava roots into dry flour with a virtually unlimited shelf life. The technology employed involves the separation of the starch granules from the tuber in as pure a form as possible. The granules are locked in cells together with all the other constituents of the protoplasm (proteins, soluble carbohydrates, fats and so on), which can only be removed by a purification process in the watery phase. Processing the starch can therefore be divided into the following stages:

- 1) **Preparation and extraction** – Crushing of the cells and separation of the granules from other insoluble matter (i.e., adhering dirt and cell-wall material) including the preparatory operations of washing and peeling the roots, rasping them, and straining the pulp with the addition of water.
- 2) **Purification** – Substitution of pure water for the aqueous solution surrounding the starch granules in the mash obtained in the first stage, as well as the operations of sedimentation and the washing of the starch in tanks and on flour tables, silting, centrifuging, and so on.

- 3) **Removal of water by centrifuging and drying.**
- 4) **Finishing** – Grinding, bolting and other finishing operations.

Starch production – This method of processing is essential in the preparation of any kind of starch. For cassava, however, because of the relatively small amount of secondary substances, the separation at each stage is performed with great ease. Whereas with maize and other cereals the grinding of the seed and the mechanical separation of the germ and the pericarp from the grain present special problems in stage 1, and the separation of protein and other constituents in stage 2 can only be accomplished with the aid of chemicals, these operations can be reduced to a minimum in cassava preparation. It is indeed possible to obtain first-rate flour from the cassava root without special equipment by using only pure water. This makes the processing of cassava flour particularly suitable for rural industries. This technology is easy to adopt by farmers.

Gari production – In west and central Africa, cassava is often processed to produce *gari* (a gelatinized, granular fermented flour commonly eaten as a staple or snack). Its good storage ability and its acceptance as a convenience food have led to the growing popularity of *gari* in urban areas across the rest of Africa and among many immigrants from this region around the world. Consequently, exports of *gari* from West Africa to Europe and North America have steadily increased in recent years.

The traditional production of *gari* involves peeling, grating, fermenting at ambient temperature and pressing, sieving and roasting (*garification*). Fermentation is said to be responsible for the flavor of *gari* and also improves the product's quality, hygiene and safety. It also contributes to cassava detoxification, especially in the case of un-grated cassava. Cassava roots are very rich in carbohydrate and are an excellent source of energy. However, the nutritional value of cassava is poor because of the lack of protein and vitamin A. Various attempts have been made in the past to increase the nutritional value of *gari* by fortification of the cassava with soybean or palm oil. The results have been limited as a result of various problems associated with the fermentation process.

Case study 5: Processing of field crops

Soybean processing and nutrition promotion – Soybean contains about 40% protein and 20% oil. Soybean is both food and a source of nutrition that can support human wellbeing. The soybean promotion project at CIAT-TSBF addresses the utilization

of soybeans through sustainable and participatory capacity building in soybean processing, nutrition, hygiene and sanitation, basic business management and mentoring in its processing to act as an incentive to boost production of soybeans at the grass-root levels (Ohiokpehai and Kingolla, 2007).

Adequate and appropriate nutrition, which can be achieved through the consumption of a balanced healthy diet (consisting of locally available foods and fortified food and/or micronutrient supplementation when needed), is vital for the health and wellbeing of all individuals (regardless of HIV status). Nutritional support helps to maintain the immune system and to sustain healthy levels of physical activity. The provision of access to know-how, technologies and credit is the key to enhancing women's opportunities, and hence our position in industry and the economy. Upgrading women's technological capabilities and enhancing their entrepreneurial and business skills, whether in simple artisanal production or in high-technology industries, will enable them to advance to more rewarding positions in the food industry.

In the case of the soybean promotion, the methodology focused on the UNIDO method of training women entrepreneurs in Africa that has been tested in several countries (including Zimbabwe, Mali, Ethiopia and Botswana). The promotion of soybean in western Kenya started with a needs assessment of the area (each district is made up of several villages). This is carried out using desk studies, field research, and interviewing stakeholders, especially women farmers and entrepreneurs. During visits to the villages, special efforts were made to use the information gathered and the results of the interviews with the stakeholders that focused on food/nutrition security, level of business in the area and the interest in gender issues.

Our methodology included visiting farmer associations and 'living positive' groups and giving short talks on the goodness of soybeans and allowing question and answer sessions to ensure that our clients had a voice. Also training of trainers (ToT) for five days and training of farmers (ToF) for two days in processing and utilization of soybeans, hygiene, sanitation, basic business management, and nutrition education were involved. Soybean was also incorporated into several locally eaten foods with taste tests carried out and analyzed to determine the degree of quality improvement. We incorporated or replaced soybeans in locally eaten dishes such as *maandazi*, *ugali*, porridges, *chapati* and *omushenye* or potato dish to increase their protein content

without changing taste. The groups trained were mainly women, and the training of youths and men will start soon. When the household-level training had been popularized, soymilk-processing machines were introduced to demonstrate milk production at the community level. We also showed how to solve scaling-up problems at this stage. First, VitaGoat was bought and introduced by Malnutrition Matters, Canada (VitaGoat, 2005). It operates without the need for electricity. Later for comparison SoyCow – an electrically operated machine – was introduced. SoyCow is 30% better in throughput than VitaGoat. At the same time, machines were being introduced through some large-scale food processing companies (NUTRO, BIDCO and others), which drew the attention of some farmers that good quality soybeans can be sold to large-scale processors, e.g., BIDCO or NUTRO. This was an incentive to encourage the farmers to organize into groups to enable them access this technology.

Nutro's roasting technique (micronization) – The Nutro plant is exceptionally versatile and is specifically designed to produce mixes of cereals (such as sorghum, wheat, maize and millet); legumes (such as soya or dry beans), milk powder and sugar. In addition the plant is capable of producing quick-cook rice and pasta, and traditional African drink powders and beer powders, with the ability to add further ingredients at a later stage. In addition, Nutro Manufacturing is working with partners on other new product lines, for example: high-energy biscuits, therapeutic relief foods, UNIMIX with higher energy levels and products designed specifically for geographical areas for school or blanket feeding using nearly any legume or grain (www.nutro.co.ke).

This flexibility, unique to Africa, creates the opportunity to design foods that are custom-made to the actual need. Nutro is therefore well positioned to supply school feeding programs, hospitals and institutions in need of high-quality fortified foods. Nutro's manufacturing plant has a capacity of 35,000 tons per annum and employs infrared roasting technology, the application of which results in high capacity, high flexibility, and an ability to accelerate delivery of a full range of foods used in relief food programs. Nutro's plant was commissioned in January 2005 to manufacture pre-cooked fortified maize-soy blends according to published recipes and methodologies. The flexibility of the plant, together with first-class quality control measures, enables Nutro to develop food products tailor-made to meet specific nutritional needs.

Botswana UNIMIX: "Tsabana" (soybeans and sorghum) processing – Protein malnutrition is the most common malnutrition among children in Botswana (Ohiokpehai et al., 1998). To ameliorate this problem the government distributed relief food donated by WFP before 1992. The government embarked on strategies to tackle the malnutrition problem. The use of specially processed low-cost nutritious foods in complementary feeding programs has been recognized as one of the most effective means of tackling malnutrition in children. It is in this line that the Government of Botswana engaged in the development of *Tsabana*, which is a complementary food composed of a 3:1 mixing ratio of sorghum and soybeans.

Tsabana was produced for children 6-36 months of age (Ohiokpehai et al., 1998). Complementary foods of an adequate macro- and micro-nutrient density are needed for optimal growth and development after six months of age when breast milk can no longer fully satisfy infant nutritional requirements. Between 6 and 24 months, the requirements for iron and zinc are particularly difficult to satisfy in the absence of fortified foods or supplements. As a result, the prevalence of anemia is higher in this age range than at any other time during the life cycle. The use of iron-fortified complementary foods led to the elimination of iron deficiency anemia as a public health problem in the United States. The fortification of milk distributed through social programs reduced the prevalence of anemia in Chile by over 60%, stimulating the implementation of similar programs in other Latin American countries. The development of the complementary food was undertaken very cautiously in order to arrive at nutritionally sound and safe products (Figure 2). The following quality control procedures were adhered to:

- 1) Raw material testing and control;
- 2) Determination of the quality analysis for nutrient composition (microbiological and physical hazards were controlled);
- 3) Routine analyses were carried out to determine the safety of the weaning food;
- 4) Quality controls on the manufactured food were put into place to ensure that all specifications were met;
- 5) The quality systems were periodically audited to ensure that the manufacturer adhered to the regulations;

- 6) All aspects of the quality assurance system were documented and produced for discussion; and
- 7) Good distribution control was put in place to ensure that the fortified food was not adulterated and that nutrient loss was minimized.

by considerable investment in post-harvest infrastructure and improvements in quality assurance systems to meet market demands. Consolidation of horticultural enterprises through cooperatives and private-sector investment have enabled the industry to meet the requirements for consistent supply of high-volume and good-quality products, which otherwise was impossible for individual small-scale farmers.

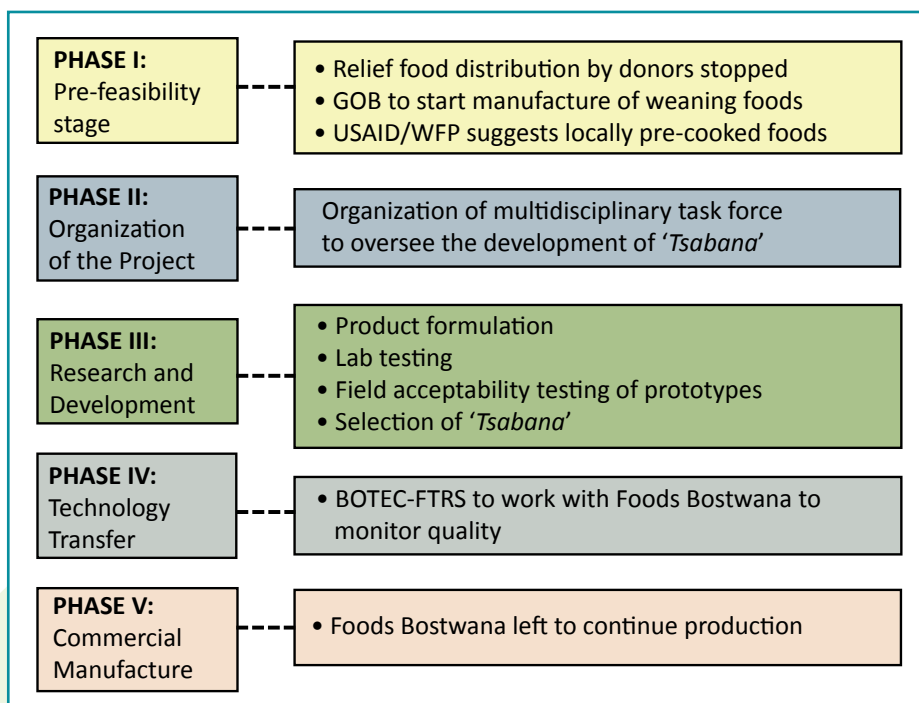


Figure 2: The development of *Tsabana*

Summary of lessons learned from the case studies

Each of the case studies described above presents several lessons that can be applied to promote success in adding value to and marketing horticultural crops in sub-Saharan Africa. The following are a few examples:

The South African agro-industry is well developed and highly successful. Among other factors, such as the availability of technical expertise, the economic incentives available for different categories of enterprise provide valuable financial and institutional encouragement for investors.

Kenya has experienced remarkable success in exporting high-value fresh horticultural produce, with additional processing into food products for export. This success has been underpinned

Although Tanzania is endowed with favorable agro-climate for successful production of a wide range of horticultural produce, the lack of proper transportation and storage structures has resulted in high incidence of post-harvest losses and poor quality produce. These factors have mitigated the efforts of farmers in linking to the potentially lucrative domestic (mainly in Dar es Salaam), regional, and international export markets. However, when the farmers' cooperative in Lushoto invested in collapsible plastic crates and replaced the wooden or plastic containers that were used for fruit, post-harvest handling and marketing losses were reduced, which in turn improved their returns.

Through local research efforts, it has been demonstrated that cassava is an excellent raw material for various industries, including the manufacture of convenience food that can be

sold to the urban middle class in supermarkets and restaurants. Through various innovative agroprocessing techniques, cassava is now readily transformed into high-value and shelf-stable primary industrial raw materials that attract premium prices in the industries.

Experiences gained in the post-harvest handling sector in Tanzania, particularly the cooperatives in Lushoto, have highlighted the need for interventions to develop technology hubs or centers to assist in promoting access to enabling technologies and infrastructure for small-scale farmers. Post-harvest handling facilities for quality control and storage will enable farmers to meet quality assurance requirements for market access.

It was demonstrated that through the manipulation of the traditional brewing method (the barley malt method), sorghum-based brewing could be developed. This can reduce the use of foreign exchange in the purchase of barley malt.

Also, the production of UNIMIX has been improved recently by using a roasting technique to increase and ameliorate the heat effect on the grain, thus producing better quality foods.

Institutional support and infrastructure for marketing and value adding

Marketing, markets and market infrastructure

Marketing is the management process responsible for identifying, anticipating and satisfying customer requirements profitably. This definition assumes the creation of products and value with defined customers. Where marketing is applied to enterprises in rural areas, the starting point is to assess the terrain of the enterprise in general then evolve the mechanism within which marketing can be applied. It is for this reason that programs supported through our initiatives promote agro-enterprises in rural areas. In seeking to intervene from a marketing perspective, we note that agro-enterprises are created with a view to eliminating poverty and improving food and nutrition security.

Efforts that seek to realize value adding and marketing of food and horticultural crops in Sub-Saharan Africa need to take cognizance of the individualized nature of smallholder farming. This can be addressed through produce aggregation and institutional formation in order to tap potential market opportunities. Indeed, the efficiency of conversion of the

agricultural produce directly to cash or to processed products, then to branded products that are presented for sale in the marketplace, and finally to cash is very important. Activities involved in the continuum – from production to the market, or the value chain – present the opportunities that must be tapped within an institutional formation.

All marketing efforts need to start with the identification of crops, or produce-based services, that when aggregated create the basis of attracting buyers. With value addition being the key focus in most development efforts in Sub-Saharan Africa

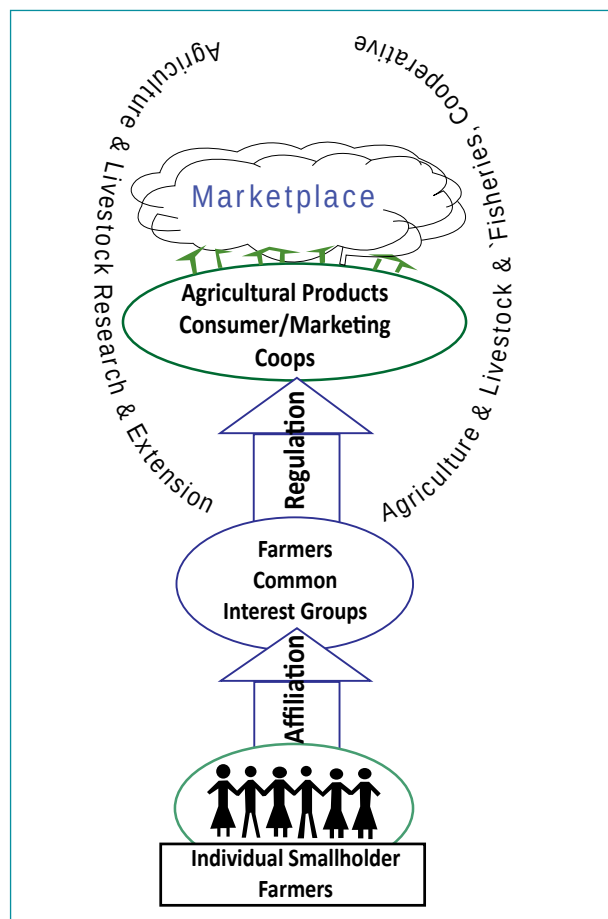


Figure 3: Marketing framework

today, the need to create institutions that revolve around agricultural produce is high. Arising from the foregoing therefore, and in order to promote access to markets and well-defined customer segments, marketing efforts need to be centered on the formation of value-adding Common Interest Groups (CIGs). These groups are created around what farmers produce and, with support, graduate into formal institutions that pool investment resources to procure processing equipment for value addition. We propose the institution creation process that runs

parallel to the capacity building efforts in entrepreneurship and nutrition so that after the capacity building efforts, the enterprises have branded value-added products for the marketplace (Figure 3). However, in seeking to address the foregoing it is necessary to take note of the institutional and operational constraints that this effort may encounter.

Agri-food markets, and more specifically horticultural markets, exhibit specific characteristics that vary from one category to the other. The markets can be divided into four categories based on size, players and the produce on offer – local, national, regional and international. As one moves from the local category to other categories, the level of sophistication increases in terms of products, transactions, infrastructure, business management and logistics. This increases the costs of doing business and forces non-complying players to drop off and thus the numbers decrease from one category to the next.

The role of cooperatives

The creation of a cooperative as the institutional vehicle for share-based marketing and investment provides a vital marketing channel for small-scale farmers. The benefit of the produce aggregation through this collective action achieves the desired economies of scale and promotes the convenience for processors to collect the produce and deliver to their factory from a centralized location. The collective action promotes the realization of better prices from the raw produce marketing. The successful development of the Kenya dairy industry provides

a very good illustration of the potential role of cooperatives in agro-industry development in sub-Saharan Africa. The Kenya dairy industry is perhaps one of the most developed in the region and ranks second after South Africa in terms of revenue. For example, Githunguri Dairy Farmers Cooperative Society (GDFCS) is a successful milk-marketing cooperative, which presents the near ideal model for adoption in the marketing and institutional formation that is considered suitable for any other commodity (Figure 4). With capacity building support, the need to engage collective action in the marketing of the raw milk enabled the farmers negotiate better prices from the Kenya Cooperative Creameries and Brookside, which were the only processors that bought milk from the cooperative in the late 1990s. It is noted that the key to the success of GDFCS was the innovation to produce small quantity (200 ml) milk packets using low-cost packaging. This allowed them to capture low-income urban consumers, who formerly bought raw milk.

Financing the agricultural value chain

Agriculture has suffered from lack of investment or products that are suited to attract investment. Value addition calls for capacity building at the various levels of the value chain, and therefore there is need for financial grants to organized community groups so that they can pay for the services that add value to the chain. The arrangement that needs to be put in place to ensure that farmers demand extension can follow the model implemented by the Kenya Agricultural Productivity Programme, where service providers flag opportunities and then get the community to pay

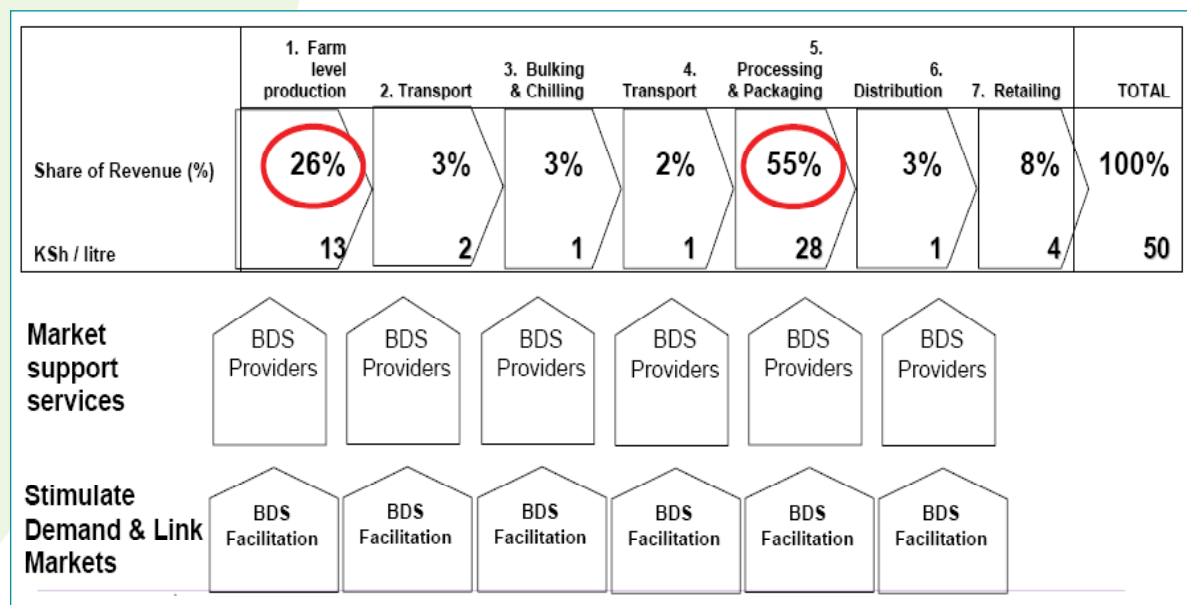


Figure 4: Overall dairy value chain

for the services based on a framework created between the Programme and community institutions. Financing value addition investments is similarly supported and this model has proved successful for adoption. Microfinance institutions also need to be supported to identify the opportunities along the value chain so that there is certainty for lending in agriculture. With organized markets, financial institutions such as banks (e.g., K-Rep, Equity, etc.) can be co-opted as partners/collaborators and important stakeholders, thereby enabling them to provide finance to farmers, entrepreneurs and other players along the value chain.

Enhancing the role of women in sub-Saharan Africa food and agro-industry

In sub-Saharan Africa, women contribute 60-80% of the labor in food production activities for household consumption and for sale. A survey of national sectoral reports for Benin, Burkina Faso, the Congo, Mauritania, Morocco, Namibia, Sudan, Tanzania and Zimbabwe found that women's contribution to household food production ranges from 30% in Sudan to 80% in the Congo, while the proportion of women in the economically active labor force in agriculture ranges from 48% in Burkina Faso to 73% in the Congo (FAO, 1994).

Many studies in Africa show that the poor achievement of the agricultural goals on the continent in terms of efficiency, sustainability and equity is due to the predominant practice of directing training and resources to men only (FAO, 1993). This realization has brought about a growing concern about gender issues. The focus of many African governments now is to increase the productivity of the agricultural sector by improving the condition of women, especially those in the rural and semi-urban areas. In Ghana's Medium Term Agricultural Development Strategy (MTADS) and the country's Vision 2020 Development Plan, the strategies are to: i) bring services physically closer to women; ii) involve women in the formation and management of programs affecting them; and iii) make women (individually or as groups) the contact point in the delivery of services directly to the beneficiaries and to receive feedback (Ministry of Food and Agriculture, Ghana, 1990).

Food processing contributes to food and nutrition security through reducing food losses, contributing to more diverse diets, and supplying important vitamins and minerals. In addition to the time-consuming tasks of grinding and pounding staple grains, and smoking fish and meats, women process and preserve the fruit and vegetable produce from their home gardens and

from the forests. Moreover, women are almost universally responsible for preparing food for their households and thus for the nutritional well being of household members. It is the belief of many that if women in Africa are given the opportunity, they will contribute substantially in the development of the food processing industry and solve the persistent problem of malnutrition and poverty in the rural and semi-urban communities.

Capacity building and information dissemination at all levels

The manufacturing industry in Africa is mainly for the domestic and to a certain extent the regional markets. Its participation in global trade remains limited, mainly due to its inability (lack of technology and know-how) to meet market demands and requirements in terms of quantity and quality (supply-side constraints) and overcome non-tariff barriers for trade. To effectively compete in these markets, African countries have to strengthen the present limited supply capacity (build competitive suppliers) and develop a reliable food safety and quality assurance system based on a food chain approach, risk analysis and traceability, especially for large-scale businesses. The improvement of agroprocessing in Sub-Saharan Africa hinges on the fact that capacity building at all levels and the development of incubator (hub) model processing and marketing centers must be placed as an integral part of the strategy to promote agroprocessing. A training analysis of the post-harvest horticulture sector in Tanzania, for example, highlighted the need to build awareness and sensitize all key stakeholders on the problems (and opportunities) facing the sector vis-à-vis its growing importance in supporting the government's ongoing efforts to improve food security in the country, as well as to create new employment opportunities, particularly in the rural sector (Prof. Linus Opara, pers. comm., 2008). Successful examples of such centers are Clayuca at CIAT headquarters, Cali, Colombia, and Agri-Business Incubation at ICRISAT headquarters in India.

In the promotion of soybean processing in Kenya, a training of trainers method was engaged. This is an effective way of disseminating information if properly applied. It was used to impart knowledge to a few individuals (10-15 participants) on soybean nutrition, processing and health issues, who in turn conveyed the same information to other community members. The approach has been used extensively and forms the basis of our capacity building (Ohiokpehai and Kingolla, 2007).

Challenges and opportunities for food product innovation

The agroprocessing and marketing value chain presents a number of challenges and opportunities that can promote wealth creation and employment generation in rural areas. The challenges have been discussed in the preceding section; the following are potential opportunities:

Development and promotion of incubator or hub model processing and marketing in Africa agroprocessing industry to boost agribusiness entrepreneurship. This provides farmers and other agro-entrepreneurs with easy access to information and transacts their input/output business. The importance of the incubator model hinges on the fact that the small-scale processors need a range of information that includes topics like food processing, marketing, quality control, basic business management, credit issues, storage issues, packaging options and packing equipment, and technical know-how.

Research opportunities will be created by increased demand at the crop and livestock levels, thus increasing sustainable creation of new knowledge and technologies to support adoption.

Extension services will be created to disseminate research findings to the rural areas. Multidimensional perspectives in the capacity building of extension personnel in both private and public institutions will be provided, both to extension service providers and to researchers.

Linkage of agricultural production will ensure that increased demand for tillage or livestock farming will mean that manual work is available to many not-so-literate rural people.

Value addition and the aggregation of agro-produce will mean creating enterprises that will need management and operational personnel. Demand for learning in institutional support will grow.

Marketing and promotion of value-added produce will create yet more opportunities for individuals in the promotion area.

Farmers will need inputs and hence trading will be supported and promoted, which means creating opportunities along the supply chain.

Financing of enterprises in rural areas will mean the creation of appropriate financing and insurance services. Institutions to supply these will need to be created and more personnel to run them will be required.

With increased production there will be need for online marketing and support, meaning more data will need to be processed. This will drive creation of high-tech data solutions and service provision at institutional and farm levels, which in turn will take technology learning institutions to rural areas and help reduce rural-to-urban migration.

The production, processing and packaging of food creates the need for movement of items and materials between enterprises, opening opportunities for transport and new linkages between enterprises.

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An assessment of the potential efficiency and profitability of value-addition and marketing innovations involving smallholder farmers under a pilot system in Tanzania*

A.B. Abass¹, S.S. Abele², N. Mlingi³, V. Rweyendela⁴ and G. Ndonguru⁵

Abstract

An assessment of four pilot processing centers in Tanzania, established for processing cassava to high quality cassava flour, chips and starch based on IITA technologies, was carried out from 2003 to 2005. We followed the value chain analysis approach, looking in detail at processing efficiency and relating it to market dynamics, in particular of the fresh cassava or raw material market. Locations with large volumes of fresh cassava were found to be very favorable for such enterprises, as prices are likely to be low and surplus production ensures a steady flow of fresh cassava as raw material. Locations with little cassava available are not suitable, even if prices are low. Sourcing fresh cassava either on-farm or in local markets during the last quarter of the year was potentially difficult and very expensive. Trade margins of fresh cassava were significantly higher in markets with obvious scarcity, but relatively low in higher volume markets. Potential profitability of the infant processing sites was remarkably influenced by capacity utilization. At 100% capacity utilization, at Chisegu (a high quality cassava flour site) profitability was US\$ 1,876, NPV was US\$ 6,402, and IRR was 77%. At the high quality cassava flour site in Zogowale, operated at 48% capacity utilization, profitability was US\$ 1,640 and NPV was US\$ -9,429. At Bungu, a cassava chips site, even though operated at 59% of its capacity the profitability was US\$ 2,126, NPV was US\$ 8,698, and IRR was 135%. When the Zogowale operations were adjusted to 100% capacity, the NPV increased substantially, to US\$ 11,013, and IRR also notably increased, to 177%. Although starch production is the most capital-intensive production technology of the three technologies studied, the starch site at Mtimbwani, when operated at 100% of installed capacity, had total profitability of US\$ 4,482, an NPV of US\$ 15,958, and an IRR of 91%. Other factors, including infrastructure such as roads and water, cultural attitudes of smallholder processors/farmers towards work, and their business outlook also affected the performance of the processing enterprises.

Introduction

Sub-Saharan Africa has the largest number of poor people in the world (World Bank, 2008). Despite the remarkable progress made in increasing food production at the global level, approximately half of the population in Sub-Saharan Africa does not have access to adequate food supplies. Agriculture, accounting for 70% of the labor force and 40% of exports, is very fragmented, lacks commercialization and is performing poorly in global trade (World Bank, 2005). African farmers have not succeeded in the application of value chain strategies to gain access to profitable markets to increase incomes. Both quantitative and qualitative food losses of highly variable magnitudes occur at all stages in the post-harvest system from harvesting, through handling, storage, traditional processing, and marketing, to final delivery to the consumer. Huge food losses in the post-harvest and marketing system, particularly in those countries where the need for food is greatest, are made worse by poor infrastructure, such as roads and transport facilities, and lack of knowledge in processing and preservation of crops to meet market requirements (AMCST, 2008). Experts estimate that between 25 and 50% of crop yields – particularly perishable crops such as fruits, vegetables, roots and tubers, milk, plantain/banana, and fish – produced by smallholder farmers in Africa are lost through post-harvest spoilage; the time, labor and money invested in such production are all lost. Hence, many small farmers are not able to recover costs, let alone make a profit.

The coping strategy for this is to produce just as much as necessary to secure family food needs, resulting in a vicious circle of subsistence agriculture, risk, food insecurity and poverty. Such loss of opportunities to increase incomes and improve livelihoods contributes to wide socio-geographic poverty differences in which rural dwellers are extremely poor and city dwellers are better off (ECA, 2004). Reduction in post-harvest losses through preservation or processing of excess production to shelf-stable food products of higher commercial value would be of great economic significance to Africa. However, the solution often sought by many governments, international development agencies and the donor community for solving food supply shortages in Africa has been food aid. In the area

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¹International Institute of Tropical Agriculture (IITA)

²International Institute of Tropical Agriculture (IITA)

³Tanzania Food and Nutrition Centre, Dar es Salaam, Tanzania

⁴International Institute of Tropical Agriculture (IITA)

⁵Tanzania Food and Nutrition Centre, Dar es Salaam, Tanzania

of research needs for increasing food supply in Africa, post-harvest preservation and processing of excess production are recognized to have the potential to contribute significantly to agricultural development. However, research on processing of the most important perishable staples of Sub-Saharan Africa, such as cassava, plantain, banana and sweet potato, are often given little or no priority for international research funding (CGIAR, 2005). Many years of production-oriented research on the most perishable African food crops have not led to significant improvements in yields. Indeed, cassava yield per hectare has either stagnated or even decreased in many countries of east and southern Africa.

Rationale of the study

To develop the income-generating potential of cassava as a cash crop, there are a number of simple market-oriented technologies that can be used to transform highly perishable fresh roots into stable market-grade intermediate products, such as chips or flour for sale as food and as raw materials to various industries. However, potential private investors often have inadequate understanding of the microeconomics of the cassava subsector. They face unfamiliar technologies with unknown investment and transaction costs, and input and output market uncertainties. Research on the economics of cassava production, processing and its marketing has received limited attention, probably because of the widely held perception that cassava is a low-value food security crop with limited prospects for large-scale commerce compared to the traditional export crops. This may be one of the reasons why cassava, despite substantial research aimed at increasing its productivity, has not been able to lift a substantial number of farmers out of poverty.

Wide application of value-adding technologies and improved market outlets will simultaneously increase the adoption of improved varieties developed through research, improve food security and farm incomes, and create employment opportunities in rural areas. One of the benefits of such an approach to cassava producing communities is a reduction in imports of cassava products and their substitutes, such as wheat flour and starch.

To introduce already developed, novel processing technologies for transforming cassava into products of higher market value into cassava-dependent communities, it was necessary to supply the technologies and provide opportunities for local

entrepreneurs to learn the art of cassava processing by doing it themselves. Such pilot enterprises are also expected to provide vital data for developing investment guidelines for prospective entrepreneurs.

Methodological framework

Site selection and setup of processing centers

Six locations were identified for pilot testing based on development domains for cassava. Maps of market access were intersected with maps of cassava production potential (Figure 1). The indices for market access were population density, road networks and market locations, while the indices for production potential were soils and climate/rainfall/temperature. The locations were traditional cassava producing communities. Participating groups of smallholder farmers/processors within the communities were selected through the collaborative efforts of the Tanzania Food and Nutrition Center (TFNC), the Ministry of Agriculture, Food Security and Cooperatives (MAFSC), the International Institute of Tropical Agriculture (IITA) the International Centre for Tropical Agriculture (CIAT) and other partners in Tanzania. Pilot processing facilities were set up with the selected groups. Model processing machines were provided on loan to the communities, while they contributed the land and buildings where the machines were installed. The characteristics of the pilot centers and the groups of pilot farmers are shown in Table 1.

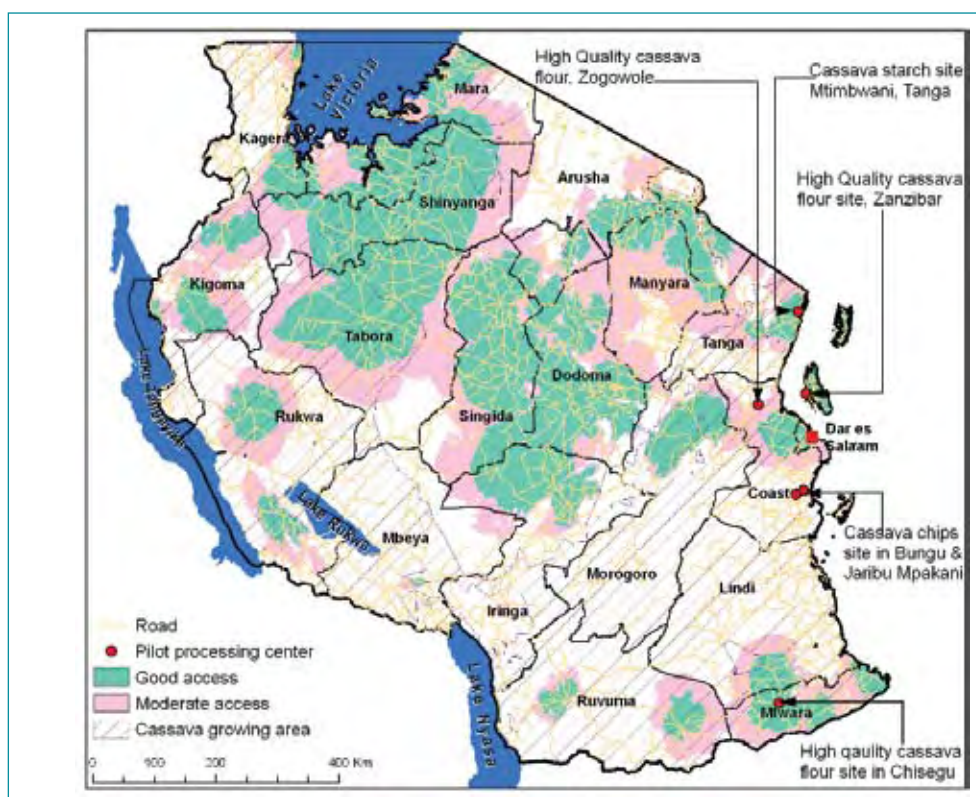


Figure 1. Six experimental sites for cassava value addition in Tanzania.

Table 1. Characteristics of the pilot processing sites and farmer groups

Location	Dominant cropping system	Processing and marketing history	Proximity to market/access to infrastructure	Pilot group composition	Processing technique introduced/ capacity of installed machinery
Bungu, Rufiji District	Cassava, cashew, and coconut	Sells roots but unattractive prices offered by traders.	150km south of Dar es Salaam, Lack electricity and water	3 men and 4 women farmers	Chipping technology introduced by IITA few months earlier; 800kg fresh roots/h
Chisegu, Masasi District	Cashew and cassava.	Exported chips to the EU in the 1980s; markets traditional dried chips	Low population density area; 600 km south of Dar es Salaam, Lack electricity and limited access to potable water	5 men and 10 women farmers	High Quality Cassava Flour (HQCF); 800kg fresh roots/h
Mtimbwani, Muheza District, Tanga	Cassava	Moderate production & insignificant market access	370 km north of Dar es Salaam; near Mombasa-Kenya; Electricity and potable water are available	6 men and 18 women farmers	800kg fresh roots/h
Zogowale, Kibaha District	Cassava	Minimal village-level trade in fresh roots and flour	70 km east of Dar es Salaam, good quality water supply, no electricity supply, very good road to Dar es Salaam market	8 men and 15 women farmers	High Quality Cassava Flour (HQCF); 800kg fresh roots/h

The pilot centers gave unique opportunities to introduce 1) new or improved technologies, such as high-yielding and disease-resistant varieties and improved management techniques, as well as novel methods developed by IITA (Abass, 2006) for processing cassava to intermediate shelf-stable products, such as chips, flour and starch; 2) supportive institutional arrangements, such as national standards for the intermediate cassava products, credits, and capacity building, and 3) market innovations, including market information, and linkages to both expanding and dormant markets for the primary cassava products, as well as the improvement of institutional arrangements like access to credit and supportive policies (Figure 2).

The pilot centers were used to understand the constraints and risks linked to private-sector investments in cassava processing and the potential impact on the economies of farm households. They were also used to test whether sustained links between small-scale cassava farmers, processors and industrial users of cassava products would lead to faster uptake of new production technologies (such as varieties that are high yielding or disease/drought resistant, better agronomic methods, etc.). They also shed light on whether farmers' livelihoods could be improved, and whether the private sector could be motivated to invest in cassava production, processing and marketing by adopting new production, processing, and marketing innovations as a single

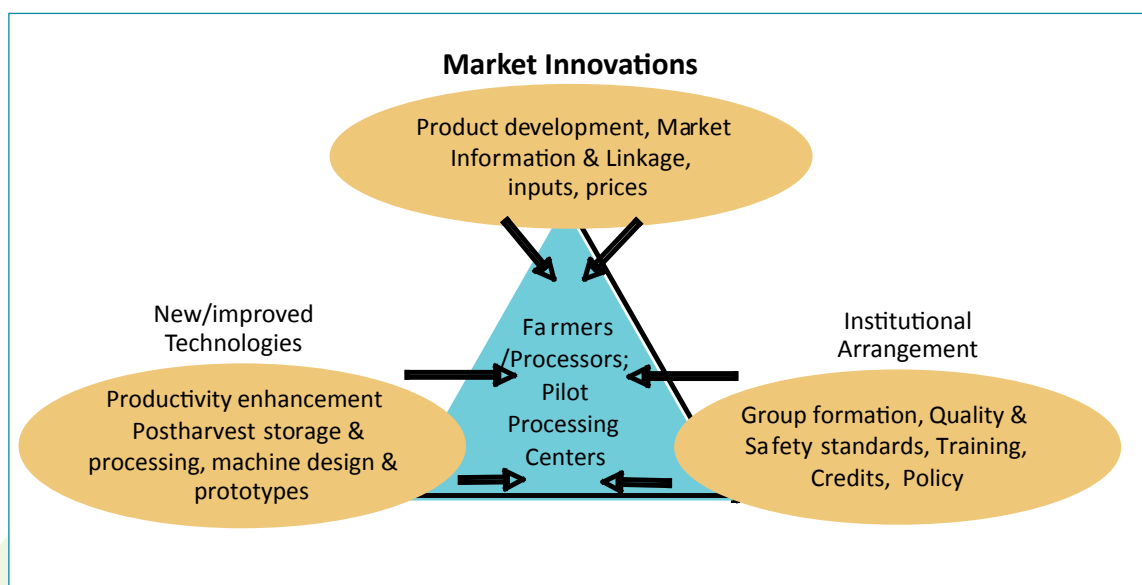


Figure 2. Conceptual framework for the pilot processing centers

The pilot centers were managed by groups of smallholder farmers/processors, and various end-use products were produced, such as chips for food and feed, starch for industrial use, and high quality cassava flour (HQCF) for food and industrial use. To produce HQCF, roots are weighed, peeled, and washed using potable water. The peeled roots are grated using a motorized grating machine. The grated mash is immediately pressed to remove water and cyanide. The pressed cake is granulated and then spread thinly on raised polythene sheets for drying. The dried granules are milled to flour and then packaged. To produce chips, the peeled and washed roots are run through a chipping machine before spreading them thinly on raised polythene sheets for drying. The chips and flour are supplied to consumers, traders or industrial end-users.

package, compared with the usual efforts to deliver different technologies to farmers at different times and locations.

Analytical framework

The concept of value chain analysis is based on Porter (1985), who suggests disaggregating an enterprise into different interlinked sections in order to analyze them and determine their contribution (or constraint) to competitive advantages. It is important to look in detail at the components of the value chain, as well as at the linkages between them, and disaggregation and linkage analyses are two important criteria that determine the quality of a value chain analysis.

While there are a number of chain analyses on cash crops, there is little such research on cassava. Although both food technology

and socio-economic research goes back as far as the 1970s, for example in the engineering design and development of a cassava peeling machine (Odigboh, 1976), there is a strong research focus on agronomy and pest management (Hahn et al., 1979) and, more recently, on agro-ecological and socio-economic assessments of cassava production distribution in Sub-Saharan Africa (Carter and Jones, 1993). The impact of technology innovations in the primary production sector on food security in Southern Africa is also a recent focus of cassava research (Rusike et al., 2009). Analyses of cassava markets and marketing, as well as some analyses of processing are found mainly in literature from South America, especially Colombia, possibly due to the long-term and ongoing research schemes of the CGIAR in this region (Pachico et al., 1983; Janssen and Wheatley, 1985; Cock et al., 1990).

Value chain descriptions for various cassava products exist for West and Central Africa (Nigeria and the DRC), yet they fall short of quantitative analyses (Wheatley et al., 2003). The same holds for emerging schemes in China, where cassava is used to produce bio-ethanol (Jansson et al., 2009).

Value chain analyses of cassava enterprises support the identification and understanding of micro-level determinants of cassava production, which in turn are important for increasing market-led supply. Issues investigated include:

- How to best organize the supply of raw materials by assessing possible input sources, both on-farm or from local markets;
- Optimization potentials for the plants in terms of turnover, seasonality of processing, and optimizing quantity and quality of outputs;
- The conditioning factors of profitability borne from input and output markets (demand in terms of quantity, timing and quality); and
- The optimal business setup/investment schemes for SME cassava processing.

A business performance analysis, based on cost-benefit and financial analyses of the new processing enterprises, was used to potentially compare the internal rates of return (IRR) and net present values (NPV) with other enterprises, e.g., fresh cassava trading vs. processing or cassava farming vs. processing.

Comparisons were made of profitability under “optimal” conditions and the status quo, which has been seen often as suboptimal because the processing sites operate below their installed capacity. Farmer interviews were conducted to establish the reasons for observed suboptimal levels of operation. It also allows for optimizing the technology level through adjustment of the processing structure, yield efficiency, and scale to optimize economic profits for small resource-poor processors, in addition to dealing with other product quality and environmental protection issues.

Results of three categories of business performance appraisal (BPA) are described in this paper, one for flour in two sites (Zogowale and Chisegu), one for chips at the Bungu site, and one for starch at the Mtimbwani site. The basic structure of the BPA follows the same scheme for all sites. It is based on data regarding:

- a) Overhead costs, which are costs of investment, depreciation, interest for investment, maintenance of machinery and equipment, and working capital (working capital is composed of fixed labor costs and other fixed and variable costs);
- b) Variable production costs consisting of the costs of raw materials, casual labor, fuel and energy. Capacity load was calculated as the ratio of actual annual raw material inputs and the maximum possible raw material inputs at each site; and
- c) Revenues, which are the product of the output volume and price per unit output.

Input and output markets were assessed both locally and regionally to determine the product types (fresh roots, chips and flour) traded on rural markets, comparing market prices with farm-gate prices, measuring the seasonal price fluctuations, and the potential for a processing enterprise to source fresh cassava (volume and price) from the open market. This was done by collecting data on prices of fresh roots on-farm and at the local marketplaces, as well as the prices and quantity of traditional products traded in the traditional products markets. Relevant local markets for each processing site were surveyed. The market in Mlandizi was surveyed for the Zogowale processing site, the Chisegu market for the Chisegu site, Mtimbwani market for the Mtimbwani site, and the market in Jaribu Mpakani (Jaribu) for the Bungu site.

Cost-benefit analysis takes into account the above three mentioned positions, including gross margin analysis (revenues minus production costs). Break-even points were calculated as the unit of output equivalent at which overheads are covered by gross margins. Cash flow analyses, which are assessments of cash inflows (revenues) and outflows (investment, overhead and production costs) over a pre-defined ten-year period, were also done for each site.

Financial analysis, using MS-Excel Version 2003, contains the computation of the net present value (NPV), which denotes the equivalent of capital investments at a given interest rate that is justified by the cash flow, as well as the internal rate of return (IRR) that is gained through the respective cash flow. At an NPV of zero, the investment yields exactly the IRR at the capital market interest rate. IRR can either be compared with the market interest rate, or with other IRR from similar enterprises.

Table 2. Features of processing activities at the four sites

Pilot site type	Site location	Average amount of cassava processed (kg/day)	Labor use: man-day/processing-day	Average peeling loss (%)
Chips	Bungu	731	4	10
Flour	Zogowale	392	19	23
Flour	Chisegu	122	20	15
Starch	Mtimbwani	172	8	26

The NPV is computed as follows:

$$NPV = -INV + [P_1/(1+i)] + [P_2/(1+i)^2] + [P_3/(1+i)^3] + \dots + [P_N/(1+i)^N] + [VN/(1+i)^N]$$

where:

NPV = net present value of the investment alternative

INV = initial investment

P = net cash flows attributed to the investment in period 1 to N

VN = terminal salvage value of the investment

N = length of the planning horizon (10 years in this case)

i = interest rate

I is the internal rate of return (IRR), marginal efficiency of capital, yield or discounted rate of return at which the NPV is zero.

Results and discussion

Analysis of factors of processing operations

There were variations in the amount of cassava processed and the frequency of processing activities by the various groups (Table 2).

The chips-processing site at Bungu processed the largest amount of cassava and used least labor. Chips processing involves the least mechanization as it requires only one chipping machine, and a drying facility of 137 m², which will accommodate up to one t/day of cassava. These factors could help in achieving a lower processing cost and better profits. Labor use varied widely at the sites, partly because of the nature of the processed products. Starch has the most unit operations to go through and thus requires more labor input; chip processing requires the least labor. It became obvious during the study that the quality of labor was lowest in one of the high-quality cassava flour sites (Zogowale).

Peeling losses during processing varied significantly among sites. The variation was due to the variety grown, root maturity, peeling methods and/or the extent of caution taken by the people peeling. Flour production in Zogowale was highest in the period from April to June, the period during which the pilot plant mill became operational. Otherwise, the same observations as for chips production hold. Flour production seems to be of interest in the low root price season in Zogowale. The peels of some varieties are easier to remove than others. Small or immature roots are more difficult to peel, resulting in high peeling loss, particularly if the peelers do not take adequate caution. Over-aged, spoiled roots and those with high levels of infection from disease, such as Cassava Brown Streak Disease (CBSD), will result in high peeling losses and long peeling time.

Raw material market assessment

For the purpose of developing a business plan for an agroprocessing enterprise or analyzing the performance of existing enterprises, the local market potential for processed cassava products has to be known; the local prices of roots available for processing including seasonal fluctuations in prices, production and sales for roots and the products need to be established. The sales and purchases, or the balance thereof respectively, of the group member farmers determine the potential to source additional raw material beyond the contracted volume, and the respective prices. Beyond direct sourcing from farmers or at the farm gate, raw material can be sourced from markets, which requires knowledge of markets and the respective prices and seasonal fluctuations.

Market dynamics were assessed to determine the farm-gate prices, the seasonal fluctuations in prices, as well as the potential for a processing enterprise to source fresh cassava (volume and price) from the open market. This was done by collecting data on prices of fresh roots on-farm and at the local marketplaces. For local markets, the relevant market for each of the processing sites was surveyed. The market in Mlandizi was surveyed for the flour processing site in Zogowale, in Chisegu town for the flour processing plant in Chisegu, in Mtimbwani town for the starch-processing site in Mtimbwani, and in Jaribu Mpakani (Jaribu) for the chips processing plant in Bungu.

Farmers' marketing pattern around the flour pilot sites in Zogowale and Chisegu

In Zogowale, the farm gate purchase price is significantly higher than the farm gate price (94 US\$/t vs. 21 US\$/t), with average quarterly farm gate volumes being about half the tonnage of the market retails (3 t vs. 6 t). The high purchase price is explained by the nearby competing cassava market of Dar es Salaam, whereas the comparatively low farm gate sales price is a result of market margins and the fact that there is not much demand for the produce due to better opportunities for the regional traders elsewhere. Chisegu seems to be a major export spot for cassava, with farm gate prices averaging US\$ 90 per ton through the year, with a quarterly sale of 63 t of cassava on the local market. Purchase prices are lower, with an average of US\$ 40/t, with about 33 t of cassava being purchased quarterly. While Chisegu seems to be an excess supply area, this supply seems to be mainly going into higher priced markets and to a lower extent back into the local households. Households seem to optimize

their purchases through paying low prices and possibly buying from other households whatever is available at low prices (Table 3).

Farmers' marketing pattern around the chips pilot site in Bungu

Cassava farm gate prices are US\$ 25 per ton (the annual average), while purchase prices are US\$ 66/t. Farm sales per quarter (three months) average 25 t, whereas purchases average 5 t per quarter. This indicates that farmers sell relatively frequently, whereas they only buy small amounts, probably to cover their deficits. The price differential between farm gate sales and market retail prices is explained by margins on local markets as well as the costs of importing cassava from elsewhere, and of course by the excess supply of cassava at the farm gate level, depending on seasonal fluctuations (Table 3).

Farmers' marketing pattern around the starch pilot site in Mtimbwani

Farm gate prices are higher than purchase prices, at US\$ 55/t and US\$ 13.7/t respectively, whereas the purchased volume is almost five times the amount of the farm gate sales volume (107 t vs. 22 t per quarter). This could be explained by a steady inflow of and demand for cassava imported from other regions, whereas production seems to be low and marketed volumes are small and only traded at peak prices from farms.

Overall assessment

As stated above, the farm gate marketing patterns determine the potential to source raw material from farmers beyond their group-contracted volume. Such additional sourcing has to be optimized in terms of volumes and prices. For Bungu, for example, the lowest costs of sourcing raw material would be from April to June, with a balance of 25 t available at a price of about US\$ 21/t. In Zogowale, it should be difficult to source additional raw material from the farmers, as the region seems to be in supply deficit with a negative balance available. The same holds for Mtimbwani, while Chisegu is a surplus area. Yet, the surplus in Chisegu obviously goes into a higher price area, so that sourcing from farmers would be quite costly.

Marketing patterns in local markets

The market situation reflects the findings at the farm gate. In particular markets in Zogowale were high-priced, which underlines the costs of sourcing raw material other than from the contracted farmers. The Bungu-related market was in the middle position in terms of price, with lower prices in the other markets (Table 4).

Table 3. Farm gate sales and purchase prices according to pilot site

Site	Period				
	Jan-March	April-June	July-Sep	Oct-Dec	Average
Flour site-Zogowale					
Farm-gate sales price (US\$/t)	20.5	17.1	29.1	19.7	21.4
Sales volume (t)	2.0	1.0	5.0	4.0	3.0
Farm gate purchase price (US\$/t)	93.2	94.9	95.7	93.2	94.0
Purchase volume (t)	6.3	8.2	7.1	1.1	6.0
Flour site-Chisegu					
Farm-gate sales price (US\$/t)	94.9	n.a.	82.9	n.a.	88.9
Sales volume (t)	70.0	n.a.	55.0	n.a.	63.0
Farm gate purchase price (US\$/t)	34.2	30.8	38.5	52.1	39.3
Purchase volume (t)	26.0	61.0	20.0	25.0	33.0
Chips site -Bungu					
Farm-gate sales price (US\$/t)	32.5	20.5	23.9	n.a.	25.6
Sales volume (t)	14.0	32.0	51.0	2.0	25.0
Farm gate purchase price (US\$/t)	42.7	53.0	115.4	50.4	65.8
Purchase volume (t)	5.8	6.9	6.2	2.7	5.0
Starch site - Mtimbwani					
Farm-gate sales price (US\$/t)	56.4	54.7	50.4	55.6	54.7
Sales volume (t)	27.0	20.0	21.0	19.0	22.0
Farm gate purchase price (US\$/t)	12.8	13.7	15.4	12.8	13.7
Purchase volume (t)	37.0	90.0	152.0	149.0	107.0

In summary, it can be said that Zogowale has a difficult raw material market situation, both due to high prices of fresh cassava and to a deficit in cassava trade. This indicates a shortage of raw materials, which possibly hampers supply to the processing site at reasonable prices. The flour site in Chisegu has a surplus at varying prices. The second flour site in Bungu, although at a medium market price level, has a cassava surplus that supports raw material supply to the processing plants. The starch site in Mtimbwani has low prices but a deficit in cassava trade at the farm gate.

Business performance appraisal (BPA)

BPA for flour processing

Cassava flour is produced in Zogowale and Chisegu. The two sites, based on the same technology, machinery type and cost structure, were compared according to their efficiency of operation, capacity utilization, potential of income sourcing and cost structure. Basically, flour production uses a grating machine, a press for dewatering, drying racks, and a mill. Other equipment items are scales and water pumps. Working capital is composed of permanent labor costs and other costs.

The total cost of equipment for small-scale, high-quality cassava flour processing is estimated at US\$ 2,344 – the costs of a grater, press, drying racks, milling machine, water pump, storage tank, and weighing scale. Accounting for cost of depreciation and maintenance over a maximum of 10 years, total fixed costs for machinery were US\$ 925, while total working capital and overhead cost were US\$ 3,938 and US\$ 4,836, respectively.

Production costs and revenues – Production costs include the costs of raw material, water and fuel costs, as well as costs for additional/casual labor. Casual labor is required when the person-days needed for processing exceed the permanent labor force of 20.

