Markets That Work

Making a Living from Livestock

2007

ANNUAL REPORT

INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

NOTE

We present this year's annual report for the International Livestock Research Institute (ILRI) primarily in web rather than printed format for greater cost-effectiveness and ease of use by most of our stakeholders. We have also designed the report to be printed easily in whole or in part, as needed. The weblinks embedded throughout the electronic text will take you to reference and other related materials that may be of interest to you. We welcome your comments on how well this format meets your needs. You will find a place to comment on our website.

Because ILRI's research covers all systems in which livestock are important, our mandate is uncommonly broad and diverse; for this reason we take a thematic rather than programmatic approach to our annual report. A disadvantage of this approach is that we are able to cover a given major topic only once in every several years. For this reason, we have also departed this year from a strict coverage of just one year's research work (2007). We include key events in the first half of 2008, particularly matters pertaining to the continuing global food price crisis, while our financial and other institutional information found in the appendices covers 2007 alone. This flexibility allows us to provide more timely and complete information on our chosen topic—what livestock markets can do for the poor.

Markets That Work
Making a Living from Livestock

International Livestock Research Institute

Annual Report 2007

ILRI

P.O. Box 30709, Nairobi 00100, Kenya

P.O. Box 5689, Addis Ababa, Ethiopia

Credits

Text, image selection	Susan MacMillan
Appendices	Susan MacMillan with Azeb Abraham, Samuel Gichuki, Brigitte Laude, Jared Odhingo.
Design, layout, photo editing, production	Eric Ouma
Special thanks to	*ILRI Ethiopia:* Azeb Abraham, Asfaw Negassa, Jean Hanson, Mohammed Jabbar, Tariku Gebremichael. *ILRI India:* Debabrata Basu, Michael Blümmel, Rameswar Deka, Arun Pal, Arindam Samaddar, Jai Pal Singh (Tata Trust), Nils Teufel, Iain Wright. *ILRI Kenya:* Derek Baker, Isabelle Baltenweck, Ade Freeman, Elphas Gibendi, Delia Grace, Mario Herrero, Christine Jost, Simeon Kaitibie, Joseph Karugia, Clare Kemp, Jeff Mariner, John McDermott, Andrew Mude, Samuel Mungai, Muthoni Njiru, Amos Omore, Brian Perry, Gabrielle Persley, Ravi Prahbu, Tom Randolph, Bruce Scott, Steve Staal, Carlos Seré, Joop van Binsbergen, Dave Watson. *ILRI Mozambique:* Maria Andrade (CIP), Richard Dove (World Vision), Manuel Filipe, Jan Low (CIP), Felisberto Maute, Boni Moyo, Arnaldo Rodrig. *ILRI Nigeria:* Iheanacho Okike. *ILRI Vietnam:* Lucy Lapar. *Colombia:* Federico Holmann (CIAT). *Egypt:* Karl Rich. *Nicaragua:* Edwin Perez. *Nigeria:* Acho Okike. *Syria:* Aggrey Majok (ICARDA). *Thailand:* Nancy Morgan (FAO). *UK:* Nick Hooten, Tim Leyland (DFID), Margaret MacDonald-Levy, Ian Scoones (IDS), Phil Thornton, Bill Thorpe, Timothy Williams.
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For extended material and the following appendices, go to www.ilri.org

Appendices

Iva Zimova/PANOS

Foreword

This is a time of intense change, with volatile food prices, a near meltdown of financial markets and the continuing growing threats of climate change and emerging diseases. Research by the International Livestock Research Institute (ILRI) and its partners is helping to address these issues by working at the intersection of small-scale livestock production systems with these new global forces. We see strong growth in demand for research into dynamic markets for livestock products; the growing competing demands for human food, animal feed and biofuels; the growing environmental concerns about the expansion of livestock production; bird flu and other emerging zoonotic diseases; and the impact of climate change on animal agriculture in developing countries.