Table 5 depicts the different cost structures at the two sites. It is assumed that both sites have an initial capacity of 170 t/yr fresh roots processing, equal to 850 kg/day. The “full capacity scenario” of the BPA assumes that the processing site would source all the cassava needed for 100% capacity utilization from farmers on contract and from the market. Hence the efficiency of operation, capacity utilization, income sourcing and the cost structure could be mostly attributed to the extent to which the

Table 4. Local market trade: prices and trade margins for cassava roots

Market/time period	Purchase price (US\$/t)	Sales price (US\$/t)	Margins (US\$/t)
Mlandizi market for Zogowale flour site			
Jan-Mar	93.2	170.9	77.7
Apr-Jun	94.9	170.9	76.0
Jul-Sep	95.7	170.9	75.2
Oct-Dec	93.2	154.7	61.5
Chisegu market for Chisegu flour site			
Jan-Mar	34.2	67.5	33.3
Apr-Jun	30.8	77.8	47
Jul-Sep	38.5	114.5	76.1
Oct-Dec	52.1	77.8	25.6
Jaribu market for Bungu chips site			
Jan-Mar	42.7	107.7	65.0
Apr-Jun	53.0	144.4	90.6
Jul-Sep	115.4	147.9	32.5
Oct-Dec	50.4	105.1	54.7
Mtimbwani market for Mtimbwani starch site			
Jan-Mar	12.8	48.7	35.9
Apr-Jun	13.7	48.7	35
Jul-Sep	15.4	47.9	32.5
Oct-Dec	12.8	27.4	14.5

different groups of smallholder farmers were able to source raw materials, operate the pilot sites on commercial basis and access market for the products.

There are few differences in the cost structure at the two sites. Casual labor costs and water are cheaper in Chisegu, whereas raw material costs less at Zogowale. The main difference lies in the capacity load. Chisegu can exploit its full capacity by sourcing additional raw material from the market, but Zogowale operates at only 48% of its capacity. This severely affects potential revenues and gross margins.

Cost-benefit analysis – The cost-benefit analysis includes the computation of profitability, as well as an assessment of gross margins and break-even points in terms of raw material processing and final flour output. Break-even points denote the capacity load that is required to cover the overhead costs by the gross margin. Gross margins are defined as revenues minus variable production costs. An assessment of costs and benefits based on the percentage capacity utilization (CU) of the sites is depicted in Table 6. Overall profits are negative at 48% CU (in Zogowale), but positive at 100% CU (in Chisegu). Both sites

have positive gross margins; this implies that if the overheads are not accounted for, they are operating profitably at variable costs. This is, in fact, a decision-making factor for maintaining production at sites with even negative overall profits. Break-even points are at around 122 t/yr for both sites, which again indicate that 48% is much below the capacity utilization requirements for breaking even under the Zogowale cost structure.

Cash flow and financial analyses – Cash flows are composed of cash inflows (revenues) and cash outflows (costs and investments) over a given period of time. Normally, cash flows are calculated over a period of ten years, given the fact that depreciation and therefore investment needs are ten years for many capital items; most credit schemes also run over ten years. The cash flow of the two sites, based on the “base run” scenarios described above, is also shown in Table 6. Cash flows are calculated from the year “zero”, where the investments have been made (which is a necessary set for the computation of IRR and NPV). The breakdown of cash flow in the two sites shows that investments occur in the year zero, as well as after three, six and nine years, as some of the equipment have to be replaced

after three and six years of use. It can be seen that operating at 48% of the installed capacity has a negative cash flow over ten years, whereas Chisegu, operating at 100% installed capacity, has a positive cash flow during the same period.

The role of farmers' knowledge, work attitudes, and socio-cultural factors on performance of flour processing sites – The disparity in potential profitability at the two flour processing sites gives a picture of the effect of socioeconomic and cultural factors on rural processing enterprises managed by small groups of rural farmers or processors. To verify what influence farmers' knowledge, work attitudes, and other socio-cultural factors had on the processing efficiency and profitability of Zogowale pilot site, the farmers' group was reorganized and a new scheme of work was introduced. The cooperative group members were

each allocated one day, in turn, to process their cassava while employing paying labor directly. The minimum amount of fresh roots that should be processed daily was fixed at 600-800 kg (71-100% capacity utilization) while the maximum number of workers to be employed was fixed at eight.

In a Scenario 2 (Table 7), the analysis was done at full capacity utilization of the Zogowale plant when operated by the individual farmers in the new arrangement; the technology used remained the same as for the "base run", but the capacity utilization was 100% as for the second flour site at Chisegu; input/yr became 170 t, about 50 t more than the break-even point.

This led to a sharp increase in total revenue, profit, and to a higher NPV and IRR than in Chisegu. In this situation, although

Table 5. Costs and revenues at the two flour-processing sites

	Zogowale	Chisegu
Capacity (fresh root t p.a.)	170	170
Capacity load (t)	82	170
Capacity load in % of total capacity	48	100
Costs		
Raw material		
Sourced from farmers at contract (t)	48	40
Average price (US\$/t)	17	42
Sourced from farmers out of contract (t)	40	0
Average price (US\$/t)	23	n.a.
Sourced from market (t)	22	130
Average price (US\$/t)	94.	36
Average price of total raw material	44	43
Total raw material costs	3,179	6,444
Casual labor costs per man-day (US\$)	0.86	0.17
Excess labor costs	0	188
Fuel costs/t raw material (US\$)	0.004	0.004
Fuel costs at capacity load	280	581
Water costs/t raw material (US\$)	0.8	0.30
Water costs at capacity load	63	49
Bagging and handling costs/t raw material (US\$).	2.30	2.30
Bagging and handling costs of final product	185	394
Total costs	3,748	7,646
Revenues		
Flour produced (t)	27	56
Price (US\$/t)	256.4	256.4
Revenues	6,938	14,385

Monetary figures are in US \$, unless otherwise indicated

Table 6. BPA summary for flour processing (Zogowale and Chisegu)

Item	48% CU (Zogowale)	100% CU (Chisegu)
Total fixed costs/yr.	4,839	4,863
Total production (variable) costs/yr.	3,746	7,646
Total revenues/yr.	6,938	14,385
Total gross margin	3,192	6,739
Flour production (t)	27.06	56.10
Gross margin/t flour	120	120
Gross margin/t fresh root equiv	40	40
Profits (overall) at present possible capacity load	-1,647	1,876
Break even point		
In flour equivalent (t)	41	40
In fresh roots equiv (t)	124	123
In capacity load ratio	0.73	0.72
Cash flow and investment analysis		
Net cash flow over 10 years	-20,314	14,916
NPV (10 years)	-9,806	6,402
IRR (10 years, percent)	n/a	77

Monetary figures are in US \$ unless otherwise indicated.

the fixed capital for Zogowale remained the same, the relative overhead costs were tremendously reduced. The lower raw material cost in Zogowale than in Chisegu contributed to the higher profit. This shows that the likelihood of increasing profitability of the processing enterprise at the rural level depends on the ability of smallholder farmers and processors to increase the efficiency of the processing operations in addition to an increase in primary production of cassava in a way that ensures a regular inflow of raw materials.

Equipment and working capital costs for cassava starch

producing site – Starch production in Mtimbwani is the most capital-intensive production technology of the three processing technologies studied. The total cost of equipment for small-scale starch processing is estimated at US\$ 4,757, which includes the costs of a cassava grater, starch settling channels, drying racks, steel sieves, a milling machine, and a weighing scale. By making financial provisions for depreciation and maintenance of the equipment over a maximum of 10 years, total fixed cost for machinery was US\$ 1,581 while total working capital and overhead costs were US\$ 1,972 and US\$ 3,553 respectively.

Equipment and working capital costs for cassava chips

producing site – Chips production requires a chipper and

drying racks. Other facilities include scales and water supply systems. The total investment in these equipment and facilities is estimated at US\$ 1,492. The cost of depreciation and maintenance of the equipment, when accounted for over a maximum of 10 years, was US\$ 457, while total working capital and overhead costs were USD 49 and US\$ 506, respectively.

Table 8 shows the different cost structure at the Mtimbwani site. It is assumed that the site has an initial capacity of 170 t/yr fresh roots processing, which equals 850 kg/day, and at 100% capacity utilization, profitability is positive despite the high investment costs. It is assumed that the Bungu cassava chips processing site has an installed capacity of 170 t/yr fresh roots processing, which equals 850 kg/day. The BPA assumes that the processing site absorbs all the cassava available at the site from farmers on contract and then from the market. Bungu operates at only 59 % of its capacity, yet its revenues are high, since costs are moderate and the prices for chips are high.

An assessment of costs and benefits is depicted in Table 8. The site has a positive gross margin, as well as a positive overall profit. Break-even point is about 75 t/yr fresh roots processed. Similarly, Bungu had a positive gross margin, as well as a positive overall profit. The break-even point is at around 18t/yr. This

Table 7. Net Present Value and Internal Rate of Return at Zogowale after input increase.

Profitability indices	Zogowale – base run (48% CU)	Zogowale at full capacity utilization (100% CU)
NPV (10 years, US\$)	-9,806	20,215
IRR (10 years, percent)	n/a	222

explains the high profitability of Bungu. It should be noted that the relatively low break-even point is because of the low investments required for chips production, compared to the other intermediate cassava products.

Cash flow and financial analysis – The Mtimbwani starch plant shows positive cash flows throughout the ten-year investment period. The same picture is reflected in the NPV and IRR. The

investment has an NPV of US \$15,958 and an IRR of 91%. However, because starch processing is water intensive, an additional investment of US\$ 450 on a water pump and storage tank to improve quality of the starch would reduce the NPV and IRR to US\$ 14,897 and 81%, respectively. However, the quality of the starch would increase. The Bungu chips plant shows positive cash flows throughout the ten-year investment period (Table 9). The investment has a positive NPV of US\$ 8,698 and an IRR of 135%.

Table 8. Costs and revenues at the Mtimbwani starch processing and Bungu chips processing sites

Item	Starch site	Chips site
Capacity (fresh root t/yr)	170	170
Capacity load (t)	170	100
Capacity load in % of total capacity	100	59
Costs		
Raw material		
Sourced from farmers on contract (t)	40	100
Average price (US\$/t)	17.1	25.6
Sourced from farmers out of contract (t)	0	0
Average price (US\$/t)	0	0
Sourced from market (t)	130	0
Average price (US\$/t)	12.8	0
Average price of total raw material (US\$/t)	14.5	
Total raw material costs	2,406	
Casual labor costs/t fresh roots processed (US\$)	0.51	0.26
Casual labor costs at capacity load	872	256
Fuel costs/t raw material (US\$)	0.12	0.12
Fuel costs at capacity load	2,034	120
Water costs/t raw material (US\$)	0.38	0.13
Water costs at capacity load	654	128
Bagging and handling costs/t raw material (US\$)	0.68	0.24
Bagging and handling costs of final product	384	239
Total costs	6,349	3,308
Revenues		
Starch/chips produced (t)	56.1	35
Price (US\$/t)	256.4	200
Revenues	14,385	5,983

All monetary figures are in US \$ unless otherwise indicated.

The role of farmers' knowledge, work attitudes, and socio-cultural factors on performance of chips and starch processing sites – Unlike the Zogowale flour processing group, the Bungu group had a business attitude and members were paid based on the amount of work done (kg of cassava processed). It therefore follows that in entrepreneurship development, it is vital for research to recognize the effects that low enterprising culture, group spirit, group motivation, commitments within members and group management (leadership structure, qualities, tenure, accountability and decision making, motivation etc.), could have on project success.

there was a huge dormant demand for all the intermediate cassava products (starch, flour, chips). Group dynamics and group organization have a great cost implication on cassava processing enterprises when processors are operating in groups. It was found that Bungu group, being smaller (Table 1), is highly organized, and was able to reduce their costs, unlike Mtimbwani and Zogowale groups.

A major factor that requires consideration for small-scale processing enterprises of this nature is the state of the support infrastructure needed for the enterprises to flourish. Some

Table 9. BPA summary for the starch (Mtimbwani) and chips (Bungu) processing sites

Item	Starch site	Chips site
Total fixed costs p.a.	3,553	563
Total production (variable) costs p.a.	6,349	3,308
Total revenues p.a.	14,385	5,983
Total gross margin	8,035	2,675
Flour production (t)	56.1	35
Gross margin/t starch or chips	140	80
Gross margin/t fresh root equiv	50	30
Profits (overall) at present possible capacity load	4,482	2,11
Break even point		
In starch/chips equivalent (t)	24.81	7,369
In fresh roots equiv (t)	75.17	22.31
In capacity load ratio	0.44	0.13
Cash flow and investment analysis		
Net cash flow over 10 years	36,503	18,775
NPV (10 years)	15,968	8,698
IRR (10 years, percent)	91	135

Other socioeconomic and cultural factors affecting rural processing enterprises managed by groups of farmers or processors include the effect of social orientation, the cultural attitude toward work, and business orientation.

Further observations of the other factors that affected the pilot processing enterprises managed by the cooperative groups of rural-based smallholder farmers or processors are that, due to lack of exposure to urban business environment, low commercial outlook, and entrepreneurial culture and experience, many rural farmers were unable to independently take advantage of available market opportunities. While most of the pilot farmers felt the markets for their products were not sufficient for the plant production capacity, the output market survey showed

of these relate to the lack of access roads and poor transport systems in most rural areas for easy delivery of fresh roots to processing plants. Farmers transport fresh cassava on their heads or bicycles to the pilot sites. This mode of raw material delivery to the processing sites is slow, tiring and inefficient. This contributed to the inability of the groups to source the quantities of raw materials necessary to attain high capacity utilization and profitability. Costs of transporting both raw material to the sites and final products to the market were high, thus eroding the gross profits.

The general lack of potable water for processing affects both the quality of final products as well as processing capacity. Poor quality cassava products are not acceptable to end-users, and a

lack of sufficient water would reduce processing outputs, such as amount of starch extractable from cassava roots. The fact that chips production is not water-intensive was a major contribution to the higher profitability exhibited in the Bungu farmers' operations. At the time of study, the group was making more chips for the animal feed industry than for the food sector.

Conclusions

The above discussion shows that business planning and financial analysis of enterprises – here called business performance appraisal – is a strong tool to assess infant industries under economic, financial and even managerial or social criteria. In summary, the determinants of profitability and overall success of processing plants were found to be:

- Ability to operate the plants at a high capacity utilization;
- Efficient use of inputs such as labor;
- Ability to maintain quality of products;
- Availability of sufficient and steady raw material at low cost and stable prices;
- Access to product market;
- Good managerial skills and good group organization; and
- Efficient support infrastructure (water, roads and transport systems).

There was a strong seasonality in root harvesting and marketing practices as well as a variation in prices across sites. Farmers sell the highest volumes of cassava roots during the last quarter of every year. However, high levels of marketing of roots appear to result from access to market for fresh roots particularly within 150 km of a city, which might also be a potential disadvantage to a processing plant situated in such location, as the plant might have to compete for roots with the more profitable fresh root market. On the other hand, locations with limited fresh root production are less suitable for any processing enterprise. The right balance of sellable quantity of fresh roots must be established at a location being considered for a processing enterprise. Rural processing plants might have difficulties in sourcing enough raw materials throughout the year, hence maintaining own farm to augment supplies during the period of shortfall is inevitable. Although the raw material was cheapest in Bungu and most expensive in Chisegu, the enterprise in Chisegu was profitable while it was not in Zogowale. It is clear that high

market prices for the final product and efficient management of a processing plant are essential in making cassava processing enterprises profitable. Although the high quality cassava flour production process is easy to adapt and apply, the profitability of processing enterprises may differ, depending on how the processors organize their daily production. A change in the processing plan could have a tremendous effect on profitability as well.

Earlier observations at the pilot processing centers showed that the skills of the operating groups, group organization, and dynamics in the groups had an impact on the number of people deployed and their efficiencies. Profitability may be affected if processors do not have a specific and efficient work schedule. In situations where individual members or a rural processing group to whom some tasks are allocated do them as and when they wish, the efficiency of the whole operation will be affected. From the viewpoint of the involvement of rural farmer groups in externally supported agriculture enterprises such as processing, it is important to highlight that without a substantial financial contribution from the group members, there is little possibility for sense of ownership and a general lack of motivation for profit. Such groups might always rely on subsidies and would not be likely to run any processing enterprises profitably. In Zogowale, for instance, most of the group members were more than 50 years old. Despite the training in business management to improve their business managerial skills, the group members retained the impression that any work at the processing center was a social endeavor. These findings clearly illustrate the strong influence that social and business orientation and people's cultural attitude to work can have on the success or failure of rural agro-based enterprises.

Analysis has shown that, operating at full capacity, all the cassava processing plants would be highly profitable. Optimal location depends on the availability of raw material and inputs (such as water) to perform at their maximum potential. That said, the steady throughput of raw material has to be insured, which implies a certain independence from volatile markets and thus the inclusion of primary production schemes into the processing setup.

Another major constraint identified during the study is sun drying, as it requires large investments in sun-drying racks, without which the drying stage can be a major bottleneck in the production process.

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Integrating informal actors into the formal dairy industry in Kenya through training and certification

Amos Omore¹ and Derek Baker²

Abstract

This paper reviews current thinking on the role of informal agribusiness in pro-poor development, and reports on the example of a recent dairy development project (the Smallholder Dairy Project) in Kenya. The project featured collaborative and participatory research, along with training and certification in milk handling practices as a practical mechanism optimizing milk quality and addressing regulatory barriers. It also targeted and helped achieve policy change, which enabled wider piloting of the training and certification activities incorporating a business development service approach by national authorities. Substantial welfare gains were achieved, as demonstrated in a recent impact assessment reviewed in the current paper. Current extensions of the project are described, and subsequent work outlined. Coherence with received wisdom is discussed along with future research topics.

Introduction

Throughout the developing world, informal or traditional agro-industry is the dominant avenue for delivery and processing of smallholders' products. It is also the principal food source for the great majority of poor consumers. It employs very large numbers of people as traders and service providers. However, agro-industrial policy has historically promoted "development" almost synonymously with the displacement of the informal sector by a formal sector featuring capital-intensive production and marketing, and the associated scale of operation. Second, support to collective action and services has addressed smallholders' needs largely by mimicking the organizational requirements of large-scale production. Other policy concerns, such as public health and municipal planning, have further selected against informal agribusiness, and livestock's informal agro-industry has been particularly targeted in this regard. Vested interests at several levels of formal agro-industry and government tend to reinforce policy bias against its informal counterpart. The basis for more widespread agro-industrial development has thus been stultified or left without policy support.

The objectives of this paper are to present dairy policy change as a means of addressing poverty, and to illustrate this with examples from interventions in the Kenyan informal milk industry that ensued. Interventions employed include training and certification associated with the delivery of improved product quality throughout the value chain. The paper argues that poverty alleviation is well served by recognizing and embracing informal agro-industry and its gradual transformation into a formal one. Further, it will present evidence that the informal dairy industry is capable of recognizing and responding to consumer demand for quality, particularly for safe food. Based on recent impact assessment, it presents evidence on welfare impacts when unjustified policy barriers are removed, and when price alone becomes the basis of competition.

This paper has seven parts. In the following section, poverty as a central theme in the agricultural development discourse is briefly reviewed. Informal agribusiness is then profiled as a substantial economic and social engine of poverty alleviation and associated pathways out of poverty. The third section profiles the Kenyan dairy industry and the fourth presents the Smallholder Dairy Project (SDP). The fifth section describes the impacts of the SDP and presents recent analyses. The sixth lists the lessons learned and the final section reviews consequential extensions and developments, and presents conclusions.

Background

The goal of poverty alleviation achieved prominence within agricultural sector development programs only at the beginning of the last decade, by way of the UN's declaration of 1996–2007 as the Decade for the Eradication of Poverty. This was accompanied by the use of Poverty Reduction Strategy Papers (PRSPs) as the basis of lending by the World Bank and International Monetary Fund, and since 1999 the establishment of eradication of extreme poverty and hunger in the eight Millennium Development Goals (MDGs), agreed in 2000.

Causality leading from economic growth to poverty reduction has been questioned. This led to identification of forms of growth that are "pro-poor", by way of their entailing a reduction in food prices, or alternatively being strongly based in investment and employment by the poor according to fundamental issues of resource endowment and allocation (UNDP, 1997). More

¹Veterinary Epidemiologist, Improving Market Opportunities, ILRI. Corresponding author (a.omore@cgiar.org).

²Team Leader, Changing Demand and Market Institutions, ILRI.

recently, the 2008 World Bank Development Report cites evidence that investment in agriculture is critical to the process of ensuring a decline in poverty, and that the poor's involvement in markets offers pathways out of poverty at the household level. Barrett (2008) identifies non-participation in markets as a rational choice by households characterized by scarcity of certain resources and inputs, and facing barriers to market entry at a number of levels. While welcoming market participation as a mechanism for pro-poor development, the World Bank (2008) proposes several relevant mechanisms: households' orientation may be toward employment in processing and service provision for the agricultural sector, or conversely exit from the sector altogether, along with production and sales by entrepreneurs. Hence, the role of the value chain in poverty reduction is complex and is deserving of further research.

Before the MDGs, it had been noted that livestock programs had – with few exceptions – little impact on the poor (LID, 1999). However, few were designed to do so: they typically aimed to increase aggregate national production of livestock products. Most were focused on cattle and promoted technologies (e.g., industrialized dairy) and associated institutions that were often intrinsically inappropriate to local situations (de Haan et al., 2001). Failure to reach poor producers in this context was therefore unremarkable. However, interest in pro-poor livestock development has since grown, and livestock-oriented development portfolios have diversified their approaches in acknowledgement of past failures and in recognition of growing evidence with respect to the importance of livestock in the livelihoods of the poor. Aside from the World Bank-sponsored PRSPs, an increasing number of international agencies and projects are now looking at livestock-mediated poverty alleviation more favorably (see Ashley et al., 1999; Dolberg, 2001; Ahmed 2000; ILRI, 2003; and IFAD, 2004).³

The great majority of such systems operate within the informal sector, featuring smallholder production, small-scale trader accumulation and distribution, and small-scale processing and retail. A new sphere of development effort targets the informal sector's capacity and performance (e.g., see FAO, 2007), little of which is concerned with its connection to the large-scale formal sector. Although supermarket-type retail development and export of selected high-value crops to the North are playing

a part, they remain a very small part of the larger picture of the reliance of the poor on agriculture in Africa and less advanced developing Asian countries (Tschirley et al., 2004; Humphrey, 2007).

The informal sector is frequently addressed as a set of problems and opportunities confronting urban development, in association with urbanization (FAO, 2003). However, extending into the countryside and with so many poor people depending on the informal sector, its recognition and embrace by policy, institutions and services are being promoted in poverty reduction (Morrison, 1995). There is ample evidence that participation in the informal sector particularly favors welfare generation for women (Ahmed, 2000; Broutin and Bricas, 2006), and some marginalized social and ethnic groups (Simon, 2000). However, besides possibilities of better nutrition, impacts on children may be less favorable, and the informal sector is reckoned to be unattractive as a career for aspirant youth in many cultures (Simon, 2000). There are indications that the informal sector can deliver pro-poor growth at both extremes of the economic cycle: providing jobs and cheap food in recessions or during conflicts (Yasmeen, 2001), and serving growing demand among the poor in boom times (Simon, 2000).

It should be noted, however, that some researchers identify the former effect as a survival impact and shed doubt on the latter effect due to agents' observed lack of skills and barriers to market entry (Lugalla, 1997). Moreover, the extent to which the informal sector competes with the formal, as well as the opportunities for synergy, have not been well explored (Varcin, 2000). Muller (2004) identifies a need for strong leadership by government in ensuring the informal sector's performance in resource allocation *à la* competitive markets. Despite significant statistical shortcomings [not the least of which are the definitions of the constituent parts of the informal sector (Muller, 2004) and their cross-tabulation with sector, gender, employment, and industrial data], some of these hypotheses were tested in a systematic way by Charmes (2000), who delivered both mixed and limited conclusions. To the extent of the authors' knowledge, no similar research has been done in the ensuing period.

³Current ILRI work in partnership with the World Bank seeks to clarify the linkages amongst market participation, poverty and project/program design (further detail is available from the authors).

Kenyan dairy

The structure of the Kenyan dairy industry is dictated largely by demand patterns. At over 100 kg/caput per year, Kenyans consume more milk than almost anyone else in the developing world⁴, and much of this is in liquid form (Sevo, 2008). Recent efforts by government and non-governmental agencies to promote milk consumption in all forms and increasing urbanization appear to be contributing to more sales of other forms, such as yoghurt and cheese, but the proportion represented by these is still small. Although dairy in most African countries is characterized by a patchwork of formal and informal market linkages (Ahmed et al., 2004), smallholders and informal raw milk market channels dominate the supply of marketed dairy products in Kenya. Imports and exports are negligible.

The line between what is considered “informal” and “formal” is often blurred. The term “informal” was coined originally to refer to people operating outside the law (particularly to avoid taxation), but it now commonly refers to small-scale traders operating legally (often with licenses) as well. In the dairy sector, “informal” refers to traders at variance with widely accepted international norms that emphasize cold-chain organization and pasteurization of marketed milk prior to sale. They may or may not have legal status, depending on the specific policy environment. Using this definition, an estimated 86% of all Kenyan milk sales are of this origin, while milk that reaches consumers after pasteurization and packaging accounts for just 14% in the early part of this decade (Omore et al., 2004a, b).

Although livestock numbers are uncertain in the absence of a recent census and due to political upheaval, it is estimated that 1.8 million cattle producers are involved in milk supply, most of whom keep 1-2 dairy cows and their replacements on small land areas (less than 2 ha).⁵ Marketed milk reaches retail points via several routes: direct milk sales from producers to consumers (42%) and from dairy farmer groups (24%), with the remainder sold via some 40,000 small-scale milk traders.

The policy and institutional approach to such informal sector dominance has pre-occupied Kenya’s public officials and other dairy stakeholders for the past decade: dairy’s management and performance have been one set of concerns; another has been the vested interests of large firms in the formal sector.

Key opposing forces constituted on one side the few large and highly capitalized, highly organized, and well-connected producer-processors selling higher-priced milk, and on the other the myriad poor, often part-time, haphazardly organized, voice-less small-scale producer-traders selling lower-priced, raw unprocessed milk. Public health concerns were thrust to the fore: competition for market share between the two groups appeared to rest not on the basis of price differences, but on perceived differences in quality and safety. Sparse evidence supported these concerns, but those wishing to influence policy employed them widely.

The Smallholder Dairy Project in Kenya

Changing mindsets regarding milk from the informal sector, based on scientific evidence, was the key focus of the Smallholder Dairy Project (SDP), with the goal of catalyzing pro-poor policy shifts⁶. SDP was initiated in 1997 as a collaborative project between ILRI and research and development partners in Kenya, with funding from the UK Department for International Development (DFID). It was initiated as an integrated research and development project aimed at the sustainable development of Kenyan smallholder dairy. Key areas proposed for SDP research and development activities included: detailed characterization of the sector, from production to consumption and including the policy environment; analysis of factors constraining competitiveness of smallholder dairy farmers; analysis of social and economic benefits from smallholder dairy production; and testing of milk products’ quality and identification of factors affecting public health. There was to be participatory development of improved technologies for farmers and traders, together with dissemination of extension and training materials, and a spatial analysis of dairy systems for improved targeting.

However, during its life the focus of the project shifted, in particular towards supporting change in the policy and institutional environment, in order to better support dairy-dependent livelihoods. During its three phases, the project moved from a focus on development of “best-bet” technologies to overcome farmers’ problems and to improve their livelihoods (Phase 1) to their uptake across a broader geographic area (Phase 2). An evaluation indicated limited potential impact would

⁴SDP Brief 1 and 10, www.smallholderdairy.org

⁵SDP Brief 10, www.smallholderdairy.org

⁶See www.smallholderdairy.org

be achieved through a focus on technologies. Detailed studies initiated during this phase to assess milk-borne public health risks weighed against benefits such as income and employment generation formed the basis of the development of a strategy for the reform of dairy policy (Phase 3). An example of behavioral findings that were far-reaching was evidence relating to consumers' predisposition to boiling milk before consuming it.

Because public health risks associated with informal milk markets were demonstrated to be exaggerated, Phase 3 saw more active

engagement with policy, particularly the need to allow small-scale milk traders or vendors (SSMV) to be licensed. In an effort to change entrenched mind-sets, practical procedures to raise milk quality were demonstrated. A pilot program to train and certify SSMVs in basic milk testing, hygiene and handling using a new model of business development services (BDS) (see Box 1) was initiated with the active involvement of the regulatory authority, the Kenya Dairy Board.

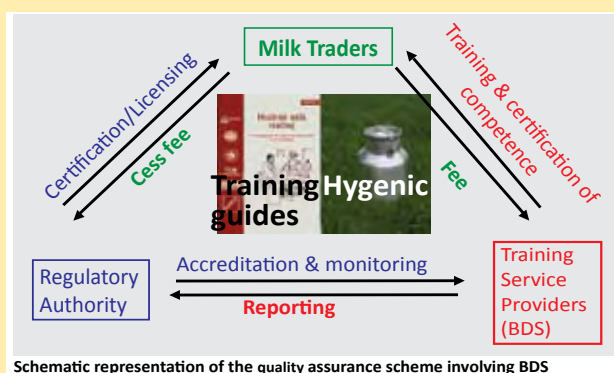
Box 1. The training and certification intervention using BDS

The key components of the quality assurance pilot scheme involving BDS were:

Accreditation of BDS providers: The involvement of BDS providers in training and provision of other services was factored to ensure the sustainability of the intervention. Selected providers were assisted to provide their services for a fee, following their accreditation by a committee established to work on behalf of the KDB and induction on how to conduct the training of traders using approved training manuals and guidelines on milk quality control and entrepreneurship. Once inducted, a public promotion campaign to stimulate demand for the BDS services was mounted. The BDS providers were empowered to issue certificates of competence in milk handling to trained milk traders on behalf of the KDB, and to report their activities regularly to the regulatory authority.

Training of milk traders: The training covered basic principles of hygienic milk production, milk handling and simple milk quality tests such as organoleptic, clot-on-boiling, alcohol and lactometer tests as elaborated in approved training guides. The guides include messages that reinforce the current common consumer practice of boiling raw milk prior to consumption because milk-borne pathogens, such as *Brucella*, can only be eliminated through appropriate heat treatment. Importantly, each training guide incorporates relevant information to pass on to suppliers of milk, thus ensuring improved quality of the milk traded along the whole chain. This is the compulsory component of the training. Additional skills imparted on demand include: business/entrepreneurship skills, mastitis testing, reproduction and animal feeding. All training and other services are provided at a fee to the BDS provider.

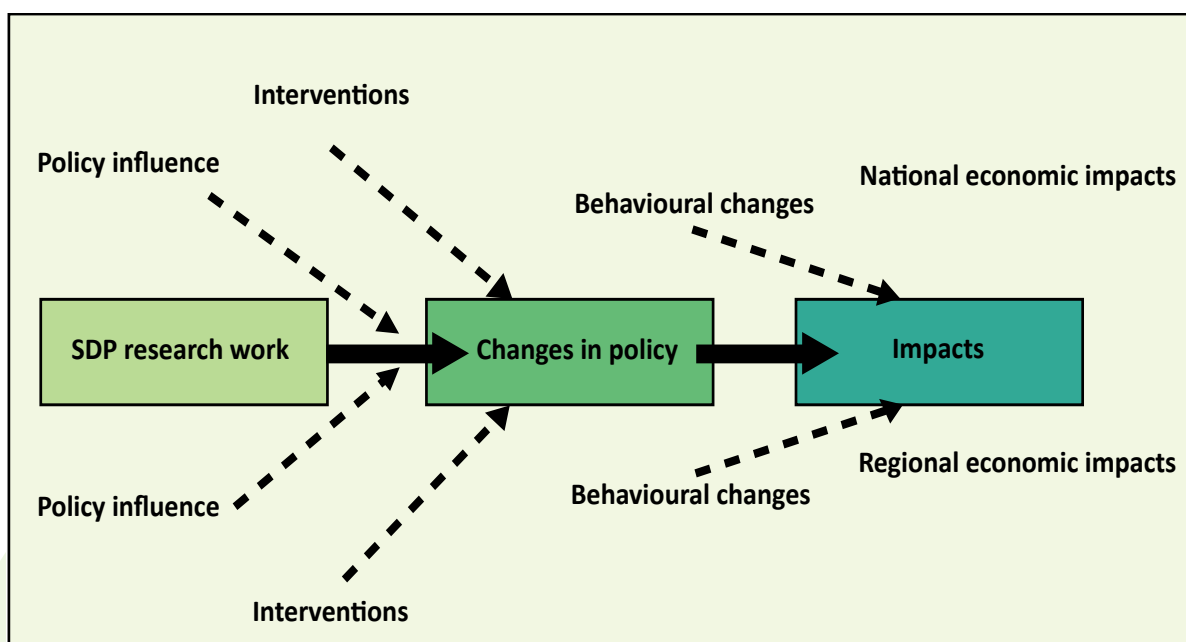
The role of the regulatory authority: In line with current legislation in Kenya, the KDB is empowered to register and license all traders in the dairy industry. An important criterion for issuing licenses is milk quality management, given high perishability of milk and potential zoonoses that can be passed through milk. The regulator therefore has a central role to play in mainstreaming the informal sector because hygiene standards and milk-borne health risks are usually a concern. The role of the KDB in the intervention was quality assurance by monitoring both the compliance of accredited BDS providers to approved trainers' competence level and compliance of certified milk traders to approved minimum standards for milk handling. KDB revised its previous rigid licensing requirements to pave way for the implementation of this new approach to service delivery.



Impacts of the SDP

The research evidence generated and widely disseminated soon crystallized a “milk war” between those representing the formal dairy sector and those advocating practical mechanisms for bridging the regulatory gap and gradually transforming the informal milk market into a formal one (see details in Box 2). The SDP has been identified as one of the rare, highly collaborative research and development projects that achieved significant impacts mainly due to a between-phase shift to address policy constraints (Leksmono et al., 2006; Kaitibie et al., 2008).

Attribution of changes in poverty amongst participants in the Kenyan smallholder dairy sector, and in their empowerment and social advancement, to specific SDP interventions is difficult partly because this was not specifically monitored. We assume, however, that income correlates with poverty. Much of what follows draws on work by Kaitibie et al. (2008), which employed the impact pathway presented in Figure 1 in an ex post analysis: essentially linking research to impacts via changes in policy.



Source: Kaitibie et al., 2008

Figure 1. Pathway of research outputs to impacts

Box 2: The “Milk War”

In December 2003, the Kenya Dairy Processors Association (KDPA), a coalition of milk processors and TetraPak (a packaging manufacturer), launched a “Safe Milk Campaign” against the SSMVs, using television, radio and newspaper advertisements and leaflets. While planned and funded by these private companies, the campaign was officially sponsored by the KDB and the Ministry of Health, and therefore perceived to be supported by government. The campaign was also co-funded by Land O’ Lakes. The campaign’s message was that the consumption of raw milk was dangerous. The informal milk traders were portrayed as criminals who added potentially dangerous substances to preserve or increase milk volumes in order to boost their profits. It was widely thought that the intention of the large processors in launching this campaign was to stamp out what they regarded as their “unfair” competitors – the SSMVs. The processors, however, argued that their intention was to warn consumers of the potential dangers of consuming raw milk. The campaign flagged public health concerns, especially zoonotic diseases such as brucellosis and tuberculosis. The processors claimed it was their corporate duty to warn consumers.

With its negative portrayal of informal milk traders as criminals, and the inaccuracy of the information released, the campaign was recognized by SDP and its civil society organization (CSO) partners as being potentially extremely damaging to large numbers of poor peoples’ dairy-dependent livelihoods. As a result, the CSO partners, Institute of Policy Analysis and Research (IPAR), ActionAid Kenya, Intermediate Technology Development Group (ITDG) East Africa and Strengthening Informal Sector Training and Enterprises (SITE), supported by SDP, held a press conference on 3rd December 2003 to contest the campaign. They issued a press statement using SDP evidence to show that the claim that informal milk traders adulterated milk was not true. They also used SDP evidence to show that unsubstantiated health concerns were likely to reduce overall milk consumption, reduce health benefits to low-income customers and destroy hundreds of thousands of farmers’ and traders’ livelihoods. The CSOs also raised the point that there was a need to engage with the SSMVs because of their substantial role in the milk market and the potential for job creation for the rural poor.

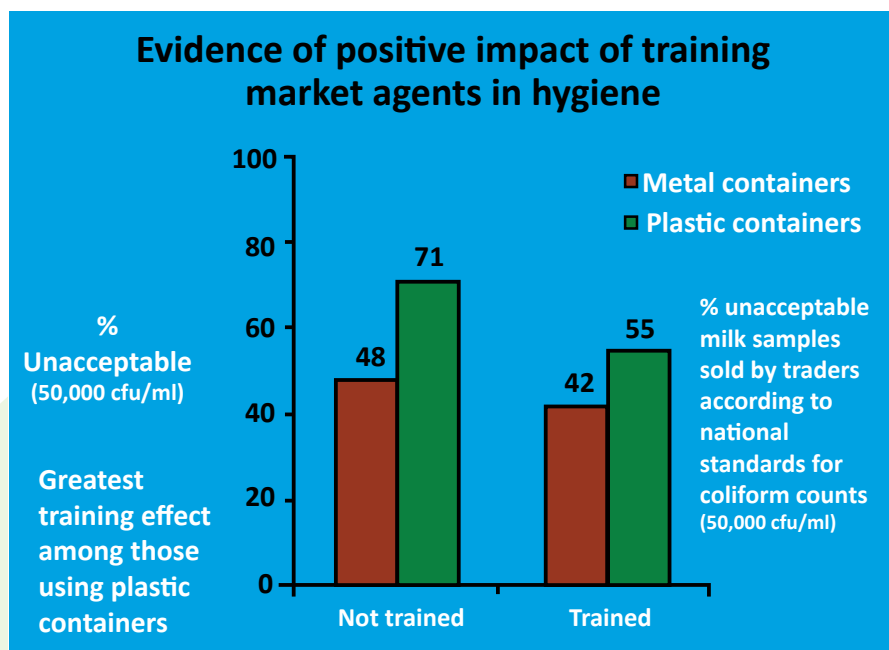
Core partner organizations implementing SDP, although actively engaged in the process leading to the press statement, were procedurally constrained from playing a leading role in policy advocacy processes, because of the institutions’ mandates. This awkward position left SDP unable to be directly involved in advocacy activities aimed at influencing policy, although the log frame required them to deliver on a policy change.

This press statement started what became popularly referred to as the “Milk War”, as the KDB and the processors tried repeatedly to challenge the CSO partners’ statement. But they were unable to produce any evidence to back their claims, while the robust evidence from SDP strongly supported the CSOs’ arguments. During the period of the Milk War, from December 2003 to March 2004, the newspapers were full of debate as the views of the opposing sides were put forward. The public also voiced their opinions, which mostly supported the CSO partners’ views. In the end, the processors decided to withdraw the Safe Milk Campaign, most probably because they saw the potential for negative publicity backfiring on them. In spite of the withdrawal of the campaign, the debate in the newspapers continued right up until the time of the Dairy Policy Forum in May 2004.

As a starting point, it can be authoritatively argued that Kenyan dairy policy and its evolution over the last 4-5 decades has had significant impact on the poor by way of production increases. Growth of dairy cattle numbers (pure exotic or crosses with local breeds) increased from 400,000 in 1961 to a current 6.7 million⁷. Kenya has become the dominant dairy producer in Eastern and Southern Africa, with over 70% of those regions' dairy cattle (Muriuki et al., 2003; Muriuki and Thorpe, 2001). Although the distributional impacts of policy changes over the years are unknown, it has been argued that poverty has been widely alleviated through dairying due to the dominance of smallholders and SSMVs in production and marketing over the years.

Shortly after the policy change in September 2004, KDB – with the support of SITE and funding from DFID's Business and Marketing Services Development Project (BMSDP) – embarked on a wider pilot of the scheme proposed under SDP. It is this intervention that is at the core of the benefits that Kaitibie et al. (2008) have documented (see Figure 3). As under SDP, the positive impacts of the scheme piloted by KDB on milk quality were demonstrated. These included significant increases in the proportion of traders adopting milk testing methods that they had been trained to use, among other associated benefits.

Assessment of impacts identified and measured by Kaitibie et al. (2008) entailed tracking the components of policy change



Source: SDP Policy Brief 4

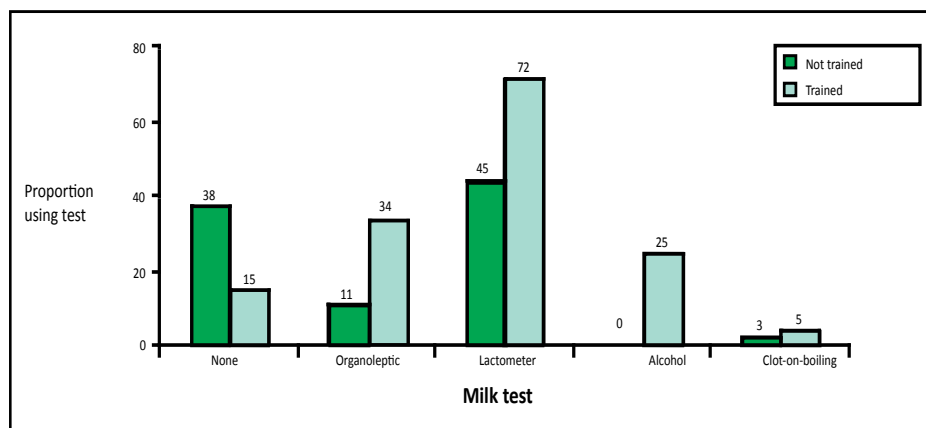
Figure 2. Comparison of quality [coliform counts (50,000 cfu/ml)] of milk samples from untrained and trained traders using metal and plastic containers

The method used by Kaitibie et al. (2008) maps the changes in policy back to research findings and dissemination activities under the SDP, revealing a very close correspondence. At the core of the evidence that precipitated mind-set and policy changes was the testing of a quality assurance approach involving training and certification of small-scale milk traders under SDP, which was shown as a practical mechanism for improving milk quality (Figure 2).

precipitated by the above interventions and measuring their likely effects. Attribution was then achieved by establishing a counterfactual scenario, i.e., the situation likely to have prevailed in the absence of policy change, which was established by way of interviews with stakeholders. The conclusion was drawn that without SDP, key policy changes would have been delayed 20 years.⁸ The policy changes tracked include behavioral aspects of enforcement and compliance, and the associated impacts on transaction costs. These are in turn linked to price and margin changes, and eventually to welfare (see Table 1).

⁷SDP Brief 10, www.smallholderdairy.org

⁸This was tested by a series of sensitivity analyses.



Source: ILRI 2006.

Figure 3. Use of milk testing methods by milk traders

Table 1. Impacts of SDP identified and measured

Change	Impact	Mechanism
Behavioral change among regulators	Engagement of SSMVs by the regulatory framework, and subsequent compliance	Traced to September 2004 in response to SDP
Market margins and volumes	SSMV's margins declined, but profits rose as a consequence of increased volumes, implying an increased speed of turnover of milk.	Response to deregulated trading environment
Welfare	Increased welfare for all chain actors, particularly producers and consumers.	Higher prices, for higher volumes, are paid to producers, while consumer prices have fallen (relative to the counterfactual)
Corruption and related matters	Reduced payments due to corruption, and an enhanced social standing for SSMVs.	Engagement of SSMVs significantly reduced incidence of bribery in association with market access.

Source: Kaitibie et al. (2008)

Within-chain impacts of the SDP, dynamics and sustainability of the welfare impacts, and deep implications of the different regional impacts revealed in the study, have all been deferred to future work. However, further impacts of SDP beyond the boundaries of the project have been identified. In addition, the changes in Kenya have had important regional knock-on effects, within the context of the Association for Strengthening Agricultural Research in Eastern and Central Africa's (ASARECA's) Policy Analysis and Advocacy Program on rationalization and harmonization of dairy policies in Eastern and Central Africa (ASARECA, 2007). The ASARECA program has been working with dairy regulators from Kenya, Uganda, Tanzania and Rwanda to promote uptake of the new institutional approaches to transform informal milk markets in the region. In 2006, the efforts culminated in an agreement by the regulators from these countries on basic requirements to rationalize and harmonize

regional policy and standards, and to pilot the new approaches incorporating BDS, along the lines of the SDP in Kenya. The agreements emphasize the use of common training materials and approaches for capacity building of informal milk traders before their certification, which is to be recognized across borders in the region (ASARECA, 2007).

Lessons learned

Key lessons from the SDP have previously been reported by Leksmono et al. (2006). Those authors emphasize the combination of practical demonstration with generation and dissemination of robust evidence through research, and the collaborative and participatory approaches that enabled these.

The collaborative and participatory approach acknowledged the centrality of stakeholder decision-making to the process

of change, and eventual welfare generation. This process, as advocated by Barrett (2008) and Lugalla (1997), addressed skills and barriers to market entry.

Impact evaluation identified the role played by markets in the generation of welfare to producers, as well as to other market participants as outlined in the World Bank's (2008) depiction of stakeholders' various orientations to the market. Within the smallholder dairy value chain, markets were harnessed in an additional manner, by introduction of a commercialized supply of training and certification in milk handling. In turn, this training and certification generated direct benefits to stakeholders and so enabled sustainability of the SDP's interventions.

KDB's leadership through broad piloting of the trader certification scheme confirms the contention by Muller (2004) that leadership by government is an important component of change. However, evidence generated by research was the basis of the willingness of authorities to consider such alternative approaches in order to meet local needs and conditions, despite departing from international norms. Hence the potential role of research, and its collaborative implementation and dissemination, was a lesson learned.

The key to enhanced impact through policy change was understanding the Kenyan political context. This was enabled by appropriate choice of project partners, and by identification of key items of information and emphasis that were required. Similar strategies enabled changes in regional-level policies.

Conclusions, extensions, challenges

This paper identifies the informal agribusiness sector as fertile ground for the alleviation of poverty and for the targeting of vulnerable groups. A current example is examined in the form of the Smallholder Dairy Project in Kenya, which combined collaborative research with practical assistance at both individual (training) and system (certification) levels to influence policy. In turn, the policy change enabled market forces to deliver benefits to the poor, which then underpinned a sustained change process through business development service provision.

These achievements support much conjecture in the development literature about the centrality of markets, and access to them, for pro-poor development. Notably they cannot be separated from, and indeed rely upon, policy and institutional change – again as promoted in the literature.

Elements of the collaborative approach and training and certification in the SDP have been extended to a larger project across several East African countries, and to a project developing the informal dairy sector in Assam, India. Transfer of lessons into other informal commodity sectors in Africa and Asia is currently in design phase, embracing goats, beef cattle and pigs. The policy changes seen in the SDP have been adopted across the East African region.

Several research challenges remain. At a technical level, these include the improved definition and characterization of the informal sector beyond dairy as carried out early in the SDP. Such characterization is playing a major role in extending the SDP to other settings. At a policy and institutional level, the linkages between the informal sector and poverty reduction require examination, particularly among vulnerable groups and specifically in relation to market participation.

Re-examination of the exploratory work by Charmes (2000) on the informal sector is timely, and would ideally embrace the alternative uses of livestock, particularly those related to risk management. Following the World Bank's classification, this would ideally examine sales, employment and emigration orientations and their relevance to effective use of pro-poor development resources. ILRI is currently pursuing such a study in partnership with the World Bank. Tracking impacts over time, specifically throughout the economic cycle and by comparing and contrasting formal and informal sectors' persistence, performance and synergy, would be a further extension of such work.

In recognition of the importance of value chains in pro-poor development, chain development trends and drivers need to be identified with respect to stakeholder roles and the maximization of beneficial pro-poor impact of structural change. This requires improved methodologies for analysis of informal value chains, and is the subject of ongoing ILRI work with IFAD.

Identification of the means by which formal and informal sectors can co-exist, or preferably develop synergies, is a further research task. This recognizes the complex relationships between the sectors and the policy and economic drivers for their separate development. Pro-poor development actors must be informed of these relationships and the dynamics by which informal becomes formal, and vice-versa. Current ILRI work in southern Africa is examining the incentives surrounding the

efficient functioning of these linkages and their effect on welfare. Further work is needed to address the sustainability of such marketing systems in the light of examples such as SDP where certification and training were effectively endogenized in the pro-poor development process.

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Section 5

Building Market Institutions

Farmer organizations and collective action institutions for improving market access and technology adoption in sub-Saharan Africa: Review of experiences and implications for policy

Bekele A Shiferaw¹ and Geoffrey Muricho²

Abstract

Farmer organizations, especially cooperatives, continue to play a fundamental role in coordinating agricultural production and marketing services in developing and developed countries. On the other hand, while many African governments supported the development of farmer organizations during the pre-adjustment era, these organizations failed to provide desired services to members and perished over time due to dependence on government support, which led to heavy political interference plus internal leadership and managerial problems. However, the hasty retreat of the state following adjustment and market liberalization reforms left an institutional void that the private sector has failed to bridge. This has left many smallholder farmers cut off from markets, causing significant backlashes and slowing efforts for sustainable productivity growth and poverty reduction. This study reviews the role that farmer organizations can play and the challenges they face in the post-adjustment era in improving access to markets and technologies for enhancing the productivity of smallholder agriculture in Sub-Saharan Africa.

Studies in Africa, Asia and Latin America have shown that despite their numerous challenges, farmer organizations can significantly enable their members to better access both factor and output markets that they could not otherwise do by acting individually. The review of specific studies in Nigeria and Kenya also points to the fact that belonging to a farmer group positively and significantly affected both the probability and intensity of adopting improved technologies. Similarly, the National Smallholder Farmers Association of Malawi (NASFAM) and other farmer organizations in Kenya provide evidence that farmer organizations can play a very important role in defending the interests of the farming community by giving voice to smallholder farmers and contributing to their empowerment and the inclusion of their interests in policy debates. The paper also outlines overlapping demands of social inclusiveness, empowerment and external competition as a result of globalization as some of the challenges facing farmer organizations in Sub-Saharan Africa. It concludes that, while

recent experience is mixed, under conditions of democratic governance, as well as homogeneous and optimal group size, transparent and market-led farmer organizations can indeed enhance farmer access to markets, agricultural technologies and services that foster productivity growth and positive change. Donors and governments therefore have an important role in stimulating the emergence and development of economically viable and self-sustaining farmer organizations. Investment in complementary market infrastructure, capacity building, access to finance, and provision of enabling regulatory and legal frameworks for establishing better governance and accountability systems are critical for development of successful farmer organizations.

Introduction

Many countries in sub-Saharan Africa have adopted structural adjustment policies, attempted to liberalize their economies, and have developed poverty reduction strategies aimed at opening up new market-led opportunities for economic growth. The results have, however, been mixed (Winter-Nelson and Temu, 2002; Dorward and Kydd, 2004; Fafchamps, 2004). A large number of smallholder farmers continue to engage in semi-subsistence agriculture and are often unable to benefit from liberalized markets. Structural problems of poor infrastructure (Kydd and Dorward, 2004; Dorward et al., 2005) and weak institutions (World Bank, 2002) continue to characterize the subsector with high transaction costs, coordination failure and market imperfections. Moreover, partial implementation of market reforms, policy reversals and re-emergence of state marketing agencies and parastatals in agricultural markets have tended to mute the positive effects of liberalization (Jayne et al., 2002). Although opportunities afforded by liberalization have not been fully exploited, the expectation that the private sector would be able to fill the institutional vacuum left after the withdrawal of the state has not been realized. In many cases, the private sector has emerged only slowly, mainly in areas of high agricultural potential where commercial crops are grown, and tends to serve mainly large commercial farmers, leaving many smallholder farmers (especially in low-potential areas) exposed to high transaction costs and market failures. The demand and use of improved productivity enhancing inputs (improved seed and chemical fertilizers) declined substantially in many countries

¹International Maize and Wheat Improvement Center (CIMMYT). Corresponding author (b.shiferaw@cgiar.org).

²International Maize and Wheat Improvement Center (CIMMYT)

following liberalization because input costs increased or the timely delivery of necessary inputs and essential credit facilities could not be assured.

This has created a renewed interest in rural institutions and farmer organizations that make use of collective action to complement government and private-sector responses for enhanced coordination in rural commodity markets. This is because such organizations can enhance economies of scale and facilitate access to input and output markets when individual marketing of produce or buying of inputs does not make economic sense due to small quantities, large spatial distances and subsequently high marketing costs – characteristics of most smallholder production in African agriculture. Underdeveloped market infrastructure and lack of effective farmer organizations that represent and mobilize the capabilities of small and scattered producers in many rural areas create disincentives for private-sector investment and agro-enterprise development, even when the agricultural potential is high. This leads to coordination failures that diminish investments at different levels, prevent opportunities for correcting market imperfections, and undermine economic development (Kydd and Dorward, 2004).

Despite the increasing realization of the role they can play in improving the performance of rural markets by mediating access to input and output markets and agricultural technologies, producer organizations tend to have ambitious objectives that call for multiple functions and face complex challenges that undermine their ability to provide desired services (Chirwa et al., 2005; Shiferaw et al., 2009). While some producer organizations have made considerable progress in improving their members' incomes through better access to markets and other services, many of them have not succeeded in attaining economic viability. Many farmer organizations are undermined by attempts to take on too many or overly ambitious objectives that range from covering all kinds of commodities in diverse regions to providing public goods (e.g., market information, agricultural extension, advocacy) to their communities. Balancing between social inclusiveness, cultures of reciprocity and non-market exchanges, and economic efficiency to achieve competitiveness in core market activities is a persistent challenge (World Bank, 2008; Bernard and Spielman, 2009). Their performance is also undermined by inadequate market infrastructure and lack of supportive market institutions, including well-defined policies

and enabling regulatory environments (Shiferaw et al., 2008). Continued government interference, as well as a tendency to replace rather than complement other service providers and the private sector, creates undesirable rigidities and inefficiency. In other cases, non-targeted subsidies and dependence on external funding or donor interference may undermine self-reliance, accountability to members and sustainability (Chirwa et al., 2005).

This paper is based on empirical work in Kenya supported by extensive review of published literature in Africa, Asia and Latin America on the experiences of various types of producer organizations in providing marketing and other agricultural services to smallholder farmers. The determinants of membership to these producer organizations, the challenges they face and the key design and policy issues that contribute to their success in attaining efficiency and sustainability are also reviewed and presented. The paper brings together experiences from case studies in the post-adjustment era and provides further insights for development policy on the functions and effective roles that producer organizations can play to improve smallholder access to markets, improved technologies and other related services in sub-Saharan Africa. While presenting the challenges to learn from experiences and avoid pitfalls, the key interest is in defining policy issues and ways to harness unutilized opportunities to encourage the growth and development of producer organizations to support the Green Revolution in Africa.

The rest of the paper is organized as follows. The next section reviews market institutions and the emerging role of farmer organizations in remedying market imperfections and improving access to technologies, information and other services in rural areas. The third section presents the experiences of farmer organizations in terms of providing membership, inclusiveness and distribution of benefits. Section four outlines the performance of farmer organizations in improving access to markets. The fifth section discusses experiences in improving access to new technology and other services. The sixth presents the key challenges facing farmer organizations, determinants of performance and design principles that contribute to economic viability and sustainability. We conclude in the last section with a summary of key findings and policy challenges in unlocking the full potential of producer organizations for improving markets and increasing productivity of smallholder agriculture in support of the Green Revolution in Africa.

Farmer organizations in imperfect rural markets

Institutions and market imperfection

According to North (1990), institutions constitute formal constraints and informal constraints that structure human interactions, and their enforcement characteristics. Similarly, the World Bank states that institutions are rules, including behavioral norms, by which agents interact to achieve desired outcomes (World Bank, 2002). Formal institutions include rules written into law by authorities and adopted by both public and private organizations operating under public law. Informal institutions, however, operate outside the formal legal system and reflect unwritten codes of social behavior. Both formal and informal institutions have their own external enforcement mechanisms, such as the judicial system and third-party arbitration. However, incentives created within existing institutional arrangements as mutually recognized systems of rewards and penalties often lead to internal enforcement of contracts. At initial stages of development, markets and trade rely more on the norm and network-based informal institutions that reduce transaction costs of collecting and processing information and risks associated with market transactions. As complexity of markets and trade increases, the number and range of partners involved in transactions expand significantly and informal institutions fail to absorb costs and risks to allow efficient market transactions, and thus the need for formal institutions. For example, inter-regional trade and participation in international markets require international rules and standards that facilitate market exchanges (World Bank, 2002).

Market failures are often caused by underlying policy and institutional failures that lead to asymmetric information, high transaction costs, and imperfectly specified property rights.³ They tend to be more pronounced in areas with underdeveloped public goods and market infrastructure (e.g., road and communication networks), typical of many rural areas in Sub-Saharan Africa (Shiferaw et al., 2009). Without supportive market institutions, rural markets in these areas tend to be thin and imperfect, leading to high marketing and transaction costs. These costs undermine the exchange process (Kranton, 1996; Gabre-Madhin, 2001) leading to poorly integrated rural markets with few rural-urban linkages. Given such market arrangements, households respond by producing a limited range of goods and

services for own consumption, especially when markets cannot be relied on to ensure household food security (de Janvry et al., 1991). Further, important market players fail to undertake profitable investments (due to absence of complementary investments) leading to coordination failures that hinder market performance (Dorward et al., 2005; Poulton et al., 2006). Associated shocks and vulnerabilities to production risk (i.e., weather, pests and sickness) and market risk also exacerbate market imperfections and lead to transaction failures (Dorward and Kydd, 2004).

How do institutions support market development? The important role of institutions is in reducing transaction costs related to inadequate information, infrastructure, incomplete definition and enforcement of property rights and barriers to entry (World Bank, 2002). This suggests that institutions (including formal rules and informal norms of collective action and their enforcement mechanisms) provide multiple functions to markets; they transmit information, mediate transactions, facilitate the transfer and enforcement of property rights and contracts, and manage the degree of competition. They can therefore be used to help remedy market imperfections and impediments in rural markets. Institutional innovations that reduce transaction costs and enhance market coordination – such as producer organizations and marketing groups that make use of collective action – can be instrumental in overcoming some of these problems.

Typology of farmer organizations and their functions

Farmer organizations⁴ can be of several types, ranging from informal groups to formal cooperatives or collectively owned agro-enterprises. Depending on their anticipated functions and legal provisions in different countries, the organizational designs may take different forms – cooperatives, associations and societies. A farmer association is a non-profit organization that leverages collective action to access certain services (e.g., agricultural extension), enable exchange of information and provide representation and voice to members. On the other hand, farmer cooperatives can engage in commercial activities, including collective marketing of produce and buying of commercial inputs. The economic benefits are often distributed to members after covering costs according to the volume of transactions undertaken through collective action. Unlike other

³Market failure is a subjective concept that is difficult to define more objectively. However, market failure is associated with conditions when markets fail to facilitate certain mutually beneficial transactions due to certain constraints related to information, exclusion, or inadequate provision of public goods. These underlying constraints often arise from policy failures or inadequate institutions.

⁴In this paper, we use farmer organizations interchangeably with producer organizations.

alternative agro-enterprises, this form of organization is often preferred by farmers as it allows exemption from taxes or qualifies the group to access other public or donor support.

Farmer organizations can be involved in several activities and may have several functions. This may include:

i) commodity specific commercial organizations (e.g., coffee, tea or cocoa cooperatives),

ii) advocacy organizations which aim to represent the interests of their members in various policy discussions (e.g., national farmer unions),

iii) development organizations that aim to improve local capacity and access to information and technology, and

iv) multipurpose organizations that engage in various economic, social development and empowerment activities, especially in areas where other providers are either unavailable or cannot offer such services at affordable costs. An example of the latter is the National Smallholder Farmers Association of Malawi (NASFAM), which has specialized subsidiaries that deal with commercial activities or the overall social and economic development of their members. Many farmer cooperatives, dealing with a diverse set of commodities and also engaging in social development and advocacy, fall into this last category. While the effectiveness and efficiency of producer organizations in providing essential services often depends on the complexity of their mandate (Chirwa et al., 2005; Thompson et al., 2009), our main interest is in market-oriented farmer cooperatives and producer marketing groups that foster commercialization and adoption of modern inputs (varieties/hybrids and fertilizer) to improve productivity of smallholder production.

Farmer cooperatives play an important role in organizing production and marketing functions in developed countries. There are, for example, over 30,000 cooperatives representing over 9 million members within the European Union alone. These cooperatives account for 50% of the market share for delivery of inputs and 60% for agricultural produce (World Bank, 2008). On the other hand, farmer cooperatives were historically introduced in Sub-Saharan Africa during the colonial period for the purpose of promoting production of cash crops by peasant farmers (Hussi et al., 1993). After independence, many governments as well as donors continued promoting cooperatives and other rural organizations as a potential source of decentralized grassroots

participation in agricultural credit, input and commodity markets (Lele and Christiansen, 1989; Hussi et al., 1993). However, their performances were mixed. In Kenya, for example, semi-autonomous agencies – such as the Kenya Tea Development Authority (KTDA) and the coffee and dairy cooperatives – were important to the growth of smallholder production, while some parastatals and cooperatives achieved mediocre records. The unsatisfactory performances are often attributed to technological problems and poor management (Wolf, 1986; Lele and Christiansen, 1989).

Farmer organizations for improving markets

Farmer organizations have the potential to mitigate the effects of imperfect markets by enabling contractual links to input and output markets and by promoting economic coordination in liberalized markets upon which market functions for smallholder farmers can be leveraged. In the output markets, collective marketing allows small-scale farmers to share the fixed costs of marketing, enhance their ability to negotiate for better prices, and improve their market power. It also allows contractual arrangements between large buyers and small producers, which would otherwise be very costly for such buyers to negotiate, monitor and enforce with many, dispersed individual farmers. Under conditions of asymmetric information, producer organizations can capitalize on local knowledge in screening participating farmers and apply peer-pressure to ensure compliance to commonly agreed contracts. In principle, organized small producers are better able to share information on market conditions, standardize production practices to comply with food-safety or fair-trade requirements, monitor the quality of their produce and supply homogenous products to meet market preferences, and absorb shocks through temporal and spatial arbitrage in agricultural markets.

As we show later, through coordination of marketing activities, cooperatives and Producer Marketing Groups (PMGs) could facilitate access to better markets, reduce marketing costs, and synchronize buying and selling practices to seasonal price conditions. PMGs can shorten marketing chains by linking producers more directly to the upper end of the marketing chain, as shown in Figure 1. Well-organized farmers would be able to bypass assemblers and brokers in rural markets and connect directly with urban wholesalers, high-value retailers and processors or exporters. This can be done through various contractual arrangements, including out-grower schemes or post-harvest bulk delivery (Shiferaw et al., 2008).

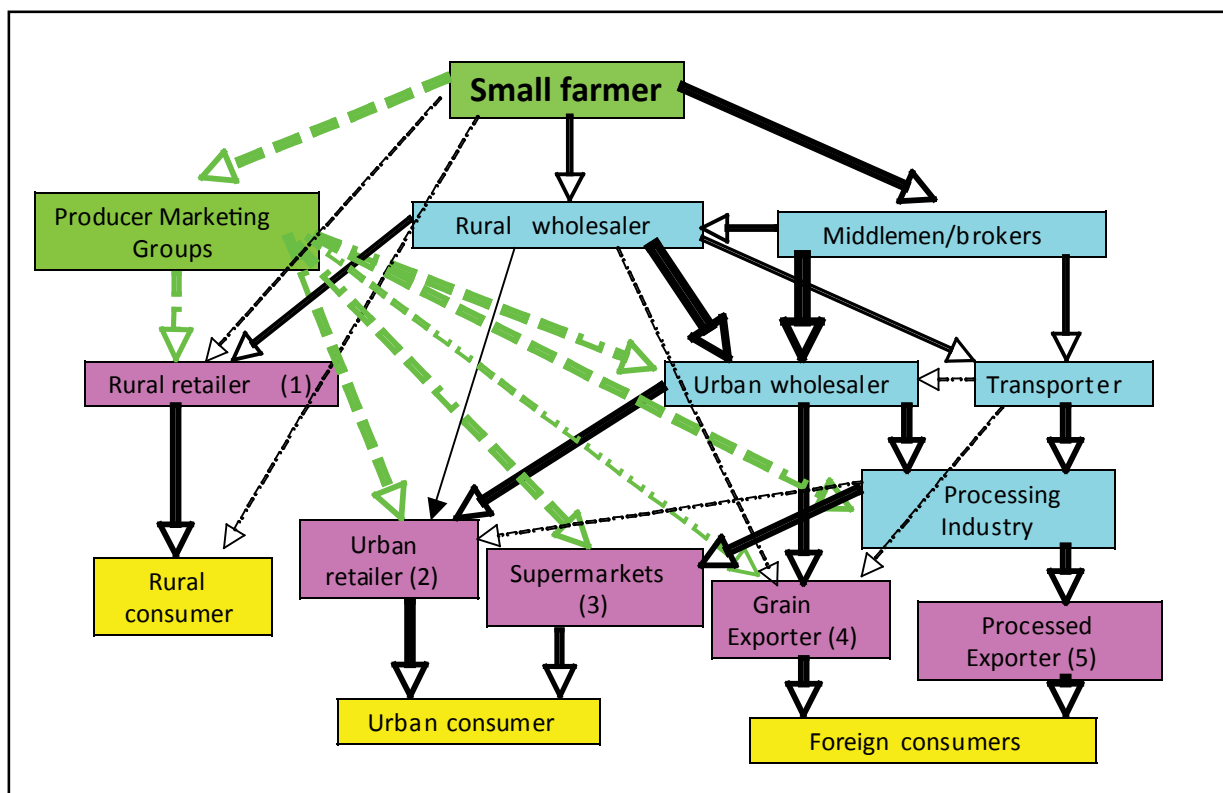
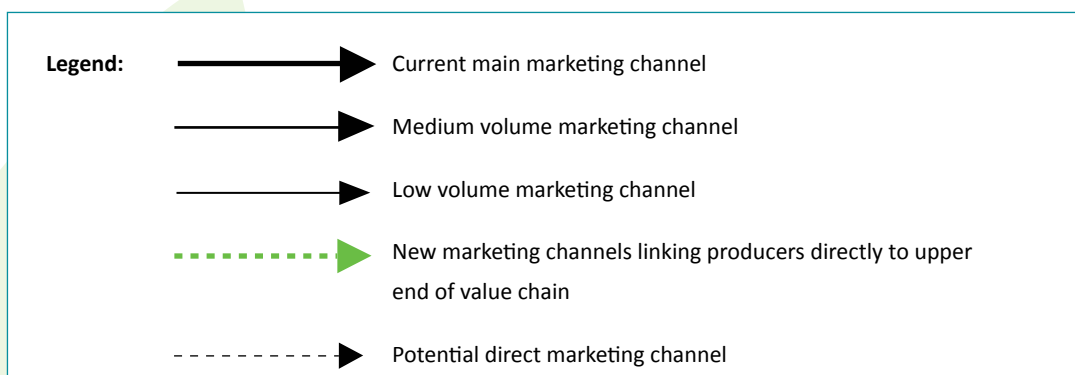


Figure 1. Role of producer marketing groups in grain markets – example of grain legumes in Kenya (Shiferaw et al., 2009)



There are similar opportunities for leveraging farmer organizations for improving access to commercial inputs, rural finance, and other marketing services. In many rural areas, agricultural inputs (e.g., seeds and fertilizer) are either unavailable, unaffordable or smallholder farmers face high transaction costs. The high input costs for small quantities bought by individual farmers resulting from high transaction and transportation costs are likely to make investments in commercial inputs uneconomical to many smallholders. This undermines their ability to adopt new technologies, increase productivity, generate marketable surplus and facilitate commercialization of production, and locks many small producers into semi-subsistence agriculture. Although the

evidence is mixed, farmer-marketing groups can facilitate input and output market access and service delivery, thus promoting commercial activities and technological change in agriculture (Shiferaw et al., 2008; Thompson et al., 2009). Realization of this potential will however depend on their ability to convey market information, coordinate production and marketing functions, define and enforce property rights and contracts, and more critically, mobilize smallholder farmers to participate in markets and enhance competitiveness of their agro-enterprises. In the following sections, we will review organizational and other challenges and the mixed evidence as to what extent farmer organizations have indeed improved market opportunities for small producers.

Evolution and development of collective action

If farmer organizations are important for overcoming market impediments and improving farmer access to markets and agricultural technologies, one important question would be whether such collective action could actually evolve autonomously. Farmer marketing groups as an outcome of collective action are unlikely to emerge on their own (Johnson et al., 2002), especially for less commercialized products like staple crops (e.g., sorghum, millets, maize, cassava) where per unit economic returns are low and the private sector lacks incentives to foster cooperative efforts. The need for collective action depends on the type of market failure and transaction costs faced by producers, degree of spatial integration, and the time required to achieve desired outcomes. Controlling for conducive environment and political leaderships, White and Runge (1995) have shown that groups will emerge and survive where a “critical mass” of individuals have practical knowledge of the potential gains from collective action, but that in the short term emergence can be constrained by biophysical factors that affect the potential net gain, and socio-cultural factors that influence the cost of establishing the new institution. It follows therefore that both micro-level biophysical and socio-cultural factors, as well as national and regional policies, are important determinants of the emergence and viability of producer organizations and collective action. Additionally, an individual's choice to participate in collective action will depend on his/her expectation of the net benefits and the behavior of other members.

While the need for farmer organizations and collective marketing increases with prevalence of incomplete markets in rural areas, actual collective action in marketing can only be expected to occur if expected benefits from lower transaction costs, better prices for inputs and outputs and/or empowerment and capacity enhancement outweigh the associated costs of complying with collective rules and norms. If the expected cooperation benefits are lower than the expected costs, households are unlikely to participate in group marketing activities. Successful collective action based on membership will, therefore, depend on the potential that group action will improve the members' expected net benefit streams above and beyond what can be achieved without participation in collective efforts. In low-potential areas where spatially dispersed farm households produce small quantities for markets, individual net gain from collective

marketing is likely to be low and unlikely to outweigh the costs of participation unless the size of the group is large enough to minimize unit costs. This observation points to the fundamental role of improving agricultural productivity and reducing production risks so as to create opportunities for market development (Barrett, 2008).

Despite the potential gains from collective action, individual cooperative behavior may not necessarily translate into collective action unless other potential beneficiaries agree to cooperate and do likewise. The presence and assurance of trust between and among individuals facilitates the potential for reciprocity and emergence of cooperative behavior (Runge, 1981; White and Runge, 1995). It therefore follows that interventions that enhance trust among members in a group, including laws of engagement and operational democracy, are likely to contribute to successful collective action. Nevertheless, the costs and benefits of participation in collective marketing are likely to differ across households depending on location, volume of production, asset endowment, education and managerial skills (Staal et al., 1997; Holloway and Ehui, 2002; Shiferaw et al., 2008). This implies that since the benefits of farmer marketing groups are unlikely to be equally distributed, some households may not find them useful unless some interventions are designed to enhance their participation – suggesting that individual participation in farmer organizations is an endogenous process that may vary across households. The key drivers of participation and the extent to which farmer organizations have achieved their goals in terms of delivery of marketing and other services will be discussed in the following sections.

Membership and inclusiveness

Producer organizations in many cases have overlapping mandates which extend from opening better market opportunities to their members to provision of other essential services (e.g., information, technologies, credit), empowerment of small producers, and contributing to larger poverty reduction efforts. While voluntary and self-driven participation of farmers will depend on several factors, including expected gains and costs, there are associated potential tradeoffs in terms of overall group performance and inclusiveness to reach out and share the benefits more widely. One question that is often raised in relation to farmer organizations is to what extent resource-poor farmers could actually participate in these organizations and benefit from collective action. This requires reviewing

the existing evidence on the determinants of participation of farmers in such groups and assessing whether the poor are included or excluded due to various entry barriers. The second element is to assess how inclusive the distribution of benefits has been, given that some benefits are non-exclusive or can be accessed through spillovers from participants to others. Before we present some evidence, it is important to highlight that performance and economic viability of farmer groups require setting certain restrictions on membership. While economies of scale increase with group size, this may also be associated with higher transaction costs in mobilizing widely dispersed farmers, and higher heterogeneity that may undermine group cohesion and reduce trust between members. Inclusiveness and expressed interest to tackle poverty may suggest wider and open membership, but the resource-poor may lack the ability to generate marketable surpluses or assets that may foster trust and creditworthiness. Nevertheless, many farmer organizations need to balance between economic viability, inclusiveness and other social goals.

In order to explore these questions, we use two case studies focusing on membership in PMGs in Kenya (Shiferaw et al., 2009) and farmer cooperatives in Ethiopia (Bernard and Spielman, 2009), both dealing with collective marketing of grain cereals and pulses, the typical less commercialized and bulkier commodities produced by small farmers in Africa. The Kenya study uses International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) data from 400 households, composed of 250 members in 10 PMGs and 150 non-members in the same villages, collected in semiarid eastern Kenya during 2005. Since households often belong to more than one group, the study used a bivariate probit model to identify the determinants of PMG membership.⁵ The bivariate specification was particularly used to test whether PMG membership is jointly determined with membership to closely related groups – agricultural production networks (APNs). Membership to APNs thus constituted the second equation in the bivariate specification. Participation in PMGs requires payment of a joining fee of about US\$ 1 and an annual subscription fee that varies between US\$ 2.5 to US\$ 6 per member. These fees were determined by groups in such a way that they do not become a significant barrier for joining, but should be high enough to signify strong commitment to the principles of collective action.

Model variables included village fixed effects (location, market access, infrastructure), household asset endowments, household characteristics, human capital, and access to information. Dependency ratios, age and gender, male and female household workforce, family education, and main occupation of the household head captured household characteristics. Six variables were included to capture the effect of wealth and asset endowments: farm size, value of livestock, interaction between livestock and farm size, value of physical assets, ownership of means of transport, and oxen numbers (all in per capita terms). Access to information was captured through ownership of ICT (radio, mobile phones, and TV) and contact with NGO extension personnel. In the absence of effective public extension services, NGOs continue to play a vital role in the economic development process in the semiarid areas. In this case, the Catholic Relief Services (CRS) was instrumental in farmer mobilization and sensitization for establishing PMGs while ICRISAT is the source of improved germplasm and crop cultivars. Location effects are captured through distance to local and main markets and average rainfall conditions for the PMG villages. For comparison, we also report the univariate probit model results (Table 1) but will only discuss here effects on participation in group marketing activities (PMG membership).

The bivariate model results showed that the residuals of the two network membership equations are not independent ($P > 0.034$). The variables with significant effects on membership include female workforce in the household ($P = 0.018$), ownership of ICT ($P = 0.067$), log of per capita farm size ($P = 0.072$), the asset interaction term (farm size*livestock) ($P = 0.042$), household education ($P = 0.014$), household occupation ($P = 0.078$), and access to information ($P = 0.095$). The distance and location effects were not significant. The important variables for our purpose here are the household assets (wealth indicators). The results show that membership is likely to increase with livestock wealth, but decrease with size of farmland per capita. This indicates that households with larger farm sizes alone are less likely to participate in collective marketing. For a given level of livestock wealth, households with lower per capita farmland have a higher probability of participation. However, households with more land and livestock assets together are more likely to become members. Although the effect of livestock wealth alone was not significant, this potentially opposing effect may result

⁵About 11% of the non-PMG and 20% of the PMG member farmers belonged to agricultural production networks (APNs). These groups are involved in agricultural production and some marketing activities, including sharing of labor and information. The membership of sample farmers to other local groups included 54% to natural resource management, 75% to saving groups (merry-go-round) and 50% to other social networks.

Table 1: Bivariate and univariate probit determinants of PMG membership.

Variable	Bivariate probit		Univariate probit
	PMG	APN	PMG membership
	Coefficient	Coefficient	Coefficient
Dist to village market (km)	-0.083 (0.061)	-0.090 (0.070)	-0.082 (0.061)
Dist to nearest main market (km)	0.006 (0.014)	-0.023 (0.018)	0.006 (0.013)
HH age (Years)	-0.006 (0.006)	0.003 (0.007)	-0.006 (0.006)
HH gender (1 = male, 0 = female)	0.182 (0.178)	-0.111 (0.207)	0.179 (0.179)
Male workforce	0.024 (0.082)	-0.104 (0.091)	0.026 (0.083)
Female workforce	0.206** (0.087)	0.056 (0.103)	0.204** (0.087)
Dependency ratio	0.029 (0.044)	0.094** (0.047)	0.028 (0.044)
HH owns ox-cart (1 = yes, 0 = otherwise)	0.138 (0.178)	0.094 (0.198)	0.131 (0.177)
HH located in average rainy area (1 = yes, 0 = otherwise)	-0.120 (0.200)	0.041 (0.219)	-0.127 (0.200)
HH located in dry area (1 = yes, 0 = otherwise)	-0.155 (0.173)	0.396** (0.200)	-0.158 (0.173)
Log of per capita Livestock asset (Ksh)	0.842 (0.533)	-0.507 (0.647)	0.837 (0.531)
Log of per capita physical asset (Ksh)	0.916 (0.703)	-0.346 (0.854)	0.911 (0.699)
Log per capita farm size (acres)	-2.093* (1.162)	-2.408* (1.330)	-2.114* (1.169)
Log of per capita Livestock* Log per capita farm size	0.766** (0.376)	0.866** (0.397)	0.772** (0.381)
Per capita oxen numbers	-0.389 (0.316)	-0.922* (0.506)	-0.388 (0.321)
Per capita family education stock	0.097** (0.040)	0.069 (0.045)	0.099** (0.040)
Main occupation (Farming = 1, 0 = otherwise)	0.301* (0.171)	0.217 (0.202)	0.299* (0.171)
HH owns ICT (1 = yes, 0 = otherwise)	-0.347* (0.190)	-0.102 (0.224)	-0.352* (0.192)
Average contact with NGOs (1 = yes, 0 = otherwise)	-0.179 (0.164)	0.243 (0.203)	-0.176 (0.164)
No contact with NGO (1 = yes, 0 = otherwise)	-0.351* (0.210)	0.490** (0.240)	-0.354* (0.210)
Constant	-2.744 (1.845)	-0.989 (2.236)	-2.726 (1.832)
/athrho	0.229** (0.108)		
Wald χ^2 (df)	[46] 98.20: Prob > χ^2 = 0.000		[23] 39.44: P > χ^2 = 0.0178
Log pseudo-likelihood	-395.854		-243.069
Wald test of $\rho = 0$	χ^2 [1] = 4.501 Prob > χ^2 = 0.034		

Note: Robust standard errors are in parentheses; [df] are degrees of freedom

when higher livestock wealth is associated with smaller cropland, which reduces the marketed surplus and increases the gains from collective marketing. The results indicate that it is primarily those farmers with small landholdings (but not necessarily resource-poor) who participate in collective marketing. These are households that produce small surpluses and probably face higher transaction costs in marketing their produce. We also found that education and farm-orientation increase the likelihood of PMG membership. Along with better education, NGO sensitization and information flow seem to be good instruments for facilitating participation in group marketing.

The Ethiopia study (Bernard and Spielman, 2009) also provides several useful insights on participation and inclusiveness in terms of distribution of benefits to members and others. The data come from two sources: a 2005 national survey of smallholders (7,186 households) to study commercialization and a survey of 205 cooperatives in 2006 conducted by the Ethiopian Development Research Institute (EDRI), in collaboration with the International Food Policy Research Institute (IFPRI). This study is particularly relevant since rural marketing cooperatives are being promoted in Ethiopia as a key strategy for accelerating commercialization of smallholder agriculture. While the level of farmer participation in marketing through cooperatives varies across regional states, about 39% of the households at the national level have access to a cooperative in their village (Bernard and Spielman, 2009). In terms of the internal rules for joining, all the surveyed cooperatives indicated that a potential member should pass the screening criteria. But the relevance of the screening criteria varied across cooperative – about 57% required buying a cooperative share (about US\$ 10 per share) and payment of annual fee (about US\$ 1), 87% required living in the same peasant association, 66% imposed lower and upper age limits, and about 8% required ownership of certain assets. These fees are slightly higher than those for PMGs in Kenya and may have the effect of excluding some from membership. Many farmer organizations in Africa set such criteria for screening members. For example, NASFAM imposes stringent screening criteria to determine its member farmer associations, and they are also required to sign a service contract.⁶ The results from the Ethiopia study indicate that membership in cooperatives is positively determined by family size, education, and household productive assets (land and oxen used in crop production).

The negative correlates included gender indicator (female = 1) and the square of land and oxen assets, indicating some kind of diminishing returns as farm size and oxen wealth increase. This seems to provide evidence for a “middle class” effect for participation in cooperatives, which suggests lower participation for the resource-poor on the bottom end and the wealthiest households on the top end of the selected wealth indicators (Bernard and Spielman, 2009).

In addition to membership, farmer organizations may achieve inclusiveness through generating non-exclusive or partially exclusive benefits for the community and non-members. For some activities where benefits from economies of scale are high, the cooperatives seem to open activities to both members and non-members. An example of this is provision of fertilizer and other inputs. However, where the associated risks from unrestricted access and service provision are high or when available supplies are limited, the service is often provided only to members (e.g., provision of credit or marketing of grain). Non-members access credit from cooperatives in less than 20% of all cases and only in 2.5% of the cases do cooperatives buy produce from non-members. However, the existence of a cooperative does seem to generate some non-excludable spillover benefits to non-members. This may include provision of non-rival or non-excludable price and agronomic information or increased market competition with private traders and other buyers, which tend to increase producer prices for all farmers (Bernard and Spielman, 2009).

Experiences in improving markets

While farmer organizations in Africa are increasingly being involved in marketing functions, much of the experience and recorded success in the past is related to cash crops (e.g., coffee and tea in Kenya and tobacco and tea in Malawi) and high-value commodities – horticultural export crops in Kenya (Stockbridge et al., 2003; Thompson et al., 2009) as well as urban and peri-urban dairying (Staal et al., 1997; Holloway and Ehui, 2002). In recent years a few more studies have examined the role of producer groups in improving markets for a range of other commodities. In this section we assess the potential effect of farmer organizations in overcoming market impediments to create better opportunities for small producers. We draw from published literature in the developing regions (mainly in Africa)

⁶NASFAM Associations are made up of clubs of between 10 and 20 farmers, which work together in Action Groups to disseminate information and aggregate member crops. The Associations thus formed will have 300-5,000 members. The Association Committee is elected by the General Body, which also elects National Assembly Representatives (www.nasfam.org).

to assess whether producer organizations increase market benefits in terms of either higher or more stable prices, higher product demand or greater market power for small producers.

The evidence shows that farmer organizations or marketing groups significantly enable their members to better access both factor and output markets that, acting individually, they could not otherwise do. Recent studies in Africa, Asia and Latin America have documented the role that farmer groups have played in enabling smallholders' access to high-value markets (Wollni and Zeller, 2007; Shiferaw et al., 2008; Bernard et al., 2008; Bernard and Spielman, 2009; Hellin et al., 2009; Narrod et al., 2009; Kaganzi et al., 2009). In their case studies of farmer organizations, collective action and market access in Central America, Hellin et al. (2009) show that benefits from farmer organization are more evident for high-value crops like vegetables, where there are better opportunities to improve producer prices through collective action. They agree that, unlike the traditional vegetable markets where small producers are linked to regional and national markets through a network of informal traders, modern vegetable markets in high-value outlets in Honduras and El Salvador consist of diverse farmer organizations linked to specialized wholesalers or directly to supermarkets, restaurants and hotels. The quality of the product and the reliability of supply are key features that need to be met in these high-value markets. They show that while collective action was not suitable for some output markets (e.g., maize in Mexico where government fixes producer prices and farmer groups can neither influence prices nor market participation), it still played an important role in ensuring access to input markets at prices affordable to farmers growing maize and other crops. For example, they report that one of the communities interviewed in Mexico successfully managed to purchase improved hybrid maize seed from a single distributor at 860 Pesos (US\$ 80), down from the normal price of 940 Pesos per bag (US\$ 88) if it was bought individually. Input suppliers may also provide additional concessions when they deal with large consignments; in this case the distributor even provided free transport to the community (Hellin et al., 2009).

Similarly, a study in Uganda highlights the role of producer marketing groups in opening market opportunities for potato producers linked to the food processing industry (Kaganzi et al., 2009). The Nyabyumba Farmers Group (NFG), located about 450 km away from the capital city, Kampala, managed to change

its production and marketing strategies to supply a modern fast-food restaurant in Kampala (Nandos Restaurant) with high quality potatoes. Though no formal contract was entered, a purchase agreement was made between NFG and Nandos specifying the volume and the frequency of supply, quality criteria and terms of payment. Despite the initial challenges of meeting the stringent quality requirements, the farmer group gradually managed to achieve the high quality standards, bringing down the amount of potatoes rejected by Nandos from about 80% initially to consistently less than 10%. In order to meet the high quality requirements, the farmer group expanded its operations and took on both seed and potato production and marketing. This evidence supports how small farmers even in remote locations can successfully leverage institutions and shift from local markets to supplying a distant formal buyer in high-value markets. Similar evidence exists for the case of fruits and vegetables in Kenya and India (Narrod et al., 2009). The high-value markets (e.g., export markets and some domestic supermarkets) for fruits and vegetables impose standards relating to pesticide residues, field and pack house operations and traceability. Organized producer groups monitoring food safety and quality standards often meet these stringent requirements and thereby become attractive to buyers (Siambi et al., 2008; Narrod et al., 2009). The high risks associated with these markets often preclude individual small producers from tapping the opportunities. Losses due to inability to meet these food safety and phytosanitary standards are enormous. Some estimates indicate that imposing tough minimum acceptable aflatoxin levels in groundnut has resulted in annual losses of over US\$ 670 million in export revenues for African farmers (Otsuki et al., 2001).

The key lesson from these studies is that the existence of a high-value market that relies on consistent supply of high quality and differentiated products creates incentive to establish connections with the farmer group and contributes to the relative success of producer organizations in exploiting market opportunities. This is not always the case in markets with undifferentiated products such as food staples. Studies from Kenya and Ethiopia provide some evidence on the challenges that farmer organizations face in improving markets for grain legumes and staple cereals (Shiferaw et al., 2008; Bernard et al., 2008; Bernard and Spielman, 2009).

Using data from cross-sectional household surveys (referred to earlier) in semiarid eastern Kenya, Shiferaw et al. (2008) test whether farmer groups (PMGs) indeed pay significantly higher prices for marketed grain than other buyers. In order to test this hypothesis, a regression model was estimated to identify the determinants of actual prices received by farmers. The main model variables included distance to the selling market, type of buyer, type grain traded, season, grain quality and household

characteristics of the farmer. The model was significant ($p < 0.001$) and explained about 61% of the variation ($R^2 = 0.612$). The results show that producer prices are significantly determined by the distance to the point of transaction, the type of crop sold, location (district), buyer type (particularly consumers, PMGs and schools) and the season the grain is sold (Table 2). When we look at the different marketing channels, consumers, PMGs and

Table 2: Determinants of grain prices received by farmers in different rural markets.

Variable ^a	Descriptive statistics (mean)	Estimated Coefficient
Amount sold (kg)	324.95	-0.001(-0.99)
Amount sold squared (1000 kg)	439	0.000(0.16)
Distance to selling point (km)	4.6	0.023(1.98)**
<i>Crop dummies:</i>		
Beans	0.06	15.151(15.04)***
Pigeon pea	0.08	11.250(12.1)***
Chickpea	0.03	13.529(9.35)***
Greengram	0.27	12.342(19.65)***
Cowpea	0.03	4.107(3.04)***
Cotton	0.04	7.791(4.81)***
Vegetables	0.04	7.492(5.59)***
Quality (1= if fair average quality)	0.92	0.186(0.22)
District (1= Makueni)	0.16	-2.254(-3.07)***
<i>Buyer dummies:</i>		
Consumer	0.05	6.7476(0.2)***
Produce Marketing Group (PMG)	0.04	5.950(5.05)***
Rural wholesaler	0.45	-0.609(-1.19)
Urban trader	0.02	0.959(0.51)
Cotton ginnery	0.02	1.074(0.52)
School buyer	0.03	3.630(2.72)***
<i>Season dummies:</i>		
Harvest season	0.71	-1.448(-1.91)*
2 to 3 months after harvest	0.19	-1.133(-1.29)
Owns Information and Communication Technology (yes = 1)	0.82	0.157(0.26)
Constant	-	14.069 (10.41)***
N		624
F (21, 602)		0.60
Adj R ²		45.06

Notes: Values in parentheses are robust standard errors

***, ** and * indicate significant at 0.01, 0.05 and 0.10 probability levels, respectively.

^a Reference variables: crop price = maize; quality = above average; district = Mbeere district; buyer = broker/assembler; season = 4-5 months after harvest.

schools respectively paid about Ksh 7, Ksh 6, and about Ksh 4 per kg of grain over and above the prices paid by the traditional buyers – brokers and assemblers ($P < 0.01$). This shows that PMGs can be attractive market outlets for small producers. About 70% of the grain is sold immediately after harvest, but farmers selling at this time (Season 1) would lose about Ksh 1.5/kg compared to those who can afford to delay selling for 4-5 months (reference season) after harvest ($P < 0.051$). Farmers can even benefit from higher prices by delaying sales for 2-3 months after harvest (Season 2) as prices for this period are not really significantly lower than prices 4-5 months after harvest. This shows that PMGs could exploit seasonal price differentials through temporal arbitrage involving bulking and storage. A further simulation analysis using these econometric results showed that prices paid by the PMGs to the member farmers

This effect was statistically significant and robust across both the Kernel based matching method and the nearest neighbor matching method. This finding on the effect of cooperatives on producer prices is corroborated by the Costa Rica study on coffee marketing, which showed that marketing through cooperatives increases the average price obtained by US\$ 0.05/lb (Wollni and Zeller, 2007). This study also showed that cooperative membership increased farmer participation in specialty coffee channels which by itself increased prices by US\$ 0.09/lb.

Farmer groups also seem to play a role in market development for underutilized crops. A study in southern India found that farmer groups were instrumental in creating incentives for production and consumption of minor millets (e.g., finger millet), which initially faced weak demand due mainly to consumer

Table 3: The effect of collective marketing on pigeon pea prices in eastern Kenya.

Buyer	Season	Point of sale	Price (Ksh/kg)	PMG price advantage (%)
PMG	Immediately after harvest	Farm gate	29.81	24.00
Brokers / assemblers			24.04	
PMG		5 km	29.93	23.88
Brokers / assemblers			24.16	
PMG	4–5 months after harvest	Farm gate	31.16	22.72
Brokers / assemblers			25.39	
PMG		5 km	31.29	22.62
Brokers / assemblers			25.52	

– after having covered operational costs – are about 22 to 24% higher than the prices paid by brokers and assemblers (Table 3). However, this price gain comes at a cost of delayed payments to grain sellers (on average for 5 weeks) (Figure 2). In contrast, other competing buyers paid on delivery or shortly thereafter. This explains why many cash-constrained farmers opt to sell through other channels, even at lower prices.

On the other hand in Ethiopia, Bernard et al. (2008) employ a treatment effects (propensity score matching) model to measure the average difference between the price received by cooperative members and that received by their matching non-member comparator groups. They use a matched sub-sample of 2,532 households from the 2005 national smallholder commercialization survey of 7,186 households (referred to earlier). The results showed that cooperative members in Ethiopia received between 7.2 and 8.9% higher prices for their cereal produce than their non-member counterparts.

ignorance of useful product attributes and poor public and scientific knowledge about the crops (Gruere et al., 2009). The study highlighted the role of collective action through producer groups as a necessary but not sufficient condition for successful commercialization and sustainable use of underutilized crops.

Experiences in access to technology and other services

Technology diffusion

Access to new agricultural technologies is critical for economic viability and market competitiveness of smallholder production. Many farmer organizations therefore include as one of their missions to improve farmer access to agricultural technologies (e.g., improved varieties and hybrids) and know-how on productivity enhancing and/or risk-reducing management practices, including post-harvest grain handling and storage. New models of agricultural extension require participation of small farmers in technology choice decisions and producer

organizations play an important role in linking research and extension services with farmers. Farmer organizations are increasingly involved in public and private sector efforts for technology testing, validation and diffusion. For example, in its effort to promote farming as a business, NASFAM facilitates farmer access to new technologies, including variety choice and best-bet agronomic practices and post-harvest management. As the capacity of farmer organizations increases, they tend to hire their own professional extension personnel to build in-house capacity for provision of agricultural extension services to their members. Despite the obvious role that farmer organizations play in catalyzing and facilitating farmer access to new technologies and transferring know-how, very few studies have actually examined this role systematically in Africa. The evidence described below is based on technology adoption studies conducted in Nigeria (Kristjanson et al., 2005) and Kenya (Shiferaw et al., 2009).

Using survey data from 462 households in northern Nigeria to assess the adoption of improved dual-purpose cowpea (IDPC) varieties, Kristjanson et al. (2005) provide empirical evidence that belonging to a farmer group has a positive effect on adoption of new varieties. In a model that controls for several household assets, demographic, farm and village characteristics, they find a significant and positive effect of participation in farmer groups on the probability and intensity of adopting IDPC varieties in the dry savannas of Nigeria. More specifically, the results showed that belonging to a farmer group increased probability of adopting IDPC varieties by about 14.2% and increased the intensity of adoption (ratio of IDPC area in total cowpea area) by about 0.31, indicating a stronger impact of participation in producer groups on facilitating technology adoption.

The Kenya study uses data from semiarid eastern Kenya to test the potential impact of PMGs in facilitating the access of smallholder farmers to improved seeds and agricultural inputs. The PMGs in eastern Kenya have been involved in local production and marketing of improved seeds of dryland crops. Selected farmer members trained in quality seed production methods produce new varieties with the support of some NGOs. The groups then market the improved seeds to members at affordable prices, while in some cases non-members could also buy seeds from the PMG outlets at relatively higher prices.

In order to test this effect, Shiferaw et al. (2009) estimated a probit model where membership (an endogenous variable) is instrumented using predicted values from a bivariate model (discussed earlier). Separate regressions were estimated for maize, pigeon pea and green gram for which a significant share of farmers indicated planting new varieties (Table 4). Group membership does not seem to have any observable significant effect on adoption of improved maize varieties (hence results not shown in Table 4). This may indicate that both members and non-members have equal levels of access to maize seed – a focus of public and other extension efforts in many parts of Kenya. On the other hand, participation in PMGs had a significant positive effect on the uptake of dryland legume crops (pigeon pea and green gram) ($P < 0.001$). These are important cash and food crops for many smallholders in the drier areas, but are not directly targeted through formal extension systems or seed companies. Adoption of improved varieties for both crops is significantly higher in the drier zones where these crops are more important. In addition, farmers with more dependent family members seem to have lower likelihoods for legume adoption, perhaps because food security concerns push these households to focus on staple cereals. This study showed that, once PMGs enable and catalyze access to new technologies, varieties would gradually spread through farmer-to-farmer exchange of information and new seeds. The role of community organizations and informal seed systems in accelerating technology diffusion is particularly evident for open-pollinated varieties and largely self-pollinated legumes where out-crossing is limited and genetic purity is maintained over 3-4 production seasons. It seems that the role of producer organizations in facilitating access to new varieties is higher for such crops where private seed companies may lack incentives due to exclusion problems.

Advocacy, voice and empowerment

In addition to the economic benefits that they generate through agro-enterprise development, farmer organizations defend the interests of the farming community, give voice to small farmers, and contribute to empowerment and inclusion of the poor in policy debates. Historically, specialized producer organizations have emerged to protect the interests of farmers growing commercial crops. In the recent past, several apex advocacy organizations (such as national producer unions) have emerged in many African countries, e.g., NASFAM in Malawi and Kenya National Federation of Agricultural Producers (Kenfap) in Kenya. NASFAM is well recognized by various stakeholders and

frequently invited to policy roundtables to represent smallholder farmers. It is widely regarded as the voice of small farmers in Malawi. It has been quite successful in lobbying on behalf of smallholder farmers (e.g., attracting funding from different donors), offering a voice for over 100,000 small-scale member farmers who would otherwise have remained marginalized. A recent achievement of NASFAM is its successful campaign to have the 7% tobacco withholding tax removed from tobacco sold through affiliated smallholder groups. Likewise, Kenfap has been instrumental in lobbying and negotiating on behalf of the small farmers in Kenya. For example, in 2008 Kenfap convinced farmers not to sell maize at the government recommended price of Ksh 1,950 per 90 kg bag, arguing that the price was far below the production cost of Ksh 2,329. After an extended negotiation, the government finally recommended a price of Ksh 2,300. Kenfap has also lobbied frequently for the government to intervene and reduce the cost of farm inputs (<http://www.kenfap.org/>). Similarly, Kenya Potato Farmers Association (KPFA), a recently

registered association, has successfully lobbied for stipulation in Legal Notice No. 113 the maximum size of bags in which potatoes can be sold. This required all local authorities to enforce the maximum standard size (110 kg) bag for potatoes. Despite vigorous opposition from brokers and traders, it continues to lobby for a “fair deal” to protect the interests of small potato farmers.

Producer organizations are now better represented in international platforms where global issues affecting agriculture in Africa and other developing regions are discussed. National farmer organizations are coming together at the regional, continental and global levels to establish solidarity across borders. For example, in West Africa, national federations of producer organizations have set up the Network of Producer Organizations of West Africa (ROPA). The International Federation of Agricultural Producers (IFAP) also recently opened its membership to producer organizations from developing

Table 4: Effect of PMG membership on technology adoption.

Variable	Pigeon pea	Green gram
Predicted membership	5.494(1.46)***	2.690(1.03)***
Age of head	0.012(0.01)*	0.002(0.01)
Head is male	-0.255(0.21)	0.305(0.25)
Male workforce	-0.098(0.09)	-0.039(0.10)
Female workforce	-0.405(0.14)***	-0.105(0.12)
Dependency ratio	-0.037(0.05)	-0.162(0.07)**
Owns radio, phone or TV	0.303(0.27)	0.553(0.25)**
Owns ox-drawn cart	-0.247(0.19)	0.281(0.21)
Lives in medium rainfall area	0.673(0.21)***	
Lives in dry area	0.807(0.17)***	-0.167(0.18)
Log of per capita land	1.316(1.63)	1.287(1.43)
Log of per capita livestock	-0.485(0.20)**	-0.163(0.20)
Log of per capita physical assets	0.277(0.16)	-0.119(0.17)
Log per capital land * log per capita livestock	-0.482(0.49)	-0.351(0.44)
Per capital oxen numbers	0.356(0.49)	1.224(0.40)***
Per capita education	-0.081(0.06)	-0.131(0.06)**
Farming as main occupation (yes = 1)	-0.647(0.23)***	-0.104(0.24)
Average contact with NGO (yes = 1)	1.295(0.27)***	0.122(0.33)
No contact with NGOs (yes = 1)	1.027(0.35)***	
Has extension contact (yes = 1)	-0.048(0.15)	-0.514(0.16)***
Predicted error	-1.226(1.47)	0.423(1.58)
Constant	-2.687(0.90)***	-1.001(1.04)

Notes: Values in parentheses are robust standard errors

***, ** and * indicate significant at 0.01, 0.05 and 0.10 probability levels, respectively.

countries. This has enabled producer organizations to participate in consultations with local, national and international bodies (World Bank, 2008).

Challenges and determinants of performance

Challenges

Despite the emerging evidence on the positive role of producer organizations in improving markets and supporting farmer access to information and technologies, success is not necessarily assured for today's farmer organizations in Sub-Saharan Africa, mainly because of several overlapping challenges. If we start with the historical evidence, the track record of farmer cooperatives in Africa during the pre-adjustment era in relation to provision of essential services to members and poverty reduction has not been exemplary (Lele, 1981; Hussi et al., 1993; Akwabi-Ameyaw, 1997). Supported by governments, they functioned primarily as social service cooperatives rather than as business enterprises owned and managed by the members. They were not allowed sufficient marketing margins to cover their operational expenses and could therefore not evolve into commercially viable enterprises. This compromised their inherent character as member-controlled organizations, which in turn discouraged member participation and eroded confidence in the leadership (Lele, 1981). With structural adjustment and economic reforms, many of the service cooperatives lost their special protection from the state, which further reduced their viability in the ensuing competitive environment.

In addition to unsuccessful past efforts that continue to overshadow future directions, today's farmer organizations face several internal and external challenges that could undermine their ability to compete more effectively or provide desired services at low costs to members. The first challenge is the complexity of demands and stakeholder interests affecting the role and functions of farmer organizations and the conflicting nature of the different needs. This includes the expressed agribusiness orientation of many farmer groups, which requires adherence to strict business principles and the overlapping demands for social inclusiveness, empowerment and poverty reduction in marginal areas, and working with vulnerable groups (Chirwa et al., 2005; World Bank, 2008). Inclusive membership may be consistent with economies of scale, but wider coverage may undermine economic performance by increasing transaction costs and bringing together conflicting interest groups. The resource-poor and marginal farmers with low supply response

cannot make significant contributions in expanding marketed surplus and may even increase the risk of default in carrying out agreed contracts (e.g., credit payments and timely delivery of produce). Such inclusiveness may also pose challenges, as resource-poor members may not meet required standards for their produce in terms of food safety and quality. Producer organizations would therefore need to carefully balance the competing and often conflicting demands for meeting multiple social objectives and aim to focus on a narrow set of objectives where they have comparative advantages in delivering tangible services to small farmers.

The second challenge relates to the risks associated with globalization and the increasing competition with external market forces, including supermarket chains, transnational agri-food companies, and subsidized producers in distant locations. In liberalized markets, the success of producer organizations will depend on access to new technology for lowering the cost of production, consistency of supply and ability to produce required volumes, and ability to meet increasingly stringent food quality and food safety standards in the emerging agri-food industry. This indicates that producer organizations need to make careful and rational choices and re-examine where their strategic market opportunities lie. For farmers producing bulk grains and food staples, the markets are largely domestic and regional. For fruits and vegetables and other high-value produce (e.g., milk, meat, poultry) there are growing opportunities in domestic urban markets, but the ability to tap these markets will require increased organizational and technical capacity.

The third challenge is the ability to mobilize internal and external resources (including finance and marketing assets) to carry out their functions. This is particularly important in relation to accessing seasonal finance to pay for produce deliveries or procuring essential inputs. Financial services (including credit and insurance) and storage and transport facilities are under-supplied in many rural areas with inadequate market infrastructure. For example, for PMGs in Kenya the most important constraints to collective marketing identified by participating farmers included lack of credit or rural finance, inadequate market information, small marketed volume, low marketing and business skills, and limited technical capacity of farmers and group leaders (Shiferaw et al., 2008).

Determinants of success and performance

What determines success and effectiveness of producer organizations and what are the implications for policy? There are no standardized measures or indicators that can be used to assess the level, viability and effectiveness (performance) of farmer organizations. This implies that our assessment of determinants of effectiveness and performance cannot be made based on comparative statistics and quantitative measures of performance. Our approach here will therefore be based on a review of case studies that indicate the degree of participation, inclusiveness in generating benefits, volume of trade, and changes in price levels and technology adoption. The intention is to identify common relevant characteristics and attributes of farmer organizations and their businesses and managerial behavior and policy factors that could be positively associated with high performance.

However, much past research on performance and effectiveness of collective action focused on management of common property or community-managed natural resources. The classic impediments of collective action in this context are group size and inequality (Olsen, 1965). A number of factors, either internal or external to the group, identified as important determinants of effective collective action include clearly defined boundaries, monitoring, mechanisms for conflict resolution, recognition of rights to organize and presence of graduated sanctions to penalize violators (Ostrom, 1990). The empirical evidence on the role of any of these factors under specific situations is quite mixed. Recent years have seen some interest to examine the factors associated with performance of collective action institutions in the context of producer organizations and marketing. Some of the factors widely attributed to the success of collective efforts of producer organizations include homogeneity, size, choice of services, commercial activities, self-reliance and autonomy, access to finance, skills and education, participation, organizational structure and governance, legislation and focus (Stockbridge et al., 2003). Whereas the empirical evidence on the actual effect of many of these factors is currently lacking, the case studies in the literature do provide some useful insights that are relevant for policy.

The examples and experiences reviewed in this paper and others show that farmer organizations tend to succeed when: farmers can manage them autonomously with minimal government interference; farmers participate actively in decision-making

at every stage of the process; and their cooperative activities are profitable (Bernard et al., 2008; Chirwa et al., 2005; World Bank, 2008). Clearly, participation in producer organizations will depend on the magnitude of expected benefits and associated costs. Participation is likely to occur if the gains, in terms of reduced transaction costs, better input and/or product prices, empowerment, and capacity enhancement outweigh the associated costs of complying with collective rules and norms. Performance of producer organizations also depends on leadership, good governance and participatory decision-making (Shiferaw et al., 2009). The potential for accessing essential services to improve agricultural incomes and tapping economic opportunities will act as a strong incentive for anyone contemplating membership. Existing skills/experience of members in relation to what is required to undertake joint activities; internal cohesion and membership-driven agenda; and the ability to effectively integrate into a wider commercial economy will determine the effectiveness of collective marketing cooperatives and marketing groups. This implies that measures designed to enhance marketing and business skills for farmer marketing groups and cooperatives will contribute to the success of producer organizations. Therefore, programs that are geared towards facilitating group self-reliance and enhancing organizational and business skills are likely to equip groups with the capacity to forge effective business interactions with the private sector and other market actors along the value chain for agricultural development (Bingen et al., 2003).

The functional orientation of farmer groups and their internal features are also important determinants of the success of farmer organizations. Larger groups may be less successful than small groups in furthering their interest, but only up to a certain threshold size. This is mainly because the transaction and managerial costs of cooperation increase faster than the gains as group size increases beyond a certain level (Hussi et al., 1993), which implies that optimal group size will depend on the type of joint activity and the features of the group.

Some design principles and policy issues

There are no blueprints and shortcuts for the success of producer organizations. Based on the experiences of the past with farmer cooperatives and current producer organizations, one may however suggest some good practices and policy options that improve the effectiveness, economic viability and competitiveness of producer organizations. These are summarized in the next page.

- Market opportunity identification** – Producer organizations face serious challenges in overcoming market impediments and in establishing competitive positions for many commodities. The existing evidence suggests that producer organizations perform better when dealing with cash crops (e.g., coffee, tea, cocoa, cotton, tobacco) and food products with high demand (e.g., fruits and vegetables, milk, etc.) in the agri-food industry, especially in the high-value markets connecting small producers with processors, exporters and retail chains. When there are no large alternative suppliers, the potential of collective action to aggregate the standardized and high-quality product from small producers to supply identified markets makes it mutually beneficial for the private sector and producer organizations to establish strategic partnerships. There are several such examples of success: potatoes to supply a fast-food outlet in Uganda (Kaganzi et al., 2009), green beans in Kenya and fruits in India (Narrod et al., 2009) and horticultural products in Honduras and El Salvador (Helin et al., 2009). The challenge is how to leverage these lessons and expand into other low-value crops and staple foods like cereals, cassava and pulses. This suggests that it would be useful for producer groups to carefully identify market opportunities in few tangible commodities of high comparative advantage and possibly leverage this to tackle marketing problems in other commodities. However, as Chirwa et al. (2005) propose, it is important that producer groups exercise caution in the process – first, building business skills and learning to be effective, second, being efficient and profitable, and third, learning to expand the scale and scope of their enterprise to exploit economies of scale.
- Define exclusive benefits to members** – The greatest incentive for collective action in producer organizations originates from the economic benefits that cooperation will generate for members. If the costs are too high or when similar benefits can be accessed from other providers at comparable costs, the incentive for cooperation will be low. The key to success lies in the ability to provide competitive, continuing and valued or income-generating services to members.
- Clear rules and norms for collective action** – Successful collective action is mediated by effective institutions that define the rules and norms of association and the enforcement mechanisms. This will create incentive systems for regulating and shaping the behavior and expectations of individual members and provide assurance to other market actors. The rules need to define the roles, rights, obligations and entitlements of individual members, and the organization itself.
- Build trust and solidarity among the members** – Successful collective action in the new generation of producer organizations will require democratic participation and greater transparency and accountability systems to assure members on issues related to governance and financial management.
- Partnership with the private sector** – Farmer organizations should not attempt to crowd out the private sector. They should try to define a niche in areas and commodities where they have a competitive advantage compared to private-sector traders and create linkages with wholesalers, processors, exporters, supermarkets and financial institutions to build more robust value chains. This should be mutually beneficial and help improve the performance of imperfect rural markets (e.g., credit, insurance, warehouse receipts). This relationship is now undermined by lack of trust and unproductive rivalry. Good business practices and ethical standards are required by both parties to establish trust in concluding business transactions and foster enforcement of contracts and agreements. The evidence on this in Africa is replete with stories of dishonest dealings and lack of compliance with advance contracts by producer organizations, as well as private traders and processors.
- Professional management but low overhead costs** – The managers of producer organizations cannot always be elected from members and cannot be expected to provide free services. Serious producer organizations should consider ways to improve efficiency by cutting overhead costs without compromising professional management.

- **Policy advocacy and lobbying** – Many small producer organizations cannot be expected to influence policy decisions. At the micro level the focus should be on production, quality control, marketing and capacity building that bring higher economic benefits to members. Farmer unions and national associations at a higher level of organization can, however, play a role in advocacy and representation of the interests of small farmers in policy discussions. The benefits from such activities are generally inclusive and may even spill over to non-members.
- **Targeted external financial and technical support** – Given the high costs of organization and low capacity of many small producers, there is a need for governments and NGOs to provide targeted and clearly defined financial support as well as technical advice on organizational, managerial and marketing aspects. Investment in public goods infrastructure (roads, telecommunications, radio, internet, etc.) and needs-based capacity building and training in new ways of doing business and establishing partnerships is important for the emergence of successful groups. External financial and technical support should not, however, undermine self-reliance, sustainability and accountability to members. It should also not distort incentives and lead to other market failures.
- **Avoid ad hoc interference and promote independence** – Undue government interference in the management and leadership of farmer organizations is a chronic problem for the success of producer groups. In order to avoid any conflict of interest, politicians, the judiciary and law enforcement officers should neither be elected to the offices of producer organizations nor should they serve on the board of trustees that has an oversight mandate for such organizations.
- **Enabling legal and policy framework** – For farmer cooperatives to be effective in serving a broad set of socio-political and economic objectives, new policies and institutional reforms are needed to facilitate their transformation to become economically viable private-sector enterprises with clear business plans (Kelly et al., 2003; Shiferaw et al., 2009). This may require cooperative laws that specify legal requirements for democratic governance, independent and transparent system of auditing, quick investigation and resolution of corruption cases, as well as legal guidelines for contract farming, grades and standards

for commodities, systems of arbitration and conflict resolution, access to seasonal finance and warehouse receipts to tackle capital constraints, and income tax benefits and other privileges to support producer organizations. It is important that the legal and regulatory framework does not lead to over-regulation that could stifle growth and development of small and nascent producer organizations (Shiferaw et al., 2008). For example, the Cooperatives Amendment Bill in Kenya requires that societies elect new office-bearers annually and maintain financial statements that meet international standards. Failure to meet these requirements may lead to dissolution (Republic of Kenya, 2004).

Conclusions

Market liberalization is a necessary but not sufficient condition for increasing access to markets by smallholder farmers in many countries of Sub-Saharan Africa. The expected economic growth from the market reform and liberalization policies has therefore largely remained unrealized. With imperfect rural markets and limited institutions to support market functions, these policies were bound to fail in integrating smallholder farmers in less-favored areas into the market system. These market imperfections or failures are the by-products of inadequate or lacking market infrastructure and supporting institutions, as well as policy failures (e.g., discretionary state interference and partial reforms) that impede the development and proper functioning of markets. Incomplete markets and institutional gaps impose significant costs in forgone growth and welfare losses for the rural poor and smallholder farmers. In order to remedy some of these market-related challenges in rural areas, producer organizations and collective marketing groups provide alternative institutional innovations to enhance the uptake of market-oriented and productivity-enhancing technologies, to link farmers to markets, and foster market participation and commercialization of smallholder production.

The experiences reviewed in this paper show that producer organizations can play a crucial role in improving access to markets and agricultural technologies and provide representation and voice to small producers. The market benefits are related to better opportunities both in output and input markets that increase producer prices and reduce input costs for small farmers. The benefits from scale economies in terms of reduced production and marketing costs or higher producer

prices create incentives for farmers to participate in farmer organizations. This has the potential to strengthen farmers' market participation. Farmer organizations generate income and employment and facilitate economic coordination by providing other enterprises (e.g., financial institutions, input suppliers) and service providers traditionally constrained by high transaction costs (e.g., extension), an efficient route to reach a large number of otherwise inaccessible farm households. One important result of greater roles for farmer organizations is increased access of small producers to new technology, information and business services in rural areas that contribute to productivity growth, intensification and commercialization of smallholder agriculture.

Nevertheless, many farmer organizations continue to face complex challenges to perform and succeed under competitive market environments – only few relatively successful farmer groups are currently able to exploit this potential. Many producer organizations continue to suffer from inefficiency and lack of economic viability, which threatens their sustainability. This is caused by several factors, including poor market opportunity identification, inadequate managerial capacity, governance problems, lack of seasonal finance, increased external competition, and ad hoc interference by government and other agencies, which undermine accountability to members and long-term economic viability. There is a continuing challenge in balancing the traditional role of farmer networks and groups in providing non-commercial services to communities with the role of producer organizations in providing efficient market outlets and establishing competitive business enterprises in dynamic markets. While some of the benefits from producer organizations are likely to be inclusive, certain benefits can only be availed to members who can afford to pay the costs of association and participation. The economic viability of producer organizations will depend on their ability to provide services that generate higher net benefits to members relative to other providers. There is a risk that farmer organizations are being conceived as conduits for reaching the rural poor and small producers with unrealistic and often conflicting demands – including political, social, economic and environmental objectives. While carefully organized groups could balance between potentially less inclusive business objectives and other more inclusive “social development” mandates, these kinds of overlapping demands – especially at early stages of development – threaten the emergence of competitive farmer-owned business enterprises.

However, these lessons provide several insights for leveraging producer organizations to remedy market impediments in rural areas and integrate small producers into value chains. There is a need to provide targeted support to mobilize and organize farmers to tackle identified constraints – enhancing participatory governance and business skills, identification of market and business opportunities, establishing strategic partnerships with the private sector, facilitating access to information and technologies, and providing start-up capital and seasonal finance to enhance competitiveness. The complementary role of the private sector in the development of producer organizations is an important factor in this process. Government policies should not create situations for producer organizations to crowd out the private sector – but to stimulate competitiveness, trust and relationships based on comparative advantages. Many emerging producer organizations with clearly defined business plans need to be supported to transition into legally recognized business entities, and not remain as self-help groups or informal associations, which restricts their ability to access essential financial and other services from the formal sector. The effectiveness of many farmer marketing groups is hampered by lack of cash capital to pay in time for produce deliveries by farmers. Many small farmers find it difficult to delay payments, even when future prices would be significantly higher. Several options, including warehouse receipt systems, can be developed to tackle the problem of seasonal finance for producer organizations. Studies have shown that if early partial payment to meet basic needs can be made, small producers are capable and willing to defer sales and benefit from temporal and spatial arbitrage.

However, given the discredited and non-exemplary past experience of cooperatives in Africa, the new generation of farmer organizations must go through a slow process of building trust to overcome persistent suspicion and fear on the part of their members, potential members and business partners. This trust can only be nurtured through greater participatory and democratic governance, openness and transparency in financial management that enhances accountability to members, good business ethics and, finally, the rewards that they bring to their constituencies. Undoubtedly, if some of these challenges can be overcome, producer organizations can play a key role in helping integrate the disenfranchised small producers into the marketing systems, which could in turn create wealth and opportunities to increase agricultural productivity and reduce poverty.

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Agricultural market development: A synthesis of CIAT's approach, priorities, experiences and case studies

J.N. Chianu¹, J. Njuki², E. Birachi³, A. González⁴, M. Lundy⁵, R. Kirkby⁶, R. Buruchara⁷, O. Ohiokpehai⁸, B. Vanlauwe⁹ and N. Sanginga¹⁰

Abstract

Within the Consultative Group on International Agricultural Research (CGIAR), the International Center for Tropical Agriculture (CIAT) pioneered research in agro-enterprise development, rural innovation and linking farmers to markets. CIAT can distill key lessons from this experience and has developed several related tools that are widely used. Related to this, CIAT is collaborating with development NGOs, private and public sector agencies, and donors in development mechanisms for reaching millions of small farm families, including those in difficult-to-reach environments. Using three diverse examples, this paper summarizes the contributions and experiences of CIAT in research in agro-enterprise development, rural innovations and in linking farmers to markets. The paper also contributes to the debate on how to promote crops other than the major staples and traditional export crops, which tend to be the focus of policy support in most African countries. It also demonstrates that collective action and value addition are potential ways of making markets work for the poor in Africa, and recommends continued agricultural commodity market research, development and capacity building to enable African smallholder farmers to graduate into competitively accessing regional and international markets.

Background

Within the Consultative Group on International Agricultural Research (CGIAR), the International Center for Tropical Agriculture (CIAT) has pioneered research in agro-enterprise development, rural innovation and linking farmers to markets. Initially, the concept of development of agro-enterprises for CIAT's mandate crops was applied to cassava, but later extended to research applicable to other crops and livestock systems. To date, CIAT continues to investigate more effective, sustainable and efficient approaches for linking farmers to

markets and has over 20 years of experience in this. Today, an integrated approach to rural agro-enterprise development including participatory value chain analysis, inclusive governance mechanisms, participatory market analysis and tools to promote shared innovation and learning, comprise the suite of mechanisms for sustainably linking farmers to markets – an approach being implemented in all of CIAT's mandate species and selected high-value crops benefiting the poor.

CIAT's presence in Latin America, Africa and Asia facilitates learning that cuts across socio-economic conditions and institutional arrangements. From its global vantage point, CIAT is well positioned to distill key lessons and principles from action research and has developed significant in-house capacity as well as widely used tools. CIAT's research is pro-poor and includes examining the extent and manner by which disadvantaged farmers in Africa can be linked to markets, and how women can maintain control of income from the crops they traditionally manage even as they become more commercialized. CIAT has learned that achieving the latter usually requires conscious investment in collective and marketing skills of women. CIAT has also learned to be concerned about the potential downsides of increased market linkage, for example in driving, at least in the short term, the mining of soil fertility. CIAT is, therefore, exploring the conditions under which increased income from market linkage encourages small farmers to invest in maintaining or improving their natural resource base.

CIAT's tools are widely adopted and adapted by local and international partners, such as NGOs, National Agricultural Research Systems (NARS) and the private sector. For example, business manuals for small-scale seed enterprises in Africa are available in at least eight local languages, and a suite of "Good Practice Guides for Agro-enterprise Development" is in use in at least 32 countries. CIAT has a vast network of partners, both in the public and private sectors, which facilitates project development and implementation and enables co-learning in development. CIAT's research on institutions and policies adds value to partners and benefits market-oriented smallholder growers. Through public-private partnerships, such as the

¹African Development Bank, Tunis, Tunisia. Corresponding author (j.chianu@afdb.org).

²International Livestock Research Institute, Nairobi, Kenya (j.njuki@cgiar.org)

³International Center for Tropical Agriculture, Kigali, Rwanda (e.birachi@cgiar.org)

⁴International Center for Tropical Agriculture, Cali, Colombia (a.gonzalez@cgiar.org)

⁵International Center for Tropical Agriculture, Cali, Colombia (m.lundy@cgiar.org)

⁶International Center for Tropical Agriculture, Kawanda, Uganda (r.kirkby@cgiar.org)

⁷International Center for Tropical Agriculture, Kawanda, Uganda (r.buruchara@cgiar.org)

⁸United States Agency for International Development, Abuja, Nigeria (oohiokpehai@yahoo.com)

⁹CIAT-TSBF, Nairobi, Kenya (b.vanlauwe@cgiar.org)

¹⁰CIAT-TSBF, Nairobi, Kenya (n.sanginga@cgiar.org)

Latin American Cassava Consortium (CLAYUCA) and the Latin America Irrigated Rice Forum (FLAR), CIAT is working with the private sector, national research organizations and international researchers to bring the benefit of research and development to small growers.

International research centers are a limited resource where demand for knowledge and skill outstrips the supply. CIAT is deeply involved in exploring the most efficient mechanisms to reach millions of small farm families, including those in difficult-to-reach environments. CIAT's novel approach in linkage building with key constituencies has been instrumental to this. CIAT scales up impact by working closely with three key sets of partners. The first is development NGOs, to which CIAT provides improved tools for adaptation to diverse needs for more impact. In Latin America, this type of learning alliance encompasses 25 direct partner agencies that work with 80 additional partners to improve the livelihoods of more than 33,000 farm families in four countries. As a result of the first phase of the Central American learning alliance, NGO partners successfully generated over US\$ 30 million in new project funding based on improved skills and capacities. In one such project, first year sales of small-scale farmers exceeded US\$ 15 million.¹¹ The second key partner is the private sector. CIAT works with corporate partners to develop new business models that benefit the poor. A new business model is one that provides both development benefit (i.e., inclusion, equity, participatory governance, sustainable natural resource management and increased income) as well as commercial benefit to other members of the supply chain. The New Business Models for Sustainable Trading Relationships project, supported by the Bill & Melinda Gates Foundation, is testing this approach in Africa with dried beans in Ethiopia, vegetables and flowers in Kenya, and cocoa in Ghana and Côte d'Ivoire, and includes partner corporations such as¹² ACOS, ASDA-Walmart, Kraft and Hersheys. The goal is to identify practices and models that allow sustained and beneficial trading relationships for all involved. The third set of partners is public-sector agencies, including donors. With these actors the focus is on identifying critical investments and policies that facilitate development of vibrant and inclusive rural economies. This work focuses on understanding the role of public policy on

the development of value chains in Latin America. The goal is to expand these processes to governments in Africa and Asia and provide peer-based learning opportunities as governments design, implement and evaluate rural development and competitiveness policies.

Linking the above-mentioned three key constituencies requires knowledge management and cooperation among multiple partners. The role of CIAT is to facilitate knowledge management platforms from which specific processes of action research can take place, while undertaking additional research and working with the private sector as needed. By identifying common questions, testing ways to answer these questions through action research and drawing lessons, these platforms leverage dispersed knowledge to the benefit of rural communities. The outcomes from these processes of knowledge management include: i) improved methods and tools that contribute to effective development interventions and community skills development; ii) cross-site analysis and learning to identify what works, the context, and disseminate effective public and private policies and targeted training, and; iii) empirical knowledge that contributes to increased understanding of processes of rural enterprise development.

CIAT's approach to linking farmers to markets combines multiple approaches and tools to work with the diverse constituencies that make up the innovation systems. The approach recognizes the critical importance of knowledge management and shared learning based on concrete experience in diverse contexts gained through action research. It also acknowledges that profitable enterprise development for the rural poor requires the development of capacities and skills along the value chain. Finally, as a global center CIAT seeks to support processes of South-South learning that contribute to improved market linkages, effective policies and sustained rural wealth creation. The remainder of this paper will provide three examples of CIAT's approach, applied in Africa.

¹¹The ACORDAR project in Nicaragua is funded by USAID and is adapting CIAT methods and tools for work in beans, roots and tubers, coffee and high-value vegetable crops with over 5,000 small farm families. Sales data come from the first annual report presented to USAID in September 2008.

¹²Agricultural Commodity Supplies (ACOS) is an Italian dried pulse company <http://www.acosnet.it/en/home/company>; ASDA is the UK brand that Walmart uses hence the reference to ASDA-Walmart <http://www.asda.co.uk/corp/home.html>

Example 1: Value chain development in Africa – CIAT's contributions

The challenge of developing value chains in Africa: theoretical aspects

Value chains in Africa have gained prominence in the last decade. Value chains can be considered networks of economic actors that span the various activities from production to consumption. A value chain is a specific type of supply chain – one where the actors actively seek to support each other to increase one another's competitiveness. They invest time, effort and money, and build relationships to reach a common goal of satisfying consumer needs and increasing their profits. Thus a value chain is a high-level model of how businesses receive raw materials as input, add value to the raw materials through various processes, and sell finished products. Managing value chains goes beyond the single enterprise. Value chains are no longer a preserve of large firms and have increasingly been recognized to play critical roles in smaller firms (e.g., farm enterprises). They ensure that the poor are not left out of gainful economic activities. The value chain approach can be considered a strategy for aligning actors behind shared common perspectives of where to go and how to get there, as well as the actors behaving in a certain way so as to achieve their shared goals. Schmitz (2005) distinguishes four types of value chains:

Arm's length market relations: Buyer and supplier do not need to develop close relationships because the product is standardized or easily customized. Buyers easily switch suppliers.

Modular networks: Firms develop information-intensive relationships. The buyer provides the specification and highly competent suppliers provide products and services.

Captive networks: Here, a firm exercises a high degree of control over other firms in the chain and occurs when the buyer has doubts about the competence of the supply chain.

Hierarchy: A lead firm takes direct ownership of some operations in the chain.

Value chain development has at least two objectives. One is to improve local or regional value chains to enable them to export their products to other countries. This ensures that the firms are recognized for their quality products and standards, improved from value chain partnership. Second, value chain development increases local trade for firms that do not export by improving profitability through appropriate responses (Meyer-Stamer,

2005). In Africa, production units do not have the common ideal characteristics that can lend themselves to value chain management. Production units are characterized as small-scale, labor intensive and subsistence-oriented. Thus, the development of value chains has to recognize the large number of small participants necessary to achieve economic quantities if they are induced to be commercial-oriented.

Dorward and Kydd (2005) observe that there is need for caution so as not to take the principle of making markets work too far. According to them, highly fragmented markets can lead to prohibitively high transaction costs, creating barriers to entry. One of the bottlenecks is given as “asset specificity”. Therefore, in a competitive market with high information cost and little direct communication between market participants, entrepreneurs may hesitate to invest in anything that displays high asset specificity. Dorward and Kydd (2005) further point out that atomized agricultural markets in African locations are creating high transaction cost that they are ultimately dysfunctional. While economic research has formulated the market/hierarchy/network triads of modes of coordination (Powell 1990; OECD, 1992), social scientists tend to distinguish market, organization and community (e.g., Wiesenthal, 2000). What is important in both strands of theorizing is the observation that in the real world it is highly unlikely that any pure mode of coordination will work. When a market does not work, the adequate answer is, in all likelihood, not more freedom in the market but rather more hierarchy and organization. Markets with lots of small suppliers and customers are real in rural Africa, yet they do not work well since it is time consuming and costly for customers to get a comprehensive picture of the variety and quality of produce on offer (Fafchamps, 2004, in Dorward and Kydd, 2005). Hierarchies, for instance out-grower systems that are managed by a major company, can turn out to be significantly more wealth-creating than markets under such circumstances.

Operationalizing value chain development: The CIAT experience

“Linking Farmers to Markets” is one of the outcome lines of CIAT. Within this outcome line are such projects as Farmer to Markets, the Integrated Soil Productivity Initiative through Research and Education, and Making Markets Work for the Poor. Implicitly, the theme is pro-poor, focusing on groups of producers who will not spontaneously link up with external buyers because of a wide gap between their supply capacity and the demand, probably

due to insufficient skills, unfavorable location, and disabling environments (Meyer-Stamer, 2005). Besides output markets, emphasis is also placed on factor markets. CIAT's Enabling Rural Innovation's method combines specific approaches (identification of bottlenecks, designing interventions, entrepreneurship promotion, management training, business development services, etc.) to develop value chains.

Where to next? On-going projects

CIAT has been applying value chain development through a number of projects over the past few years. Market value chain analysis has been used as a basis for selecting enterprises around which to create innovation platforms. The most promising enterprises are selected by the producers using participatory approaches. A number of CIAT's projects combine standard research with action research. Development NGOs help to mobilize farmers. Using participatory rural appraisal (PRA) approaches, several enterprises are preselected for inclusion in value chain analysis. Producers are guided through on participatory market research skills and are able to use the same knowledge to compile market research reports, which together with the results of the value chain analysis are discussed to select profitable enterprises. Participatory market research provides information on available market opportunities and margins. Value chain research provides detailed information on margins at the farm and market levels. Two to three value chains are then selected. Innovation platforms, consisting of various stakeholders associated with the enterprise of interest (inputs' suppliers, germplasm producers, micro-financiers, traders, etc.) are then formed around the selected value chains to achieve synergies and mutual benefits.

CIAT's projects in the East and Central Africa region are testing to see "whether integrated development initiatives lead to improvement in the welfare of households involved through profitable association in the markets using the selected market

value chains". Conventional research approaches are then compared with the integrated research approach. Results are not yet available to prove that value chains will improve the economic well being of the household compared to conventional research approaches.

Profitability and enterprise selection: The Consortium for Improvement of Agricultural Livelihoods in Central Africa (CIALCA) experience in Rwanda and the Democratic Republic of Congo (DRC)

CIAT's value chain approach is being applied in Rwanda and DRC to evaluate the influence of various technological interventions on profitability of grain legumes and to evaluate what determines technology uptake. The projects are under the CIALCA, a partnership of CIAT, the International Institute for Tropical Agriculture (IITA), and Bioversity International. The studies seek to identify the most profitable technology and plot conditions at the farm level and the profitability of common bean, soybean, groundnut, cowpea, and pigeon pea at the market level. These evaluations are taking place in the Bugesera, Umtara, Gikongoro and Kibungo regions in Rwanda and in the Ngweshe and Katana areas of Sud Kivu province of the DRC. In Rwanda, provisional results indicate that planting in upland plots was the most profitable for all legume types (see Table 1). For soybean, the most profitable condition was pure stand in upland plots, Gikongoro reporting the highest profitability. Common bean was most profitable when intercropped, Kibungo reporting the highest profitability. Groundnuts were most profitable when planted as pure stands and the highest profitability was reported in Kibungo. These results show that, at farm level, while soybean recorded the lowest relative profitability, groundnuts recorded the highest profitability.

The three legumes in Table 1 were also evaluated for their profitability at the market level. Preliminary results indicate that all the three returned positive profitability for all the chain

Table 1: Profitability of legume systems on per kg basis in response to organic fertilizer use

Grain legume (system)	Area or region				
	Gikongoro	Gitarama	Kibungo	Bugesera	Umtara
Soybean (Pure stands)	51	6.57	23.33	—	—
Bean (Intercropped, except at Umtara)	—	—	91	59.25	57*
Groundnuts (pure stand)	—	—	118	102	106

All figures in Rwanda Francs. 1.00 US\$ = 540 Rwanda Francs. A "—" means the enterprise was not evaluated in the region; * implies pure stands.

actors (see Table 2 for Rwanda and Table 3 for DRC). However, assemblers/transporters returned the highest profitability compared to other actors. Wholesalers had the lowest profit. In the DRC, farm-level preliminary results for two regions (Katana and Ngweshe) indicate that common bean was profitable in both regions. The study in DRC was carried out under ordinary operating (farming and business) conditions. In the Ngweshe region, peas were the most profitable enterprise. At the general household level, only common bean and peas had positive margins.

Table 2: Profitability per kg of legume enterprise at the market level in Rwanda

Enterprise	Value chain actor		
	Collectors	Retailers	Wholesalers
Common bean	13	10	3
Groundnut	9	4	2
Soybean	4	3	4

All figures in Rwanda Francs. 1 US\$ = 540 Rwanda Francs

Table 3: Farm level profitability in legumes in selected regions in Sud Kivu province, DRC

	Katana (Francs per ha)	Ngweshe (Francs per ha)	All households (pooled) per kg
Common bean	21050	26316	4.70
Groundnuts	-12300	—	-10.70
Soybean	-41340	299	-18.00
Cowpea	-321400	—	-69.60
Pea	—	55260	27.20

Currency: Congolese Francs

Example 2: Organizing smallholder farmers to link to markets – enabling rural innovation in Africa

For farmers to thrive in the global economy, it is necessary to create an entrepreneurial culture in rural communities where “farmers produce for markets rather than try to market what they produce” (Lundy et al., 2002), and to organize to take advantage of economies of scale and more bargaining power.

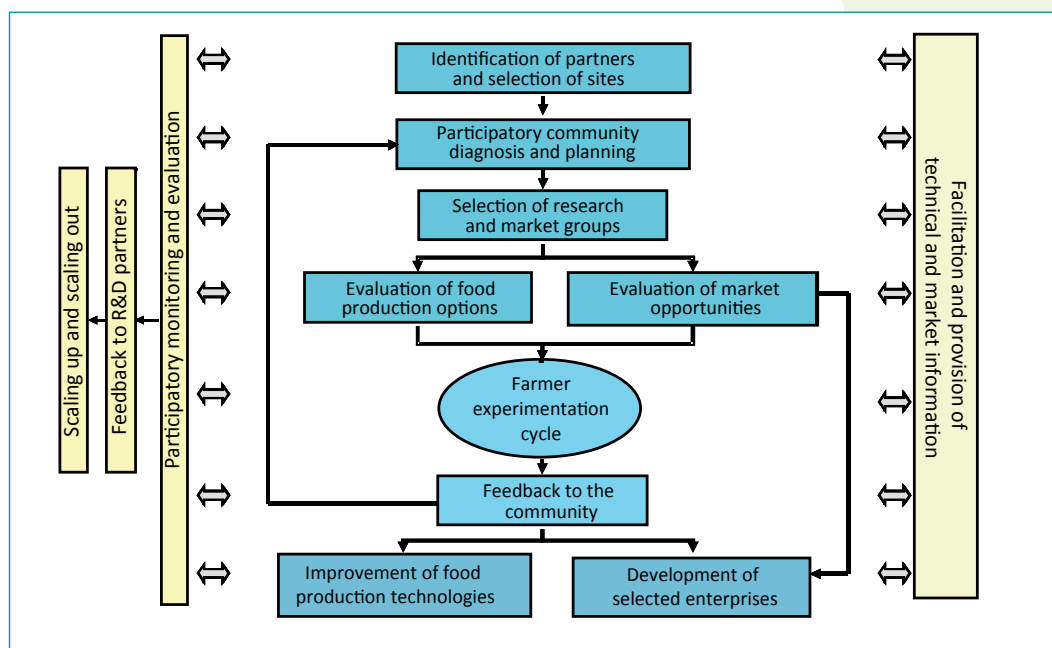


Figure 1: Keys steps in the Enabling Rural Innovation approach

This has placed renewed attention on institutions of collective action – most often realized through farmer groups – an important and efficient mechanism for enhancing the marketing performance of small farmers (Kariuki and Place, 2005). While many studies have documented impressive results of linking farmers to export markets, small farmers have rarely benefited from these, as niche markets tend to be highly specialized and competitive, with rigorous quality standards (Diao and Hazell, 2004). Domestic and regional markets, however, still represent a growing opportunity for small farmers in Africa to diversify into high-value products.

In East and Southern Africa, CIAT has been using the Enabling Rural Innovation (ERI) to organize and link smallholder farmers to markets, develop agro-enterprises, strengthen social organization and entrepreneurial skills, and link to research and other services in support of their enterprises. It is a partnership of national agricultural research and extension systems, NGOs and CIAT, working together with rural communities and farmer organizations. The approach uses a resource-to-consumption framework, which builds linkages between production, marketing and investments in the natural resource base (Kaaria and Ashby, 2001). Figure 1 shows the steps in organizing farmers to produce for the market and balance food security and markets.

This paper uses two case studies from Malawi and Uganda to highlight the key steps and procedures in building capacity among farmers, farmers' groups, and communities; to identify and evaluate market opportunities; and to develop profitable agro-enterprises and intensify production, while sustaining the resources upon which livelihoods depend.

The Tigwirane Dzanja Club, Katundulu, Malawi

The ERI work started its operations in Katundulu village, Ukwé Extension Planning Area (EPA), Lilongwe District in 2003. This was implemented in partnership with the Department of Agriculture Research Services (DARS) and Lilongwe Agricultural Development Division (LADD). The community formed a group called "Tigwirane Dzanja Club", meaning, "Let us hold each other's hand". The purpose was to alleviate poverty through group action. The community observed that it was difficult to disentangle itself from these problems through individual efforts and therefore decided to join hands in order to learn together, sharing ideas and experiences. In partnership with DARS and LADD, the community was taken through the ERI steps, starting

with participatory diagnosis, market opportunities identification and enterprise selection, farmer participatory research and gender and HIV/AIDS awareness, similar to Chinseu community. The community then selected four committees: the main committee, which also served as the participatory monitoring and evaluation committee; a participatory market research (PMR) committee; a farmer participatory research committee; and a livestock committee. To manage the process, the group was also trained in group dynamics and leadership, gender, and HIV/AIDS. With very little previous marketing experience, the PMR committee, together with external facilitators, carried out market assessments (e.g., open air markets, city markets, hotels, schools, etc.) to identify market options and understand needs. The group analyzed the results using profitability analysis and evaluated the options. Two enterprises were selected: common bean (common subsistence crop in the area) and pigs (new enterprise with which farmers had no prior experience). Farmers were then trained in pig production, feed formulation, pen construction and disease management. Farmer participatory research was initiated to test different options for pig feeding, and growing of different replacement substitutes such as pigeon peas, soybeans and potato vines.

While the farmers have been very successful in supplying local markets with piglets (the main buyers are other farmers and NGO projects), they have been unable to meet the stringent quality needs of the meat-processing factory, which currently imports pork from Brazil. The market for piglets is an attractive option as piglets are sold within one month of birth, thus avoiding the competition for food between pigs and people arising during dry season. At the moment, the farmers cannot meet the demand for piglets. Pig production has become a common activity for households. When they sell piglets to NGOs, farmers earn additional income from the training they provide to recipient farmers. Farmers also earn up to US\$ 1,000 from sale of pigs and training of other farmers.

Nyabyumba United Farmers' Group, Kabale, Uganda

The Nyabyumba United Farmers' Group is located in Kamuganguzi sub-county of Kabale District in southwestern Uganda. Over 90% of the population is engaged in small-scale farming. The group was formed in 1998 as a Farmer Field School with the aim of producing seed potato of top quality. Group dynamics support was provided by Africare (an international NGO that earlier provided the farmers with seeds of other crops, such as beans and hybrid maize seed). In 1999 the group became

a member of the Uganda National Seed Potato Producers' Association, with 20 members. For 3-4 years, the association successfully produced seed potato, selling mostly to NGOs in the area who supplied other farmers freely. Increased seed potato sales led to the formation of an association of six groups with 120 members, 60% women. By 2004, demand for seed potato ceased as farmers were unable to sell increased volumes of ware potatoes. CIAT went in to work with the Nyabyumba group and Africare to test participatory marketing approaches. An initial step consisted of the farmers mapping the chain of actors and identifying service providers in the existing potato system. This was followed by participatory market research to identify various marketing channels for ware potatoes from the site. Farmers identified a number of markets (e.g., wholesale, retail, supermarkets, hotels, fast food chains, etc.). The analysis collated information on basic buying conditions (price, frequency of purchase, quality needed, payment conditions, etc.). Based on this, the group decided that linkage to Nandos (a multinational fast-food restaurant) was the most attractive option. Nandos utilizes ~5-10 tons of fresh potatoes each month.

Based on discussions between the group and Nandos, they carried out profitability analysis. Results showed that the enterprise could be profitable if farmers sold to Nandos throughout the year. All parties agreed upon terms and farmers moved to detailed planning. During planning, farmers noted that they would need to change their production system and include other farmer groups to meet the quantity desired by Nandos. A participatory evaluation process was initiated to test different technologies for potato production with the aim of achieving the market quality needs. Some of the specific issues of experimentation were new varieties, potato size, and moisture content. Farmers also required services (transport, finance, communications, marketing support, research support, etc.). Size and moisture content problems led to high rejection rates of initial consignments. However, through trials, rejection rates were reduced rates to < 10%. In 2 years, the farmers sold 50 tons of potatoes to Nandos at a total value of about US\$ 50,000. Since the farmers became able to engage with the market, their earlier external service providers started withdrawing, moving to other groups. Farmers also managed to deal with the problem of poor savings and credit services by setting up savings and loans schemes.

In both the Uganda and Malawi cases, there was strong evidence of a positive impact on income. Average household earnings were higher in sites where the approach was implemented than in other sites. In Malawi, the additional income earned was used to improve food security, accumulate assets, improve living conditions, and purchase mineral fertilizers. In Uganda, the emphasis was on improving living standards and the purchase of farmland. An explicit attention to gender issues in the approach resulted in more equitable sharing of benefits than previously. However, in Malawi, as common bean became increasingly commercialized, the income share of women fell, although their absolute income continued to increase.

While forming farmer groups is recognized as essential to making learning more efficient, for receiving support, and for achieving economies of scale, simply being in a group does not ensure success in the market place. There is growing evidence that farmer groups that are formed hastily, with little reference to building trust and linking to markets, tend to fail through lack of benefits (Sanginga et al., 2004). Dedicated and committed leadership is a vital ingredient if farmers' groups are to access and maintain links to markets. As groups take on more risks and increase their assets, governance and transparency are essential to success. All markets carry risk and prices of agricultural products are often volatile. Risks increase as market values increase. Farmers need to be fully aware of their exposure and ability to deal with risks. Contrary to the common view that farmers are risk-averse, the Nyabyumba farmers decided to link with a high-value market, taking on debt and investing in high-value capital assets, such as the purchase of trucks. For the less experienced farmers in the Malawi case, taking on a relatively new enterprise was risky. The step-by-step approach taken helped to build their confidence in enterprise management.

Example 3: Model for agricultural market creation in Africa – soybean in Kenya

Agriculture is failing to be the engine of economic development in many African countries. This has been attributed to failure in linking agricultural growth with market opportunities (Kormawa, 1996). Even where farmers are linked with markets, the terms are frequently unfavorable. Studies have shown that investments in non-traditional crops provide a profitable option (Kormawa, 1996). Experiences with soybean (*Glycine max*) promotion in Nigeria and Zimbabwe confirm this finding. As a result, the Tropical Soil Biology and Fertility institute of CIAT began to

explore the possibility of intervening in the soybean sector in East Africa. However, most past efforts at promoting soybean in Kenya led to insignificant results; domestic production stands at about 5000 tons per annum (Karuga and Gachanja, 2004). Several industries in Kenya continue to import 50,000–100,000 tons of soybeans annually (Karuga and Gachanja, 2004). Meanwhile biophysical conditions in many parts of Kenya support soybean production. This study uses the reasons for successes in Nigeria and Zimbabwe and the missing links that led to past failures in Kenya to test a three-tier model for sustainable soybean promotion in Kenya. Data collection was from: i) literature review and other secondary sources, ii) formal and informal interviews using a checklist, and iii) formal farm-level survey using data forms. Analysis was carried out using Microsoft Excel and SPSS.

Review of Nigerian experience and reasons for success

Soybean promotion in Nigeria was largely driven by domestic demand, import substitution, and favorable policy. Production increased by 166% (150,000 tons in 1988 to 405,000 tons in 1998) (FAOSTATS, 2001) and there was widespread incorporation into local dishes. Over the period, average yields more than doubled (from 340 to 740 kg/ha); area cultivated increased by 24%; the number of farmers cultivating improved varieties increased by 228% (Sanginga et al., 2003); and more women got involved. The rate of adoption of some processing technologies was as high as 99% in some communities (Sanginga et al., 1999). A combination of approaches (facilitation, incentives, collective action, capacity building, demand creation, processing and value addition, information exchange, credit facilities, etc.) was responsible for the success in Nigeria. Through a project funded by the International Development Research Centre and implemented by IITA between 1987 and 1999, over 47,000 persons (64% of them women) were trained by 1998 (Sanginga et al., 1999). Development of simple methods of processing for home consumption, response to market needs, and profitability played key roles (Osho, 1989; Kormawa, 1996). Coordination ensured that processors and producers got along on mutually beneficial terms, volumes, prices and qualities.

Review of Zimbabwean experience and reasons for success

The soybean promotion success story in Zimbabwe resulted from smallholder-focused intervention led by the University of Zimbabwe. It started with 55 small farmers in 1996 and was supported by the government through the creation of the

Soybean Promotion Task Force (SPTF). Over 50,000 smallholders (working in groups) are presently participating, producing over 40,000 tons of soybean annually. Farmers' groups were trained to process and sell various soy products for cash. Some groups have expanded into establishing village banks, accepting deposits and giving credit. Zimbabwe has well-developed capacity for oil extraction and feed formulation using soybean. Following the activities of the SPTF, Olivine Industries Ltd., a private firm, guaranteed to buy all soybean produced by small farmers at agreed prices for different qualities. The goal was to incorporate smallholder soybean farmers into the value chain, not just production. Household and community-level processing were used to effectively develop other levels of the soybean market to increase the benefits to small farmers. Public policy and institutional support played a key role.

Review of reasons for failure in Kenya

Lack of awareness regarding processing, lack of markets with favorable terms, low yields, and lack of policy support were among the main reasons for failure of past Kenya soybean projects (Karuga and Gachanja, 2004). Most of the projects were isolated, limited in scope, and lacked coordination among stakeholders, leading to lack of market information (buyers' needs, local soybean availability, etc.) and poor linkage of producers and processors. Buyers had difficulties knowing where to source soybean. There was no effort to assemble produce (e.g., through contracts) from farmers who also did not operate organized marketing with low transaction costs to attract buyers. Emphasis was on establishing a strong production base. Most households that knew anything about soybean processing were aware of insignificant uses, inimical to widespread consumption and could hardly lead to demand expansion. Cottage industries and other commercially viable small and medium-scale enterprises failed to spring up in support of processing, and this was compounded by a lack of affordable processing technologies. Inadequate technical capacity and resources constrained the ability of extension and home economics staff to train households on processing and consumption. Soybean production in Kenya competes with low-priced imports. The Cost Insurance Freight (CIF) Mombasa (Kenya) price of soybean meal was about US\$ 280/t [or Kenya Shilling (KShs) 22.4/kg] (Karuga and Gachanja, 2004) – a price far lower than the farm-gate price of 35–45 KShs/kg and the open market price of 50–60 KShs/kg for soybean in Kenya, creating strong incentives for importation. However, the turnover effect of the relatively lower market

clearing prices given by processors offer better opportunities for increased income and poverty reduction. Collective actions among farmers were largely not explored and there was little or no policy attention.

Three-tier model

We developed a “three-tier model”, supported by three pillars (Strategic Alliance of stakeholders, awareness creation, and capacity building) for sustainable soybean market development and promotion in Kenya. The first tier focuses on household-level production, aiming to train households on processing. Recipe development and inclusion of soybean in local dishes are key aspects. The second tier focuses at community level. Surpluses after household consumption are absorbed and processed. VitaCow or Vitagoat milk making machines are used in some cases. Farmers’ groups can afford VitaCow via collective action (delivery and installation costs range from 435,000-637,500 KShs or US\$ 5,800-8,500). Vitagoat performs at 70% capacity of VitaCow, which converts 2.5 kg of pre-soaked soybeans into 15 liters of soy milk. By-products from milk production are used to make such products as bread and cake. This tier forestalls produce glut at household level. The third tier is industrial-level soybean market development, linking farmers to processors for import substitution and to clear the market at agreed prices. It involves interacting with the industry to find out what it needs, and with farmers to evaluate their ability and requirement to deliver products that meet industrial specifications. Three pillars support the model. The first is a strategic alliance (SA) of

stakeholders. Processors are not keen on local supply at current volumes, and farmers would not invest in production without assured markets. An alliance brought all stakeholders together to: i) solve the entire problem, ii) put each stakeholder within a larger framework, iii) analyze perceptions of different actors, iv) facilitate trade, and v) deal with duality. Representatives of each stakeholder in the SA articulate and present their views at SA meetings, and provide feedback to members. Awareness creation is the second pillar and is about agronomy, post-harvest activities, marketing, nutrition, etc., emphasizing various benefits and how all stand to gain, correcting wrong ideas about soybean. The third pillar is capacity building (on how all can obtain the various benefits) for sustainability in all tiers.

Results from the model

Growth in farmers’ groups: Farmers’ interest has been stimulated. Between 2005 and 2007 (6 cropping seasons), the number of farmers’ groups (15–130 members) growing soybean has increased from 7 (during the long rains of 2005) to 121 (during the short rains of 2008) across the action and non-action sites¹³. The corresponding area planted to soybean by farmers’ groups increased from 5.7 to 100.9 ha (Table 4). About 30 farmers’ groups from outside the action sites (e.g., Kisumu Rural, Teso, Busia and Kakamega districts) are currently participating in the project. With women playing a dominant role in the production and processing of soybean, the intervention clearly has a positive impact on their empowerment. The intervention also has a positive impact on the establishment of local

Table 4: Growth in farmers’ groups involved in soybean promotion in Kenya: 2005-2007

Period	Migori action site		Butere-Mumias action site		Outside action site		Total	
	No. of zones/ groups	Area (ha)	No. of groups	Area (ha)	No. of groups	Area (ha)	No. of groups	Area (ha)
Long rains 2005	3	4.1	4	1.6	-	-	7	5.7
Short rains 2005	6	16.3	16	6.2	-	-	22	22.5
Long rains 2006	7	16.3	26	14.3	8	11.7	41	42.3
Short rains 2006	7	16.3	38	22.3	30	36.3	75	74.9
Long rains 2007	7	17.2	68	31.0	30	33.0	105	81.2
Short rains 2007	7	19.3	68	33.1	30	31.0	105	83.4
Long rains 2008	7	23.2	74	34.9	34	36.3	115	94.4
Short rains 2008	7	25.2	80	38.8	34	36.9	121	100.9

¹³Refers to our initial areas of concentration

Table 5: Cost-returns analysis of soybean production in Kenya: long rainy season 2005

Farmers' group/ Farmer	Plot size (acres)	Yield (kg/ha)	Cost of all inputs* (KShs/ha)	Gross returns (@ KShs 50/kg)	Net returns (KShs/ha)
Jitolee women	0.25	741.3	26021.05	37065.00	11043.95
Itako women	0.25	533.7	26943.38	26685.00	-258.38
Shishebu farmers	0.25	1245.0	19565.22	62250.00	42684.78
Emabole farmers	0.25	771.0	14525.69	38550.00	24024.31
Richard Aringo	0.25	553.4	13339.92	27670.00	14330.08
Boaz Kivanda	1.00	444.8	9661.48	22240.00	12578.52

* Labor cost was reduced to 33% because of small size of plots.

enterprises. Over the years, farmers are increasingly generating marketable surpluses; some are becoming regular and reliable suppliers to processing firms. Over 50% of the soybean farmers have 20-30% more income than before.

Profitability of production: Economic data collected from plots of four farmers' groups and two farmers are presented in Table 5. Yield ranges from 445 to 1,245 kg/ha (mean 715 kg/ha). Production costs varied from 9,662 to 26,943 KShs/ha (mean 18,343 KShs/ha). Net returns ranged from -258 to 42,685 KShs/ha (mean 17,401 KShs/ha). Unadjusted labor costs accounted for 75-84% of the total cost of production (Table 5, rows II-V), going down with adjustment of labor inputs due to small plot sizes and showing how net returns depend on yield and labor use.

Household processing and consumption: Over 90% of households interviewed in 2005 were not processing and consuming soybean on regular basis. They lacked processing skill. The few that processed and consumed soybean on regular basis

were only able to process it into nuts or beverages. Recent data show that about 55% of the households in the study area now process and consume soybean in one way or another. Over 75% of the households have been trained in processing methods and now make flour, milk, *maandazi*, *chapati*, etc. also for income.

Profitability of soy milk production: We carried out financial analyses of soy milk production using VitaCow under two the price scenarios. In the optimistic scenario (Column II, Table 6), the price of imported soy milk in supermarkets was used. In the pessimistic scenario (Column III, Table 6), based on our understanding that soy milk is new and must compete with dairy milk, we applied a price (KShs 40/liter), which was two-thirds the price of dairy milk (KShs 60/liter). The price of soybean grains (KShs 40/kg) applied under both scenarios was conservative. A net benefit per month of KShs 145,979 (pessimistic scenario) and KShs 530,171 (optimistic scenario) indicates a highly profitable enterprise. With these net returns, the cost of VitaCow can be recovered in 4-5 months, *ceteris paribus*. Since variable costs

Table 6: Returns on soymilk production using VitaCow – optimistic & pessimistic price scenarios

Budget item	(KShs)*	(KShs)*
5,760 liters of soymilk @ 106.7 KShs/liter	614,592.00	—
5,760 liters of soymilk @ 40 KShs/liter (2/3 of the price of dairy milk)	—	230,400.00
Total revenue/month	614, 592.00	230,400.00
960 kg soybean grains @ KShs 40/kg	38,400.00	38,400.00
11,520 packaging sachets @ KShs 1.05 each	12,096.00	12,096.00
Cost of electricity @ KShs 7,500/month	7,500.00	7,500.00
Salary of Operator @ KShs11,250/month	11,250.00	11,250.00
Salary of Packer/Sealer @ KShs7,500/month	7,500.00	7,500.00
Miscellaneous expenses @ 10% of all above costs	7,674.60	7,674.60
Total variable cost/month	84,420.60	84,420.60
Net benefit/month	530,171.40	145,979.40

* (US\$ 1 = KShs 75); Column II = Optimistic scenario; Column III = Pessimistic scenario

are the same in both scenarios, results show the effect of high price on profitability. This analysis has demonstrated how value addition can increase returns by 4 to 14 times, from KShs 38,400 (from sale of the 960 kg of soybean used as grain) to KShs 145,979 (pessimistic scenario) or KShs 530,171 (optimistic scenario) (converting the 960 kg soybean into soy milk).

Economic returns from processing other products: We evaluated economic returns from processing other soy products: *maandazi*, *chapati*, *chin chin*, and *puff puff*, taking into account all input costs and village-level output prices (Table 7). An opportunity cost approach was used to estimate labor cost. The time (minutes) taken to process the recipes evaluated was 15 for *maandazi* and *puff puff*, 25 for *chapati*, and 30 for *chin chin*. Net returns (in KSh) for the products produced within those times were 51 (*chapati*), 159 (*puff puff*), 204 (*maandazi*), and 508 (*chin chin*). Returns to each KSh invested were 0.43 (*chapati*), 1.2 (*maandazi*), 1.6 (*puff puff*), and 2.4 (*chin chin*), showing that soybean processing and sales of products have promise in market creation and poverty reduction in Kenya.

Table 7: Summary returns from processing *maandazi*, *chapati*, *chin chin* and *puff puff*

Summary budget item	Maandazi	Chapati	Chin chin	Puff puff
Total revenue *	369.0	170.0	720.0	260.0
Total variable cost **	164.7	118.6	211.7	101.3
Net benefit	204.3	51.4	508.3	158.7
Break-even price	1.3	7.0	1.5	2.0
Returns to each KSh invested	1.2	0.43	2.4	1.6

* Derived as: 123 *maandazi* @ KShs 3 each, 17 *chapatis* @ KShs 10 each, 144 *chin chin* packets @ KShs 5 each, and 52 *Puff puffs* @ KShs 5 each;

** Cost items: soy flour (2 cups or 0.5 kg), wheat flour (6 cups or 1 kg), baking powder (8 teaspoonfuls), sugar (1 glass), salt (1 pinch), vegetable oil, fuel wood, labor (15 minutes) (*maandazi*); soy flour (2 cups or 0.5 kg), wheat flour (6 cups or 1 kg), cooking fat, salt (1 pinch), fuel wood, labor (25 minutes) (*chapati*); soy flour (3 cups or 0.75 kg), wheat flour (6 cups or 1 kg), egg, cooking fat, sugar, fuel wood, labor (30 minutes) (*chin chin*); soy flour (2 cups or 0.5 kg), wheat flour (3 cups or 0.5 kg), yeast, sugar, fuelwood, labor (15 minutes) (*puff puff*).

Interactions with stakeholders: Results underscore the importance of interacting with various stakeholders in the SA. Different stakeholders had different viewpoints. Interactions with industry leaders reveal the importance of i) negotiating import substitution, ii) understanding grain qualities they desire,

iii) ascertaining the price processors want to offer for different grades, and iv) the other mutually beneficial collaboration between producers and industries.

Sale of grain to industries: Notwithstanding that most industries want minimum amounts of 5 tons at a time, some of our farmers' groups (from Busia, Teso) have supplied to Bidco.

Conclusion, recommendations and the way forward

While the ERI approach has been successful in linking smallholder farmers to domestic markets, it must also be complemented by the development of market institutions to prepare farmers to competitively access regional and international markets. Increased collaboration between research, development and business support service providers and capacity building will continue to be key ingredients in this direction. Using CIAT's diverse approach (enabling rural innovation, three-tier model, etc.) that emphasizes agricultural commodity market development for equitable and widespread poverty alleviation, this paper contributes to the debate on how to promote crops other than the major staples and traditional export crops, which tend to be the focus of policy support in most African countries. The paper also demonstrates that collective action and value addition are potential ways of making markets work for the poor in Africa and recommends continued agricultural commodity market research, development and capacity building to enable African smallholder farmers to graduate into competitively accessing regional and international markets.

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Improving the efficiency of African agricultural marketing systems through promoting formalised exchange infrastructure: Potential benefits, challenges and prospects

Gideon E. Onumah¹

Abstract

African governments and donors are increasing investment in the agricultural sector, partly in response to the widening gap in food supply to the continent's growing population. While investment in agricultural research, extension and uptake of inputs and farm technology is expected to help raise farm output and productivity, there is growing recognition that the capacity of local and regional markets to absorb surpluses needs to be significantly enhanced if any increase is to be sustained. This paper discusses how the development of exchange infrastructure can help to improve agricultural marketing systems in Africa and boost domestic food supply. The paper reviews six cases of agricultural commodity exchanges across four regions in Africa and concludes that their performance can be substantially improved if there is investment in developing supporting institutional infrastructure such as regulated warehouse receipts systems, enforceable trade-friendly commodity standards and reliable market information systems. Also crucial are an enabling policy environment and supportive regulatory framework. To ensure that smallholder farmers benefit from the development of exchange infrastructure, it is essential that collective marketing by primary-level farmers' organizations is actively promoted. The paper stresses that since the supportive institutional infrastructure for commodity exchanges is also fundamental to efficient marketing systems, public investment in its development can generate significant social benefits.

Introduction

The recent global food crisis has refocused attention on the need to strengthen the capacity of Sub-Saharan Africa (SSA) to feed its growing population. Its food imports bill is considerable and rising. In 1990-92 the annual food imports bill of SSA stood

at US\$ 16 billion but by 2004 it had reached US\$ 25 billion – excluding the US\$ 2 billion in food aid provided by relief agencies every year (ECA, 2007). It is projected that the continent will rely even more on food imports by 2015². Inadequate and highly variable domestic food production partly accounts for the growing frequency and severity of food crises in most parts of Africa, especially in eastern and southern Africa (Tschirley and Jayne, 2007). While per capita food production increased by 27% and 12%, respectively, in Asia and Latin America between 1980 and 1995, in sub-Saharan Africa, it actually fell by 8% during that period. Indeed, Africa is the only region where average per capita food production has been falling for the past four decades³.

Civil conflict, political and economic crises, and the HIV/AIDS pandemic are among the complex range of factors responsible for food supply gaps at national and regional levels in Africa (Clover, 2003)⁴. Yields obtained by smallholder farmers, who dominate African agriculture, are comparatively low and have generally stagnated since the early 1960s⁵. Cereal yields in Africa, for example, increased by only 29% in the 43 years between the early 1960s to early 2000s, compared to 144% and 177%, respectively, for Latin America and Asia (Staatz and Dembele, 2008). However, there is growing recognition that input-intensive programs that focus on increasing farm productivity by promoting uptake of fertilizer and improved planting materials are insufficient in the attempt to bridge the food supply and demand gap in Africa. Sustained increase in agricultural output and productivity requires major improvements in the functioning of African agricultural marketing systems. This is evident in the design of the Comprehensive Africa Agriculture Development Programme (CAADP) initiated by the New Partnership for Africa's Development (NEPAD). Pillar II of CAADP focuses on "improving...trade-related capacities for market access". The Alliance for a Green Revolution (AGRA), another continent-wide agricultural development initiative, appropriately recognizes that "a sustainable Green Revolution in Africa can be hedged on well-functioning markets that provide reliable outlets for farm produce while also serving as dependable sources of affordable food"⁶.

¹Natural Resources Institute – Enterprise, Trade and Food Management Group. Corresponding author (g.e.onumah@gre.ac.uk)

²Source: http://www.africangreenrevolution.com/en/african_agriculture/development/index.html

³Source: http://www.africangreenrevolution.com/en/african_agriculture/development/index.html

⁴Discussion of these factors is beyond the scope of this paper.

⁵Brussels Briefing Session No. 7: Rising food prices: an opportunity for change? 16th October 2008. Building A. Borschette, Rue Froissart, 36-1040 Brussels.

⁶Source: (AGRA website): <http://www.agra-alliance.org/section/work/markets1>

This paper discusses the potential role of exchange infrastructure in improving the functioning of agricultural marketing systems in Africa, thereby boosting domestic food supply and reducing food price variability. The next section defines exchange infrastructure, demonstrating how the associated benefits can help address some of the factors that hamper efficient food trade. The paper then identifies the prerequisites for successful development of exchange infrastructure, and reviews the performance of commodity exchanges in Africa. The paper concludes with a summary of the priority actions which African countries need to pursue in promoting viable exchange infrastructure as part of efforts to transform the performance of agricultural marketing systems.

Description and benefits of exchange infrastructure

Description of exchange infrastructure

Exchange infrastructure can be described as institutional innovations that can improve efficiency in food marketing in Africa. That is, it is perceived as a set of market institutions that foster fluid and cost-efficient trade and can, as argued by North (1990), improve the performance of agricultural markets with long-term beneficial impact on food supply and prices as producer margins increase. It consists of agricultural commodity exchanges as well as the essential physical and institutional infrastructure that guarantees delivery and payment for commodities traded. These include warehouse (or silo) receipt systems (WRS), enforceable commodity standards, reliable payment systems and market information systems (MIS), as well as the legal and regulatory framework that define the “rules of the game” for exchange trading.

A commodity exchange provides a venue, which may be physical or virtual (electronic), at which buyers and sellers are brought together to trade, usually through a group of registered brokers. Trading in this marketplace may be in physical commodities or derivatives, which are financial contracts/instruments, whose values are derived from the value of an underlying asset, which can be commodities, equities (stocks), mortgages, bonds, interest rates and exchange rates. Derivatives are usually used to reduce the risk that the value of the underlying asset will change unexpectedly. Warehouse (or silo) receipt systems, which often underpin delivery against exchange-traded contracts, involve the issue of a warehouse receipt (WR) to a named depositor as evidence that he/she has deposited a specified commodity, of

stated quantity and quality, at a specified location. The holder of the receipt may pledge it to a lender (with the stored commodity being the collateral for a loan) or transfer it to a buyer (by way of a sale) (Coulter and Onumah, 2002). The warehouse operator or collateral manager, who has custody of the stocks, guarantees delivery against the receipt and should be able to make good any value lost through theft, fire or other catastrophes.

Though exchange trading began in the US in the 19th Century, it was only in the early 1990s that many African countries showed interest in promoting agricultural commodity exchanges. Ghana, Nigeria, Kenya, South Africa, Uganda, Zambia and Zimbabwe are among African countries that attempted to establish agricultural commodity exchanges. These initiatives were endorsed by policymakers at the continental level at the Second Extraordinary Session of African Ministers of Trade held in Arusha in November 2005. The Ministers resolved that African countries should prioritize the development of exchange infrastructure as part of measures to improve commodity marketing, access to trade finance and risk management.

The focus on developing market institutions such as commodity exchanges occurred following liberalization of agricultural markets in most African countries. Prior to that, agricultural marketing systems in most African countries were characterized by pervasive government interventions (Akiyama et al., 2001). The institutional vehicles and policy framework employed by most governments to support the production and marketing of strategic food staples and export crops included pan-territorial and pan-seasonal pricing, regardless of the cost of assembling produce from particular regions; enforcement of formal commodity standards by marketing boards; sole distribution by the state of subsidized inputs to producers; and promotion of cooperatives as intermediaries in the marketing chain. In most cases, these interventions became an unsustainable fiscal burden, contributed to real decline in producer prices and failed to produce any significant increase in per capita output in food crops (Hubbard, 2003).

The policy focus shifted in the 1980s to “rolling back the state”, based on the orthodox thinking that state interventions directly or indirectly create distortions that undermine market efficiency and have to be dismantled (World Bank, 1997). Little emphasis was placed on developing institutions to help the private sector succeed in expanding its marketing activities. However, nearly two decades after the reforms were initiated, agricultural

markets in Africa remained inefficient and characterized by high food distribution margins and seasonal price variability. Though spatial marketing margins declined in the post-reform era in a number of African countries, they remained very high (Badiane et al., 1997). Temporal marketing margins are similarly high, ranging between 32% in Malawi and over 100% in Ghana (Coulter and Poulton, 2001). Consequently, producer margins are substantially squeezed, effectively stymieing investment in productivity-enhancement in Africa's farm sector. This is largely attributable to a myriad of constraints, including high transaction costs, imperfect information and incomplete markets that characterize these markets. Some of the constraints can be addressed with the development of viable agricultural commodity exchanges and related institutional infrastructure as is illustrated in the discussions in the next sub-section.

Potential benefits of exchange infrastructure

Reducing transaction costs through exchange trading – High transaction costs constitute a major barrier to the development of efficient trade in agricultural commodities in Africa. In a study of Benin and Malawi, Fafchamps and Gabre-Madhin (2006) find that the largest transaction costs for the observed traders are associated with search and transportation. The cost of assembling produce tends to be high as a result of atomized production over wide geographical areas. Transactors are often poorly informed – buyers have limited information about inventories held by rural producers who also lack timely and reliable access to price information from local or regional markets. The absence of formal commodity standards for quality as well as weights and measures creates uncertainty about the quality and quantity attributes of commodities being traded⁷. Hence, physical sampling is the norm in most rural transactions and contributes to raising the cost of transacting. Formal contract enforcement mechanisms are also weak (Fafchamps, 1996). Hence, the rural trade thrives where trust has been developed on the basis of repeat transactions or informal relationships, creating a significant barrier to entry in large-scale food trade and limiting participation by smallholders in the evolving modern marketing systems or in the sub-regional commodity trade.

Exchange trading generally saves time and cost of transacting as well as reduces counterparty risks by guaranteeing payment for and delivery of traded commodities. It reduces the cost of

sourcing produce for traders and processors, while lowering the cost of accessing markets for farmers, especially for premium quality produce. It avoids the high-cost and time-intensive process of physical sampling of goods before purchase, which is predominant in the informal agricultural trade in the country. This is because the quality and quantity of the traded product is assured, thus making “sight-unseen” trade possible, implying sellers can sell to buyers in a wider geographical area than their immediate location. For instance, a farmer in a rural location can sell his/her deposited crop to traders in regional markets without the need for any physical contact, making the trade more competitive because many more traders can participate.

The guarantee of delivery by the exchange, based on guarantees by warehouse operators, reduces the risk of non-performance of trade contracts. Sellers are also assured of payment for the commodity sold, with systems being in place to minimize the risk of default by buyers, especially when the market moves against them. The greater security in trade transactions provided, leads to significantly lower cost (including time lost) associated with contract enforcement, especially where litigation is time-consuming and expensive.

Improved storage services will reduce post-harvest losses –

Among factors limiting temporal arbitrage, which also contribute to high seasonal price variability, is lack of efficient storage facilities. During the pre-liberalization period, where the state played a major role in food marketing, especially of staple grains, considerable investment in storage infrastructure was made by donors and African governments. These facilities have sometimes remained under public-sector control long after the role of parastatal marketing boards was either abolished or scaled down substantially. Private-sector investment in storage infrastructure is often concentrated in urban areas and tends to support import/export trade rather than the domestic food trade. Storage management capacity is also highly variable in many countries and, as a consequence, storage in food surplus-producing areas is largely undertaken by ill-equipped farmers, resulting in very high post-harvest losses.

The WRS that underpin delivery systems for commodity exchanges encourage storage of agricultural commodities in well-run facilities. This reduces storage losses and can therefore help

⁷For instance, in Ghana, the average weight of a “maxi-bag” of maize differs from location to location. Zambia has a more formalized maize marketing system, but grain sampling is usually by sight and highly subjective. This increases the risk of cheating on weights and quality, and makes physical sampling imperative.

to significantly reduce post-harvest losses, which in many African countries is estimated at well over 10% of output. The risk of loss of value to holders of warehouse receipts is further minimized as operators are required to insure against storage losses. The cost of storage is also likely to be lower, especially for fungible commodities such as grains. These can be stored together (commingled) if they meet set grading standards, making it possible for a number of depositors to jointly use available storage space.

Liquidity in the agricultural trade can be enhanced – Lack of suitable storage facilities as well as limited access to inventory credit hampers intra- and inter-seasonal stockholding. While the capacity of traders to store tends to be limited, producers are discouraged from holding inventories as they are compelled to sell the bulk of their output immediately after harvest, when prices are very low, primarily to meet the cash needs of farm households. The stabilizing function that traders play in developed commodity markets through temporal and spatial arbitrage is severely limited in African agricultural markets (Fafchamps and Gabre-Madhin, 2006).

Liquidity in agricultural trade can be enhanced if lenders' aversion to the provision of inventory finance is addressed through the development of exchange infrastructure. For instance, a credible WRS that underpins a viable commodity exchange allows stored commodities to be used as collateral for

loans, thereby making inventory finance more readily available. Alternative forms of financing – mainly balance sheet financing and lending against immovable property in prime urban locations, which predominate in most African countries – exclude many entrepreneurs, especially those in agriculture, from the credit market. Structured finance based on WRS tends not to discriminate against normally disadvantaged borrowers if they are able to utilize the services of licensed warehouse operators. Exchange trading offers a transparent and more reliable means by which lenders can liquidate collateralized commodities and so make financing backed by inventory more attractive. Furthermore, as an exchange matures from a spot market into offering various risk management instruments, including futures and options contracts, lenders are able to use such instruments to hedge price risks. By so doing, they reduce credit risks, leading to lower cost of borrowing.

Access to inventory financing enables producers to defer sales during the harvest season, when prices are low, and ride the price curve to gain from seasonal price increases (see Box 1). It also allows traders and processors to build up inventories and overcome limitations to scaling up due to lack of capital or cash flow difficulties. Another benefit is more moderate seasonal variability in the supply and prices of agricultural commodities. This will benefit consumers, who will pay relatively less for food during the lean season while producer prices at harvest will be relatively higher.

Box 1: WRS pilot for maize in Zambia

A warehouse receipt system was piloted in Zambia for grains under a project funded by the Common Fund for Commodities (CFC) and implemented by the Natural Resources Institute (NRI). The project succeeded in creating the foundations for a thriving WRS, which was accessible to both commercial and smallholder farmers. Implementation of the WRS project was launched in 2000 and its pilot use occurred in the 2003/04 season. It was most successful during the 2004/05 season, when the following outcome was achieved:

- Four certified warehouse operators (total capacity 105,000 tonnes)
- Grain deposits of over 65,900 tons (2,100 tons from smallholder farmer groups)
- Receipted stocks financed at an average advance rate of 78.6%
- Participating banks: Inter-market Discount House, Barclays, Standard Chartered and Stanbic Bank

Though policy uncertainty has hampered growth of receipting activity in Zambia, the pilot successfully demonstrated that it was possible for smallholders to use such a system to trade with large processors and to obtain finance from lead banks such as Barclays Bank.

Source: NRI Reports.

Information asymmetry and policy uncertainty can be reduced

– Information asymmetry between smallholder producers and traders in the rural trade as well as severe household liquidity constraints often skews bargaining power in favor of the latter (traders). It is for this reason that donors and governments invested in agricultural market information systems (MIS) in many African countries. Exchange trading improves the collection and dissemination of market information to players. Prices on the exchange, which are discovered through a transparent process, are widely disseminated. Brokers, who facilitate trade and provide market advice to their clients, receive and analyze price-sensitive market information, thereby assisting buyers and sellers in making trade decisions. Furthermore, the exchange offers a competitive trading platform by bringing together a large number of sellers and buyers to trade on the basis of reliable information. The bargaining position of producers is thus strengthened because information dissemination is not de-linked

from access to remunerative market opportunities as tends to be the case with most government and donor-funded MIS.

Uncertainty regarding government policy on food markets – for example delivering subsidized grains, imposing export bans or ad hoc waiver of duties on imported food in response short-term price increase – discourages traders from holding significant stocks while making inventory financing even more risky. Like private players, governments and relief agencies can use price-risk management instruments offered by exchanges to hedge their positions on grain markets, and thereby bring greater stability to the net prices at which they are traded in the market. The Malawi case cited in Box 2 illustrates this.

Again, governments and relief agencies such as the World Food Programme can also use the WRS to cost-effectively procure and store food from domestic and regional markets and manage strategic food reserves (Coulter, Walker and Hodges, 2007).

Box 2: Malawi uses options to manage price of imported maize

Governments can use options to better manage supplies and prices within the domestic market for staple foods. Relief agencies can similarly use these instruments traded on the exchange or over-the-counter to insure against a surge in the price of locally procured grain. An example of the use of this instrument was by the Government of Malawi (GOM). In September 2005, the GOM signed an options contract with Standard Bank of South Africa giving it the right, but not the obligation, to buy additional maize at a price fixed at the time the contract was signed. The contract allowed for the purchase of a maximum of 60,000 tons of maize at a cost of approximately US\$ 18 million – enough to meet the food gap if donor and private-sector commercial imports did not reach anticipated levels. The UK Department for International Development (DFID) provided the financing to pay the options premium up-front, and the World Bank provided technical support. The options contract provided the Government with a mechanism to trigger additional imports at short notice, put a price cap on the cost of maize from South Africa and provided protection against the risk that prices would move higher. Finally, agreeing to an “over-the-counter” contract meant that the cost included delivery to Malawi, reducing uncertainty over transport prices. Previously, examination of the scope for using risk-management tools such as futures and options to help manage price volatility in food-insecure countries was limited by a concern about basis risk: the risk that prices on the exchange would not move in a correlated way with prices at the local level, for example in a different country often geographically far away from the exchange. This risk was removed with the over-the-counter call option contract used by the Government of Malawi since it was structured to include price protection on the South Africa Futures Exchange (SAFEX) white maize futures price and for transport to Malawi.

Source: Slater and Dana (2006)

Exchange infrastructure is not a cure-all

High transport costs, which contribute to the rather high marketing costs in most African countries, are a problem that cannot be addressed by the development of exchange infrastructure per se. Inland transport costs are particularly high and sometimes exceed ocean freight and insurance costs for imports (Coulter and Poulton, 2001). Poor rural transport infrastructure is one of the contributory factors. Quite often investment in rail and road transport infrastructure is skewed in favor of urban as well as leading mining and industrial communities. Rural food-surplus areas often lack good road and rail networks, a situation that discourages investment in haulage transport facilities in rural communities. It is quite common to see produce assemblers, who are the first link in the distribution chain, using passenger transport vehicles in bulking produce for the main wholesale markets. Most of the available vehicles are also ill-maintained and over-loaded, leading to high transit losses, the cost of which is passed onto consumers (Teravaninthorn and Raballand, 2009).

Investing in improved rural transport can enhance rural food trade and have beneficial impacts on the rural economy. As an illustration, Limao and Venables (2001) conclude on the basis of an empirical study that a 10% drop in transport cost as a result of improved transport infrastructure is likely generate a 25% increase in trade and drive down distribution margins to the benefit of producers and consumers. The imposition of levies by district authorities and checkpoints mounted by the police also increase the cost of transporting agricultural produce in Africa.

Review of agricultural commodity exchanges in Africa

Though many African countries have shown interest in promoting agricultural commodity exchanges, most of the exchanges have been unable to sustain spot trading, much less trading in futures and other derivatives as noted by UNCTAD (2007). The major exceptions in Africa are the Zimbabwe Agricultural Commodities Exchange (ZIMACE) and JSE/SAFEX (formerly South Africa Futures Exchange or SAFEX) in South Africa. ZIMACE successfully traded in grains from 1994 until 2001 when it was abolished as the Government of Zimbabwe intervened in the market to control the marketing of staple grains. To understand why agricultural commodity exchanges have not fared well in Africa, we review their performance against the backdrop of the key prerequisites for successful exchanges.

Prerequisites for viable agricultural commodity exchanges

Based on the case of JSE/SAFEX, Figure 1 presents an illustrative summary of the basic pillars for a successful commodity exchange. Transparent trading platforms are critical in ensuring competitive trading. Electronic trading platforms are increasingly replacing the traditional “open outcry” systems used by most of the established commodity exchanges. Advances in information technology (IT) have made it possible for countries such as South Africa to build local capacity to develop and maintain electronic trading platforms. Such a system is currently being used by JSE/SAFEX and by the Uganda Commodity Exchange.

The emergence of electronic trading platforms has made it possible for investors to route their orders directly to an exchange but brokers continue to play their traditional role in facilitating exchange transactions. This is because their knowledge of markets and expertise in processing market information allows them to offer investment advice to their clients (who are, however, responsible for their decisions). They also conduct and oversee each transaction – from placement and execution to clearance – on behalf of their clients. Some brokers may even be given permission by their clients to act on their behalf at the broker’s own discretion.

In many African countries stock exchanges preceded commodity exchanges. Though the markets for the equities and government debt instruments that are traded on the stock exchanges tend to be rather thin, the advent of stock markets has led to the emergence of a cadre of brokers who can be trained to offer services on commodity exchanges. Indeed, in Zambia, Uganda and Ghana, brokers on the stock exchanges have been keen to trade on domestic commodity exchanges if they are established, mainly because of the opportunity to expand their trading portfolios.

A credible clearing and settlement system is important in assuring payment to sellers. This service is often provided by clearing banks that are members of the commodity exchange. Financial liberalization and adoption of pretty tight financial regulations in many African countries has led to the emergence of competitive and healthy banks as well as non-bank financial institutions (Fosu et al., 2003). It is therefore feasible for credible banks in these countries to offer clearing and settlement systems to underpin trade in commodities and derivatives.

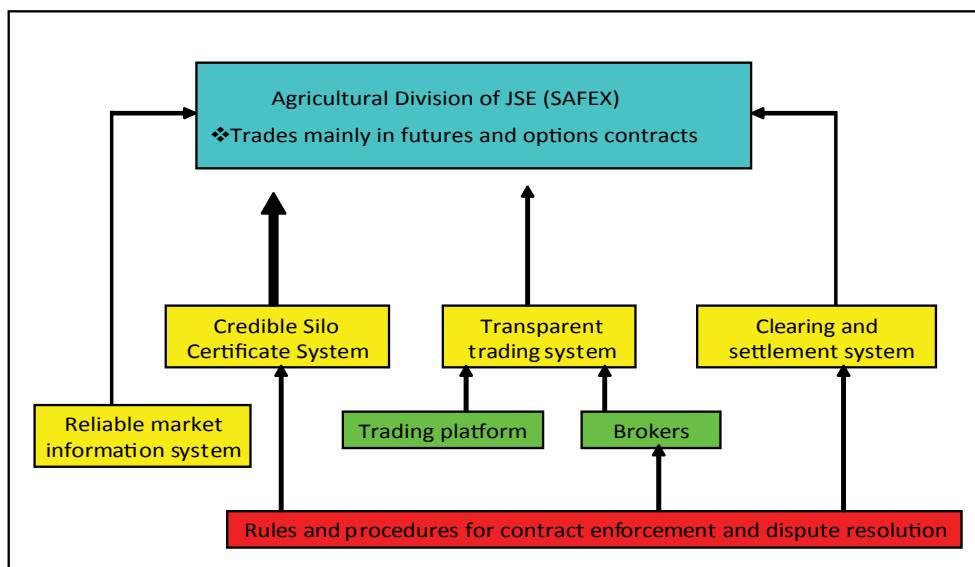


Figure 1: Systems underpinning the operations of JSE/SAFEX^a

The rules and procedures that guide contracting, contract enforcement and dispute resolution are crucial in assuring payment and guaranteeing delivery of traded commodities. These are important in engendering trust in an exchange. However, establishing a credible delivery system can be quite challenging. A robustly regulated and trusted WRS appears to hold the key to success in assuring delivery. However, in Africa, the most common main types of WRS are unregulated commercial WRS or NGO/donor-sponsored systems.

An unregulated commercial WRS is a legal/formal system of inventory collateralization, in that the provision of services as well as the rights and obligations of counterparties are based on existing contract laws. Aggrieved parties can seek redress through the courts, but there is no oversight by an independent regulatory agency (Coulter and Onumah, 2002). Under this system collateral management firms set up bespoke tripartite “collateral management agreements” (CMAs) between a bank, a borrower and a collateral manager. Warehouse receipts are issued directly to the financing bank, not to the depositor, and are non-transferable. Hence, they cannot be used as delivery instruments against contracts, i.e., for trade, but only to secure bank credit. The system has proved beneficial in easing access to finance for import and export trade but rarely for the domestic trade, except where the depositor is a large processor or major trading company. Furthermore, access tends to be limited to

large operators, who own or can rent entire warehouses or silos, and can afford fees costing thousands of US dollars per month.

The unregulated inventory credit system⁹ is often organized around targeted farmer groups, who are assured access through the use of warehouses with very low storage capacity (some as low as 20 tons) and are located in villages. The designated warehouses are usually managed by participating farmers’ groups. In cases where relatively larger warehouses (with storage capacity of up to about 1,000 tons) are used, collateral managers may be appointed, but the collateral management fees and storage fees tend to be heavily subsidized by the sponsoring donor or NGO. Financing is often by microfinance institutions (MFI) or agricultural development banks and is secured against the non-transferable receipt issued and a guarantee that may be up to 100% of the value of the credit advanced. Though this system proved beneficial in easing access to inventory credit by smallholder farmers, its sustainability is often difficult to assure and the warehouse receipts issued cannot support exchange transactions because they are not transferable.

The regulated WRS model, which is illustrated in Figure 2, involves an independent regulator who is responsible for licensing/certifying warehouse operators as custodians of collateralized stocks and ensuring that they comply with criteria set in relevant laws and regulations. They also regulate the issue

^aSource: Author (pers. comm. with JSE/SAFEX officials and other players).

⁹Ghana was one of the first African countries to pioneer the unregulated inventory credit system under a project implemented by TechnoServe. It has been widely promoted in the Sahel Region as well as in some eastern and southern African countries.

of standardized warehouse receipts to minimize the risk of fraud and oversee the operations of warehouse operators, including carrying out unannounced stock and quality verifications. Licensed operators offer “public” warehousing services, implying they can store commodities on behalf of multiple

depositors (of all sizes) in a single warehouse or site. The receipts issued may be transferable and negotiable, depending on the enabling legislation. Licensed warehouse operators may include international as well as local inspection companies, and processing companies such as ginneries.

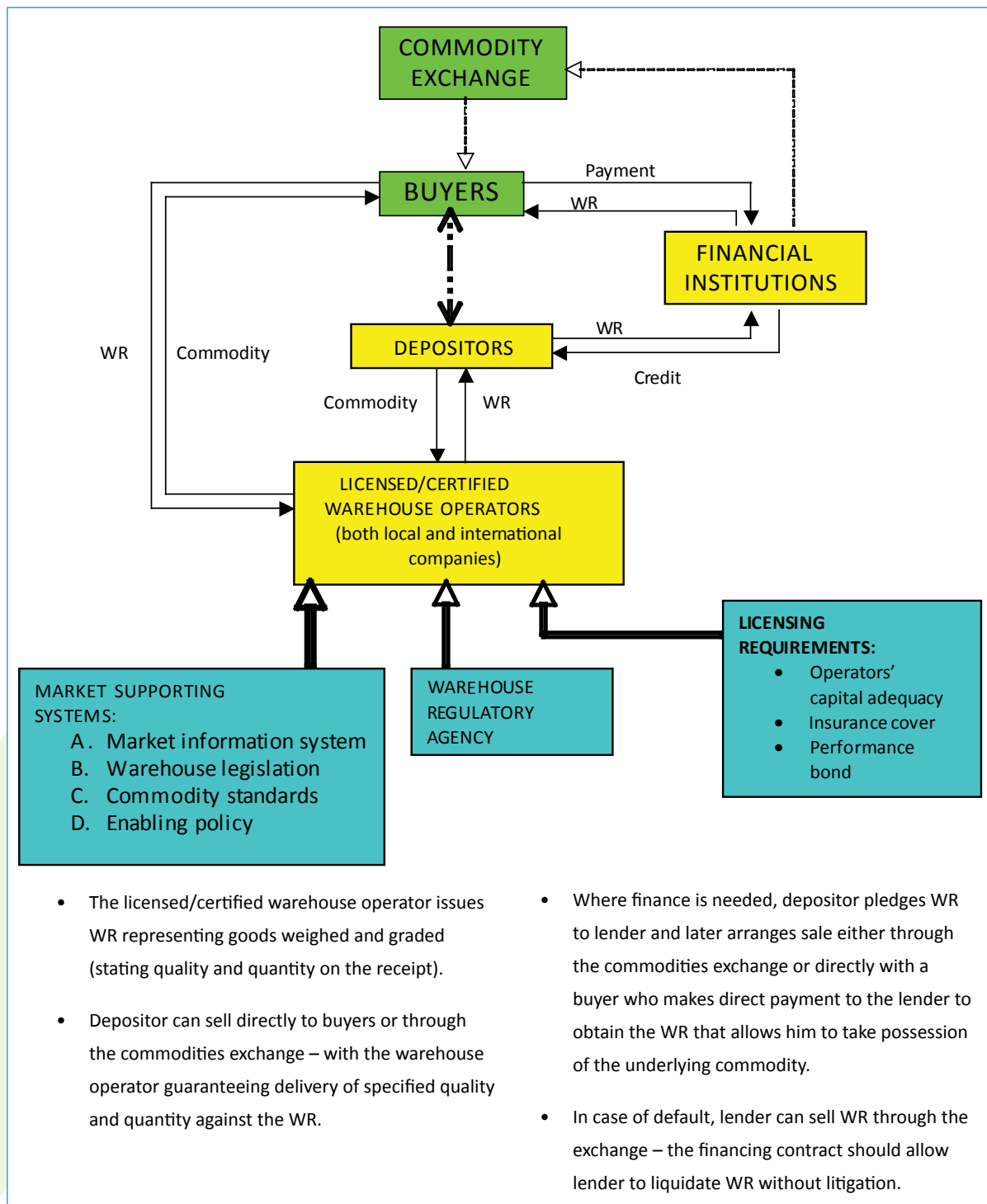


Figure 2: Illustration of a regulated Warehouse Receipt System

Africa's agricultural commodity exchanges

This sub-section focuses on a review of the performance of agricultural commodity exchanges established in six countries in central, western, eastern and southern Africa.

The Ethiopia Commodity Exchange (ECX) is the most recent spot/cash exchange in Africa, which was launched in 2007. It is owned by the Government of Ethiopia, which funded the initial capitalization of about US\$ 20 million, with some contribution by external partners. The government also underwrites all performance risks. However, ECX is run by a board representing farmer cooperatives, the state-owned grain trading enterprise and trading members. The trading platform involves the use of open outcry, but an electronic trading system is being developed and is expected to be launched in the near future. The main commodities traded by ECX are maize (white and mixed), wheat (hard and soft), sesame and beans (white pea beans and red kidney beans). It is expected that teff (a major Ethiopian staple) and coffee will be traded on the exchange in the near future. The standard ECX contracts specify the following:

- Commodity – type and grade;
- Standard lot size;
- Price quotation and contract quote basis (e.g., cost and freight included);
- Mode of payment and delivery;
- Delivery period;
- Weight or quality or other tolerance from agreed terms;
- Arbitration terms in case of dispute; and
- Any other terms agreed with the exchange

Buyers and sellers generally have to agree on the price and quantity of the standard lots. The standard lot size is five tons – tailored to the current average load per small truck in rural Ethiopia and to ensure broad participation, including small-scale market players. All contracts are quoted as “arrived Addis Ababa” and a locational differential (discount or premium) applied based on transport tariffs from Addis Ababa to the actual delivery location. ECX regularly updates the transport differentials

and makes this information known in advance of a trading session. Clearing and settlement are handled by three partner settlement banks and the contracts are for immediate delivery of the physical commodities (it is anticipated that ECX will in future introduce trading in futures contracts). The ECX owns and operates a network of 10 warehouses spread across six main production areas in the country as well as additional 20 remote terminal centers in major market centers. These warehouses were leased from the state-owned Ethiopian Grain Trading Enterprise (EGTE). The exchange enforces warehouse standards.

The ECX operates an electronic warehouse receipt (EWR) system controlled by the Exchange Central Depository, which is the sole entity authorized to issue EWRs, transfer legal title and cancel receipts. The EWR represents legal title and is transferable and negotiable on the exchange. It may be used for purposes of securing collateralized finance and may, upon request, be materialized into a paper receipt.

It is apparent from the brief description above that the ECX has all the basic requirements for operating a commodity exchange. By September 2009¹⁰, the ECX had recorded trade representing 150,000 tons of commodities held in 14 of its designated warehouses. Coffee accounted for over 90% of the commodities traded, valued at about US\$ 300 million. Cooperatives representing almost 850,000 farmers accounted for 12% of the trade in coffee on the ECX. It has to be noted, however, that 95% of Ethiopian coffee is produced by smallholder farmers. Government policy requiring coffee for the export market to be traded through the ECX contributed to the success of the exchange in attracting substantial volumes of the commodity. It is reported that exchange trade has impacted positively on the quality of Ethiopia's coffee exports while also increasing returns to farmers¹¹. The ECX has launched a warehouse receipt-financing scheme, with support from the International Finance Corporation. This is expected to improve access to agricultural finance while increasing the volume of stocks held in the formal sector and available for trading through the exchange. Staple grains, which are produced predominantly by smallholder farmers, are being particularly targeted.

¹⁰Data and information based on presentation by ECX official at the workshop on improving the functioning of commodity markets in eastern and southern Africa. 30 September - 2 October 2009. Lusaka, Zambia.

¹¹These reports are yet to be validated by any empirical studies.

The Uganda Commodity Exchange (UCE) was incorporated in 1998 by four founding shareholders led by the Uganda Cooperative Alliance (UCA). The other founding members were the Uganda Coffee Trade Federation, the Uganda Farmers' Federation and the Uganda Export Promotion Board. They were later joined by other shareholders, including UNEX (a private coffee trading firm in which UCA has interest), Olam Uganda Limited (a multinational coffee trader), NGOs (Africa 2000 Network and Satnet) and three cooperative societies. The Government of Uganda had no equity stake in the UCE. However, through its Department of Cooperatives under the Ministry of Trade, Tourism and Industry, the Government supported the UCE, funding its operating costs (including staff remuneration) while it was not financially sustainable. The Government also assisted the UCE in securing funding from the EC for restructuring its operations to enable it to achieve financial sustainability. The board of the UCE is, however, dominated by private interests.

The main commodities traded include coffee, maize, sesame, beans, soybeans and rice. The minimum lot size was set at 10 tons. Unlike the ECX, the UCE operated until 2006 without a network of warehouses and trading was not done on the basis of certified commodities at designated locations. No formal WRS was in place and verification of the quality and quantity of commodities offered for sale on the exchange was typically by means of on-site physical sampling by personnel of the exchange. This process was costly and unreliable. Samples were sometimes not representative of the stocks offered and quantities offered could be sold while officials of the exchange were busy contacting potential buyers. The occurrence of non-performance, particularly by sellers, undermined confidence in the UCE, leading to very low trading volumes [only 11 contracts were traded between March 2002 and June 2004 (Onumah and Linton, 2004)].

With support from the EC, the UCE is being restructured to enhance its prospects of viability. As part of this process, it is building on a WRS developed for cotton and coffee under a project funded by the Common Fund for Commodities (CFC). Under the CFC project, the Government promulgated warehouse legislation recognizing warehouse receipts as negotiable documents of title and also instituted regulatory oversight of the issuing of warehouse receipts. The regulatory authority has been

delegated by the Minister of Trade to the UCE, which is therefore responsible for licensing warehouses and operators, collateral managers and the issuing of negotiable warehouse receipts. An electronic receipt system and trading platform have been developed for the exchange. The restructuring process, which has encompassed the development of the basic prerequisites for the UCE, is yet to be completed and therefore the UCE is yet to achieve operational viability.

The Abuja Securities and Commodity Exchange (ASCE) is a spot/cash exchange promoted and largely funded by the Government of Nigeria which provided office facilities, vehicles and other office equipment and funds for recurrent expenditures, including remuneration of its rather large management structure. As was the case of UCE prior to 2006, the exchange operates a trading system that lacks a credible delivery mechanism. Not surprisingly, therefore, it has struggled to achieve significant volumes of trade. Between July 2006 and the first quarter of 2009, the ASCE traded a total 2,874 tons of sorghum, maize, cowpea, millet and soybeans valued at just under US\$ 400,000¹². The volume of commodities traded represents a very tiny fraction (0.12%) of annual demand from formal buyers (i.e., industrial end-users) for cocoa and the commodities listed above¹³.

The Kenya Agricultural Commodity Exchange (KACE) is another spot/cash exchange. It was initiated by a private entrepreneur but has been supported by various donors, including USAID, Rockefeller Foundation, the Hans Seidal Foundation of Germany and CTA in the Netherlands. However, it is yet to trade sufficient volumes to assure financial sustainability. To date, its major achievements have been in collecting and disseminating market information, as well as operating an electronic bulletin board through which sellers and buyers "advertise" commodities they intend to sell or buy. KACE has not instituted any standards pertaining to grades and minimum lot sizes and has no designated warehouses as licensed delivery locations. Its poor performance has principally been attributed to the missing prerequisites. It has only been successful as an electronic information platform and therefore cannot appropriately be described as a commodity exchange.

To remedy the situation, in late 2007 the East African Grain Council (EAGC), with support from USAID, launched a program to develop a WRS for grains in Kenya. Implementation of the WRS,

¹²Source: ASCE reports.

¹³Estimates by the author based on data from USDA, USAID and Federal Government of Nigeria reports.

centered in the grain surplus-producing region of Western Kenya, was disrupted by the recent post-election conflict in Kenya. It is expected that success in developing the WRS will see the emergence of one of the key pillars that will help transform the prospects of KACE or a successor exchange that the EAGC and other stakeholders may promote.

The Zimbabwe Agricultural Commodity Exchange (ZIMACE)

was the most successful spot/cash agricultural commodities exchange in Africa until 2004, when the Government of Zimbabwe introduced strict controls over grain trading (ZIMACE was subsequently abolished). ZIMACE was incorporated in 1994 and its member-shareholders were mainly producer associations, millers, major grain traders and the state-owned Grain Marketing Board (GMB). It was run as a private operation funded by fees from members and commissions. The main commodities traded were maize, wheat and soybeans. Daily trading sessions were held on the floor of the exchange, using open outcry and with trading through appointed brokers. Trading contracts were similar to those used by the ECX. The designated delivery locations were warehouses belonging to the GMB, which met specified warehouse standards. Warehouse inspection was undertaken on behalf of ZIMACE by appointed inspection companies, notably ITS Socotec. Standard ZIMACE warehouse receipts were issued for deposited commodities and formed the basis of trading on the exchange. By 2001, the value of contracts traded by ZIMACE was about US\$ 500 million – the success primarily due to the integrity of the underlying systems that guaranteed delivery and payment. Despite its apparent success, the exchange was perceived as a “club” for large-scale producers and their counterparts in industry – a perception that provided justification for its abolition in 2004.

The South Africa Futures Exchange (SAFEX) was established by private-sector players in 1996, just after the agricultural marketing system was liberalized by the Government of South Africa. It was subsequently taken over by JSE Securities, which operates the stock exchange, becoming better known as JSE/SAFEX. Liberalization involved repealing a previous Act that allowed for single channel marketing systems, and promulgating a new Act that limited Government intervention in agricultural markets to provision of market information and support for market-related research. The Government also encouraged advocacy by the private-sector organizations. Under the new marketing system, producers deposit grain with silo operators,

who issue silo certificates (SC) confirming the deposit of grain of stated quality and quantity by the named depositor at the specified silo. The silo operators are certified by JSE/SAFEX, which oversees their operations to protect the interest of depositors and bona fide parties to whom ownership of the underlying commodity is transferred. Silo operators can either issue SCs in their own name, or issue the more widely used SAFEX receipts.

Most large-scale producers sell their grains through JSE/SAFEX (usually by appointing brokers to sell the SCs representing the crop). There are cases where some producers sell directly to processors, but these are relatively few and declining compared to sale through the exchange. The benchmark price in such cases is usually the JSE/SAFEX price. Where producers wish to defer sale, they can obtain finance against the SC. In such cases, the borrower is usually required to hedge against any downside price risks using futures and options traded on the exchange.

As a result of the availability of price risk management instruments developed on the basis of the receipt system, banks have been able to structure production finance, requiring borrowers to deposit their produce with certified silos. Their track record in deposits is used in determining their output, against which finance is provided. Buyers of SCs include processors, who may take delivery of the underlying commodity on presentation to silo operators or to investors. The investors participate in the market primarily to make gains from anticipated price movements, but play a crucial role of making the market liquid and enabling risk sharing.

The main commodities traded by JSE/SAFEX are maize (white and yellow), wheat, sunflower seeds and soybeans. The standard lot sizes per contracts are 100 tons of maize, 50 tons each of wheat and sunflower seeds and 25 tons of soybeans. On average, JSE/SAFEX trades futures and options contracts representing about 200,000 tons of maize per day. Only a small and continually declining portion of these contracts end with physical delivery because the bulk of the trading is for hedging. This is despite the fact that all products traded can be physically delivered at expiry in fulfillment of a futures contract. The SCs were initially paper documents, but the sheer load of paper documentation and risk of loss led to the adoption of an electronic receipt system. Most depositors obtain inventory finance secured with the SCs.

Reviewing the market reforms in 2002, South Africa's National Department of Agriculture reported that the successful transition from a state-controlled single marketing channel to a liberal marketing system could be attributed partly to the successful development of JSE/SAFEX and related institutional infrastructure (illustrated in Figure 1 above). However, it was acknowledged that government commitment to the development of the free market in agricultural commodities had been instrumental in engendering private-sector confidence in the market. This commitment was tested in 2000 when the government resisted pressure from producers to provide price supports when grain prices collapsed as a result of a glut. Again in 2001 and 2002 the government refused to intervene to force down grain prices that had risen as a result of significant domestic and regional supply deficits. The National Agricultural Marketing Council (NAMC), which is a representative body for key private stakeholders in the agricultural sector, has been instrumental in facilitating policy dialogue and managing the risk of policy uncertainty. The Council also collaborates with the Government of South Africa in raising funds through levies on traded commodities. The funds are to finance sector-related research and market information collection and dissemination.

Scale diseconomies and advocacy for regional exchanges

Low volumes of marketable surplus of commodities can undermine the viability of agricultural commodity exchanges. It is for this reason that it is sometimes argued that Africa should pursue the development of regional or continental exchanges. African Ministers of Trade concurred with this suggestion at their summit in Arusha in November 2005. This objective may be desirable as regional or pan-African exchanges can enjoy the benefit of scale economies that will assure viability and liquidity. There may also be better prospects for attracting global players to regional exchanges than to national exchanges with rather thin markets.

However, pursuing this option is fraught with major challenges. Harmonization of commodity standards, sanitary and phytosanitary regulations, as well as storage and trading regulations is required to make this feasible. Eastern and southern African governments have been working on these issues as part of the "Maize without Borders" initiative supported by the USAID-funded Regional Agricultural and Trade Expansion (RATES) program. Progress has been rather slow. Equally important in promoting regional commodity

exchanges is the need to lower policy barriers to trade, at least at regional levels. In most regions of Africa, the regional economic communities (e.g., ECOWAS and COMESA) have clear protocols to facilitate regional trade. However, compliance with these protocols is often compromised, especially in the food trade, when national governments perceive regional trade as a drain on domestic food supply during seasons when there is a short crop. Credible commitments by governments to foster regional trade appear, therefore, to be dependent on enhanced capacity to manage short-term food crisis.

Other policy-related bottlenecks that need to be reduced in promoting regional or pan-African exchanges include restrictive currency exchange regulations and macroeconomic instability. Reducing existing natural transport barriers to lower the cost of transacting between players across regions is also essential. On the basis of the foregoing, it appears that in the short term, African governments may be better off focusing on building national institutions rather than the much tougher option of regional and/or pan-African exchanges. This does not, however, imply abandoning efforts to remove natural, technical and policy bottlenecks that hamper trade across regions.

Conclusions and priority actions in promoting exchanges

Driving agricultural output and productivity growth is back to the top of the development agenda in Africa. Based on the CAADP framework, African governments and donors have pledged significant investment in agricultural research, extension and the uptake of inputs and farm technology to increase output and productivity. However, there is growing recognition that production expansion will be difficult to sustain if the capacity of local and regional markets to absorb surpluses is not significantly enhanced. This is because the highly inelastic demand for most agricultural produce tends to result in precipitous price plunges when local markets are unable to absorb surplus output.

The discussions in this paper illustrate that exchange infrastructure can potentially enable African countries to simultaneously address many of the marketing and financing constraints which hamper productivity and output growth in the farm sector. As market institutions, exchange infrastructure can lower transaction costs, thereby facilitating spatial and temporal arbitrage that will contribute better producer incentives and therefore better prospects for raising farm productivity and food

production in Africa. To assess whether the identified potential benefits have been realized in any African country, we reviewed agricultural commodity exchanges in six African countries. It is apparent from the review that most of the exchanges are struggling to achieve significant trading volumes. The ECX in Ethiopia has recorded appreciable trading volumes in coffee but not in the major food staples. With the exception of JSE/SAFEX, none of the exchanges has advanced beyond spot/cash trading into futures markets that offer price-risk management instruments. The review further showed that this rather disappointing performance is due to the fact that some of the prerequisites for successful exchanges are either missing or underdeveloped.

Prominent among the prerequisites is a trusted WRS under which transferable warehouse receipts can be issued to back trade contracts, as well as secure inventory finance. Unregulated CMA-based receipts systems, which are commonly used in Africa to secure finance for the import and export trade, cannot be used to underpin exchange trading because the receipts are not legally transferable. For similar reasons the targeted inventory credit schemes, which are usually favored by donors and NGOs, may have the advantage of being directly accessible by smallholder farmers, but the receipts issued cannot be used as delivery instruments for an exchange. What is required is a robustly regulated WRS, which is also widely accessible. Legislative intervention represents a quick means by which transferability or negotiability of warehouse receipts may be assured. This option has been adopted in Tanzania and Uganda. However, their experience also shows the importance of the regulator-licensed warehouses being perceived by all parties as strong and unbiased.

A network of well-run warehouses constitutes the spine around which the WRS can be developed. Currently, in many African countries the bulk of private storage infrastructure is concentrated in urban areas, and they mainly service the import and export trade. Storage capacity in the food surplus-producing areas is very limited and mainly owned by the state – following investments in the 1960-70s under various donor-supported agricultural marketing initiatives that focused on strengthening the capacity of the parastatal marketing boards. Storage in the state-owned storage facilities has been declining largely because of a lack of credibility in public storage agencies. Zambia resolved this conundrum by allowing private operators to lease state-

owned warehouses and silos through a transparent bidding process. Though the facilities remain in public ownership, the operation is by credible private parties operating in a competitive market and the services are available to all players in the agricultural sector.

Other important institutional infrastructure that supports viable commodity exchanges is trade-friendly commodity standards that minimize storage losses and foster trade-by-description as occurs on exchanges. Many governments in Africa, often with donor support, have invested in the development of market information systems (MIS), which are necessary in ensuring that market players are well-informed. In most cases, the MIS has been difficult to sustain after donor support ended and the quality of information has suffered as a result of delays in collection and processing of market data. Sustainable MIS models need to be developed. An example is the South African Grain Information Service (SAGIS), which is responsible for disseminating price data and information on supply and demand, including crop forecasts. SAGIS is funded partly by levies paid by stakeholders in the agricultural sector.

Equity investment by governments and donors in establishing national agricultural commodity exchanges in Ethiopia, Nigeria and Uganda tends to significantly dwarf private contributions. It is our view that the focus of public and donor investment should be on the development of the institutional infrastructure that we have identified above as being critical to the success of an exchange. It has to be emphasized, as noted by Rashid et al. (2008), that such institutional infrastructure is also fundamental to the development of efficient marketing systems. Hence, whether or not a country intends to establish a commodity exchange, investing in their development can generate significant social benefits. The lessons from the cases reviewed in this paper also point to the need for governments to credibly commit to creating and maintaining a policy and regulatory environment that is supportive of the operations of an exchange and efficient free markets in general. It is essential in particular to avoid policy uncertainties that inhibit private investment in commodity markets. One means of assuring this is to create public-private policy forums, such as the EAGC in Kenya and NAMC in South Africa, to provide platforms for effective policy dialogue.

A final – and critically important – issue is the challenge posed by the dominance of smallholder farmers in Africa's agricultural

production system. The low marketable surplus produced by smallholder households makes it uneconomic for them to directly access modern market institutions and remunerative markets. This is one of the main reasons why it has not been possible for smallholder producers in South Africa to utilize marketing facilities offered by JSE/SAFEX to any significant extent. The same can be said of access by smallholder farmers in Zimbabwe regarding access to ZIMACE. However, as has occurred in Tanzania and Zambia, strong farmer organizations can facilitate the use of these systems by smallholders for purposes of collective marketing and related financing opportunities. Onumah et al. (2008) document key lessons learned by these countries, demonstrating the need to focus capacity building for collective marketing at the primary or grassroots level, rather than at secondary or tertiary levels where attention tends to be concentrated more on policy advocacy.

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Collective action for smallholder market access: Evidence and implications for Africa¹

Helen Markelova² and Esther Mwangi³

Abstract

It is widely acknowledged that the involvement of small farmers in markets can contribute to higher productivity and income growth, which in turn can enhance food security, poverty reduction efforts, and overall economic growth. In Africa, as in other parts of the developing world, agricultural production systems and their participants face significant challenges as a result of changing economic, environmental and sociopolitical contexts. New dynamics in the global agricultural economy, such as the growth of supermarkets, are providing smallholders with both new opportunities and new constraints to participating in and benefiting from market exchanges. Collective action in form of producer groups can enable African smallholders to take advantage of new value chains and deal with existing market imperfections. However, certain conditions must be in place to create and sustain incentives for farmers to organize around marketing. Experiences from collective action in natural resource management (NRM) have shown that the types of markets and products, characteristics of user groups, institutional arrangements, and external environments need to be considered in order to determine the effectiveness and sustainability of collective marketing for smallholders. This paper applies the lessons from collective action in NRM to marketing, using existing case studies of producer groups in Africa, and offers policy recommendations on the factors that contribute to the success of collective marketing efforts.

Introduction

Challenges for African agriculture

The issues concerning small agricultural producers feature prominently in the global discussions about poverty reduction as the majority of the world's poor belong to such households. It is widely acknowledged that the involvement of small farmers in markets can contribute to higher productivity and income growth, which in turn can enhance food security, poverty reduction efforts, and overall economic growth (Fafchamps, 2005; Bernard and Spielman, 2009; Barrett, 2008). In sub-Saharan Africa, this issue becomes even more acute, since two-thirds of the population live in rural areas and depend on

small-scale farming for their livelihoods, which so far has failed to produce enough food for consumption or generate sufficient incomes. At the same time, agriculture constitutes 30-50% of national incomes and has the potential to be the driver of economic growth on the continent (Teonniessen et al., 2008). To achieve this goal, there is a clear need not only to increase the productivity of African smallholders, but also to effectively link them with markets.

However, in Africa, as in other parts of the developing world, agricultural production systems and their participants are facing significant challenges in the face of changing economic, environmental, and sociopolitical backgrounds. Unlike their Asian counterparts, African rural producers did not benefit from the first Green Revolution in the 1960s and 1970s, mostly due to the fact that governments in Africa did not provide the complementary support needed, such as infrastructure investments and input subsidies, for the agricultural technologies to succeed and for rural markets to develop (Teonniessen et al., 2008). Structural adjustment programs and trade liberalization efforts, whether incomplete or insufficient, failed to move African smallholders out of a subsistence mode, especially in areas removed from market centers (Barrett, 2008; Teonniessen et al., 2008). In addition to the failed and/or ineffective agricultural policies and programs by governments and international financial institutions, the agricultural sector in Africa has been negatively affected by changing environmental conditions, such as increasingly unpredictable weather patterns and diminishing availability of productive land and water resources (Teonniessen et al., 2008; Dorward et al., 2009). Poor human and animal health and heterogeneous patterns of population density, which result in fragmented rural markets, are among other major problems faced by African farmers (Dorward et al., 2009).

Changes in the global agricultural economy are providing smallholders with both new constraints and new opportunities. The demand for higher value and processed food products has grown worldwide as a result of increasing purchasing power and rising opportunity cost of the time required for food preparation (Gehlhar and Regmi, 2005). As a consequence of trade liberalization policies, many African countries have begun producing non-traditional agricultural products to

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²International Food Policy Research Institute (IFPRI)

³Center for International Forestry Research (CIFOR)

diversify their agricultural exports and find new markets (Okello et al., 2007). Farmers are increasingly catering to long and sophisticated supply chains and have to meet stringent food safety standards, particularly in discerning international markets (Markelova et al., 2009). The rise of supermarkets across both developed and developing countries has implications for the entire food marketing system, as it alters procurement systems and introduces new quality standards (Reardon et al., 2005; Hernandez et al., 2007). The rapid spread of supermarkets and large discount stores has led to the transformation of the African retail food sector with large retailers displacing more traditional ones, such as small shops and public markets (Weatherspoon and Reardon, 2003).

Even though these changes create opportunities to raise agricultural incomes, these modern value chains have mostly engaged large and medium farmers for the scale and quality standard reasons, bypassing small farmers, who are usually the focus of pro-poor development efforts (Okello et al., 2007; Hernandez et al., 2007). Smallholders, who in addition to the landless represent the poorest segment of the rural population, can potentially benefit from participating in market exchanges since most of them are linked to the markets in one way or another. While most are engaged in local markets that may not render much profit, there are instances and opportunities for their participation in more profitable domestic and even export markets (Ashraf et al., 2008; Weatherspoon and Reardon, 2003).

However, their successful involvement in markets is challenged by multiple barriers to entry, even though they have some competitive advantages over larger commercial producers, especially in their low transaction costs in accessing family labor and in their intensive local knowledge (Poulton et al., 2005; Pingali, 2006). First, much of the literature points to the pervasive imperfections that characterize markets in the developing world (De Janvry et al., 1991). Lack of information on prices and technologies, high transaction costs, and credit constraints make it difficult for smallholder farmers to take advantage of the marketing opportunities (Key et al., 2000; Poulton et al., 2005; Shiferaw et al., 2008). Access to profitable high-value markets is more limited for smallholders since access to these markets may require expensive third-party certification (Barrett et al., 2001; King and Venturini, 2005). In addition, with

the increasing number of the free trade agreements affecting both national and international commodity markets, smallholder farmers are being forced to compete not only with their local cohorts, but also with farmers from other countries as well as domestic and international agribusinesses (Schwentenius and Gómez, 2002). The absence of effective and sustainable rural institutions is often identified as another challenge for the commercialization of rural areas in Africa (Poulton and Lyne, 2009; Shiferaw et al., 2008; Cadot et al., 2006).

The case for collective action in smallholder marketing

There is increasing evidence from both research and practice that one way for smallholders to overcome market failures and maintain their position in the market may be through organizing into farmer groups or producer organizations (Markelova et al., 2009; Poulton and Lyne, 2009). When acting collectively, these smallholders may be in a better position to reduce transaction costs of their market exchanges, obtain the necessary market information, secure access to new technologies, and tap into the high-value markets, which would give them an advantage when competing with large farmers and agribusinesses (Key et al., 2000; Stockbridge et al., 2003; Kruijsen et al., 2009). Producer groups can simplify long marketing chains by directly connecting smallholders to markets bypassing various marketing intermediaries and negotiate better terms of trade as well as lower vertical and horizontal coordination costs (Shiferaw et al., 2006; Bernard and Spielman, 2009; Barrett, 2008). They would also be able to adjust to the changing food sector and participate in the new procurement systems by overcoming volume and coordination problems (Weatherspoon and Reardon, 2003; Poulton and Lyne, 2009).

Research in natural resource management (NRM) has already demonstrated the advantages of collective action – voluntary action by a group to pursue shared objectives (Marshall, 1998)⁴ – for technology adoption, and to ensure that resource use is efficient, equitable, and sustainable (Meinzen-Dick et al., 2002). Even though NRM and market access differ both in terms of obstacles faced by smallholders and in terms of welfare opportunities to be gained from participation, cooperation has been recognized as crucial for the poor to overcome challenges presented by unfavorable policy and market contexts and create sustainable livelihood options (Thorp et al., 2005; Heyer et al.,

⁴Based on this definition of collective action, contract farming is not considered collective action as parties are bound to act together by contracts with financial stipulation, and not on a voluntary basis.

2002; Bebbington, 1991). Besides, more and more attention is being given to the importance of institutions, including those of collective action, and their effectiveness in poverty reduction and agricultural development in addition to pro-poor macroeconomic policies (Barrett, 2008; Kirsten et al., 2009; Mwangi and Markelova, 2009).

The idea of farmer organization and collective marketing is not new and continues to be advocated by some policymakers, donors, and practitioners as a valid development strategy, especially for sub-Saharan Africa, since agricultural growth there is linked with the commercialization of smallholder farmers (Teonniessen et al., 2008; Bernard and Spielman, 2009). Earlier experiences with cooperatives, for example, were decidedly mixed; their failure can be explained in part by the mechanistic approach to institutional development that reflected the overall technocratic approach to development in the 1970s (Ostrom et al., 1993). However, the cooperative movement demonstrated that smallholder groups can achieve economies of scale that overcome the high transaction costs that individual farmers face (Shepherd, 2007; Temu, 2009). Hence, there is a need for a better understanding of the factors that matter for successful and effective group formation for marketing.

The extensive literature on collective action in natural resource management has identified factors such as group composition, management rules, and policy environment, among others, which influence successful and equitable cooperation around resource management. It has shown that effective local collective action that was built with consideration of these factors can indeed be a useful approach for the poorer resource-dependent communities to sustainably manage their resources, improve resource conditions, and build strong bottom-up institutions (see Meinzen-Dick et al., 2002 for a collection of studies, and Agrawal, 2001). Since groups organized for the purpose of resource management have been studied and conditions for their success and failure have been identified, the lessons from these studies can be applied to the study of collective action in other development domains. This paper uses these experiences from NRM to identify issues that are important for collective action in smallholder marketing and applies them to the discussion of factors that may influence the formation and effective and sustainable operation of producer groups. Several

case studies of farmer groups in Africa are used to illustrate how these factors are relevant for smallholder marketing and enhance their understanding in the African context. Policy-relevant implications are drawn based on these factors as recommendations on how to catalyze effective and lasting groups of smallholder producers and strengthen the existing groups.

What matters for collective action in marketing

The NRM literature offers numerous lessons that can be applied to collective action in marketing (for review, see Agrawal, 2001; Baland and Platteau, 1996; Meinzen-Dick et al., 2002; Ostrom, 1990, 2007). In particular, this literature identifies three broad categories of factors that are important for effective formation and functioning of groups: characteristics of the resource (boundaries, size); characteristics of the user groups (shared norms, level of social capital, endowment heterogeneity); and institutional arrangements (access and management rules, enforcement mechanisms, accountability structures). The same principles may also be relevant and applicable for collective action in other areas, including smallholder marketing. Resource characteristics can be considered as the types of products and the types of markets; characteristics of user groups can be understood as the attributes of the smallholder marketing groups. The concept of institutional arrangements (such as rules and sanctions) in NRM can be applied directly to the area of marketing as various operation rules such as bylaws and membership fees. The last important element to consider is the external environment, which involves the groups' relationships with the state, market, and civil society.

Types of markets

In a situation of well-functioning rural markets, small agricultural producers in developing countries, just as their better-endowed peers, can choose to sell their products to several types of markets: local (rural), emerging urban, regional, and international.⁵ While smallholders face many barriers to entry into any of these markets, local markets are by far easier to reach than the other three. First, there are smaller logistical hurdles, such as transportation costs, quality standards, and scale issues in accessing local markets. Second, at the local level smallholders do not have to deal with competition from larger

⁵For peri-urban smallholders, informal urban markets can be generally considered as local since these are most accessible to them (as opposed to supermarkets, etc). Even though the distance to the more profitable urban outlets is reduced for these smallholders, they face the same issues (scale, quality, etc) in accessing these markets as their rural counterparts.

domestic and international farmers. Since local markets may be easier to access for smallholders, these markets offer relatively low gains from organizing since each farmer can sell individually (Markelova et al., 2009). Where collective action comes into play is in the attempts to reach larger markets, i.e., domestic urban, regional, and international, where acting collectively enables small farmers to deal with transportation and storage issues, acquire technologies and certificates to comply with required quality standards, and reach the necessary scale to supply the desired quantity of their products.

In general, “longer” marketing chains present greater disadvantages for smallholders and thus create more incentives for cooperation (Markelova et al., 2009). Urban domestic markets in many African countries are being transformed beyond the simple exchanges for immediate local consumption with the appearance of domestic and multinational chains that are in search of suppliers (Weatherspoon and Reardon, 2003). These growing urban markets, represented by supermarkets, restaurants and hotels, have a potential to offer high returns to smallholders who are “upgraded” with capacity to meet the needs of these buyers (Weatherspoon and Reardon, 2003). The requirements that these outlets have for their suppliers are beyond the capacity of individual smallholders (Schwentesius and Gómez, 2002). For example, the case of a group of potato farmers in Uganda shows how collective action enabled small potato growers to become a steady supplier to the popular Nandos restaurant chain, thus increasing their incomes and securing a stable market. In return, Nandos receives a guaranteed amount and quality of potatoes, which would not have been possible for each individual farmer (Kaganzi et al., 2009).

However, export markets present many more challenges in terms of quality control, transport, and market risks. Even by overcoming some scale and quality issues with collective action, smallholders may still be unable to compete with agribusinesses and internationally set quality and food safety standards because of high costs and complicated procedures of obtaining the necessary certificates. Despite these challenges, there are some documented examples of smallholder groups supplying export markets. Okello et al. (2007) present a case where farmer groups in Kenya, Ethiopia and Zambia cultivating green beans were able to export their crops to Europe.

An increasingly important sector of the export market is the organic market, which has been rapidly growing since the 1990s and presents opportunities for developing-country producers to participate in these markets because many of them may already be practising sustainable land management techniques without pesticides (Robins et al., 2000). However, stringent certifications are necessary in order to supply organic outlets in the developed countries, which stands as a challenge to many small farmers who are practising organic farming but cannot overcome the obstacles of costs and knowledge constraints to obtain the formal status as organic producers (Barrett et al., 2002). Since international certification and underlying inspection can be very expensive, for many small farmers organizing into groups may be one way for reducing these high costs. There are already schemes in place for the organic certification of producer groups where the group pays one fee for the certification, and all members get the certification provided that the internal monitoring system within the group functions well and all member plots are inspected each year (Soil Association, 2001). For example, TWIN trading, a UK-based company, works with several producer groups in 10 developing countries, including several countries in Africa, to help them obtain and maintain organic (and fair trade) certification for coffee, cocoa, and tea by operating the revolving funds to finance credit needs of small-scale farmers (Browne et al., 2000).

Both of the examples above show that the area where organizing of small producers into groups seems to be particularly important is accessing the quality-conscious markets, which requires investments in certifications and compliance with food-safety standards, as well as high coordination costs (Narrod et al., 2009). These markets, sometimes referred to as “high-value markets,” offer higher premiums and, thus, are more desirable. Potato-growing groups in Uganda were successful in selling their crops to a fast food chain in Kampala when they worked on improving the quality of their outputs to satisfy the company’s quality requirements (Kaganzi et al., 2009). The Kenyan green bean case also highlighted the efforts of producer groups to comply with food safety standards set by the European Union by obtaining certifications and complying with various food-safety regulations (Okello et al., 2007).

Types of products

Closely connected with the type of markets is the type of products that are best suited for collective marketing with the purpose of increasing opportunities for smallholders. Here, the links with NRM are also well pronounced. The degree of predictability, mobility and storage are important factors for the effectiveness of collective action in natural resources (Agrawal, 2001; Rasmussen and Meinzen-Dick, 1995). Similarly, the type and natural properties of a product are important for success of farmer groups and may act as an incentive or disincentive for organizing.

For the purpose of marketing, the main categories that agricultural products grown by smallholders fall into are staples, perishables and cash crops (Poulton et al., 2005). Staples, such as maize, are easy to store and transport; in addition, a good portion of such crops is usually destined for local markets for local consumption through traders or sold to government-run marketing boards that guarantee a buyer, even though usually with a low price (Alene et al., 2008; Hellin et al., 2009). Therefore, there may not be many incentives for farmers to organize around the marketing of staples. Besides, Barrett (2008) reports that a relatively small portion of smallholders in eastern and southern Africa is involved in staple food grain sales, and the transaction costs due to poor institutional arrangements and physical infrastructure are quite high in the marketing of staples (especially compared to higher-value commodities). Similar sentiment regarding high transaction costs is found in the Alene et al. (2008) account of maize farmers in Western Kenya. Even though collective action among staple producers may have advantages in terms of bulking and storage (i.e., overcoming scale issues), quality control and accessing inputs, the marginal benefits from collective (as opposed to individual) marketing may not be enough to offset transaction costs associated with organizing due to lower revenues from marketing these types of products (Berdegue, 2001; Coulter, 2007).

Therefore, in most cases, there may not be many advantages in the group marketing of staples. However, as the Uganda potato case illustrates, there is a growing urban market for staples, which can become accessible for smallholders organized into groups (thus reducing some transaction costs) and provide a steady source of income (Kaganzi et al., 2009). Interestingly, this case shows there are opportunities for smallholders to sell their staples in profitable markets, thus turning them into cash crops.

It is commonly acknowledged that it is the transaction costs associated with the marketing of a crop that enable it to demand a higher price. Typically, it is the perishable goods, such as fruits and vegetables, which become “high-value” due to the costs associated with storage and transportation. However, there are case studies where a staple crop can also get a higher price as a result of agroprocessing and quality improvements, or simply increased market demand (Gruere et al., 2009; Devaux et al., 2009). The example of maize sold through producer associations that were part of the Maize Marketing Movement in Western Kenya (Alene et al., 2008) shows how a staple crop can become a cash crop through a process of quality improvements and linkages with the industrial sector, which offers better prices than local traders or the state marketing board.

Perishables not only carry a higher risk, but require more sophisticated and costly storage and transportation facilities, thus precluding smallholders from successfully marketing them due to the lack of funds, capital and technical expertise (Markelova et al., 2009). Because of the special quality requirements and demand-supply patterns, coordination is of vital importance in the marketing of such products (Poulton and Lyne, 2009). Ashraf et al. (2008) mention that some types of perishables, such as French beans and baby corn in Kenya, even have an advantage for small farmers, since they are less capital intensive, simpler to grow, and have shorter growing periods. Moreover, the revenue potential from marketing of these crops is more likely to offset organizational costs and provides more incentives for farmers to organize (Coulter, 2007; Berdegue, 2001). Acting collectively may enable them to obtain the necessary equipment and certifications, cover transportation costs, and access technical expertise and market knowledge to market horticultural or livestock products. This advantage of collective action in marketing perishables becomes even more evident for growing local quality-conscious markets, such as supermarkets, which are willing to procure these crops from organized smallholders over individual small producers (Schwentenius and Gómez, 2002). Processing fresh produce is a way to reduce perishability and add value. This is another area where collective action allows smallholders to capture more value from high-value crops by owning processing facilities, even though such ownership may require a higher level of financial capital and technical knowledge (Bebbington, 1996; Stringfellow et al., 1997).

Livestock marketing may be another arena where smallholder groups can offer advantage over individual farming. Even though there are not many documented experiences, Kyeyamwa et al. (2008) report that small producers face particularly high transaction fees and other barriers (such as a small number of animals owned, lack of relevant market information, etc.) that reduce their incentives to participate in formal markets. In the study of several sites in the cattle corridor of Uganda these authors find that the majority of formal sales happen at the primary market level (collection sites), which renders a much smaller profit than the larger secondary and the much larger tertiary/terminal markets. They suggest that innovative institutional arrangements, such as vertical and horizontal coordination, can help reduce these barriers for small livestock producers and enable them to enter more profitable markets (Kyeyamwa et al., 2008).

The more traditional cash crops, such as coffee and cocoa, usually require processing, so smallholders often have little choice but to sell to larger farmers or agribusinesses that can afford processing equipment. However, an example of the smallholder tea associations in Malawi shows that organized smallholders can enter formal contracts with tea processors, who in addition to buying the tea crop also provide input credit, leaf collection and transportation facilities, and extension services (Chirwa and Kydd, 2009). The example of cash crop producers entering organic and fair trade markets through group certifications (Browne et al., 2000) shows that collective action can offer cash crops a potential for even greater revenue.

Types of producers and their organizations

The literature on NRM reports that there are certain characteristics, such as group size and diversity of members, which affect the success of collective action. Similarly, the literature on marketing finds that for the most part, the same factors may be important for the effectiveness of the producer groups. For example, smaller groups have higher internal cohesion because it is easier to monitor other members (Coulter, 2007; Agrawal, 2001). The cases of successful collective marketing efforts report a smaller group size, in the range of 20-40 members (Markelova et al., 2009). There is evidence that larger groups can achieve economies of scale, but at the same time this increases the cost of coordination, which can require delegating much of the decision authority to a management

body (Stringfellow et al., 1997; Bernard and Spielman, 2009; Poulton and Lyne, 2009). Besides, larger group size may lead to management inefficiencies or even rent seeking within the management structures as peer-based accountability, monitoring, and sanctioning structures may weaken (Poteete and Ostrom, 2004).⁶ Federated structures can build upon small group dynamics, but also take advantage of scale economies (Bebbington, 1996; Devaux et al., 2009).

Another important factor for producer groups is their internal composition. In the literature on collective action in NRM there is a debate on whether heterogeneity in terms of wealth, age, ethnicity, location, and gender results in better-functioning groups (Agrawal, 2001; Baland and Platteau, 1996). The same question applies to collective marketing. On the one hand, there is evidence that groups whose members are of the same socioeconomic status are more stable and effective, since homogeneity may lower coordination costs and increase compliance (Stockbridge et al., 2003; Bernard and Spielman, 2009). On the other hand, internal differentiation may allow for the natural evolution of leadership in a group (Thorpe et al., 2005), but can also lead to concentration of the wealthier members in the decision-making positions (Bernard and Spielman, 2009). Besides, the example of Ethiopian grain marketing cooperative shows that in many cases the wealthiest and the poorest do not join these groups for lack of incentives, albeit of different nature, creating the “middle class” effect in these groups. This study also shows a preference for “geographic” homogeneity: 87% of the cooperatives studied accept only members who live within the same *kebele* (administrative unit) as a means of reducing monitoring costs (Bernard and Spielman, 2009).

Shared norms and values, which often arise as a result of prior involvement in groups and networks, is another enabling factor for collective action (Agrawal, 2001; Uphoff and Wijayarathna, 2001). Marketing groups that build upon experiences of working together in the past have an advantage in terms of the trust and cohesiveness (Kruijssen et al., 2009; Place et al., 2004). For example, Ethiopian pastoralists in the Borana area have been effective in marketing their livestock not just in Ethiopia, but even to the Nairobi markets – their groups were initially formed as savings and credit associations (Desta et al., 2006). Internal

⁶See, for example, problems related to management inefficiency in the growing cooperatives in Latin America in the 1970s (Dorner, 1992).

group dynamics and connections between group members through other activities are also important. Barham and Chitemi (2009) show that in Tanzania marketing groups in which members are involved in other group activities beyond marketing are more likely to improve their marketing performance. The authors conclude that sustaining these “extra” activities necessitates the establishment of other internal institutions in the groups, which then facilitate coordination and resource mobilization for marketing.

There are cases where collective marketing efforts fail because external actors push marketing activities on groups that have not been involved in marketing before, and therefore, do not have the necessary capacity or incentives to get involved in these activities (Stringfellow et al., 1997). In their study of Ethiopian pastoralists in the Borana area, Desta et al. (2006) conclude that the pastoral groups may not have been able to take advantage of the increased marketing opportunities had it not been for complementary investments to increase their capacity related to credit, savings, small-business practices, and even basic literacy and numeracy. Finally, leadership is important for collective action in both NRM and marketing. Group leaders should be knowledgeable and skilled in collective enterprise as well as motivated and trusted by the group members (Markelova et al., 2009; Meinzen-Dick et al., 2002).

Institutional arrangements

Institutional arrangements, such as organizational structures and rules, are important for shaping the operations of farmer groups, be it in NRM or marketing. The NRM literature shows that simple and understandable rules increase compliance within organizations since they are easily monitored (Agrawal and Ostrom, 2001). Besides, such rules also reduce monitoring and coordination costs (Shiferaw et al., 2006; Poulton and Lyne, 2009). Graduated sanctions and low-cost adjudication are also important, alongside established accountability and enforcement mechanisms (Stockbridge et al., 2003). In addition, rules crafted by the group members themselves and adapted to the local context (as opposed to the rules imposed from outside of the group) have a higher likelihood of being understood and followed, which would contribute to the effectiveness and sustainability of collective marketing efforts (Agrawal, 2001; Markelova and Swallow, 2008). For example, earlier smallholder tea associations in Malawi, established in a top-down manner by the government, have not been sustainable, and many tea farmers have left and organized into their own smaller

associations (Chirwa and Kydd, 2009). The provision for the rules to be established endogenously is especially important for smallholders to identify with their organization and comply with the rules (Agrawal and Gibson, 1999).

The literature shows that the types of organization that are most appropriate for collective commercial activities range from small groups to federated structures to multiple linkages and networks along the commodity value chain (Bebbington, 1996; Devaux et al., 2009). Public-private partnerships have also been successful in linking smallholder groups with other actors in the marketing chains who enable these groups to “upgrade” their facilities, skills and production techniques. For example, groups of green bean producers in Kenya, Ethiopia, and Zambia were able to reach international markets as a result of links and collaboration with government ministries, donors, and private companies (Okello et al., 2007). Overall, the pattern that emerges from examples of various producer groups points to the need to match farmers’ skills, needs, and managerial experience with different forms of organizations.

External environment

The external environment for producer marketing groups primarily involves their relationship with the state. Interestingly, for collective action in NRM, relations with the market is another important aspect, and links to markets are often seen to reduce collective action in resource management since in the communities with less market integration, people are more interdependent (Agrawal, 2001).

For successful collective marketing, an enabling political and economic environment is crucial. Group formation and operation cannot happen in a state of hostility or macroeconomic instability as they undermine incentives for cooperation (Thorp et al., 2005; Chirwa et al., 2005). The examples of good governance that would enable collective marketing by smallholders include legal and credit systems available and favorable to the poor, which would increase livelihood options and create incentives to join with others for marketing activities (World Bank, 2001). Furthermore, reducing the bureaucratic red tape can allow groups to register and access input and service markets easier. For example, Shiferaw et al. (2008) show that producer marketing groups in Eastern Kenya were only able to register as self-help groups by Kenyan law, thus lacking the status of business enterprises, which restricts their access to financial institutions. On the other hand, Coulter (2007) reports that

African smallholders have been more successful in the marketing of horticultural products than their cohorts in India as a result of less stringent bureaucratic procedures.

Coulter (2007) shows how macroeconomic policies affect the incentives for cooperation around various types of crops. For example, trade liberalization can open opportunities for certain producers to find niche markets abroad and organize to obtain the necessary quality certifications to sell their products to larger markets yielding greater returns. On the other hand, opening up of the markets had negative effects on cooperatives in Tanzania, with the demise in marketing activity greater for the staple producer groups than for groups involved in the marketing of other crops, such as coffee (Coulter and Golob, 1992). In Malawi, farmers' clubs contributed to the intensification of maize under the parastatally controlled system of the 1970s and 1980s, but failed in the liberalized regime of the 1990s; they now focus on cotton, tobacco and other high-value crops (Chirwa et al., 2005). However, as in the case of the maize cooperatives in Uganda, market liberalization, although damaging initially, allowed these groups to "reinvent" themselves by reducing the group size, introducing accountability and clear communication flows into the internal structure, shifting the focus of activities to simultaneous marketing and intensification, and making quality improvements by engaging with the UN World Food Program. All of these changes led to the increase in revenue received by these producer organizations (Coulter, 2007).

In addition, Hazell et al. (2007) highlight that efforts to increase market access for smallholders must include the provision of the "basics" such as rural roads, education, access to water, and agricultural extension. Improving rural communication systems is cited as another important input into linking small farmers with markets (Kyeyamwa et al., 2008). Investments in these "basics" will reduce the infrastructural and informational remoteness of the smallholders in rural areas, thus giving them opportunities to market their products collectively. For example, Barham and Chitemi (2009) report that in their study sites in Tanzania farmer groups who had access to a reliable water source improved their marketing performance. Access to services, both financial and non-financial, is another important aspect of the sociopolitical context, which would enable producer cooperatives to compete in agri-food markets (Poulton et al., 2005; Hazell et al., 2007).

Policy implications: How to make collective action effective for smallholder marketing

Creating incentives for cooperation

The factors that affect the effectiveness, success and sustainability of collective action in marketing shed light on what could be done to create an environment favorable for groups of smallholders. Primarily, there is the need to create appropriate incentive structures for farmers to organize around marketing when such cooperation would bring about improvement in their livelihoods. Such incentives hinge on the marketing activity undertaken being profitable for smallholders and being "doable" by them.

An in-depth analysis of a particular commodity value chain can reveal whether groups of smallholder farmers would have an advantage over individual efforts in marketing a particular commodity. For example, while collective action is necessary for accessing profitable outlets for certain products, such as perishables, staple goods in many cases can be successfully sold by individual farmers. Similarly, local markets may not be "worth" the investment in producer groups since the price received would be the same for groups and individuals. However, organizing for the purpose of supplying an urban outlet (restaurants, hotels, supermarkets) may motivate the need for cooperation. Place et al. (2004) report that, among the 442 surveyed rural households in Central Kenya, nearly a half (46%) were strongly interested in collective action for selling milk (a perishable commodity) and 55% were interested in joint processing activities.

Once a group is formed or an existing group is chosen for marketing activities, and the commodity and markets are established, the technical and human capacity of the group to handle the task needs to be assessed. If a marketing scheme involves specialized skills and knowledge that is not available to the group, its activities may be hindered by the lack of expertise, thus nullifying the incentives for collective marketing (Stringfellow et al., 1997). Therefore, equipping groups with technical and marketing skills, as well providing management and leadership training, would strengthen them and ensure their duration (Schwentenius and Gómez, 2002). For example, the application of the participatory Enabling Rural Innovations (ERI) approach for enhancing market participation for farmers in Uganda and Malawi built their capacity to identify viable marketing opportunities for new and existing products by

matching these with community assets, which led to the development of profitable agro-enterprises through collective action (Kaaria et al., 2008).

To enable farmer groups to effectively compete in markets, certain “basics” need to be put in place. As discussed above, these conditions include improving rural infrastructure, providing extension services, making credit markets accessible to the poor, and making relevant market information available (Shiferaw et al., 2008). Since the main challenge for smallholders to engage in markets is high transaction costs, such interventions would lower the costs for farmer groups to participate in markets, creating additional incentives for them to organize around an appropriate marketing activity. In addition, making the registration process easier would facilitate the smooth formation and operation of groups in situations where formal registration is required to access inputs and services.

Furthermore, the literature on NRM reveals that cooperation itself may also carry direct and hidden costs, which may discourage some farmers from joining groups (Meinzen-Dick et al., 2002). Such costs may include the trade-offs between self-interest and collective good, membership fees, and the possibilities of free riders benefiting from the collective efforts if the goods provided through the group efforts are non-rivalrous and non-excludable (Bernard and Spielman, 2009). Even though an economic cost-benefit analysis may reveal some direct commercial “pluses” and “minuses” of cooperation, a deeper examination of the surrounding context is necessary to uncover the “hidden” barriers to group formation. Studies of collective action in natural resource management can provide further insights on this issue.

Role of outsiders in collective marketing

The literature on marketing shows that farmer organizations rarely self-organize on a formal, as opposed to informal, basis. Since a certain degree of formality is needed to supply profitable markets, such as urban outlets or international quality-conscious markets, external input is needed to facilitate an establishment of a formal farmer organization (Markelova et al., 2009). The role of a facilitator, or a chain champion, is crucial for enabling farmer groups to access profitable markets. This facilitator serves as a catalyst of collective action around marketing by providing information, technical assistance, and, in some cases, financial means as well as building managerial and entrepreneurial capacity of the group (IFAD, 2001; Chirwa et al., 2005; Kaganzi et

al., 2009; Stringfellow et al., 1997). By serving as a “development intermediary” (Bianchi, 2002), this facilitator also enables the farmers to renegotiate power relations along the value chain by introducing marketing and institutional innovations, which involves redefining roles and objectives, finding new ways to market a product, and access to sources of funding and training opportunities (Uphoff and Wijayarathna, 2000). In sum, this actor smoothes the processes by which farmer groups overcome barriers to entry, such as low technical and organizational capacity, informational asymmetries, and often even financial constraints (IFAD, 2001).

While the need for an outside facilitator of collective marketing is clear, the question of who serves in this role is less settled. This position can be assumed by the state government and its agencies, by members of civil societies (NGOs), or even by firms. The last category always causes concern as it is assumed that commercial agents always seek to maximize their profits without necessarily sharing the benefits with smallholders. For example, Ribot (1998) reports that merchants and wholesalers captured the profits from Senegal’s charcoal commodity chain. Successful public-private partnerships (see Narrod et al., 2009), as well as cases of local firms partnering with producer groups (Kaganzi et al., 2009), provide counterexamples where a commercial enterprise benefits from a strong producer group and thus acts to enhance the ability of such groups to participate in a commodity value chain.

The state, on the other hand, can play an important role in creating the enabling environment discussed above, thus enhancing the incentives for farmers to join together as well as facilitating that process. In addition, much has been written about the public-sector provision of business development services, which the private sector is unable to provide efficiently due to high transaction costs, dispersed clientele, and low profitability of such investments (Miehlbradt and McVay, 2003). Besides, the state is more likely to have a pro-poor orientation in its investments, making the support of farmer groups a part of its development agenda. However, Shepherd (2007) warns against making business development for the poor part of social policy because successful marketing often has to prioritize profits over equity or sustainability concerns. Besides, the private-sector actors prefer to deal with farmers who have demonstrated capacity for commercial production, which by default often excludes the poorest who are less likely to form groups in the

first place because of the low asset endowments (including lower stocks of social capital) or may be excluded from existing and/or successful groups, especially those formed for economic purposes (Thorp et al., 2005; Quisumbing et al., 2008).

Another important question that comes up when considering the role of the public and private sector in promoting collective marketing is the issue of financing, be it direct funding or through the credit market. Based on the evidence presented in this paper, it is clear that some type of outside funding is necessary for groups to reach a certain asset level at which they can successfully participate in profitable market exchanges, be it the costs of machinery, transportation, or certificates. In fact, Shiferaw et al. (2008) show that in the case of the producer marketing groups in Eastern Kenya, their effectiveness in marketing legumes was hampered by the lack of funds, even in the form of credit, for certain activities. Interestingly, there are examples from the region where groups were able to self-finance even their start-up costs through membership dues – the green bean groups in Kenya, Ethiopia, and Zambia finance most of their costs through entry fees and donations from members (Okello et al., 2007).

Civil society, represented by NGOs and non-profit agricultural research institutions, may be a better-suited facilitator of collective action in marketing, while not serving as the donor (Thorp, 2002; Escobal and Torrero, 2006). In addition to having a stated development agenda, these organizations also work “on the ground” and may understand the context, especially in terms of the existing social capital, that would provide the basis for marketing groups. For example, Barham and Chitemi (2009) show that producer groups in Tanzania were able to improve their marketing performance as a result of the training in marketing skills and group strengthening as well as linkages with agribusinesses provided by NGOs. However, even NGOs may not always be altruistic and disinterested facilitators. Shepherd (2007) reports that some groups may see the best chances of demonstrating short-term success as coming from working with richer farmers who already have a market orientation, similarly to the private sector. NGOs may also compete with each other to work in villages with known dynamic leaders.

Therefore, the participation of all three sectors may be necessary for a group of smallholders to effectively participate in markets. This calls for innovative institutional arrangements between state agencies, companies, NGOs, and producer groups that

would take care of various relationships along a commodity value chain and ensure the timely provision of inputs and business development services (Stringfellow et al., 1997; Weatherspoon and Reardon, 2003; Okello et al., 2007; Teoniessen et al., 2008). These arrangements should include innovative financing schemes through collaboration with lending institutions to make credit and savings options available for producer organizations (Schwentesius and Gómez, 2002).

This recommendation fits well with some established frameworks for policy processes, such as Sabatier’s Advocacy Coalition Approach (Sabatier, 1988). It highlights the importance of involving various members of the policy community and private institutions who share similar beliefs to ensure that sound policies are formed through processes of learning and collaboration. Such coalitions aim to promote their members’ interests, which can be done effectively only by engaging in policy debate with other coalitions (Sabatier, 1988; Lertzman et al., 1996). Such collaboration between various levels of relevant government agencies, interested private firms, including finance institutions, and members of the civil society (development NGOs and agricultural research organizations) may be able to create conditions for successful functioning of farmer marketing groups. These coalitions can also work to shift power relations along the marketing chains to catalyze even greater structural changes in favor of the poor.

Sustainability and equity considerations

Closely related to the issue of outside assistance is the question of how to give collective marketing a development, or pro-poor, focus. The literature shows that market development is not always going to help the poorest, since they do not have the minimum asset threshold (human, physical, and even social) needed to participate in market exchanges. However, many case studies demonstrate that collective marketing does enhance livelihood options for smallholders who may be unable to overcome barriers to entry on their own.

Considering the need for long-term orientation of pro-poor development policies and programs, sustainability of collective marketing is an important issue. Sustainability in this case involves both business (marketing) sustainability, and the sustainability of collective action, i.e., the stability and durability of the group. The former must take into account the commercial nature of market exchanges; therefore, prioritizing poverty reduction may hinder the business sustainability (Shepherd,

2007). This is where the participation of the public sector (in providing financing opportunities for the poorest, for example) may allow for the reconciliation of the market development and social development agendas. However, Coulter (2007) shows that while public-sector financing in the form of subsidies, for example, may be needed for a time, their continued presence may create perverse incentives for collective action.

Furthermore, the involvement of any type of an outside agent needs to be carefully planned and timed. While this involvement is crucial, especially in the initial stages of market development and organizing, its longevity may hamper the sustainability and long-term effectiveness of the group by creating dependency (for example, on continued financial support). The facilitating agent must carefully assess its role, capacity (both financial and human), and level of participation at the onset of the project, and design a viable exit strategy. Inability to adjust to changing marketing context and absence of a sustainable funding source could also lead to the failure of the producer group (Ashraf et al., 2008). Building and strengthening the group's capacity is a valuable building block of such strategy. However, some ongoing facilitation in the form of "repair and maintenance" support may be needed in order for the farmer groups to scale up their operations or maintain their competitiveness in the existing markets (through quality upgrades and organizational adaptations, for example) (Kaganzi et al., 2009).

Equity is another issue for pro-poor collective marketing. There is ample evidence that poorer and more disadvantaged community members tend to be excluded from participation in such groups. For example, entry and membership fees cited in several case studies indicate that the poor may be precluded from participation in the marketing groups, especially those catering to more profitable markets (Okello et al., 2007; Ashraf et al., 2008). Bernard and Spielman (2009) show that the asset endowment in form of land and livestock holdings may be a determinant to participation in grain marketing cooperatives in Ethiopia. While they also show that there are some positive spillovers from collective activities, such as increased supply of production inputs, these benefits to non-members are limited, and there is evidence that group activities can have negative consequences for non-members, such as further reduction in available credit. Desta et al. (2006) echo these findings: in their study of collective action among pastoralists in the Borana Plateau in Ethiopia, it was the groups residing near towns and

market centers (as compared to "pure" pastoralists from more remote locations) who benefited from increased marketing opportunities.

Delayed payments, a feature of some of the newer procurement chains, may also force smallholders to sell their crops at a lower price directly to local wholesalers for immediate payment rather than going through a marketing group (Hernandez et al., 2007; Shiferaw et al., 2008). Barham and Chitemi (2009) also report that in Tanzania groups dominated and led by women fared worse in their marketing activities than male-led and male-dominated groups. Thus, policies and programs aiming to enhance marketing access for the poorest need to carefully consider their targeted beneficiaries.

Conclusions: Lessons learned

Case studies of collective action in marketing show that organizing for marketing purposes can indeed enable smallholders to overcome multiple market imperfections that are pervasive in the developing world as well as deal with high transaction costs associated with marketing. The success and effectiveness of these groups depends on certain factors, such as group size and composition, types of products marketed and types of markets targeted, the external environment, and the institutional structure chosen. In most cases, facilitation by an outside agent from the private, public, or civil society sectors (or all three) is needed to catalyze both collective action and market development, and these actors may prefer to work with groups rather than individual smallholders to maximize their investments and reach a greater number of the poor.

Collective marketing may also offer some benefits that go beyond monetary gains. For example, organizing around marketing activities can increase the bargaining power of smallholders, allowing them to negotiate better terms of trade. It can promote linkages across the market chain and connect producers, processors, and buyers into networks that would be beneficial for all actors, creating valuable pro-poor coalitions. Moreover, the leverage that acting together gives smallholders may also have socio-cultural importance, if the smallholders are an ethnic minority or the products chosen for commercialization are underutilized, but culturally important species.

However, despite the advantages and benefits that collective action introduces into the marketing activities of the smallholders, this approach to development is not a "silver

bullet” applicable and replicable in all situations. The issues of creating and sustaining incentives and determining the appropriate level of outside assistance may add to the high physical costs and other collective action challenges, such as dealing with free riders, that are involved in organizing farmers around marketing. Greater attention is thus needed to assessing the costs of organizing and operating collectively, and whether these costs are borne by group members or by external programs. In addition, the distributional consequences of such activities on women and the very poor remain somewhat unclear. The possible negative effects of group marketing on non-participants (such as higher prices for inputs, limited market access, and lower prices for outputs) present another piece of evidence that collective action may not be able to make all markets work for all poor.

Lastly, when considering pro-poor market development, there is a need to be realistic about the potential benefits and benefit recipients of collective action. While collective marketing does enable smallholders to raise incomes through participating in more profitable markets, these smallholders may not represent the poorest layers of the rural communities. In fact, there is evidence that the poorest may be disadvantaged in the accumulation of not just physical and human capitals, but social capital as well (Quisumbing et al., 2008), precluding them from benefitting from collective marketing. A study of producer associations in Madagascar also found that, while group activities did raise returns from marketing, they did not facilitate entry of subsistence farmers into commercial farming (Cadot et al., 2006). Whether there are possible positive spillover effects for the poorest from collective marketing remains to be seen.

For the purpose of determining the economic and social returns of collective marketing, there is a need to examine both positive and negative spillover effects – on other producers and on consumers of such activities. Costs and spillover effects also relate to the critical issue of whether (and how) collective marketing initiatives can be scaled up to benefit large numbers of smallholders, rather than being limited to pilot projects with intensive external assistance. African governments who seem enthusiastic about the cooperatives approach to engaging smallholders in markets need to understand these costs and spillover effects when advising communities to organize around marketing.

Related to the aforementioned issues and in a way summarizing them is the question of the ultimate goal of development programs and research that work on organizing smallholders to jointly market their products. Is the main objective of these efforts to reduce poverty by making the markets work for the poor? In this case, collective action may be a phase in market development, an important means to an end of improving the welfare and broadening the scope of opportunities for millions of small farmers. For now, there is evidence that while collective marketing works for some of the poor and in certain situations, it is not a panacea for the pro-poor development agenda.

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Section 6

Encouraging Regional Trade

The impact of non-tariff barriers on maize and beef trade in East Africa*

Joseph Karugia¹, Juliet Wanjiku², Jonathan Nzuma³, Sika Gbeganbe², Eric Macharia², Stella Massawe², Ade Freeman⁴, Michael Waithaka⁵ and Simeon Kaitibie⁶

Abstract

On March 2, 2004, the East African Community (EAC) member states signed the protocol for the establishment of the East African Community Customs Union, which commits them, among others, to eliminate non-tariff barriers (NTBs) to increase intraregional trade. However, several NTBs are still applied by member states, raising concerns among policy makers and the business community. There is, however, no information about the magnitude of the impact of these NTBs. This study identifies the existing NTBs on maize and beef trade in East Africa and quantifies their impact on trade and the welfare of EAC citizens using a Spatial Equilibrium Model (SEM). Data on NTBs were collected from traders and transporters of maize and beef cattle in East Africa. In addition, the study found that the main types of NTBs within the three founding members of the EAC (Kenya, Tanzania and Uganda) are similar. They include administrative requirements (mainly licenses, municipal and council permits), taxes/duties (mainly excise and cess duty), roadblocks, customs barriers, weighbridges, licensing, corruption (e.g., through bribes) and transiting.

The results of the welfare analysis vary across the three countries, but the net monetary gains are positive in all cases. A complete abolishment or a reduction of the existing NTBs in maize and beef trade increases intra-EAC maize and beef trade flows, with Kenya importing more maize from both Uganda and Tanzania, while Uganda's beef exports to Kenya and Tanzania increase. As a result, positive net welfare gains are attained for the entire EAC maize and beef sub-sectors. In all cases, those who gain from the proposed reductions in NTBs can potentially compensate the losers, leading to potential improvements in welfare. These findings give compelling evidence in support of the elimination of NTBs within the EAC customs union.

The study recommends taking a regional approach to eliminating the existing NTBs since they are similar across the member countries and across commodities so as to exploit economies of scale. Other policy recommendations include streamlining of administrative procedures at border points to improve efficiency, and speeding up the implementation of procedures at point of origin and at the border points. Finally, the study recommends the need to design and implement monitoring systems to provide feedback to the relevant authorities on the implementation of measures to remove unnecessary barriers to trade within the EAC region.

Introduction

The East African Community (EAC)⁷, which is one of the four major regional trading blocks within eastern and southern Africa, aims at widening and deepening cooperation among its partner states in, among others, political, economic and social fields for their mutual benefit. To this extent the EAC countries established a Customs Union (East African Community Secretariat, 2004) and started applying a common external tariff (CET) in January 2005 to all non-EAC imports. Under the customs union, intra-EAC tariffs were abolished. However, Kenya – the region's largest exporter – will continue to pay duties on its goods entering the other four countries until 2010.

The creation of the EAC customs union is expected to facilitate increased trade and investment flows between member states, and at the same time create a large market for the East African people. The EAC customs union commits member states to removing barriers and obstacles to trade within East Africa. These obstacles include both tariff and non-tariff barriers (NTBs) to trade, whose removal reduces the cost of doing business within a region and ultimately improves welfare. In the EAC protocol, NTBs means "laws, regulations, administrative and technical requirements other than tariffs imposed by a partner state whose effect is to impede trade" (EAC Secretariat, 2004). As a customs union, the EAC has succeeded in abolishing intra-EAC tariffs and adopting a CET towards imports from non-EAC

¹ReSAKSS-ECA, ILRI P.O. Box 30709-00100 Nairobi, Kenya. Email: j.karugia@cgiar.org. (Corresponding Author)

²ReSAKSS-ECA, ILRI P.O. Box 30709-00100 Nairobi, Kenya.

³Department of Agricultural Economics, University of Nairobi, P.O. Box 29053-0625, Nairobi, Kenya.

⁴Independent Evaluation Group, World Bank, Washington, DC.

⁵ASARECA, P. O. Box 765, Entebbe, Uganda.

⁶CARDA, P.O. Box 5466, Aleppo, Syrian Arab Republic.

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⁷The East African Community (EAC) is a regional intergovernmental organization headquartered in Arusha, Tanzania whose membership comprises Kenya, Uganda, Tanzania, Rwanda and Burundi.

sources. However, trade between the EAC partner states is still being hampered by the existence of NTBs. Governments have continued to selectively apply various types of NTBs to protect some strategic sectors. While the EAC protocol calls for the elimination of NTBs, in practice several NTBs are still applied variously by the member states.

Trade between the three countries is carried out both through formal (regulated and recorded) and informal sectors accounting for over 95% of trade in livestock and up to 60% of trade in staple grains (Ackello-Ogutu and Echessah, 1997; Little, 2007). Policy makers and the business community have raised serious concerns about these NTBs. It is generally accepted that NTBs lead to trade distortion with concomitant losses in welfare. However, in the EAC case, the cost of these NTBs, their impacts on regional trade and their welfare impacts are not well understood.

This study examines the trade and welfare impacts of NTBs on maize and beef cattle trade within the founding EAC member states of Kenya, Uganda and Tanzania, with a view to suggesting interventions that can enhance regional trade and improve the welfare of the EAC citizens. The objectives of the study were: i) to identify the various types of NTBs applied by countries within the EAC; ii) to evaluate the cost of various types of NTBs within the EAC partner states; and iii) to quantify the trade and welfare impacts of the identified NTBs. The knowledge generated will be of interest to EAC maize and beef cattle traders, policy makers and development agencies.

Non-tariff barriers to trade in East Africa

Economists generally agree that NTBs are detrimental to regional trade. NTBs diminish the potential benefits that could be derived from the trade preferences offered through regional trading arrangements. These trade preference benefits include better access to partner country markets, increased export volumes and prices, improved economic welfare, more jobs, and more rapid economic growth. Moreover, NTBs are a serious impediment to the growth of intra-regional trade and the associated benefits.

In a recent study, the East African Business Council (EABC) sought to identify the nature and extent of NTBs applied within the EAC. The study found out that NTBs indeed existed in the general areas of business registration and licensing, customs procedures, police road checks, road axle regulations and control, and standards and certification requirements. In decreasing order

of severity, respondents from both the private and public sector ranked the major NTBs as: i) administration of duties/taxes, ii) corruption, iii) customs administration, iv) transiting checks, v) police checks, vi) immigration procedures, and vii) licensing procedures (EABC, 2005). While the EABC study highlighted the main NTBs to EAC trade, it did not quantify the trade and welfare impacts of the NTBs. This study extends the EABC study by quantifying the effects of the NTBs on regional trade for beef cattle and maize. Maize is the main staple food in Kenya and Tanzania and second to bananas in Uganda. It constitutes 14% of the agricultural exports from East Africa to the rest of the continent. Beef cattle are the main livestock tradable commodity across the EAC region.

Other studies analyzed EAC (particularly Kenya, Uganda and Tanzania) trade with other COMESA countries over the period 2001 to 2005 (Ihiga, 2007; Tumuhimbise and Ihiga, 2007; Mmasi and Ihiga, 2007). This included a detailed analysis of exports and imports, including EAC/COMESA destination countries, exports and trends, and major products traded between 2001 and 2005. Consultations were held with relevant representatives of the private and public sector. These consultations validated NTBs earlier identified and identified new ones. The analysis found that a number of NTBs affect the ability of Kenyan, Ugandan and Tanzanian businesses to export and import. The major related NTBs were reported to fall under government participation in trade and restrictive practices tolerated by governments; customs and administrative entry procedures; sanitary and phytosanitary measures (SPS); technical barriers to trade; and the time and costs involved in accessing trade-related services. The studies thus recommended the need for partner states within EAC and COMESA to consolidate and demonstrate their political and technical goodwill to implement the aspirations of the EAC and COMESA treaties. Emphasis was also placed on the need to build capacity at the coordinating ministries and business associations to enable the NTBs monitoring committee to play its role of facilitating, reporting, monitoring and eliminating NTBs. The studies also recommended the need for harmonization of regional transit traffic schemes aimed at reducing transport and trade facilitation costs in the different countries. This will ensure that transportation within the region becomes more efficient and cost-effective through harmonized transit procedures. This study extended the work by specifically addressing the barriers in the agricultural sector, mainly to beef cattle and maize trade. The current study further quantified the impact of the NTBs on welfare.

Methodology

Economic approaches for measuring impacts of NTBs

There are three main approaches used to analyze the effects of trade policies on regional trade: Computable general equilibrium (CGE) models; partial equilibrium models; and multi-market models. CGE models are multi-sector, economy-wide models that can be used to study effects of policies on income, employment and welfare. The models can be built to study dynamic economy-wide interactions and to assess the strength of linkages or impact of policies over time. CGE models provide considerable scope for understanding how changes in policy on NTBs might affect trade and investment in various market settings. However, their measures of specific NTBs are heavily aggregated and cannot capture the complexities of regulations at the sectoral level.

Partial equilibrium models provide a framework for analyzing tariff-rate equivalents of policy change on NTBs, such as standards and technical regulations and associated welfare changes. Welfare change is estimated by investigating impacts on domestic consumer and producer surplus caused by an increase in costs to comply with standards. Demand and supply elasticities are often calibrated from existing studies. At the sacrifice of generality, the partial equilibrium approach has the advantage of transparency and comprehensiveness in analyzing changes in various welfare components and in incorporating standards and regulations.

A multi-market model is a partial equilibrium model that does not explicitly model the macro side of the economy, such as the relationship between savings and investments or foreign exchange markets (Sadoulet and de Janvry, 1995). Multi-market models are policy tools that can be used to analyze a wide range of sectoral issues. To build a multi-market model, sectoral data must be compiled. This includes obtaining figures for prices (inputs, outputs), production (area, yield), production technology (conversion rates, losses, seed rates), trade volumes, taxes, transportation costs and market margins. Supply and demand parameters are then obtained through econometric estimations or from “guesstimates” based on data in literature.

Supply and demand equations in the input and output markets are set up as well as the specification of income and foreign trade. These equations can be set up to examine the spatial multi-market relationships as well. Unlike partial equilibrium models, which typically focus on the dynamics in a single sector, multi-market models measure the interactions between different markets in an economy as specified by the analyst (Goletti and Rich, 1998). Multi-market models are useful in analyzing the impact of changes in public policy at the sectoral level. These policy changes can be traced to examine their effects on production, demand, household incomes, government revenues, international trade and welfare (Rich and Lundeborg, 2002; Devadoss et al., 2005).

The Spatial Equilibrium Model (SEM) – which is a type of a multi-market model – was popularized by Takayama and Judge (1971) following the seminal work of Samuelson (1952). The SEM consists of n regions (or countries), and these regions are separated by distance, thus the name spatial equilibrium model. Trade policies and transportation costs are treated as exogenous in the model (Devadoss et al., 2005). The SEM is frequently used to determine the effects of trade policy changes on quantities, prices and welfare, and was found suitable for the current study, which analyzes the impact of NTBs on regional trade for two tradable commodities, maize and beef cattle.

The Spatial Equilibrium Model (SEM)

This study adopts the SEM used in Devadoss et al. (2005) and adjusts it to estimate the impacts of NTBs on maize and beef cross-border trade within the EAC since intra-EAC import tariffs have been abolished. The SEM provides quantitative measures of the welfare impacts of reducing NTBs, which helps to weight the benefits and costs of preferential trade liberalization. It is calibrated to the price and quantity values for the 2006 data based on elasticity estimates adopted from earlier studies undertaken in the region. Following Devadoss et al. (2005), the inverted supply and demand functions for maize and beef in Kenya, Uganda and Tanzania can be represented as follows:

$$p_i^d = a_i - b_i y_i \quad i=1,\dots,n \quad (1)$$

$$p_i^s = c_i - d_i x_i \quad i=1,\dots,n \quad (2)$$

where a , b , c and d are coefficients, and p_i^d , p_i^s , y_i and x_i are regional demand and supply prices and regional quantities demanded and supplied in i th region. The supply and demand functions are used in the calibration of SEM, which provides the welfare objective function and the market clearing conditions mathematically as follows:

$$W = \sum_{i=1}^n (a_i - b_i y_i) y_i - \sum_{i=1}^n (c_i + d_i x_i) x_i - \sum_{i,j} x_{ij} t_{ij} - \sum_{i,j} x_{ij} (\rho_j^d - \rho_i^s) + \sum_{i,j} x_{ij} \left(\rho_j^d \frac{1}{1+\delta_{ij}} - \rho_i^s \right) \quad (3)$$

Subject to:

$$\sum_{j=1}^n x_{ij} \leq x_i \quad \text{for all } i \quad (4)$$

$$\sum_{i=1}^n x_{ij} \geq y_j \quad \text{for all } j \quad (5)$$

$$c_i + d_i \geq \rho_i^s \quad \text{for all } i \quad (6)$$

$$a_i - b_i y_i \leq \rho_i^d \quad \text{for all } i \quad (7)$$

$$(1 + \delta_{ij})(\rho_i^s + t_{ij}) \geq \rho_j^d \quad \text{for all } i \text{ and } j \quad (8)$$

$$y_i, x_i, x_{ij} \geq 0 \quad \text{for all } i \text{ and } j \quad (9)$$

where x_{ij} is the quantity of beef cattle or maize transported from region i to j , t_{ij} is the unitary transportation cost from i to j , y_i is quantity demanded in country i , δ_{ij} is cost of NTBs imposed by region j on imports from region i , ρ_i^d is country demand price, and ρ_i^s is country supply price.

The SEM employs a non-linear optimization technique to maximize the net social monetary gains function (equation 3), subject to a set of linear constraints (equations 4 to 9). The net social monetary gain function is used as the objective function instead of net social welfare function since NTBs are modeled. The net social monetary gain is the sum of all the countries' total revenues, minus total production costs, minus transportation costs, minus net societal loss arising from NTBs. Equation (4) states that the total quantity of maize/beef transported from country 'i' must be lower or equal to national production in that country. Equation (5) states that the total quantity transported into a country must be greater than or equal to quantity demanded in the destination country. Equation (6) shows that the regional EAC supply price must be greater than or equal to the specific country supply price. Equation (7) is similar to equation (6) but relates to demand; it implies that regional and national demand prices must be equal if national demand is positive. If the regional demand price is lower than the national demand price, then national demand ought to be

zero. Equation (8) is a market clearing condition showing that market supply price in i plus transportation cost adjusted for NTBs must be greater than or equal to market demand price in j . The last constraint shows that demand, supply and transported quantities are non-negative.

The underlying assumption related to equations (6), (7) and (8) is that the price difference between any two countries is explained by transportation costs, comparative advantage, and NTBs. In this analysis, tariff barriers are not considered since intra-EAC tariffs were zero-rated in 2005 with the formation of the EAC customs union. However, various other forces affect market prices in the EAC, but might not be captured in the SEM presented above. For example, due to poor communication networks, traders in Tanzania or Uganda might generally be uncertain of what the price of maize/beef might be in Kenya such that the prices at which they are expecting to sell their products in Kenya might differ from that defined in the model. Similarly, some traders in Uganda, Kenya or Tanzania might sell

their maize/beef cattle at prices below or above that defined in the model because they have a lower/higher negotiating power compared to their buyers. In addition, it might be true that roads work better between Kenya and Tanzania compared to between Kenya and Uganda such that the true transportation cost per kilometer between Kenya and Tanzania might be lower than that between Kenya and Uganda.

Data collection

This study evaluates the impact of NTBs on maize and beef trade in Kenya, Uganda and Tanzania and the implications for welfare. As noted earlier, these are important agricultural commodities in East Africa and form an important source of livelihood in terms of food security, employment and government revenue.

Although there are several methods in the trade literature that can be used to quantify the cost of NTBs, each has its own suitability and limitation. Thus, a single analytical method may not be adequate to quantify the cost of the entire spectrum of NTBs (Deardorff and Stern, 1997). One approach, the price differential approach (price-wedge method), computes the cost of NTBs as the differential between the import price and the domestic price of each commodity, less the tariff rate on the commodity. This approach provides a direct measure of the price impact of NTBs. It allows for an easy computation of the implicit tariffs or implicit rates of protection. The result is treated as a non-tariff barrier. The main advantages of this method are that it is easy to estimate and it enables a quick understanding of the situation. However, the price-wedge method has several limitations. First, although the method enables the analyst to quantify the effect of a set of NTBs present in the market, it seldom makes it possible to identify what those NTBs are precisely. Second, formulas that measure the NTBs in an implicit way, as a percentage price wedge between imports and domestic prices, are valid only under the assumption that imported goods are perfect substitutes. For large-scale studies, available data are often too aggregated to reflect differences in the quality of imported goods (Beghin and Bureau, 2001).

Inventory-based approaches can be used from both a quantitative and a qualitative perspective to assess the importance of domestic regulations as trade barriers. This approach can be useful for directing attention to the frequency of occurrence and the trade or production coverage of various types of NTBs. The major limitations of this method are: i) it does

not provide a quantification of the effect of regulations on trade per se; ii) data availability is a major problem; and iii) standards vary in importance across sectors and products.

A gravity model explains bilateral trade flows by trading partners' Gross National Product and geographical distance between countries. The gravity model has been extended to include additional variables for examining the effect of trade promoting and limiting factors. That is, the gravity-based approach includes estimating a gravity equation with residual errors then considered as the effect of NTBs. It quantifies the effect of NTBs on trade flows. However, there may be factors other than NTBs responsible for residual errors.

Risk assessment approaches appear to be far removed from the measurement of NTBs. However, these methods have been coupled with cost-benefit calculations and indirectly contribute to the measurement of the effect of regulations and, therefore, of NTBs. Rather than quantifying the actual impact of this measure on trade, they provide some indication of what should be included as trade barriers based on the effect on welfare. The main advantage of this method is in its combined use of scientific and cost-benefit assessment for identifying and assessing the effects of NTBs. The main limitation of this approach is the uncertainty that surrounds the level of risks and the economic consequences.

Using stylized macroeconomic approaches, the effects of NTBs are estimated by observing the displacement of the market equilibrium induced by a regulation. It helps in assessing how much trade is forgone because of regulations, how extensively consumer preferences are affected and what the effect of harmonization of regulations versus mutual recognition agreements might be for particular nations. The major disadvantage lies in the fact that the analytical framework becomes rapidly intractable unless drastic simplifying assumptions are made.

Survey-based approaches have been used to obtain data on costs of NTBs when information from other sources is not available. This method uses surveys conducted among practitioners (e.g., exporters) to find the various types of NTBs faced during their activities. In the absence of information from other sources, survey-based methods are useful. With this method, it is possible to identify and gain perspectives about trade impediments that may be difficult for economists to measure (for example,

administrative procedures) (Beghin and Bureau, 2001). However, this approach is costly and resource-intensive. Some of the data from surveys can also be used in quantitative methods.

Given the non-availability of data on NTBs in the EAC, the survey approach was employed in this study. Primary data were obtained through a detailed field survey of maize and beef cattle traders and transporters along the trade routes across the three countries. Beef cattle and maize traders and transporters were interviewed to obtain data on the transfer costs and the various NTBs that they face while trading in maize and beef cattle in EAC countries. A cluster sampling method was used to identify 357 and 450 beef cattle and maize traders and transporters, respectively, who were interviewed using a semi-structured questionnaire. In the first stage of the cluster sampling, the major markets located along the main trade routes and the major border points in Kenya, Uganda and Tanzania were selected. The second stage of the cluster sampling selected a total of 807 beef cattle and maize traders and transporters in the selected markets along the major trade routes. In addition, secondary data sources were used to provide data used for the other variables required by the SEM analysis outlined above. Although primary data were collected on beef cattle, these were converted to beef in kilograms for the purpose of the SEM analysis.

Results

Characteristics of trade

Within the maize sector, traders and transporters in the three EAC countries mainly engage in local purchase and sale and this constitutes more than 80% of their trade volumes. In contrast, maize imports and exports in EAC account for less than 10% of total volumes handled by traders and transporters. Regional trade is therefore much lower relative to domestic trade in maize. A similar trade pattern is observed in the beef cattle subsector where local trade accounts for over 80% of all trade while regional trade accounts for less than 5% of total beef cattle trade. The low trade volumes in these key food commodities, coupled with simultaneous existence of food deficits and surpluses in the region, undermine food security in EAC (Karugia et al., 2008). Domestic food prices are to a large extent determined by local and regional demand and supply conditions. Maize is a strategic food crop in the EA region and there is need to promote intra-regional trade for increased food security. Similar results have been reported for the COMESA region where

total trade in maize was worth US\$ 1.35 billion in 2002 and US\$ 0.8 billion in 2003. However, less than 10% of this trade has been intra-regional. These findings should be interpreted with caution since the region also experiences high informal trade in both maize and beef cattle (RATES, 2003). Typically, maize crosses the EAC borders informally in small quantities that are transported by bicycles and by trekking. On the other hand, informal beef cattle trade is made possible by the possibility of moving cattle on foot across EAC border points.

Over 70% of maize and beef cattle traders in the three EAC countries used vehicles to transport their merchandise. Use of lorries, trailers or trucks was the preferred mode of transportation for maize and beef cattle within the EAC. Among the motorized transportation methods, the lorry was the most preferred means of transport across the EAC countries. The other means of transport, such as bicycle, cart and ship, were used infrequently. However, another common mode of transport used by the beef cattle traders was trekking to the market place.

All traders and transporters of beef cattle and maize traveled on average over 150 km per trip within the EAC region from origin to destination. It is important to note that both origin and destination points were within the three EAC countries. On average, the amount of time taken per trip across the three countries was up to two days. The greatest distances per trip were reported in Tanzania, where maize and beef cattle traders and transporters covered an average of 278 and 341 kilometers, respectively. This is expected since Tanzania is a vast country relative to Kenya and Uganda. Tanzania's vastness offers a high potential trade base and the highly dispersed markets in the country are an avenue that traders should seek to exploit. In addition, traders and transporters of beef cattle and maize in Tanzania transported the highest quantities among all three countries in the EAC region in both inter- and intra-regional trade. Tanzania traders and transporters on average transported 34 beef cattle and 21 tons of maize per trip. In Kenya, the corresponding figures were 17 beef cattle and 13 tons of maize per trip, and Uganda traders and transporters transported on average 20 beef cattle and 16 tons of maize per trip.

Table 1: Main markets in EA and transfer cost with and without NTBs

Maize	With NTBs			Without NTB	
	Distance in km	Transfer cost per km/maize ton in US \$	Total transfer cost US\$	Transfer cost per km/maize ton in US \$	Total transfer cost US\$
Nairobi-Namanga	170	0.46	78	0.37	63
Nairobi-Busia	500	0.46	230	0.37	185
Busia – Kampala	250	0.44	110	0.29	73
Dar es Salaam – Namanga	772	0.35	270	0.24	185
Beef	With NTBs			Without NTB	
	Distance in km	Transfer cost per km/ beef ton in US \$	Total cost US\$	Transfer cost per km/beef ton in US\$	Total transfer cost US\$
Nairobi-Namanga	170	0.34	57.8	0.17	28.9
Nairobi-Busia	500	0.34	170	0.17	85
Busia - Kampala	250	0.40	100	0.09	22.5
Dar es Salaam – Namanga	772	0.43	331.96	0.20	154.4

Source: Survey results, 2007-08

Transfer cost of maize and beef cattle per kilometer was estimated by the summation of all costs incurred as the traders and transporters moved from trade point of origin to destination. These costs were further split into two groups: non-NTB transfer costs (costs that are not considered NTBs, such as vehicle hire and maintenance, loading and off-loading and transporters' allowances) and NTB transfer costs (weighbridges, security, transiting, custom clearance, road toll stations, branding of cattle, standards and certification, and bribes). A variable was classified as an NTB cost if it acted as an impediment to trade in terms of increasing transfer costs and/or increased the time required for trade over the normal amount of time needed. This extra cost was reflected through bribes and extra time through queues experienced by traders as they acquired various trade services. Table 1 shows transfer costs and the various trade routes using main towns in the region.

Types of non-tariff barriers to maize and beef trade in EAC

The main NTBs are similar in the three EAC countries covered in the study. They include administrative requirements (mainly licenses, municipal and council permits), taxes/duties (mainly excise and cess duty), roadblocks, customs barriers,

weighbridges, licensing, corruption (e.g., through bribes) and transiting. In addition, security constitutes a main administrative requirement in Tanzania. Various licenses are also required. These include a business license, road transport license and a livestock clearance certificate. Roughly a third of the respondents in the three countries indicated that business licenses were a mandatory administrative requirement for trade in both maize and beef cattle.

Roadblocks were identified as a barrier to trade in the region. Kenya has the highest total number of roadblocks impeding free trade in the EAC (Table 2). Kimenyi (2008) reported that, on average, there were 47 roadblocks on the road from Mombasa to Busia (a distance of 1,050 km). The Kenyan government has indicated that it intends to reduce the roadblocks from 47 to 15 (a reduction of 68%) to encourage inter-regional trade. Roadblocks were reported to be time wasting, too many in number, staffed by unfriendly police officers and were an avenue for corruption (bribery).

Table 2: Average number of roadblocks and respective distances

Category	Number of road blocks			Average distance in kilometers		
	Kenya	Tanzania	Uganda	Kenya	Tanzania	Uganda
Beef cattle	12	7	5	198	341	236
Maize	10	5	14	190	278	190

Source: Survey results, 2008

Bribes are paid by traders at various levels of the trade transactions in the EA region. Table 3 shows that over half of traders and transporters gave bribes in order to overcome various trade barriers.

The number of weighbridges that traders and transporters were subjected to in Kenya, Uganda and Tanzania was low (5 in Uganda for both beef cattle and maize traders, 3 in Tanzania for both traders of beef cattle and maize while 2 for maize traders

in Kenya and none for beef cattle traders in Kenya). Overall, the majority of traders in the three countries do not regard weighbridges as serious obstacles to trade.

Traders and transporters of both maize and beef cattle encountered long queues at customs offices. The longest time spent in queues per trip was approximately 7 hours in Uganda by maize traders. In Kenya beef cattle and maize traders spent on average 3 hours at customs offices, while in Tanzania traders

Table 3: Number of respondents who gave any form of bribe as they traded

Category	Kenya		Tanzania		Uganda	
	No.	Percent	No.	Percent	No.	Percent
Beef cattle traders	29	62	68	96	40	61
Beef cattle transporters	29	64	107	98	10	53
Maize traders	35	51	81	94	21	33
Maize transporters	44	83	145	99	25	76

Source: Survey results, 2008

Table 4: NTBs as a percentage of total transfer costs

NTB description	Maize			Beef cattle		
	Kenya	Tanzania	Uganda	Kenya	Tanzania	Uganda
Weighbridges	2.41	0.97	4.25	0	0.1	0
Security	0.45	0.73	0.26	0.26	6.69	1.48
Transiting	0.49	0	33.87	0.49	0	9.47
Municipal permits	3.61	2.39	2.21	4.2	3.69	3.18
Council permits	3.74	4.31	1.79	4.24	4.69	3.15
Licenses	2.75	0.37	4.46	1.74	0.17	5.93
Customs clearance	12.83	0.75	2.75	0.62	0.05	2.98
Immigration	0	0.13	0.31	0	0	2.35
Standards and certification	4.92	0.41	2.63	8.53	1.14	3.89
Road toll stations	1.42	0.35	0.63	0	0.34	2.89
Bribes	1.94	1.27	1.41	7.43	1.47	3.17
Branding of cattle	0	0	0	0.63	0.36	1.08
Transfer costs taken up by NTBs (%)	34.56	11.68	54.57	28.14	18.7	39.57

Source: Survey results, 2008

spent less than one hour at the customs offices per trip. These long queues were reported to be caused by inadequate staff at customs offices, discrimination by customs officials, and failure by customs officials to clarify the rules and regulations of trade. The inspection process at customs points required unnecessary unloading of commodities.

NTBs as a percentage of transfer costs

Nearly 35% of total maize transfer cost is contributed by various NTBs in Kenya from origin to destination (Table 4). In Uganda, the cost rises to over 50% and only 12% of total maize transfer cost in Tanzania was taken up by NTBs. In beef cattle trade, Kenya and Uganda reported that NTBs constitute over 25% of total transfer cost while Tanzania reported approximately 19% of total transfer cost. Reduction or elimination of NTBs will reduce the high transfer cost in the region. Table 4 illustrates the scenario.

Welfare impacts

The impacts of NTBs on cross-border trade and welfare were computed using a static SEM. The General Algebraic Modeling Systems (GAMS) package was used to solve the equations in the model. Estimates were compiled for the quantities of maize and beef supplied and consumed in the three EAC countries, their corresponding prices and their supply and demand elasticities. In addition, data were collected on the cost of NTBs and transport costs. The own-price elasticities of supply for maize in Kenya, Uganda and Tanzania were set at 2.17, 0.8 and 1.96, respectively. These supply responses were adopted from earlier studies⁹. On the other hand, supply response for beef in the three EAC countries was set at 0.35⁹.

On the consumption side, aggregate demand for maize and beef depends on own prices and income. The own-price elasticity of demand for maize was set at - 0.80, - 0.77 and - 0.9 for Kenya, Uganda and Tanzania, respectively¹⁰. On the other hand, the own-price elasticities for beef in Kenya, Uganda and Tanzania were set at - 1.68, - 1.01 and - 1.18, respectively. These parameters were used to calibrate the SEM to reproduce the 2006 base scenario when NTBs were the major barriers to trade in the EAC.

Three policy scenarios are simulated to quantify the impacts of NTBs within the EAC. These comprise a 50% reduction in all

NTBs, a complete abolishment of all NTBs, and the elimination of specific types of NTB, such as roadblocks. To solve the model, estimates were compiled for the quantities of maize and beef supplied and consumed in the three EAC countries, their corresponding prices and their price elasticities. In addition, the cost of NTBs and transport costs were used in the SEM. The variables of interest in the quantification of the impacts of NTBs on cross-border trade are maize and beef prices, demand, supply, trade flows and welfare changes (consumer and producer surplus). The base scenario replicates the existing trade patterns where the three EAC countries trade in both maize and beef. Since maize retail prices are higher in Kenya than in Uganda and Tanzania, Kenya formally imports maize from both Uganda and Tanzania to the tune of 134,000 and 86,000 tons, respectively. Uganda exports beef to both Kenya and Tanzania since beef retail prices are lower in Uganda than in both the other countries. The base scenario produces positive welfare impacts for the maize and beef subsectors in the three countries. Overall, the combined social surplus for the maize and beef subsectors in Kenya, Uganda and Tanzania amounted to US\$ 2.3 billion, US\$ 0.8 billion and US\$ 1.8 billion, respectively.

Impact of a complete elimination of NTBs

When NTBs within the EAC are completely abolished, various changes relative to the base scenario are observed. Maize producer and consumer prices in Kenya fall by about 9% and 3%, respectively, but increase by 20% and 24%, respectively, in Uganda (Table 5). In Tanzania producer and consumer prices fall by 35% and 5%, respectively. The declining maize prices in Kenya result in a 4% rise in maize consumption, but cause a 6% decline in maize production. Maize consumption declines in Uganda by 2%, while production increases by 3%. In Tanzania, maize production declines by 5% while consumption increases by about 2%. The changes in prices and quantities occasion changes in intra-EAC maize trade. Consequently, Uganda's exports to Kenya rise by about 99% relative to the base scenario, while Tanzania's maize exports to Kenya increase by 33%. While percentage changes in intra-EAC maize exports appear substantial, the changes in export volumes are quite small since the model only takes note of the formal maize trade.

⁹In particular, the elasticity of supply for maize in Kenya is adopted from Nzuma (2007), while those for Uganda and Tanzania are derived from Delgado et al. (2003) and Wood and You (2001).

¹⁰The beef supply response used in this study was adopted from the IMPACT study by IFPRI.

¹¹The demand elasticities for maize and beef in Kenya are adopted from Musyoka (2008), while those for Tanzania are derived from Weliwita et al. (2003) and the Ugandan estimates are derived from IFPRI. It should be noted that the estimation of all the demand elasticities satisfy the demand theory restrictions.

Table 5. Impacts of a complete elimination of NTBs

Variable Description	Complete elimination of NTBs		
	Kenya	Uganda	Tanzania
Maize			
Producer Price (US\$/MT)	-14 (-8.86)	26 (19.55)	-55 (-34.59)
Consumer Price (US\$/MT)	-6 (-2.96)	35 (24.31)	-8 (-4.79)
Quantity Demanded ('000 MT)	55 (3.61)	-14 (-2.34)	21 (1.56)
Quantity Supplied ('000 MT)	-145 (-6.49)	16 (3.25)	-179 (-4.69)
Quantity Traded ('000 MT)			
Kenya	-118 (-3.69)	0 (0)	0 (0)
Uganda	133 (99.25)	-59 (-5.4)	0 (0)
Tanzania	29 (33.72)	0 (0)	-10 (-0.27)
Consumer Surplus (US\$ Million)	12 (7.43)	-14 (-4.69)	1 (0.6)
Producer Surplus (US\$ Million)	-11 (-2.77)	16 (12.31)	-2 (-0.64)
Social Surplus (US\$ Million)	1 (4.66)	2 (7.62)	-1 (-0.04)
Beef			
Producer Price (US\$/MT)	-939 (-15.51)	454 (34.92)	-829 (-14.95)
Consumer Price (US\$/MT)	-1047 (-15.22)	528 (38.82)	-914 (-15.41)
Quantity Demanded ('000 MT)	294 (19.3)	-43 (-35.54)	155 (16.36)
Quantity Supplied ('000 MT)	-121 (-19.66)	43 (12.65)	-81 (-16.88)
Quantity Traded ('000 MT)			
Kenya	1 (0.19)	0 (0)	0 (0)
Uganda	2 (9.70)	-3 (-1.8)	5 (19.23)
Tanzania	1 (1.50)	0 (0)	-2 (-0.5)
Consumer Surplus (US\$ Million)	3 (1.51)	-5 (-3.36)	9 (1.65)
Producer Surplus (US\$ Million)	-2 (-0.18)	9 (6.46)	-7 (-0.84)
Social Surplus (US\$ Million)	1 (1.33)	4 (3.10)	2 (0.81)
Total Surplus (US\$ Million)	2 (0.09)	6 (0.56)	1 (0.11)

Note: The values represent differences from the base scenario; figures in parentheses are percentage changes and total surplus is the summation of consumer and producer surplus for both maize and beef; MT = metric ton.

Source: Authors' SEM Analysis, 2008.

The welfare changes emanating from a complete abolishment of NTBs in the maize trade within EAC vary across the three countries. In Kenya, consumer surplus increases by 7%, while producer surplus falls by 3% (Table 5). In contrast, consumer surplus in Uganda falls by 5%, while producer surplus increases by 12%. In Tanzania, producer surplus falls by 0.6% while consumer surplus increases marginally 0.6%. The net welfare effect within the maize subsectors in Kenya and Uganda is an increase in social surplus by 5% and 8%, respectively, while the social surplus in Tanzania declines by a percentage point (Table 5).

Within the maize subsector, the greatest gainers from a complete abolishment of NTBs would be maize producers in Uganda while the greatest losers from this policy change would be maize producers in Kenya. Ugandan maize producers benefit from the increasing domestic maize prices and expand their exports to Kenya. In contrast, Kenya's maize producers are hurt by declining maize prices and as a result cut back on production. However, maize consumers in Kenya and Tanzania benefit from a complete abolishment of NTBs, while their counterparts in Uganda are hurt by this policy change. Overall, the gainers from a complete elimination of NTBs within the EAC maize subsector can potentially compensate the losers and thus, the policy can be recommended based on the compensation principle.

Within the beef subsector, a complete elimination of NTBs yields a 15% decline in beef producer prices in both Kenya and Tanzania but leads to a 35% increase in Ugandan beef producer prices relative to the base scenario (Table 5). Similarly, beef retail prices in both Kenya and Tanzania decline by more than 15%, but increase by 39% in Uganda. Subsequently, beef consumption in Kenya and Tanzania increases by 19% and 15%, respectively, while it falls by 35% in Uganda (Table 5). In contrast, beef production in Kenya and Tanzania falls by 20% and 17%, respectively, while beef production increases by 13% in Uganda. As a result, Uganda expands its beef exports to Kenya and

Tanzania by 10% and 19%, respectively, while Tanzanian beef exports to Kenya rise by about 2%.

The changes in beef prices and volumes occasion changes in welfare measures. As a result, consumer surplus in both Kenya and Tanzania increase by 2% and falls by 3% in Uganda (Table 5). However, producer surplus within the beef subsectors in Kenya and Tanzania fall by less than 1%, while in Uganda producer surplus for beef producers increases by 6% relative to the base scenario. The net welfare gain within the beef subsectors of the three countries is a 3% increase in social surplus in Uganda and

Table 6. Welfare impacts of reducing the existing NTBs by half

Variable Description	50% reduction in existing NTBs		
	Kenya	Uganda	Tanzania
Maize			
Producer Price (US\$/MT)	-7 (-4.43)	11 (8.27)	-9 (-5.66)
Consumer Price (US\$/MT)	-4 (-1.97)	29 (20.14)	-7 (-4.19)
Quantity Demanded ('000 MT)	33 (2.97)	16 (1.53)	16 (1.42)
Quantity Supplied ('000 MT)	-85 (-2.63)	370 (2.79)	-34 (-1.89)
Quantity Traded ('000 MT)			
Kenya	0 (0)	0 (0)	0 (0)
Uganda	67 (25)	-29 (-2.65)	0 (0)
Tanzania	15 (17.44)	0 (0)	-5 (-0.13)
Consumer Surplus (US\$ Million)	7 (3.39)	-7 (-4.34)	1 (0.3)
Producer Surplus (US\$ Million)	-6 (-2.05)	8 (6.15)	-2 (-0.64)
Social Surplus (US\$ Million)	1 (1.34)	1 (1.84)	-1 (-0.34)
Beef			
Producer Price (US\$/MT)	-659 (-5.45)	384 (19.54)	-749 (-8.32)
Consumer Price (US\$/MT)	-1048 (-7.27)	538 (19.56)	-904 (-9.86)
Quantity Demanded ('000 MT)	295 (9.61)	-45 (-17.19)	154 (6)
Quantity Supplied ('000 MT)	-121 (-9.06)	43 (7.65)	-79 (-6.46)
Quantity Traded ('000 MT)			
Kenya	0 (0)	0 (0)	0 (0)
Uganda	1 (4)	-1 (-0.6)	2 (7.69)
Tanzania	0 (0)	0 (0)	0 (0)
Consumer Surplus (US\$ Million)	1 (0.15)	-3 (-2.01)	4 (0.82)
Producer Surplus (US\$ Million)	-0.5 (-0.09)	3 (3.63)	-4 (-0.48)
Social Surplus (US\$ Million)	0.5 (0.14)	3 (1.62)	1 (0.34)
Total Surplus (US\$ Million)	1 (0.04)	2 (0.23)	0 (0.06)

Note: The values represent differences from the base scenario, figures in parentheses are percentage changes from the base scenario and total surplus is the summation of consumer and producer surplus for both maize and beef; MT = metric ton.

Source: Authors' SEM Analysis, 2008.

1% increases in social surplus in both Kenya and Tanzania. Thus, social surplus in the three countries increases by an aggregate 4%. Once again, beef producers in Uganda would gain most from a complete removal of NTBs within the EAC while beef producers in Tanzania would be the greatest losers from this policy change. As observed in the maize subsector, the gainers from a complete removal of NTBs within the EAC beef subsector can potentially compensate the losers. Thus, a complete elimination of beef trade NTBs leads to a potential improvement in welfare and should be advocated as an appropriate policy.

Impact of a 50% reduction in NTBs

The impacts of a 50% reduction in NTBs within the EAC closely track those of a complete elimination of NTBs, but are much more dampened. When the NTB rates within the EAC are reduced by half, maize producer and consumer prices in Kenya fall by about 4% and 2%, respectively, increase by 8% and 20%, respectively, in Uganda and fall by 6% and 4%, respectively, in Tanzania. Table 6 illustrates this scenario. The fall in price benefits Kenyan maize consumers, who gain US\$ 7 million while producers lose US\$ 6 million. This results in a rise in maize consumption in Kenya, but leads to a decline in domestic maize production. Price increases in Uganda lead to consumers losing US\$ 7 million while producers gain US\$ 8 million. In Tanzania, consumers gain US\$ 1 million while producers lose US\$ 2 million. On the other hand, Uganda's maize production increases by about 3% or 370,000 tons, while maize production in Tanzania increases by 34,000 tons (2%) but declines in Kenya by 3% (85,000 tons). These changes are accompanied by changes in the trade pattern. Uganda's maize exports to Kenya increase by 67,000 tons and by 15,000 tons from Tanzania. Ugandan and Tanzanian producers benefit from the increased production, but no similar gains accrue to Kenyan producers who lose 2%. As a result, social welfare in the maize subsector increases in Kenya and Uganda but declines marginally in Tanzania. Overall, total benefit in the maize subsector increases by 1% (US\$ 1 million) in Kenya, by 2% (US\$1 million) in Uganda, but declines by 0.3% in Tanzania.

Within the beef subsector, the reduction of NTBs by half results in a 5% and 8% fall in beef producer prices in Kenya and Tanzania, respectively, but leads to a 20% increase in beef prices in Uganda (Table 6). The increased beef prices in Uganda lead to an 8% (43,000 tons) rise in beef production in Uganda, while

production in Kenya and Tanzania declines by 9% (121,000 tons) and 6% (79,000 tons), respectively, from the base scenario. On the other hand, beef retail prices fall in Kenya and Tanzania by 7% and 10%, respectively, while they increase by 20% in Uganda. As a result, beef consumption in Kenya and Tanzania increases by 10% (295,000 tons) and 6% (154,000 tons), respectively, while Uganda's beef consumption declines by 17% (45,000 tons). In addition, Uganda's beef exports to Kenya and Tanzania increase by 4% (1,000 tons) and 8% (2,000 tons), respectively.

The effect of this is that the consumer surplus for beef in both Kenya and Tanzania increases by about 0.2% and 0.8%, respectively, from the base scenario, while consumer surplus falls by about 2% in Uganda (Table 6). In contrast, beef producer surplus falls by about 0.1% and 0.5% from the base scenario in Kenya and Tanzania, respectively, while it increases by about 4% in Uganda. Thus, beef producers in Uganda would gain the most from a 50% reduction in beef NTBs within the EAC while beef consumers in Uganda would be the greatest losers from this policy change.

In addition, the welfare effects of separately eliminating individual types of NTBs such as roadblocks, permits and customs clearance were also analyzed but the results¹¹ are not presented. The welfare impacts of eliminating specific NTBs were positive but marginal. However, the welfare impacts give compelling evidence in support of eliminating NTBs. The foregoing analysis seems to suggest that a complete abolishment or a reduction of the existing NTBs in maize and beef trade increases intra-EAC maize and beef trade flows as Kenya imports more maize from both Uganda and Tanzania and Uganda exports more beef to Kenya and Tanzania. As a result, positive net welfare gains are attained for the entire EAC maize and beef subsectors. In both cases, the gainers from the proposed reductions in NTB can potentially compensate the losers. These findings give compelling evidence in support of eliminating NTBs within the EAC customs union.

Conclusions and policy implications

The main purpose of this study was to assess the impact of NTBs on maize and beef cattle cross-border trade in the East African Community with a view to suggesting areas of reform in order to enhance regional trade. The main NTBs are corruption through

¹¹Results are available from the authors on request.

various bribes, roadblocks, custom procedures, and harassment or discrimination during licensing and obtaining permits. There are also numerous administrative requirements while trading in maize and beef cattle in EA (at least 10). Licenses and municipal and council permits are required across all three countries. Most NTBs are difficult to quantify and it can also be difficult to get raw data (e.g., for bribes).

The SEM results show that complete removal of all NTBs brings positive welfare change in East Africa. Reduction or removal of individual NTBs brings very minimal welfare changes, so a comprehensive approach to addressing the barriers is warranted. In particular, the effects of eliminating three types of NTBs – mainly roadblocks, permits and customs clearances – reported positive but marginal welfare impacts (less than 0.5% change). The impact of NTBs on social welfare stresses the importance of eliminating or reducing the NTBs in order to gain trade benefits in the region. The specific policy recommendations that can be drawn from this study include:

- Member countries should streamline administrative procedures at border points to improve efficiency by harmonizing trade regulations.
- Member countries should speed up implementation of procedures at points of origin and at border points.
- There is need to consider ways to minimize time lost at checkpoints, such as roadblocks and weighbridges.
- EAC countries should take a regional approach to removing NTBs, since they are similar across the member countries and across commodities, so as to exploit economies of scale.
- EAC countries should design and implement efficient monitoring systems to provide feedback to the relevant authorities on the implementation of measures to remove unnecessary barriers to trade in the region. This can be done by establishing a system of gathering information on NTBs, including private-sector and government participation in verification and monitoring. This will ensure that the measures implemented will be sustainable. Monitoring bodies should comprise stakeholders from government and the private sector, and small-scale traders should also be represented to ensure beneficial impacts for all levels of traders.

- There is need to greatly improve the road network to reduce high transportation costs.

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Developing agricultural commodity markets for improved regional trade in Africa

D. Olu Ajakaiye¹ and Ade S. Olomola²

Abstract

Over the years, the balance of agricultural trade has been largely against Africa, as many countries remain net food importers. In general, agricultural export performance is poor and intra-regional trade in particular is grossly limited, reflecting continued reliance on export of primary commodities and bottlenecks in the marketing systems at national and sub-regional levels. In Africa, the food and agricultural markets are extremely fragmented along sub-regional, national and even sub-national levels, resulting in segmented markets of sub-optimal size, which does not ensure profitability of sizeable private investment in the different stages of the commodity chain. This paper therefore, seeks to i) identify the constraints on agricultural marketing in Africa, ii) examine the rationale and opportunities for developing African agricultural commodity markets, and iii) determine effective approaches to market development and regional trade.

The identified constraints on agricultural markets include infrastructural inadequacies, limited investment in marketing activities and weak links in commodity chains. At sub-regional level constraints include lack of marketing information, un-harmonized customs procedures, technical barriers to trade, poor certification mechanisms, poor storage and processing facilities, poor road infrastructure, poor packaging, low production levels, weak private marketing institutions, and weak regulatory frameworks. Nonetheless, the paper argues that the demand for African agricultural products cannot be assigned for markets outside of Africa. For improved regional trade, there is need to overcome the constraints in the agricultural marketing system at the national and sub-regional levels. Key approaches include i) reduction in transactions costs, ii) promotion of market access for small-scale farmers, iii) price and income stabilization, iv) promotion of efficiency of African agricultural, commodity markets, and v) removal of intra-African technical barriers to trade.

The paper concludes that agricultural markets should be integrated not only at the national level but also at the sub-regional level, leading ultimately to an African Common Agricultural Market that will serve as an important forerunner for a continental common market for all goods and services. It should increase efficiency by reducing transaction costs and stimulate further development of the marketing system at the national level as each country strives to comply with the rules and maximize the opportunities offered by an expanded market.

Introduction

Agriculture remains the foundation of most African economies and African peoples' livelihoods. About 70% of Africans and roughly 80% of the continent's poor live in rural areas and depend mainly on agriculture for their livelihood. The sector accounts for about 20% of Africa's GDP (UNECA, 2004), 60% of its labor force and 20% of total merchandise exports (AU-NEPAD, 2003). Agriculture is the main source of income for 90% of the rural population in Africa (UNECA, 2005). Agricultural productivity levels in Africa, in terms of both land and labor productivity, still lag far behind other developing regions. Total Factor Productivity grew at an annual rate of 1.3% on average during the 1990s, accounting for approximately 40% of the 3.1% annual growth in agricultural output. Growth in the traditional inputs of land, labor, and livestock accounted for the other 60% of agricultural output growth. The average annual growth in cereal yield in 1980-2000 has been low in Sub-Saharan Africa (0.7%) compared to Asia (2.3%), Latin America (1.9%) and the Middle East and North Africa (1.2%) (AU-NEPAD, 2006). On the basis of value added per worker, which is another measure of productivity that is crucial for increased competitiveness of African agriculture in the global market, Africa's performance is also low compared to other regions of the world. As shown in Table 1, value added per worker has been the world's lowest. By 2004, world agricultural productivity (US\$ 919/worker) averaged three times that of Sub-Saharan Africa (US\$ 344/worker) while in Latin America agriculture is nearly 10 times more productive at US\$ 3,183. Such low levels of productivity constitute an impediment to poverty reduction in Africa. However, within Africa, there are large variations between different countries' average levels

¹Director of Research, African Economic Research Consortium (AERC), Nairobi, Kenya

²Director, Agriculture & Rural Development Department, Nigerian Institute of Social and Economic Research (NISER), Ibadan, Nigeria. Corresponding author (as_olomola@yahoo.com).

Table 1. Comparison of agricultural productivity, by region (US\$/worker)

Region	1990	2000	2001	2002	2003	2004
East Asia & Pacific	295.8	389.7	400.1	411.2	424.5	446.1
Europe & Central Asia	1922.1	1767.5	1880.0	1957.7	2000.5	2173.9
Latin America & Caribbean	2177.9	2725.1	2829.3	2906.7	3036.4	3183.7
Middle East & North Africa	1525.9	1761.2	1833.0	1909.7	2014.2	2049.5
South Asia	339.4	389.3	401.9	375.6	401.6	399.5
Sub-Saharan Africa	317.2	331.1	339.5	342.1	329.2	343.9
World	748.6	863.9	867.3	868.3	889.8	918.9

Source: World Development Indicators 2007, World Bank

of productivity. Countries such as Tanzania, Mozambique, the Congo Republic, Guinea, Mali, Burkina Faso, Central African Republic and Rwanda have shown sustained growth over the past years. Others, such as Burundi, the Democratic Republic of the Congo, Madagascar, Mauritania, Swaziland, Lesotho, Senegal, Seychelles and Zimbabwe, have suffered significant decreases in agricultural productivity (Table 2).

There is need for agricultural value chains in Africa to become more productive and competitive in the global market. Agricultural goods need to achieve greater value within Africa, as well. Increases in competitiveness can assist those dependent on agriculture and agri-business in increasing their incomes and wealth. And this is imperative in view of the fact that in various sub-regions of Africa, many countries remain largely dependent on agricultural commodities, as evidenced by key trade indicators between 1995 and 2000. The major export commodities are cocoa, coffee, cotton, tobacco, tea, sugar, cashew nut, livestock and fish (Table 3). In West Africa, the share of agriculture in total export earnings stood at 79.7% in Guinea Bissau, followed by Burkina Faso (69%), Chad (60.2%), and Côte d'Ivoire (55%) between 2001 and 2003. The ratio of agricultural exports to agricultural GDP is exceptionally high in the case of Côte d'Ivoire (89.5%), which is the largest producer of cocoa in the world (Table 4). In Central Africa, Sao Tome and Principe appears to be the only country where agricultural exports are significant in relation to agricultural GDP and in terms of its contribution to total export earnings (Table 5). In East Africa, the share of agricultural exports in total export earnings is well over 50% in Burundi, Tanzania, Somalia, Ethiopia and Djibouti, while it is only in Kenya that the ratio of agricultural exports to agricultural GDP is more than 50% (Table 6). In Southern Africa, Malawi is the most dependent on agricultural commodities, with its agricultural exports having a massive share of total

exports (about 95%) in the same period. Relative to agricultural GDP, agricultural exports are significant in Botswana, Mauritius, Malawi, Namibia, South Africa and Swaziland (Table 7).

After decades of decline of per capita food production, there is now growing optimism about the prospects for Africa and for African agriculture. Sub-Saharan Africa has been experiencing a remarkable recovery over the last 10 years. As a result, the continent has witnessed the longest period of sustained positive per capita income growth since the 1960s, in particular with high and increasing per capita income growth rates. Moreover, there has been a steady increase in the level of per capita food production over the same period. The recovery process that started in the late 1990s has accelerated over the last decade and has now reached average growth rates of 6% per year for GDP and 4-5% for agriculture. Another encouraging development is the fact that the economic and agricultural growth recovery is not just accelerating, but is also spreading to more countries – the number of countries with higher growth rates has gone up considerably over the last five years (AU, 2008).

The global recession, ravaging food crisis, volatility of the oil market, and rising unemployment pose tremendous challenges for both oil-rich countries and those dependent on agricultural commodities to diversify their economies in general and their agricultural sectors in particular. Many countries are now more vulnerable to food insecurity than ever before and are finding it increasingly impossible to meet the Millennium Development Goals. The growth targets and poverty reduction gains in many countries are clearly at risk. This indicates the advisability to diversify the economic base and minimize the adverse consequences of the crisis. In Africa, the transformation of agriculture holds the key to economic diversification and sustainable growth, but development in the

Table 2. Trends in agricultural productivity in Africa, 1990-2004

Country	1990	2000	2004	Change (%) 1990-2004	Change (%) 2000-2004
Angola	208.0	126.5	193.5	-7	53
Benin	350.1	541.6	622.0	78	15
Botswana	577.3	398.9	429.6	-26	8
Burkina Faso	127.8	168.8	188.9	48	12
Burundi	108.8	86.5	73.7	-32	-15
Cameroon	731.0	1024.3	1179.8	61	15
Cape Verde	1325.8	1593.5			
Central African Rep.	288.5	376.4	421.8	46	12
Chad	141.0	208.0	214.0	52	3
Comoros	407.3	401.8	419.0	3	4
Congo Dem. Rep	185.8	164.5	150.6	-19	-8
Congo Rep.	330.3	299.6	367.6	11	23
Côte d'Ivoire	605.6	804.6	835.7	38	4
Equatorial Guinea	478.4	706.5			
Eritrea		63.7	59.4		-7
Ethiopia		148.9	154.2		4
Gabon	1567.4	1513.3	1929.1	23	27
Gambia	231.4	254.2	239.8	4	-6
Ghana	301.3	320.9	354.2	18	10
Guinea	171.2	206.9	236.6	38	14
Guinea-Bissau	201.7	228.7	236.9	17	4
Kenya	352.2	306.4	326.2	-7	6
Lesotho	557.5	518.0	493.9	-11	-5
Madagascar	186.9	178.9	174.7	-7	-2
Malawi	73.6	135.9	136.7	86	1
Mali	205.3	205.5	229.3	12	12
Mauritania	554.5	441.6	337.7	-39	-24
Mauritius	3802.7	3774.8	4966.7	31	32
Mozambique	121.5	116.9	157.6	30	35
Namibia	786.7	1078.6	1099.4	40	2
Niger	165.6	156.4			
Nigeria	578.1	774.2	949.4	64	23
Rwanda	172.4	201.0	221.5	29	10
Sao Tome & Principe	181.4	216.0	220.8	22	2
Senegal	263.5	275.7	258.9	-2	-6
Seychelles	618.7	579.9	511.8	-17	-12
South Africa	1911.8	2270.7	2498.5	31	10
Sub-Saharan Africa	317.2	331.1	343.9	8	4
Sudan	328.6	658.5			
Swaziland	1296.3	1237.2	1211.8	-7	-2
Tanzania	245.8	264.9	302.6	23	14
Togo	360.6	395.1	411.8	14	4
Uganda	188.1	221.9	237.2	26	7
Zambia	178.3	211.2	219.3	23	4
Zimbabwe	267.7	325.8	235.8	-12	-28

Source: FAOSTAT

Table 3. Countries dependent on agricultural commodities for export earnings (annual average export data US\$, 1995-2000)

	>50% of export earnings	20-49% of export earnings	10-19% of export earnings
Cocoa		Sao Tome and Principe ^a (48%) Côte d'Ivoire (28%) Ghana ^a (27%)	
Coffee	Burundi ^a (76%) Ethiopia (62%) Uganda (83%)	Rwanda ^a (48%)	Madagascar ^a (15%) Kenya ^a (13%) Tanzania ^a (16%) Congo, Dem. Rep ^a (11%) Central African Republic ^a (11%)
Cotton		Burkina Faso (41%) Chad ^a (37%) Benin (34%) Mali ^a (34%)	Togo (17%) Central African Republic ^a (12%) Tanzania ^a (11%)
Tobacco	Malawi (59%)	Zimbabwe (29%)	
Tea		Kenya ^a (24%) Rwanda ^a (21%)	Burundi ^a (12%)
Vanilla		Comoros (35%)	
Sugar	Gambia ^a (87%)	Mauritius (23%) Djibouti ^a (45%)	Swaziland ^a (18%)
Cashew Nut	Guinea Bissau (83%)		
Livestock	Somalia (55%)		Chad ^a (18%) Mali ^a (18%) Sudan (14%) Niger ^a (14%) Namibia ^a (12%) Djibouti ^a (17%)
Fish	Seychelles (59%)	Mozambique (32%) Sao Tome and Principe ^a (30%) Madagascar ^a (30) Senegal (30%) Sierra Leone ^a (25%)	Namibia ^a (19%) Cape Verde (19%) Gambia ^a (15%) Mauritania ^a (14%) Morocco (11%)

Adapted from: DFID (2004) "Rethinking Tropical Agricultural Commodities".

^aCountry is dependent on more than one commodity

Table 4. Trade indicators in West Africa (Average 2001-03)

	Agricultural exports	Agricultural imports	Agricultural exports as share of total exports	Agricultural imports as share of total imports	Net food imports	Agricultural export relative to agricultural GDP
	(million US\$)	(million US\$)	(%)	(%)	('000 US\$)	(%)
Benin	203	235	44.9	33.6	130 955	20.0
Burkina Faso	162	139	69.0	18.6	69712	15.1
Cape Verde	0	83	1.9	31.9	59 463	0.3
Chad	109	43	60.2	5.1	-18 688	12.9
Côte d'Ivoire	2751	511	55.0	14.5	-2025365	89.5
Ghana	728	569	42.1	17.0	-221118	31.9
Guinea	37	169	4.7	18.0	90 083	4.9
Guinea-Bissau	49	36	79.7	54.4	-20415	37.5
Liberia	60	72	12.1	17.9	56 638	25.7
Mali	289	167	34.4	20.0	51387	24.6
Mauritania	35	255	9.1	57.6	152 561	18.6
Niger	67	149	22.9	39.6	41703	7.4
Nigeria	479	1899	2.6	19.9	1122339	3.2
Senegal	145	593	14.0	30.4	442 822	15.9
Sierra Leone	9	137	10.4	28.4	108593	2.6
Togo	106	82	23.2	12.6	26713	17.9
Gambia	15	90	54.9	37.9	57868	13.7

Adapted from FAO: The State of Food and Agriculture, 2005 – Statistical Annex

Table 5. Agricultural trade indicators in Central Africa (Average 2001-03)

	Agricultural exports	Agricultural imports	Agricultural exports as share of total exports	Agricultural imports as share of total imports	Net food imports	Agricultural export relative to agricultural GDP
	(million US\$)	(million US\$)	(%)	(%)	('000US\$)	(%)
Central African Republic	11	22	7.9	20.5	13 188	2.0
Congo	25	180	1.1	31.2	115 988	13.0
Democratic Rep. of Congo	24	258	6.3	50.0	205 787	0.8
Equatorial Guinea	4	30	0.5	6.1	7 900	3.4
Sao Tome and Principe	5	14	38.9	27.4	3 978	51.8
Gabon	5	164	0.2	16.0	124602	1.3
Burundi	29	22	79.6	15.9	-7 915	9.5
Rwanda	30	48	42.7	18.1	11 051	4.3

Adapted from FAO: The State of Food and Agriculture, 2005 – Statistical Annex

Table 6. Agricultural trade indicators in East Africa (Average 2001-03)

	Agricultural exports	Agricultural imports	Agricultural exports as share of total exports	Agricultural imports as share of total imports	Net food imports	Agricultural export relative to agricultural GDP
	(million US\$)	(million US\$)	(%)	(%)	('000 US\$)	(%)
Comoros	12	23	30.6	28.1	7 834	11.2
Djibouti	11	145	51.8	74.8	82 925	...
Eritrea	2	75	5.6	16.7	61 630	1.8
Ethiopia	330	335	63.1	15.5	59 913	12.9
Seychelles	1	57	0.3	13.1	30 422	4.0
Somalia	65	106	69.3	28.9	32 049	...
Sudan	348	443	19.2	24.5	214 607	5.8
Tanzania	385	287	51.2	17.9	-44 765	9.5
Uganda	169	147	36.0	11.9	-5 044	9.4
Kenya	968	460	45.4	12.9	-435 509	51.3

Adapted from FAO: The State of Food and Agriculture, 2005 – Statistical Annex

Table 7. Agricultural trade indicators in southern Africa (Average 2001-03)

	Agricultural exports	Agricultural imports	Agricultural exports as share of total exports	Agricultural imports as share of total imports	Net food imports	Agricultural export relative to agricultural GDP
	(million US\$)	(million US\$)	(%)	(%)	('000 US\$)	(%)
Angola	2	658	0.0	19.9	386 113	0.2
Botswana	77	237	3.2	14.2	140 640	52.2
Lesotho	6	105	1.8	13.5	77 886	4.6
Mauritius	336	303	18.6	13.8	-82640	121.4
Malawi	406	79	94.7	12.3	-40 469	67.7
Namibia	193	187	17.2	13.5	36 137	58.1
South Africa	2 569	1 572	8.1	4.8	-747671	58.6
Swaziland	189	138	19.0	11.6	-72 362	150.2
Zambia	111	132	9.6	11.9	37 353	14.2
Zimbabwe	746	181	33.1	10.9	-12 066	36.5
Mozambique	78	278	8.7	17.9	171 972	8.7
Madagascar	196	114	46.8	15.6	-106 075	14.9

Adapted from FAO: The State of Food and Agriculture, 2005 – Statistical Annex

sector itself must be diversified. More often than not, efforts aimed at developing agriculture are concentrated on output expansion and productivity improvement, while the marketing of agricultural commodities is taken for granted. It is often believed that in each country, there is a sizable population to consume the commodities produced and that the challenge is to continue to increase production to meet rising demand. Recent

developments in the global economy indicate that development of production systems cannot be undertaken in isolation of marketing systems. The desired productivity improvements and competitiveness in African agriculture have been difficult to achieve due to weaknesses in the commodity marketing system and the lack of attention to develop the commodity chains, produce value-added commodities and enhance market access.

The balance of agricultural trade has been largely against Africa, as many countries remain net food importers. Total imports into many African countries have been persistently dominated by food imports for a long time. From 1980 to 2005, the share of food imports ranged between 85-95%, whereas the share of agricultural exports in total exports has been growing haphazardly with a range of between 12-30%. Over the period, the share of intra-African exports has been very low; ranging between 6% and 18% (Figure 1). The poor agricultural export performance and limited intra-regional trade reflect bottlenecks in the marketing systems at national and sub-regional levels and continued reliance on the export of primary commodities.

In light of the foregoing, there is need for actions to develop commodity markets not only at the national levels, but also at the sub-regional and regional levels. The emerging scenario indicates that enhanced intra-regional trade through strengthened regional integration arrangements holds the key to Africa's agriculture and food insecurity problems. In Africa, the food and agricultural markets are extremely fragmented along sub-regional, national and even sub-national levels, resulting in segmented markets of sub-optimal size that do not ensure profitability of sizeable private investment in the different stages of the commodity chain. These segmented gaps between

regional/national domestic production and regional demand are increasingly being filled by imports of non-African origin, and further dampening the prospects for agricultural transformation, revenue generation and poverty reduction.

If recent improvements in agricultural growth are to be sustained in Africa, development of the marketing system has to be given a pride of place. But how can Africa overcome constraints in the commodity markets and how will the continent derive the desired benefits through the instrumentality of regional trade? This is the challenge of this paper. Specifically, the objectives are to i) identify the constraints on agricultural marketing in Africa, ii) examine the rationale and opportunities for developing African agricultural commodity markets and iii) determine effective approaches to market development and regional trade. The rest of the paper is structured as follows: section two identifies the various agricultural market constraints in Africa, while the rationale and opportunities for improved regional trade are examined in section three. In section four, the key approaches to the development of agricultural markets in Africa are articulated, with emphasis on specific strategies aimed at overcoming the agricultural market constraints. The paper is rounded off in section five with some concluding remarks.

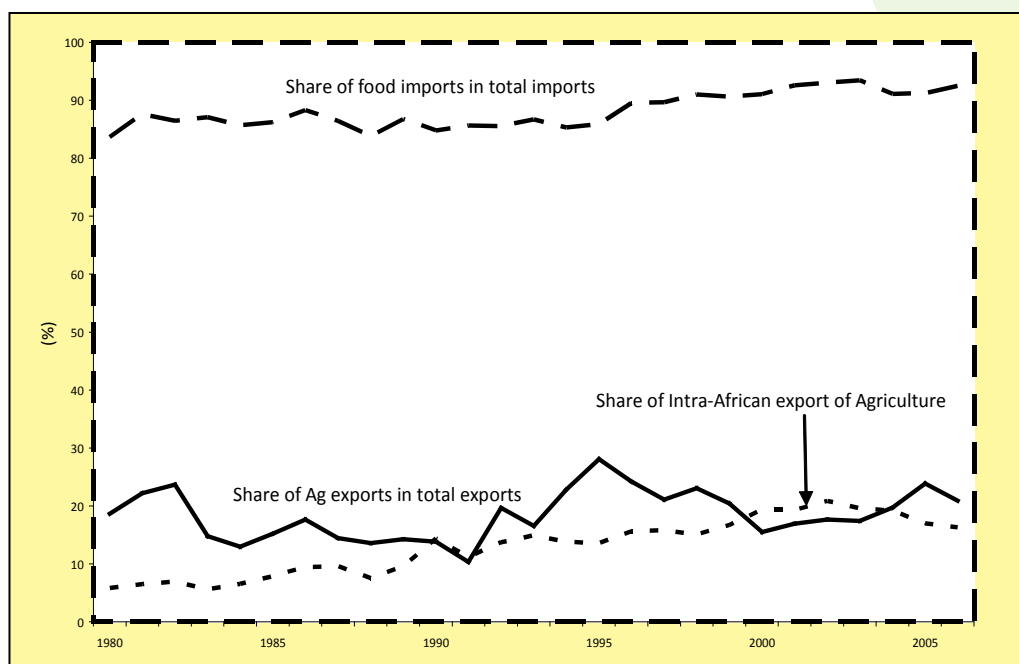


Figure 1: Trend in intra-African agricultural commodity export, 1980-2005

Agricultural market constraints in Africa

The market constraints in African agriculture need to be fully understood at the level of specific commodity chains, but also in terms of obstacles to market performance within and between sub-regions. The analysis of agricultural market constraints should have a wider coverage in order to fully unravel the various dimensions, determine the extent of remedial measures required and identify the various categories of relevant stakeholders that are expected to contribute to making the markets perform more efficiently. By and large, there are constraints at the domestic (national) level, sub-regional level and international level that have, over the years, affected the structure, conduct and performance of agricultural markets. In what follows we examine the nature of these constraints.

Constraints of domestic agricultural markets

Infrastructural inadequacies – Agricultural performance in Africa is greatly impaired by the low level of development of infrastructure. In rural areas where majority of smallholders operate, inadequate infrastructure constitutes a major constraint to agricultural investment, production and trade. In many parts of Africa, physical and marketing infrastructure are poorly developed, storage facilities are rudimentary and access to information and markets is highly restricted. According to Torero and Chowdhury (2005), Sub-Saharan Africa continues to lag significantly behind other regions in infrastructure investments, including paved roads, telephone lines and electricity production. The situation is a reflection of the urban bias in the pattern of development in many countries. Transport infrastructure is particularly critical to trade as it facilitates movement of goods from points of production to final destinations. According to Limao and Venables (2000) a 10% increase in transport costs results in reduction in trade volumes by about 20%. Infrastructure deficits in Africa have been a major source of comparative disadvantage and have greatly impeded intra-African trade over the years.

Limited investment in marketing activities – In many African countries, production and marketing activities are largely in the hands of small-scale operators with very low levels of investment. The domestic agricultural market systems contain numerous small, undercapitalized players, but relatively few large ones (Fafchamps, 2004). Thus, while they may at times be fiercely competitive, they remain high-cost, as they are unable to exploit economies of scale (in transportation or market

intelligence) and they incur cumulatively high transaction costs in trading products through numerous hands along the marketing chain.

Weak links in commodity chains – In general, there are few mechanisms linking output market opportunities with pre-harvest services (such as input supply, extension and credit). This tends to limit producers' abilities to respond to market opportunities. Smallholders have no storage facilities and other capacity to absorb shocks. They are largely ill-equipped to face market volatility arising from production fluctuations on account of seasonality, climatic fluctuations and policy somersaults.

Constraints at the sub-regional level

Agricultural commodity flows across Regional Economic Communities (RECs) in Africa are not organized and are indeed curtailed by several technical barriers. There are export restrictions in and out of seasons, poorly harmonized measures, grades and standards and very weak custom services. Invariably, trade in agricultural commodities within some of the RECs is largely informal. Available data in many sub-regions reveal very low intra-regional trade implying that despite numerous protocols, summits and declarations about African economic integration over the years only limited achievement has been made. Studies on agricultural marketing in COMESA find a number of key marketing constraints that stand in the way of the development of intra-Africa and sub-regional agricultural marketing. They include lack of marketing information, un-harmonized SPS and customs procedures, technical barriers to trade, poor certification mechanisms, poor storage and processing facilities, poor road infrastructure, poor packaging, low production levels, weak private marketing institutions and weak regulatory frameworks (ADF, 2003).

These constraints are not peculiar to COMESA or to any of the RECs in Africa. They have generally been responsible for the low level of economic integration in the continent over the years. As a result of these constraints, intra-Africa agricultural trade remains at a very low level, despite the huge potential and opportunities. As shown in Tables 8, 9 and 10, numerous agricultural commodities ranging from the key staples to traditional and non-traditional export commodities are being traded within and outside Africa. Overall, intra-regional trade is most pronounced in Southern Africa (15.4%) followed by East Africa (7.9%) and West Africa (6.1%). However, intra-Africa trade in food staples, such as cereals, beans, cassava,

Table 8. West African major agricultural export commodities (annual average 1996-2000)

Category	Commodity	(1) West Africa to the world		(2) West Africa to SSA		Share of intra-regional trade
		Value (million US\$)	Share in (1) %	Value (million US\$)	Share in (2) %	(2)/(1)%
Staples	Other cereals	23	0.3	19	4.5	82.3
	Meat	15	0.2	10	2.2	64.9
	Livestock	10	0.1	10	2.2	98.3
	Maize	2	0.0	2	0.5	88.7
	Cassava	2	0.0	0	0.0	0.4
	Beans	1	0.0	1	0.2	67.2
	Sub-total	52	0.7	41	9.6	79.8
Non-traditional	Fish	1,122	15.8	136	31.5	12.1
	Vegetables & fruits	551	7.8	11	2.6	2.0
	Oils & fat	195	2.8	45	10.4	23.0
	Miscellaneous	172	2.4	15	3.5	8.9
	Oilseeds	82	1.2	6	1.5	7.7
	Processed food	62	0.9	32	7.4	51.5
	Beverages	12	0.2	7	1.7	59.6
	Sub-total	2,194	31.0	252	58.6	11.5
Traditional	Cocoa bean	2,321	32.8	9	2.0	0.4
	Cotton	1,028	14.5	57	13.2	5.5
	Coffee green	534	7.5	3	0.6	0.5
	Cashew nuts	102	1.4	1	0.1	0.6
	Sugar	53	0.8	11	2.7	21.5
	Other nuts	22	0.3	6	1.3	25.2
	Tobacco	8	0.1	1	0.3	17.4
	Tea	3	0.0	1	0.3	49.1
	Other fibers	1	0.0	0	0.0	14.2
	Sub-total	4,072	57.5	89	20.6	2.2
Others	Processed cocoa	450	6.3	10	2.4	2.3
	Animal skin	144	2.0	2	0.4	1.2
	Coffee roasted	78	1.1	17	4.0	22.1
	Feed stuff	70	1.0	6	1.5	9.2
	Cigarettes	18	0.3	12	2.9	68.1
	Spices	6	0.1	0	0.1	7.6
	Sub-total	765	10.8	48	11.2	6.3
	TOTAL	7,084		430		6.1

Source: Adapted from Diao et al. (2003)

Table 9. East African major agricultural export commodities (annual average 1996-2000)

Category	Commodity	(1) East Africa to the world		(2) East Africa to SSA		Share of intra-regional trade
		Value (million US\$)	Share in (1) %	Value (million US\$)	Share in (2) %	(2)/(1) %
Staples	Livestock	111	2.5	2	0.4	1.4
	Other cereals	50	1.1	28	7.9	55.7
	Beans	44	1.0	13	3.6	28.9
	Meat	38	0.8	4	1.1	10.0
	Maize	30	0.7	27	7.7	90.0
	Cassava	0	0.0	0	0.0	7.0
	Sub-total	274	6.1	73	20.6	26.9
Non-traditional	Fish	474	10.5	13	3.6	2.7
	Miscellaneous	342	7.6	49	13.8	14.4
	Vegetables & fruits	330	7.3	15	4.3	4.6
	Oilseeds	162	3.6	3	0.9	1.9
	Oils & fat	87	1.9	34	9.5	39.1
	Processed foods	19	0.4	17	4.9	90.3
	Beverages	11	0.2	8	2.3	77.3
	Sub-total	1,426	31.7	140	39.2	9.8
Traditional	Coffee green	1,406	31.3	35	9.7	2.5
	Tea	524	11.6	38	10.7	7.3
	Cotton	226	5.0	11	3.2	5.0
	Tobacco	100	2.2	10	2.7	9.5
	Cashew nuts	81	1.8	0	0.0	0.2
	Sugar	80	1.8	17	4.9	21.7
	Other fibers	30	0.7	1	0.3	3.9
	Cocoa bean	13	0.3	0	0.0	0.1
	Other nuts	7	0.2	0	0.0	1.2
	Sub-total	2,467	54.9	112	31.5	4.6
Others	Animal skin	159	3.5	3	0.7	1.6
	Spices	110	2.5	3	0.4	1.4
	Feed stuff	24	0.5	4	1.0	15.3
	Cigarettes	20	0.5	18	5.1	89.9
	Coffee roasted	14	0.3	3	0.9	23.5
	Processed cocoa	2	0.0	1	0.4	78.8
	Sub-total	330	7.3	31	8.6	9.3
	TOTAL	4,496		357		7.9

Adapted from Diao et al. (2003)

Table 10. Southern African major agricultural export commodities (annual average 1996-2000)

Category	Commodity	(1) S. Africa to the world	(2) S. Africa excluding SACU to the world		(3) S. Africa to SSA	(4) S. Africa excluding SACU to SSA		Share of intra-regional trade
		Value (million US\$)	Value (million US\$)	Share in (2)(%)	Value (million US\$)	(million US\$)	Share in (4) (%)	(3)/(1) (%)
Staples	Meat	287	65	2.6	80	18	5.3	28.0
	Maize	258	37	1.5	120	30	9.0	46.5
	Other cereals	143	37	1.5	112	34	10.0	78.0
	Livestock	16	8	0.3	11	6	1.6	70.6
	Beans	13	6	0.2	8	2	0.7	58.5
	Cassava	0	0	0.0	0	0	0.0	1.9
	Sub-total	718	153	6.2	331	90	26.6	46.1
Non-traditional	Fish	777	228	9.3	48	11	3.3	6.2
	Miscellaneous	256	96	3.9	16	4	1.2	6.0
	Vegetables & fruits	1,520	78	3.2	100	10	3.0	6.6
	Oilseeds	67	23	0.9	21	14	4.2	31.0
	Processed food	74	10	0.4	54	9	2.6	73.6
	Oils and fat	95	7	0.3	57	6	1.8	60.3
	Beverages	298	7	0.3	70	5	1.6	23.5
	Sub-total	3,096	450	18	366	60	18	11.8
Traditional	Tobacco	973	943	38.4	54	45	13.2	5.5
	Sugar	933	491	20.0	121	46	13.6	12.9
	Cotton	211	186	7.6	48	47	14.1	22.9
	Tea	99	51	2.1	15	11	3.3	15.3
	Coffee green	63	49	2.0	5	3	1.0	7.2
	Cashew nuts	35	35	1.4	1	1	0.3	3.4
	Other nuts	14	3	0.1	1	0	0.1	5.4
	Other fibers	217	0	0.0	4	0	0.0	1.8
	Cocoa bean	1	0	0.0	0	0	0.0	0.8
	Sub-total	2,546	1,759	71.6	248	154	45.6	9.8
Others	Animal skin	286	29	1.2	6	3	0.8	2.0
	Feed stuff	58	25	1.0	32	16	4.9	55.1
	Spices	39	22	0.9	6	2	0.6	15.7
	Cigarettes	62	18	0.7	47	12	3.4	75.7
	Coffee roasted	6	1	0.0	5	1	0.2	84.8
	Processed cocoa	22	0	0.0	10	0	0.1	44.6
	Sub-total	472	96	3.9	105	34	10.0	22.3
	TOTAL	6,832	2,457		1,051	338		15.4

SACU= Southern African Customs Union

Adapted from Diao et al. (2003)

Table 11. Scope of intra-Africa trade, 2002-2005

Products	Africa's export to the world (Million US\$)	Intra-Africa trade (Million US\$)	Share of intra-Africa trade (%)
Cereals	868	558	64.3
Oil and fats	622	190	30.5
Oil seeds	282	75	26.6
Dairy products	197	115	58.3
Meat and meat products	245	122	49.8
Sugar	993	313	31.5
Vegetables and fruits	3557	266	7.5
Beverages	844	271	32.1
Live animals	315	163	51.6
Coffee, cocoa, tea	4363	321	7.4
Spices	237	18	7.6
Miscellaneous food products	4380	869	19.8
TOTAL	16904	3280	19.4

Source: Mosoti and Koroma (2008)

meat and livestock, is most pronounced in West Africa (79.8%) compared to 46.1% in Southern Africa and 26.9% in East Africa. The generally low level of intra-Africa trade in agricultural commodities corroborates the high level of food import dependency earlier observed. Available data indicate that between 2002 and 2005, intra-Africa agricultural trade on the average represents only about 19% of the total agricultural export to the world (Table 11). In other words, agricultural commodity exports respond more to foreign market forces, while regional potentials and opportunities remain largely untapped.

Intra-Africa trade is particularly badly affected by a number of market access constraints (natural barriers, man-made barriers and non-tariff or technical barriers). Natural barriers to trade, such as social and political conflicts and infrastructure constraints, constitute an important contributor to low intra-Africa trade (Daya et al., 2006). Man-made constraints and non-tariff barriers, such as import and export restrictions, customs

formalities, export procedures (like customs valuation) and SPS measures contribute significantly to the contraction in regional trade. There are also technical barriers to intra-Africa trade in the form of technical regulations and standards that set out specific characteristics of a product including its size, shape, design or labeling and packaging.

International constraints on African agricultural markets

The global phenomenon of agricultural commodity price volatility poses a challenge for the development of African agricultural markets especially in terms of developing affordable price stabilization and insurance mechanisms to permit effective participation of smallholders and ensure that investors operate profitably in the market. The problem of the limited competitiveness of small-scale producers tends to be compounded by protectionist (tariff and non-tariff) policies, domestic agricultural support and export subsidies by developed countries. The subsidies have promoted African dependence on

imports and discouraged meaningful development of markets at national and sub-regional levels. Other perspectives of the international dimensions of the market constraints are as follows.

Market concentration – The international markets for agricultural commodities have become much more concentrated. Large trading companies dealing in many commodities have replaced smaller, specialized companies, while the total share of all trading companies has fallen relative to direct purchases by processors or final sellers. A highly concentrated commodity market has a strong influence on prices and will not allow free expression of the forces of demand and supply. The concentration of the markets for certain commodities implies that fewer larger companies can dictate the prices they are willing to pay to producers. Producers in Sub-Saharan African countries are mainly smallholders who are largely unorganized and in no way capable of negotiating commodity prices. For instance, about 50% of the world's coffee beans are purchased by only five companies: Nestlé, Kraft, Proctor and Gamble, Sara Lee and Tchibo (Brown and Gibson, 2006). Thus, even when prices are rising, the level may not be high enough to provide farmers with adequate returns on their investment due mainly to imposition by powerful buyers. The situation is worsened by the abolition of commodity boards in many sub-Saharan African countries. The boards should have served as useful intermediaries to improve farmers' bargaining power with large corporate buyers. Some of the services formerly provided by the boards (such as financing and stockholding) are now provided by foreign companies, thus decreasing the share of commodity income remaining in the producing country.

Export dumping – Despite the free trade era being championed by the World Trade Organization, industrialized countries have protected themselves against the most dynamic exports of developing countries, including textiles and clothing, agriculture and processed raw materials. The proportion by which the average prices of the commodities fell below the cost of production in 2003 stood at 28% in the case of wheat, 10% for soybeans, 10% for corn, 47% for cotton and 26% for rice (The NewFarm, 2005). Huge surpluses of products like sugar, dairy and beef that are accumulated under high tariff walls in industrialized countries are often disposed of by resorting to subsidized exports, to the detriment of African producers in particular, as they displace their products in third country (export) markets

and in the domestic markets of African countries themselves (ECA, 2000).

Rationale and opportunities for improved agricultural trade in Africa

The recession currently being experienced in developed economies indicates the advisability to reposition African agriculture in an increasingly globalized world. This implies that the supply and demand of agricultural commodities in Africa can be managed to provide optimum benefits to the economic agents involved, as opposed to the current situation in which Africa is serving as a supplier of raw materials to foreign consumers who have considerable influence over the prices of such commodities through a plethora of institutional arrangements.

There are several reasons in support of greater intra-regional trade in Africa. First, it is likely to increase incentives for large private traders to invest in the fixed costs of setting up large trading operations to profit from annual fluctuations of local marketable surpluses within wider areas. This is one way of addressing the problem of limited economies of scale in individual countries where marketing activities are in the hands of small-scale operators. Second is the potential to reduce fluctuations in prices both within and across seasons, if harvests are imperfectly correlated (or, better still, negatively correlated) across regional trading blocs. Third, intra-regional trade is apt to provide a valuable outlet for surpluses as national production of a given commodity approaches "self-sufficiency", thus reducing the extent of price declines during years of bumper harvests. Fourth, it can stimulate additional production growth through local specialization based on comparative advantage, in which case regional produce may replace imports from international markets (Poulton et al. (2006).

The demand prospects

Arguably, demand for African agricultural products cannot be assigned to markets outside of Africa. In point of fact, the global economic meltdown is expected to weaken foreign demand for African agricultural commodities. Export growth in many developing countries (including African countries) is already slowing down considerably as a result of the global economic crisis. For instance, in Bangladesh, orders for ready-made garments from Europe and the US dropped 7% in September 2008. Year-on-year exports from the Philippines to the US are

down by 15%. The private sector in Sri Lanka is concerned about the falling prices of rubber, tea, coconuts and garments arising from intense competition occasioned by the crisis. In Thailand, the agricultural sector has witnessed the negative impact of the global meltdown. External demands for rubber and cassava dropped sharply in 2008 and the prices of the two commodities have plunged drastically. Other agricultural products, such as maize and rice, have also witnessed a decrease in their prices. In Kenya, the cut flower industry is suffering as European customers are hit by the crisis. Although exports of horticultural products, coffee, tea and clothing may benefit, at least temporarily, from exchange rate depreciation, sales of these items in their traditional markets seem likely to fall in the foreseeable future. Exports are expected to drop as customers in the US and Europe in particular look for ways to cut expenses. In this regard, imported fruits and vegetables and expensive specialty coffees from Africa are likely candidates (IDS, 2008).

In light of the foregoing, intra-Africa trade has to be developed to take advantage of potential demand in the region. Evidence suggests that Africa's own demand for various food products is worth about US\$ 50 billion per annum, which compares favorably with international exports of only US\$ 16.6 billion per annum, and African demand is likely to double by 2020 owing to population growth, urbanization and income growth (Diao et al. (2003). If commodity markets are well developed, a substantial part of this demand can be satisfied with domestic and regional production rather than with imports from abroad, and this could generate considerable gains in income for African smallholder producers. African agricultural commodity trade will continue to be determined by a complex interaction of many factors, including the domestic production environment and utilization trends, exchange rates and commodity prices.

The role of population and income growth, and urbanization

Population and income growth will exert strong influences on demand, especially with respect to food commodities. Indeed, a major shift in global cereal demand is underway. For instance, demand for maize in developing countries (especially African countries) will surpass the demand for both wheat and rice by 2020. Studies have shown that maize requirements in the developing world alone will increase from 282 million tons in 1995 to 504 million tons in 2020. The challenge of meeting this unprecedented demand for maize is daunting, especially in Africa given its level of subsistence farming. Rising incomes and

the subsequent growth in meat and poultry consumption will result in a rapid increase in the demand for maize as livestock feed (especially for poultry and piglets). Unabated population growth and the persistence of poverty will maintain upward pressure on the demand for food maize. Relative to the 1995 level, annual maize demand in Sub-Saharan Africa is expected to double to 52 million tons by 2020. Global population growth will stimulate demand for the crop at an annual rate of approximately 3% in this century. Rising incomes will translate into increased demands for maize, both for livestock feed and human consumption. At higher income levels, the demand for maize for food may diminish, but this effect will be more than offset by an increase in demand for maize used as feed and/or in industry (IFPRI, 2003).

In general, the high rates of urbanization in Africa are putting enormous pressure on freshwater and other natural resources. During the next quarter century the urban population will be growing almost twice as fast as the general population, and by 2020 Africa will have 11 mega-cities with 5 million or more inhabitants and almost 720 cities with populations of more than 100,000 (UNECA, 2007). This will give rise to a tremendous demand for food and agricultural products. Externally, heavily subsidized products in developed countries present a major obstacle to African agricultural exports. African countries also lack the productive capacity to compete with other developing countries like Brazil, China and India. Therefore, expansion of alternative markets of agricultural products (food, feed and fuel) and other biochemical demand for agricultural products (pharmaceuticals, cosmetics, etc.) in Africa can boost the agricultural sector within the region if the necessary capacity is created.

With the available information on urbanization and population growth it is imperative for agricultural policymakers and planners to strategize in terms of ensuring that population distribution works in favor of effective expansion and efficiency of agricultural markets. Rapid population growth is not only likely to be a drag on growth but can also generate huge unemployment problems among the youth. Agricultural development should thus be seen as an opportunity to generate much more employment for rural youth and thereby help stem urbanization. While the demographic transition has barely begun in Sub-Saharan Africa, faster economic growth, higher female education, and a resumption of family planning programs could significantly

accelerate it, and thereby create a population dividend for future economic and agricultural growth.

For effective agricultural market expansion, there is need to harness the enormous land reserves of the continent; and this will require more labor and migration of populations from higher population density areas and areas with little or declining agricultural potential to the lower population density areas where better quality agricultural land is available. Such migration would be greatly facilitated by regional integration that would allow for international labor movements. However, the land reserves cannot simply be harnessed by migration, but require enormous investments in infrastructure and technology. The expected higher agricultural price environment provides a major opportunity for such investments. Rather than fueling land degradation, longitudinal studies have convincingly shown that population growth, market access and higher incomes can contribute to more sustainable use of agricultural land and other resources. It induces intensification, higher land investments, crop livestock integration and more trees. If combined with better input and output markets and organic agriculture it can promote sustainable development of agriculture and enhance value addition in agricultural markets.

In sum, higher world prices, combined with rapid demand growth associated with population growth, urbanization and income growth, open the greatest opportunities for African farmers in domestic and regional markets. In these markets farmers compete at import parity prices rather than at the lower export parity prices, and face lower phytosanitary and quality challenges than in overseas markets. Through import substitution they therefore have a major opportunity to re-conquer markets lost to imports in the previous decades. Undoubtedly farmers will also be benefiting from enhanced overseas market opportunities, especially in the longer run after developing their domestic and regional markets (Binswanger-Mkhize, 2008).

The influence of market information

Moreover, development partners have launched a number of programs, projects and networks that tend to foster intra-regional trade through the dissemination of market information in many sub-regions of Africa. For instance, the FAO's Global Early Warning System on food and agriculture provides information on food supply and demand, including information bulletins and situation reports on food crop production and

markets. USAID's Famine Early Warning System (FEWS) identifies acute food security threats that can worsen malnutrition, morbidity and mortality, and monitors and facilitates access to food security information. It recommends and advocates critical actions for stopping famine before it develops, provides regular food security assessments, and disseminates food security information to the public. The USAID Regional Agricultural Trade Expansion Support Program (RATES) is designed to increase agricultural trade in East and Southern Africa and between the region and the rest of the world, harmonize policies and procedures, create an efficient regional market information and intelligence system and promote advocacy and networking on trade policies. There is also the Regional Marketing Information System (RMIS) of the Inter-Governmental Authority on Development (IGAD) (Italy/CIDA-financed), which aims to provide market information so as to promote intra-regional trade in food items and enhance regional food security. However, some of these programs have limited scale, restricted scope and short life spans. The issue of sustainability is not often an integral part of the design and so progress towards ensuring improved participation of small-scale producers in the market has not been remarkable. There is, therefore, a need to strengthen these institutions so that they can contribute effectively to greater intra-regional trade.

Approaches to agricultural market development

For improved regional trade, there is need to overcome the constraints in the agricultural marketing system at the national and sub-regional levels. The key approaches include i) reduction in transactions costs, ii) promotion of market access for small-scale farmers, iii) price and income stabilization, iv) promotion of efficiency of African agricultural commodity markets, and v) addressing intra-African technical barriers to trade.

Reduction in transaction costs

Investment in infrastructure – Maintaining physical access to markets, reducing transaction costs, and ensuring appropriate production and consumption linkages depend on the availability of physical infrastructure, especially in rural areas. Sustained development of rural road networks and transport infrastructure is apt to engender striking returns in terms of export growth and intra-regional trade. It is also important to ensure availability of such services as rural electrification, rural water supply, rural telephony and other communication services. According to Diao et al. (2003), efforts to decrease marketing costs by improving

the productivity of the transport sector by 30% in South Africa and by 50% in all other African countries could boost Africa's total agricultural exports by 28% and intra-regional trade by 22%. Moreover, lower transportation cost will open markets for high-value perishable crops and processed foods and improve access to inputs needed to increase productivity in all sectors including agriculture.

Promotion of market access for small-scale farmers

Reduce market concentration – As indicated earlier, there is high concentration of international trading and processing of agricultural commodities among a few developed countries, which tends to reduce the export gains in agriculture commodity-dependent developing countries (ACDDCs). There is need to create competition in these segments of the market through partnerships among developed and developing countries and private-sector organizations. What is recommended is the creation of domestic trading companies in sub-Saharan African countries through the assistance of developed countries. These companies will process products in African countries in association with developed-country processors. Some countries have already made moves to deal with anti-competitive behaviors in the agricultural commodity markets. Kenya, Uganda and Tanzania requested the WTO to take steps to deal with the anti-competitive behaviors of foreign firms and to improve the bargaining position of small producers *vis-à-vis* such firms (WTO, 2003). In view of the controversial nature of the issue, many analysts and NGOs believe that a pro-development competition agreement is more likely to be achieved elsewhere in the UN system (DFID, 2004; IFAP, 2004). Sub-Saharan African countries need to pursue the matter in conjunction with development partners and NGOs to ensure an introduction of a pre-established level of concentration that can trigger a presumption of a violation of existing anti-trust laws. Moreover, African countries should provide information on a regular basis about any company, public or private, with more than a given percentage of the import or export market, and use such information to engage the WTO accordingly. This will be in the spirit of current WTO rules that require governments to complete questionnaires about any state trading enterprises operating in their countries. Such a move towards improved transparency would help in checking restrictive business practices at the international level.

Effective linkage between agricultural production, processing and marketing – It is widely recognized that the market reforms

so far enacted in Africa have been necessary but not sufficient to generate greater agricultural production and competitiveness in export markets. A key challenge in the future is to better address the linkage between production, processing and marketing of agricultural commodities. Improved and cheaper transport services are essential in this respect. Market liberalization removed major distortions, but did little to ensure that small-scale farmers, particularly those without easy access to roads and markets, could benefit. Even in areas close to export and domestic markets, incomplete or inconsistent reforms have produced mixed results. If farmers are to benefit from the market reforms, then they will need to see improved access to markets and lower marketing costs.

The weakness of rural markets is partly a problem of poor infrastructure, particularly roads and communications systems, but problems with quality standards, timing, market information, and assured supplies are also penalizing local products in both domestic and international markets. According to Hazell and Johnson (2002), the private sector could play a larger role if it were not also constrained by some of these same factors, as well as by weak legal and financial institutions. The public sector has a role to play in providing necessary infrastructure and in creating and maintaining high standards. With the necessary infrastructure it should be possible to attract the private sector to contribute to the development of the market and to reduce marketing constraints.

Promotion of contract farming – Contract farming is a partnership arrangement between the private sector and small-scale farmers that should be encouraged in view of its commercial orientation and employment potential, especially in ensuring longer-term contractual production relationships. Contract farming is becoming increasingly recognized as an important approach for the modernization of peasant farming. It guarantees linkages between smallholders and large-scale producers and facilitates access to modern inputs and production credit. It is also an approach that can ensure small-scale farmers play active roles in export trade. Many agricultural products, such as banana, rubber, cotton and sugar, have been produced and marketed through contracting small-scale producers in developing countries. For instance, in many COMESA countries, private companies have been promoting the growing and marketing of cotton, tobacco, coffee, tea, sugar, and high-value horticultural crops through provision to smallholder

farmers of extension, credit and even markets for their crops. Kenya and Zimbabwe supply off-season specialty vegetables; South Africa is a major exporter of off-season fruit to European Christmas markets. In particular, contract farming is becoming increasingly important in Zimbabwean horticultural export trade in which smallholders produce for larger commercial farms engaged in packing. About 3,000 smallholders are growing for export on a contract basis (IFAD, 2001). Indeed, two of Africa's largest exporters have demonstrated that smallholder sourcing can meet the quality requirements of supermarkets in Europe. Usually, the exporter takes responsibility for organizing growers, arranging finance, providing technical support and ensuring traceability.

Transformation of agricultural exports from primary to value-added commodities – There is need to promote value-added agriculture as a way of transforming the agricultural sector and the rural economy for increased employment generation, sustained economic growth and poverty reduction. This should include a shift from export of raw materials (primary products) to export of secondary and tertiary products to enhance the value of output and strengthen the role of the sector in terms of creating jobs and generating income in the non-farm sector. Given the declining demand for traditional export commodities and widening sources of supply, there is a tendency for the structural decline in commodity prices to continue and thus limit the growth of export revenue. A shift to value-added agriculture involving expanded production, increased productivity and processing of major export commodities should be an appropriate mechanism to address the unfavorable international price of export crops and to achieve the desired growth in export revenue. Nonetheless, a big challenge in Africa is how to ensure that the value-added activities leading to the production of tradable commodities actually take place within the local communities in order to minimize transaction costs and contribute to the growth of the non-farm sector. In this connection, it is important to stress that emphasis should not only be on changing the market value of what local producers have to sell, but also on ensuring increased investment in the communities where the commodities are produced. Local communities must be empowered to have control over activities in the value chain and to gain direct access to markets and remain competitive in the markets.

Negotiation of long-term preferential access to industrialized markets – As part of the ways to promote growth of export trade, free access to industrialized markets is being canvassed by many analysts. Although this is necessary, it is not sufficient to sustain growth in the export sector and to realize significant contribution to poverty reduction in Africa. In order to reduce poverty, Africa will continue to negotiate for preferential arrangements. The preferential access is likely to attract foreign investments to Africa, which apart from the capital involved would also bring technological change and valuable know-how in resource management. Preferential access for the next 10-15 years could provide Africa with a window of opportunity to improve the productivity and competitiveness of agri-business enterprises.

Removal of agricultural as well as export subsidies in developed countries – The on-going agricultural negotiations under the Doha Development Agenda must come with specific dates for the removal of agricultural subsidies in developed countries in view of the unbearable costs imposed on developing countries by the various forms of agricultural support in those rich countries. Oxfam estimates show that protectionism in rich countries costs the developing world £ 60 billion a year. Indeed, if the US and EU remove their farm subsidies, the value of African food exports would double (New Statesman, 2005). The abolition of production and export subsidies is likely to result in higher world market prices, providing African producers with higher prices for their agricultural exports. The removal of subsidies given to American and European cotton farmers, for instance, is estimated to result in an increase in the world cotton price by 12 cents per pound. This, in turn, could increase revenues from cotton by US\$ 250 million per year for West and Central African countries, equal to about 14% of the total development assistance received by these countries annually. With regard to sugar subsidies, analysts believe that recent EU proposals are likely to continue to benefit the richest farmers in the world at the expense of the poorest. Highly distortionary mechanisms, such as inflated price guarantees, generous export refunds, and high import tariffs surrounding sugar production, have to undergo drastic reform. The guaranteed price of sugar within the EU is three times higher than the world price of € 157 per ton and it is estimated that the price system gives the 27 largest sugar beet farmers in the UK an average of £ 137,595 per year in support (Frith, 2005). These mechanisms make it virtually impossible for African farmers to compete in the international sugar market.

Price and income stabilization

Commodity prices can vary within and across seasons. Some intra-seasonal variation is inevitable, given the strong seasonality in local supply and the cost of storage. Similarly, some inter-seasonal variation may be desirable, as higher prices compensate producers for lower harvests in poor years (Newbery and Stiglitz, 1981). However, inelastic demand for many of the principal crops produced by African smallholders and imperfections in the functioning of commodity markets can combine to make both intra- and inter-seasonal price variations unhelpfully severe. Smallholder producers are particularly discouraged when bumper harvests lead to price collapses for particular crops, while the poorest consumers are vulnerable to very high prices for staple foods in the lean season following a bad harvest.

Operation of a system of guaranteed minimum price – At the national level, government can achieve price stabilization by offering a degree of price support and guarantees of market access to identified “critical commodity chains”. Under this system, each year around planting time a state agency would offer to chosen producer associations a limited number of free “options” under which it would guarantee to buy from option-holders a certain volume of grain after harvest at a specified price. A further set of options would be offered for sale by auction. Owners of options could then decide at harvest time whether or not to exercise their option to sell at the set price. Such a system would not guarantee a general post-harvest floor price for producers other than those holding options, and the actual fiscal costs would vary from year to year, being highest in years of bumper harvest (when some stocks might have to be stored for 18 months or more before disposal). However, it would support investment in grain production by “critical” smallholder suppliers, whose marketed surpluses would form the basis of national food availability. A key issue would be how the free option rights would be distributed and how – and how often – the allocation of these rights would be reviewed (Poulton et al., 2006).

Establishment of Commodity Boards – Several years of post-reform experience in the agricultural export sector have shown that the dissolution of Commodity Boards in many sub-Saharan African countries amounts to “throwing away the baby with the bath water”. Despite the absence of the Boards in some countries, farmers continue to be shielded from world markets and remain unprotected in the face of frequent shocks arising

from “normal sources” and from the operations of the market. Little wonder, therefore, that despite reforms, vigorous efforts regarding export promotion in such countries have had little or no effect on poverty alleviation. In some countries, the Boards were hurriedly dismantled in the wake of the SAP without any thought of how their various functions would continue to be performed or what would have been the best strategy of transforming them into an effective instrument for managing volatile commodity markets and for ensuring favorable income growth for farmers. Of course, the protagonists of the dissolution of Commodity Boards at that time were not concerned about poverty reduction.

The fact that farmers remain in abject poverty up till today in many ACDDCs, especially in sub-Saharan Africa, in spite of the boom in agricultural trade, is largely due to the absence of the Commodity Boards. Moreover, the reformers who insisted on the dissolution of Commodity Boards also failed to bring to bear experiences in developed countries where such Boards existed (and continue to exist till today) on their decisions. A revisit of the issue is hereby recommended. Fortunately, the increasing pressures on state trading enterprises within the WTO are largely targeted at developed-country state trading enterprises. The revival of the Commodity Boards should not be hurriedly undertaken; and the Boards need not be revived where credible alternatives already exist. Many sub-Saharan African countries, especially where poverty in the agricultural sector still looms large, will find a revitalized and effective Commodity Board an important instrument for eliminating the bottlenecks in the marketing system and stabilizing the income of producers.

In revisiting the Commodity Board issue, there should be an in-depth study that will reflect on the various deficiencies of the defunct Boards and design corrective measures. The lessons learned from experience since their abolition should be properly articulated and entrenched in the design of new Boards. The functions, funding, administration, stabilization mechanisms and issues of sustainability should be carefully addressed to avoid overlaps and to ensure that they synchronize with national objectives of enhancing growth and poverty reduction.

Establish Agricultural Commodity Exchanges and strengthen existing ones – Whereas, Commodity Boards are desirable for strengthening the participation of small-scale operators in the market, Commodity Exchanges are required in order to create a fair, orderly and efficient system for matching supply

and demand. They should provide the necessary institutional arrangements to link small and large-scale operators and enhance the efficiency of agricultural markets. The Kenya Agricultural Commodity Exchange enhances the efficiency of impersonal, long-distance trade by providing market information and offering fast and low-cost resolution mechanisms for contractual disputes. Western Kenyan experience shows that well-organized farmers, as well as traders, can benefit from commodity exchanges (Woomer and Mukhwana, 2004). Some African countries have established Agricultural Commodity Exchanges within the past two decades, but their performance leaves much to be desired. Where they exist, there is need to strengthen them by providing appropriate legal frameworks for their operations, ensuring adequate publicity for their activities, enhancing their capacity to collect and process marketing information, and providing adequate electronic linkages between them and their clients.

Promote commercial storage (warehousing) – There is need to encourage private investment in storage of grains and other non-perishable commodities. The development of warehouse receipt systems, leading to the development of inventory credit products, shows great promise for increasing commercial storage activity, with possible additional benefits for smallholder producer groups (Coulter and Onumah, 2002). A warehouse receipt is a certified document reflecting a known quality and quantity of a product stored in a known certified warehouse for a given individual. The warehouse receipt system protects farmers against throwaway sale prices for their commodities by providing them with safer storage for such commodities until market prices become attractive. When the commodities are stored, receipts reflecting commodity values at the time of storage are issued to commodity owners. Farmers can use the receipts issued at the warehouses to get loans from commercial banks with their produce serving as security. Millers and other organizations, including food-aid agencies operating in the country, can buy the warehouse receipts whose quality is guaranteed. The warehouse receipt system can also facilitate intra-regional trade and assist governments that are interested in building food stocks to enhance food security.

Promotion of efficiency of African agricultural commodity markets

Efficient market information system – Uninterrupted flow of balanced information within the marketing system is required for the enhancement of the efficiency of national and regional

markets. There is need for market information systems not only to increase market efficiency, but also to strengthen the bargaining position and competitiveness of smaller players (producers against traders, small traders against large) within the market. A number of innovative approaches are being piloted around Africa. These build on advances in communications technology and liberalization – especially local FM radio, mobile phones, internet and satellites – to speed up information dissemination and to recognize the need to involve stakeholders in system design, management (for example, the farmers' union in Mali), and/or financing (for example, traders in the Foodnet system in East Africa). Mechanisms for collating and sharing information regarding food supply and demand in different sub-regions of Africa already exist but they need to be strengthened for their impact to be felt especially among the small-scale entrepreneurs. Various initiatives, such as the Regional Agricultural Trade Intelligence Network (RATIN), the Eastern Africa Grain Council (EAGC) and the Famine Early Warning Systems Network (FEWSNET), are already collecting and disseminating market data with funding assistance from development partners (especially USAID). Value can be added to the market information if the analyses include forecasts over longer time horizons (of at least six months) and options for remedial actions.

Create an African Commodity Exchange – One of the greatest problems currently being faced by African farmers is inadequate access to markets; and this has tended to limit production and income even in the absence of shocks. For instance, farmers in Nigeria have been facing this problem within the last couple of years (Olomola, 2008). The marketing problem is particularly severe in the case of cassava, rice, maize and soybean. Thus, for the purpose of income generation, stabilization and poverty reduction, the bottlenecks in the marketing system have to be removed. For Africa overall, there is need to increase the geographical coverage of commodity markets and improve farmers' access to markets in general. Improved market access has the potential to bring individual producers the information they need to negotiate more effectively. With better knowledge of market prices, producers can be encouraged to engage in contracts with more favorable terms than hitherto has been the case in order to hedge against price drops. In view of the foregoing the establishment of an African Commodity Exchange is recommended. This is an issue that can be taken up at the level of the African Union. Fortunately, agricultural commodity

exchanges are now operational at the level of individual countries in Africa, thus there are lessons to be learned. Many of them have been designed to ensure a fair, orderly, and efficient marketing system to encourage smallholder farmers to produce more for the market, to benefit domestic agro-industry through a more efficient and reliable supply chain, and to enhance export competitiveness through getting the domestic market in order. It should be possible to begin by conducting studies on the performance of the existing exchanges and the feasibility of establishing one at the continental level.

Fast track establishment of an African Common Market for agricultural products – A practical solution to the fragmentation of agricultural markets in Africa evolved during the 2004 AU Meeting in Sirte, Libya, and subsequently in the December 2006 Abuja AU/NEPAD Summit on Food Security in Africa. The proposal is that, to achieve significant economies of vertical integration and scale in African agriculture, emphasis should be placed at the regional/sub-regional level around a limited number of strategic commodities without prejudice to on-going efforts for sector-wide development. Thus, for selected strategic commodities, a “Common African Market” that transcends national and sub-regional borders would offer an appropriate economic space to foster private investments at the level of regional economies. This implies that, for the selected strategic commodities, there would be a need to move market integration beyond the current pace of reform to create a Free Trade Area at the continental level. Thus, the Abuja 2006 Food Security Summit calls on African countries to “promote and protect rice, legumes, maize, cotton, oil palm, beef, dairy, poultry and fisheries products as strategic commodities at the continental level, and cassava, sorghum and millet at sub-regional level, without prejudice to focused attention being given also to products of particular national importance”. These strategic products are compatible with those identified as “special products” under the framework of the WTO and are also amongst the sensitive products in many of the RECs.

A recent study examines the feasibility of establishing an African Common Market for agricultural products. The study examines the key legal and economic issues involved in establishing an African Union Common Market for Agricultural Products (CMAP). The analysis reveals that there already exists a broad consensus that increased intra-regional trade liberalization will be beneficial for the continent and that indeed, a roadmap to this effect already exists in the form of the Treaty Establishing the African

Economic Community. What is required at this juncture is to fast-track the process of establishing the CMAP. Priority actions are required in the following areas.

- Elimination of tariff and non-tariff barriers to trade in agricultural products;
- Avoidance of complications in the definition of appropriate rules of origin regarding the products eligible for preferential treatment in order to facilitate and not obstruct trade;
- Ensuring that SPS measures conform to international standards to the fullest extent possible;
- Ensuring that member nations are provided with technical assistance to comply with reporting requirements;
- The AU Committee on Rural Economy and Agricultural Matters and the Committee on Trade, Customs and Immigration Matters should be strengthened to enable them to monitor and assist in the implementation of the Protocol;
- Conclusion of the protocol concerning Non-Tariff Trade Barriers contemplated in Article 31 of the Abuja Treaty;
- Conclusion of the protocol concerning the Rules of Origin contemplated in Article 33 of the Abuja Treaty to complement the Rules intended for use in the CMAP;
- Conclusion of the protocol concerning standardization, quality assurance and measurement systems contemplated in Article 67 of the Abuja Treaty;
- Strict enforcement of free movement of people within the various RECs; and
- Removal of Intra-African Technical Barriers to Trade

The establishment of CMAP will contribute to poverty reduction and help overcome food insecurity. It is a great response to the challenges of climate change, as it will reduce food dependency and vulnerability to control of African economies by external forces. Moreover, it will strengthen regional integration and empower the continent in international trade negotiations. It is expected that the RECs would form the basis of the CMAP and since a number of them already have a common external tariff (CET) in place, it should be possible for such RECs to liberalize trade with African countries and thus provide the platform to fast-track the establishment of CMAP.

Concluding remarks

African agriculture has not witnessed the desired level of growth despite a plethora of policy interventions over the last two decades. The balance of agricultural trade has been largely against Africa, as many countries remain net food importers. The poor agricultural export performance and limited intra-regional trade reflect bottlenecks in the marketing systems at national and sub-regional levels and continued reliance on the export of primary commodities. In designing remedial measures, emphasis has always been placed on increased production and productivity improvement, while the bottlenecks in the marketing system have received little attention. There are constraints at the domestic (national) level, sub-regional level and international level that have over the years affected the structure, conduct and performance of agricultural markets. Constraints on domestic agricultural markets include infrastructural inadequacies, limited investment in marketing activities and weak links in commodity chains. At the sub-regional level, constraints include lack of marketing information, un-harmonized SPS and customs procedures, technical barriers to trade, poor certification mechanisms, poor storage and processing facilities, poor road infrastructure, poor packaging, low production levels, weak private marketing institutions, and weak regulatory frameworks. The problem of the low level of competitiveness of small-scale producers tends to be compounded by protectionist (tariff and non-tariff) policies, domestic agricultural support, and export subsidies by developed countries. Subsidies have promoted African dependence on imports and discouraged meaningful development of markets at national and sub-regional levels.

At the country level, the agricultural sector needs to be developed beyond the level of primary production and the smallholders that depend on agriculture for their livelihoods should have access to markets and remunerative prices. With an increased commercial orientation, increased production of value-added output, and higher levels of income, there is apt to be reduction in poverty and food insecurity. For those countries that are able to achieve food surpluses, it should be possible to achieve further increases in income if producers are able to diversify their production systems, base their production decisions on changing market opportunities and increase their participation in the export market (Olomola, 2006). Moreover, intra-Africa trade has to be developed to take advantage of potential demand in the region. The demand for

African agricultural products cannot be assigned for markets outside of Africa. For improved regional trade, there is need to overcome the constraints in the agricultural marketing system at the national and sub-regional levels. The key approaches include i) reduction in transactions costs, ii) promotion of market access for small-scale farmers, iii) price and income stabilization, iv) promotion of efficiency of African agricultural commodity markets and v) removal of technical barriers to intra-Africa trade.

The development of African agricultural markets must proceed in such a way as to accelerate and deepen regional integration of strategic agricultural commodity chains. Markets should be integrated not only at the national level but also at the sub-regional level, leading ultimately to an African Common Market for Agricultural Products (CMAP). The development of a CMAP will serve as an important forerunner for a continental common market for all goods and services. It should increase efficiency by reducing transaction costs and stimulate further development of the marketing system at the national level as each country strives to comply with the rules and maximize the opportunities offered by an expanded market.

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Regional trade: An opportunity to spur growth in eastern and central Africa

Michael Waithaka¹ and Miriam Kyotalimye²

Abstract

It is now largely acknowledged that significant reductions in hunger and poverty in Sub-Saharan Africa will be driven by increases in the agricultural income growth rate. This paper postulates that the macro policy reforms of the 1990s have been captured in most countries and additional growth rate increases in agriculture will largely depend on sharp productivity increases. This paper further postulates that a truly integrated regional market would expand the size of the market, increase elasticity of demand facing farmers, reduce price instabilities, provide remunerative prices and hence provide incentives for sustained farmer investment in productivity enhancing technologies. Using experiences from ASARECA research and elsewhere, evidence is provided based on successes in implemented or analytical research on three possibilities for ensuring more regional integration in trade. Improving the quality of regional infrastructure to ease commodity transfer costs between surplus and deficit regions, providing an effective regulatory regime and removal of non-tariff barriers to trade show immense promise. However, regional agreements need to be followed through with real investments and policy shifts to effect the change needed to spur agricultural productivity.

Introduction

In much of Sub-Saharan Africa, agriculture is a strong option for spurring growth, overcoming poverty, and enhancing food security. In eastern and central Africa (ECA) with a population of more than 280 million people, agriculture looms large and accounts for 43% of total gross domestic product (Omamo et al., 2006). In ECA, yields of most crops are below African and global levels, except for cassava, beans, coffee and tea. For instance, yields of maize are low with national averages of about 1.5 tons per hectare compared to a global average of 4.5 tons per hectare (Omamo et al., 2006). Sluggish growth in agricultural production translates into slow growth and low per capita incomes. Accelerated growth requires a sharp productivity increase in smallholder farming, combined with more effective support to the millions coping as subsistence farmers, many of them in remote areas.

While the growth rate of agricultural gross domestic product per capita was close to zero during the early 1970s and negative through the 1980s and early 1990s, positive growth rates in the past 10 years suggest that the stagnation in many countries in ECA agriculture may be over and that agriculture could be the engine of faster growth and poverty reduction in the region (World Bank, 2007). First, between 1995-2006 many ECA economies exhibited faster and steadier economic growth in tandem with the rest of the world and had reversed the collapses during 1975-85 and the stagnation that prevailed from 1985-95. This growth, which has been accompanied by some reductions in poverty and hunger, is a result in part of significant policy reforms, especially at the macro level. To achieve the above-mentioned development objectives, this growth needs to be increased and sustained. Second, ECA governments and their development partners have embraced agriculture as a priority for Africa's poverty reduction and economic growth strategies. Since the easy gains from price reforms have already been captured in many countries, future growth will have to rely more on increased productivity. Large gaps between current yields and what can be economically achieved with better support services, especially in high-potential areas, provide optimism that rapid productivity growth can be achieved. While recent improved performance held promise and there were many emerging successes that could be scaled up, the global financial crunch and increasing food prices may dampen those gains.

According to FAO, global food prices shot up to unprecedented levels between 2007 and 2008. While global prices exhibited rising trends up to March 2008, food prices in ECA also increased, but at lower rates (Karugia et al., 2008a). Between March and June 2008, the global food price index stagnated, and has even decreased since then. However, the decreasing trend in global food prices has not been reflected in ECA. Food price indices for the majority of the countries in ECA have continued to rise after July 2008.

In 2003, ECA heads of state joined their counterparts in the rest of Africa to adopt the Comprehensive Africa Agriculture Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD), an African-led plan to stimulate agriculture on the continent. The specific targets of CAADP include achieving annual agriculture growth rates of 6% by

¹Policy Analysis and Advocacy Programme, Association for Strengthening Agricultural Research in Eastern and Central Africa, PO Box 765, Entebbe, Uganda. Corresponding author (m.waithaka@asareca.org).

²As above

allocating 10% of national budgets to the agricultural sector by 2008. Fulfilling the current commitments to CAADP and MDG targets is an important first step to avoiding a relapse resulting from the recent food price crisis. A few countries (Angola, Ethiopia and Malawi) are already following through on the commitments, but the majority is behind and will require greater efforts to reach the targets and ensure long-term growth (Johnson et al., 2007). This will require focus on three functional areas critical to agricultural growth within which institutional and organizational reform will play out: technical change and productivity, market efficiency, and increased private-sector investments.

Increases in food crop productivity will likely remain a key driver of rural non-farm activity in ECA. Nearly two-thirds of rural households derive most of their total income from food production for their own consumption. Increased productivity is the basic engine of agricultural growth and will depend on an appropriate incentive environment that generates the profits that motivate farmer-investment in new technologies. Increased profits and cash flow will in turn depend on better relative prices received by farmers and access to investment resources, all of which will arise from more efficient output, input and financial markets. Widespread productivity increases in food crops would therefore release labor and capital from food crop production – for large numbers of households, especially the poorest – making them available for the production of higher-value crops and non-farm activities such as manufacturing and services. In addition, policies aimed at strengthening institutions and reducing input costs, e.g., reduction in tariffs and taxes, are required. However, targeted interventions to support the poor without distorting domestic incentives to produce more food, e.g., cash transfers based on income level, location or occupation, and subsidized inputs, e.g., fertilizers and seeds, may be required. Since smallholder-farming systems in ECA are highly diversified, no single intervention is going to lead to significant increases in incomes. Integrated packages that motivate sustained investment by farmers in improved productivity will be required. Productivity growth will require an expansion of area irrigated, improvements in management of soil fertility, as well as the adoption of better seeds which will require increased investment in public research and development.

Increases in productivity alone will not go far. There appears to be a vicious cycle in which low surplus production constrains

the development of markets, which in turn constrains the ability of smallholders to use productive farm technologies in a sustainable manner, reinforcing semi-subsistence agriculture. Crop production expansion is difficult to sustain in the face of highly inelastic product demand, which causes precipitous price plunges when local markets are unable to absorb surplus output. Such price drops are a major cause of subsequent farm dis-adoption of improved technology. The demand function for staple grain crops can be made more elastic, and shifted outward, through market-facilitating public investments and policy choices and by nurturing important marketing institutions (Jayne et al., 2006). Transport costs are generally the largest single component of price differences between surplus and deficit areas. As transport costs decline, the size of the market expands for any particular farmer and demand becomes more elastic. More generally, there is strong evidence that a country's level of infrastructural development is associated with its level of agricultural productivity (Mghenyi and Jayne, 2006).

Through the CAADP Roundtable processes, national agricultural policies in ECA countries have been undergoing reevaluation. These processes have recognized the need to improve market access and expand smallholder participation in domestic, regional, and global markets, and countries are enacting policies to create enabling institutional and marketing environments. Regional trade, in combination with good transport infrastructure between countries, has the potential to expand the size of the market, increase the elasticity of demand facing farmers, and reduce price instability. Local production shocks can be mitigated by regional trade, which tends to stabilize markets by linking together areas with covariate production. By integrating the region's food markets and simplifying its food trade regulations, the region could link up food-deficit to food-surplus areas and thus provide its citizens with staples in any given season. A truly integrated regional market would provide farmers with remunerative prices and alternative reliable markets for their produce while also providing urban consumers and rural net buyers of food with a variety of reasonably priced food staples throughout the year (Karugia et al., 2008a). Unless regional markets are better integrated, markets will remain small and ineffective.

The Common Market for Eastern and Southern Africa (COMESA), which embraces eight countries in ECA and another 11 in southern Africa and the East African Community (EAC), are

leading regional integration. Regional integration is critical especially for landlocked countries, given its ability to generate positive spillovers, new market opportunities, and enhanced food security. COMESA and EAC are taking a lead role in the CAADP process by encouraging member countries to open their markets for regional trade and investment, with the eventual goal of establishing free trade areas. Among their investment priorities are increased investment in regional infrastructure, streamlining of regulations and minimization trade barriers. These investments are augmented by facilitation of regional research initiatives to harmonize policies, regulations and procedures aimed at increasing generation and transfer of technologies and trade.

Regional trade can provide the platform for accelerating agricultural productivity growth in ECA. The volume of intra-regional trade in ECA is less than 10% of the region's total trade. This pattern of orientation towards the rest of the world rather than to within-ECA is in part due to homogeneity of production that focuses on primary commodities with limited intra-region value addition. In turn, most governments have invested more in infrastructure that links production to seaports, with limited inward expansion. ECA hence functions as small fragmented markets with variations in the conditions of roads and the policies and procedures governing trade. Where policies and procedures are agreed, non-tariff barriers further impede progress towards improved across border transactions. This paper lays emphasis on three conditions for facilitating regional trade and integration of markets in ECA, with a focus on support to regional infrastructure and experiences from the Association of Strengthening of Agricultural Research in Eastern and Central Africa (ASARECA) in provision of an efficient regulatory regime for seeds and elimination of non-tariff trade barriers

Support to regional infrastructure

One of the key factors that impede movement of goods from surplus to deficit regions is high commodity transfer costs – poor infrastructure, expensive transport, and communication barriers that increase the costs of delivery of the commodity (Rapsomanikis et al., 2006). This factor gets compounded for landlocked economies where transfer costs in landlocked economies are estimated to average about three quarters of the value of exports, making it extremely difficult to deliver goods to the market at competitive prices (Abuka, 2005). For instance, the Logistics Unit of the Uganda office of the World

Food Programme reported in 2008 that the cost for shipping bulk grain from US seaports to Mombasa was US\$ 153 per metric ton. Mombasa port charges, including repacking, average US\$ 30. Overland transport from Mombasa to Kampala by rail was US\$ 87 per metric ton (by road it is US\$ 123). The local price is often higher than the export parity price removing the incentive to trade in grain beyond Uganda's immediate neighbors (IFPRI 2008). Average freight rates provided by the Logistics unit for 2010 show that on average, freight rates for bulk grain shipments such as wheat and sorghum weighing 35,000 to 50,000 mt (metric tons) from US Gulf ports to Mombasa range between US\$ 90.00 to US\$ 150.00/mt. The rates rise to US\$ 120.00 to US\$ 180.00/mt for quantities between 10,000 to 35,000 mt and can be anywhere US\$ 150.00 to US\$ 230.00 for quantities between 1,000 to 5,000 mt. Conversely, freight rates from the Gulf to China dropped from US\$ 110/mt to US\$ 55/mt and from US\$ 105/mt to US\$ 62/mt for Japan for grain shipments between January 2008 and January 2010 (http://investmenttools.com/futures/bdi_baltic_dry_index.htm#freight_rates). According to the Uganda Logistics unit of the WFP, bulk shipments to Mombasa attract a higher rate than elsewhere due to lower trade volumes between the region and the US.

Intra-regional shipping costs are also relatively higher than extra-regional costs. Shipping a car from Japan to Abidjan costs US\$ 1,500, while an exporter would incur US\$ 5,000 to ship the same car from Abidjan to Addis Ababa (Abuka, 2005). Amjadi et al. (1996) estimate freight costs to be 42% of transport costs for all landlocked countries in Africa on average. Custom delays also compound trading costs, averaging 12.1 days for Sub-Saharan Africa compared to only 3.4 days in Western Europe. Non-tariff barriers, including excessive bureaucracy and corruption, add to these costs, impeding the smooth flow of food from surplus to deficit regions. Transport costs are generally the largest single component of price differences between surplus and deficit areas. As transport costs decline, the size of the market expands for any particular farmer and demand becomes more elastic.

Although several regional infrastructure initiatives are underway, progress on regional infrastructure is slowed by the technical complexity of multi-country projects and the time required for decisions by multiple governments. Although, ECA has been slow to mobilize the private sector for the provision and financing of infrastructure, there is an upward trend in private-sector provision and management of infrastructure, especially

in telecommunications and energy. Concessions have also been awarded to operate and rehabilitate some railways (Karugia et al., 2008a). Suffice is to say that to assure the food security of ECA, there is need to address the quality of its infrastructure.

An effective regulatory regime

The second factor necessary for enhancing regional trade is support towards an effective regulatory regime and draws on ASARECA's experience in harmonization of seed policies, laws, regulations and procedures. Use of *ad hoc* country-specific policies, laws and procedures has limited the size of the ECA market by raising both the time and cost of transacting business across borders.

Africa's share of global seed trade is marginal, amounting to less than 2% on average. The low presence on the global scene is explained by several factors, and in 1999 ASARECA started a project to address one of these impediments – an ineffective policy and regulatory environment (ECAPAPA 2002). For instance, procedures for variety testing and approval constituted a significant barrier to seed trade and inhibited the spread of new varieties beyond national boundaries. This led to delays in the release and often rejection of useful varieties that did not meet the criteria and procedures. A public variety released in one country faced long battles to gain release in a second country. Phytosanitary regulations that were not based on scientific evidence further restricted possibilities for trade. Commercial seed trade was also hampered by lack of intellectual property protection for plant varieties and by different procedures for import and export of seed. Since seed markets in the region were small and highly fragmented, many released varieties had never been widely disseminated due to closed national markets dominated by a few international companies and parastatals, as well as restrictive laws, regulations and policies. Transaction costs within and across national boundaries are high because of differing regulatory and trade arrangements across countries. To create a more enabling environment for private-sector participation in seed trade, many countries in ECA are investing in the creation of an enabling policy environment to transform smallholder farming from its common quasi-subsistence nature to market-oriented commercial entities. One of the avenues being pursued is the establishment of common regulatory structures to reduce transactions costs and promote increased trade and hence use of improved seeds (Minde and Waithaka, 2006).

The project began with extensive analyses of seed systems in Kenya, Tanzania and Uganda and a range of national- and regional-level activities and meetings that developed an agenda for seed regulatory reform. National efforts were augmented by regional workshops that discussed modalities for regional coordination and implementation of the harmonization agreement (ECAPAPA 2002). In 2001, a Seed Regional Working Group (S-RWG) drawing members from the public and private sectors was formed and mandated to coordinate implementation of agreements reached. In 2004, the S-RWG was transformed into the Eastern African Seed Committee (EASCOM) comprising four representatives from each of the 10 countries of ASARECA, covering policy (Ministry of Agriculture), regulation, seed trade, and plant breeding.

The process of seed policy harmonization followed a four-stage policy cycle. In the first stage, national resource persons collected country data on constraints and concerns in the seed industry. This information was analyzed in the next stage – policy data analysis – by the resource persons and a range of international experts in seed evaluation, registration, certification, plant variety protection and phytosanitary issues. International standards in the major categories of seed were considered and compared with existing and proposed regional standards. The end results were different options that included benefits and costs, as well as winners and losers in the game. These two stages were technical and scientists played a leading role.

The third stage – policy dialogue – was essentially a political process where changes suggested by technical teams were communicated to a broad range of stakeholders at national and regional levels. Participants included multidisciplinary sets of scientists, seed companies, transporters, stockists, government technocrats, politicians and policymakers. This stage was highly interactive and required effective communication of potential solutions, forging of mutual expectations and several rounds of discussions to reach consensus on a common course of action. The fourth stage – policy action – dwells on the implementation of the agreements reached. Agreements on changes relied much more on open discussion of problems and proposals than on the advice of external experts (Tripp, 2005). Table 1 summarizes achievements of seeds harmonization in ECA.

Table 1. Progress of implementation of seed harmonization in ECA to date

Policy area	Progress indicator
1. Variety evaluation and release process	- National Certification Agencies (NCA) validate tests in national performance trials and recommend release through a national policy committee. - Kenya and Tanzania have established independent NCA: the Kenya Plant Health Inspectorate Service (KEPHIS) and Tanzania Official Seed Certification Institute (TOSCI). - The length of the period for national performance trials has reduced from three years to two seasons on average. - Agreement contained in Uganda Seed and Plant Act (2007); Tanzania Seeds Act (2003), Kenya Seed Bill (2008) and Rwanda Seed Act (2003) - Regional variety list produced for Kenya, Uganda and Tanzania.
2. Seed certification	- Regional seed certification standards for Kenya, Uganda, Tanzania and Rwanda published and captured in Kenya's Draft Seed Bill (2007), in Tanzania's Seed Regulations (2007) and in Uganda's Seed and Plant Act (2007). - Uganda acceded to Organization for Economic and Cooperation Development (OECD) standards in 2005. - Tanzania has initiated the process of acceding to OECD Field Schemes and ISTA lab testing rules.
3. Phytosanitary measures	Quarantine pest lists have been revised for Kenya, Rwanda, Tanzania and Uganda and are under validation by the National Plant Protection Organizations of Tanzania, Uganda and Kenya and the Rwandan Ministry of Agriculture before publication.
4. Plant Variety Protection (PVP)	- The region agreed to develop a sui generis system of PVP based on the International Union for the Protection of New Varieties of Plants (UPOV) 1991 Convention. - Effective PVP is currently operational in Kenya and Tanzania. - Kenya's Seeds and Plant Varieties Act (Amendment) Bill (2008) and National Seed Development Policy providing for liberalization of seed sector approved. - Ethiopia has enacted PVP Law, which has provision for farmers to exchange seed (Plant Breeders' Right Proclamation No. 481/2006 of 27th February, 2006).
5. Import/export documentation	Simplified forms have reduced the time taken to process seed import/export documentation thereby lowering the cost of cross-border trade.

Source: Obongo et al. (2008).

Amending laws and regulations takes time, but changes in attitude and interpretation are often as important and as difficult to achieve. In addition, many regulatory reforms imply changes in institutional responsibilities and the establishment of new protocols that require additional resources. All the same, considerable progress has been made in harmonization of seed policies, laws and regulations. Convergence in processes such as certification standards, variety evaluation and release, and trade documentation in ECA countries has led to opening up of trade in high-yielding varieties of seed across borders and broadened the market for players.

The ECA region has seen an increase in both the number of seed companies operating and the volume of intra-regional trade in seed. Between 2002 and 2006, 140, 24 and 15 new varieties were released in Kenya, Tanzania and Uganda, respectively (Obongo et al., 2008). Over the same period, 37 enterprises traded an average of 28,512 tons of improved seeds in Kenya. It was estimated that the formal sector in Uganda supplied more than 7.5% of the 62,000 tons of improved seeds requirements per year. In Tanzania, the private sector contributed 74% of the 120,000 tons of improved seed per year while the public sector supplied 25% and small-scale farmers 1%. However, efforts by governments to develop legal and institutional frameworks to support required reforms need to be speeded up and EASCOM is at the fore front of advocating individual countries to implement parts of the agreements that are still withstanding.

Addressing non-tariff barriers to trade

The third thorny issue affecting growth in regional trade is non-tariff barriers (NTBs) to trade. Multilateral trade agreements have brought down tariff barriers to trade following negotiations under the General Agreements on Trade and Tariffs (GATT) and subsequent rounds. However, non-tariff barriers have gained prominence as alternative trade policy instruments for domestic industry protection or for regulating trade. There are several definitions of NTBs in trade literature. In general they are all the barriers to trade that are not tariffs (Deardoff and Stern, 1997). However, this definition is very broad because it includes both trade-restricting measures (quotas, technical barriers, etc.) and trade-promoting measures (export subsidies and domestic farms support). Trade between EAC countries is carried out both through formal (regulated and recorded) and informal (unregulated and unrecorded) channels. The existence of NTBs may explain why most trade in the region continues to be

informal, accounting for over 95% of trade in livestock and up to 60% for staple grains (Ackello-Ogutu and Echessah, 1997; Little, 2007).

In March 2004, member states of the EAC signed a protocol for establishment of the East African Community Customs Union that commits the states to eliminate trade-restricting barriers. However, despite this agreement, NTBs in the form of bureaucratic import/export procedures inhibit formal trade between the EAC countries. Inappropriate policy interventions in the commodity markets tend to distort relative prices thereby encouraging informal cross-border trade, a more costly alternative. In light of its effects on trade, a study commissioned by the East African Business Council (EABC) in 2004 showed that NTBs evolve around business registration and licensing, customs procedures, police road checks, road axle regulations and control, and standards and certification requirements (EABC 2005).

Between November 2006 and February 2007, a follow-up survey on the East Africa Community Business Climate Index was conducted on 504 respondents drawn from EAC. The study categorized obstacles to business under six trade-related areas: customs procedures; immigration and work permits; business registration and licensing; police road blocks; weighbridge stations and quality standards; and export certification. The most frequently cited constraint was customs procedures. On average, Kenyan businesses were more affected than their counterparts in Tanzania and Uganda, just like in the findings from 2004. Other constraints were time and extra costs incurred at border points and corrupt practices.

Since the EABC survey of 2004 and the follow-up did not quantify the cost of NTBs and their welfare effects to the region, the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) and ASARECA – in collaboration with the Economic Policy Research Centre (EPRC) in Uganda, the Economic and Social Research Foundation (ESRF) in Tanzania, and the Kenya Institute for Public Policy Research and Analysis (KIPPRA) – conducted a follow up study to quantify the impacts on maize and beef trade in Kenya, Uganda and Tanzania (Karugia et al., 2009b).

The study defines NTB transfer costs for the maize and beef sectors to include extra transit costs encountered at weighbridges, security, transiting, customs clearance, road toll

stations, branding of cattle, standards and certification, and bribes. They find that on average, the cost of NTBs to trade in maize per kilometer per ton was US\$ 0.09, US\$ 0.15, and US\$ 0.11 in Kenya, Uganda, and Tanzania, respectively. The cost of beef trade NTBs per kilometer per ton was US\$ 0.17, US\$ 0.31, and US\$ 0.23 in Kenya, Uganda, and Tanzania, respectively. When distances between capital cities, which are the major trading centers, are accounted for, then these additional transfer costs as a result of NTBs become significantly substantial.

It is worth noting that the issue of regional trade barriers is not specific to just the EAC region. Nieuwoudt (2007) reviews a study on the impact of non-tariff barriers on goods passing through the South African port city of Durban from Zimbabwe via the Beit Bridge border post. This crossing is one of the busiest in Africa and certainly the busiest in the SADC region. Basing on data in 2006, it took between 63 and 83 hours for heavy commercial vehicles seeking multiple-entry permission to cross Beit Bridge on the northbound route from South Africa to Zimbabwe. Application for single-entry permission can take between 48 and 53 hours on the northbound route. On the southbound route, single-entry permission can take between 23 and 44 hours. Furthermore they report serious ship and truck congestion at the Durban port in South Africa. Ship queues waiting to enter the terminal are between 10 and 15 kilometers long and resulting in delays of between three and six hours, which translates into a cost of US\$ 46 per hour per truck.

In general, the barriers to trade are not very different across Africa. However, the existence of regional trade integration bodies such as the EAC, COMESA, ECOWAS and SADC provide a platform for a region-wide approach. Successful approaches can then be scaled up from region to region. Positive steps are already underway. By 2002, about 34 countries in Africa had installed ASYCUDA, a compatible excise and customs software, and the Mombasa port is now a 24-hour port, which has considerably eased customs clearance for the many landlocked countries that are serviced by this port. A more detailed account of barriers to regional trade in the East Africa region is given in the paper by Karugia et al. in this volume.

Conclusions

Regional trade offers hope for spurring agricultural productivity in ECA. However, for that to happen, key requirements would be to improve regional infrastructure and harmonize regulatory and procedural regimes in major sectors. To effect such harmonization, countries must implement agreements they have reached. This requires advocacy and identification of opportunities in regulatory frameworks that can speed up implementation processes. The agreements made need to be followed through with real investment and policy shifts. Investments in regional infrastructure need to be tackled head on with a lead from regional economic communities. For regional trade to translate into high productivity gains and improved incomes for smallholder farmers, a many-pronged approach to removing barriers to trade is required.

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International Livestock Research Institute
P O Box 30709, Nairobi 00100, Kenya
Phone + 254 20 422 3000
Email: ILRI-Kenya@cgiar.org

www.ilri.org



Alliance for a Green Revolution in Africa
P O Box 66773, Westlands
Nairobi 00800, Kenya
Phone + 254 20 367 5000
Email: AGRA@agra-alliance.org

CSIR Office Complex
#6 Agostino Neto Road
Airport Residential Area,
PMB KIA 114 Accra, Ghana
Phone +233 21 740 660 / 768

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