Livestock is one of the fastest growing sub-sectors in developing countries, where it already accounts for a third of GDP and is predicted to become the most important agricultural sub-sector by 2020 in terms of added value. We view market-led pro-poor growth, the topic of this year's annual report, not as a silver bullet that will solve all the ills of the livestock sector in poor countries but rather as one of several pillars of livestock development. The livestock markets and trading systems of developing countries are as yet remarkably poorly studied and understood. What we do know is that they are far more complex and dynamic and have far higher through-put than is commonly assumed.

The increasing demand for livestock products is creating opportunities for improving the welfare of millions of poor people who depend on livestock for their livelihoods, but changes in production, procurement, processing and retailing of food, along with environmental and food safety concerns, erosion of animal genetic resources and the threat of emerging infectious diseases, threaten the potential of the poor to benefit from the on-going livestock revolution. With these new challenges, we believe livestock researchers must find new ways of working, including adopting innovation systems and value-chain approaches to their work.

The role of research is never greater than during times of change. With our research investors and partners, we continue to look for ways to adapt ourselves to continual change while seeking technical, institutional and policy solutions to complex problems. We continue to support national work to build indigenous livestock research capacity and to develop institutional arrangements that encourage continual learning. And we continue to look for effective ways to integrate research results and share research-based knowledge with those who need it most. We thank those investors and partners who continued to make this all possible in 2007.

Uwe Werblow,
Chairman of the Board of Trustees

Carlos Seré,
Director General

Who we are:
International Livestock Research Institute

The International Livestock Research Institute (ILRI) works at the crossroads of livestock and poverty, bringing high-quality science and capacity-building to bear on poverty reduction and sustainable development. ILRI works in Africa and Asia, with offices in eastern (Nairobi, Addis Ababa), western (Ibadan, Bamako) and southern (Maputo) Africa, South Asia (New Delhi, Hyderabad, Guwahati), Southeast Asia (Bangkok, Jakarta, Hanoi) and East Asia (Beijing).

ILRI is a non-profit-making and non-governmental organization with headquarters in Nairobi, Kenya, and a second principal campus in Addis Ababa, Ethiopia. We employ nearly 700 staff from about 34 countries. About 80 staff are recruited through international competitions and represent some 30 disciplines. Around 600 staff are nationally recruited, largely from Kenya and Ethiopia.

PARTNERSHIPS

All ILRI work is conducted in extensive and strategic partnerships that facilitate and add value to the contribution of many other players in livestock research for development work. ILRI employs an innovation systems approach to enhance the effectiveness of its research. We believe fundamental change in culture and process must complement changes in technologies to support innovations at all levels, from individual livestock keepers to national and international decision-makers.

WHY LIVESTOCK RESEARCH FOR THE POOR?

Farm animals are an ancient, vital and renewable natural resource. Throughout the developing world, they are means for hundreds of millions of people to escape absolute poverty. Livestock in developing countries contribute up to 80 percent of agricultural gross domestic product; nearly 1 billion rural poor people rely on livestock for their livelihoods. Globally, livestock are becoming agriculture's most economically important subsector, with demand in developing countries for animal foods projected to double over the next 20 years. The ongoing 'livestock revolution' offers many of the world's poor a pathway out of poverty.

Livestock not only provide poor people with food, income, traction and fertilizer but also act as catalysts that transform subsistence farming into income-generating enterprises, allowing poor households to join the market economy.

Livestock sustain most forms of agricultural intensification—from the Sahelian rangelands of West Africa to the mixed smallholdings in the highlands of East Africa and the drylands of southern Africa to highly intensified wheat production in South Asia and rice production in Southeast Asia.

Holding back livestock development in poor countries are inappropriate policies, scarce livestock feeds, devastating diseases, degraded lands and water resources, and poor access to markets. Research by ILRI and its partners is helping to alleviate these problems by developing new knowledge as well as technological and policy options.

POVERTY FOCUS

ILRI's strategic intention is to use livestock as a development tool, one that widens and sustains three major pathways out of poverty: (1) securing the assets of the poor, (2) improving smallholder and pastoral productivity and (3) increasing market participation by the poor. ILRI conducts research in four themes—Targeting and innovations; Improving market opportunities; Biotechnology to secure livestock assets; and People, livestock and the environment—and coordinates the Systemwide Livestock Programme of the Consultative Group on International Agricultural Research (CGIAR).

GOVERNANCE

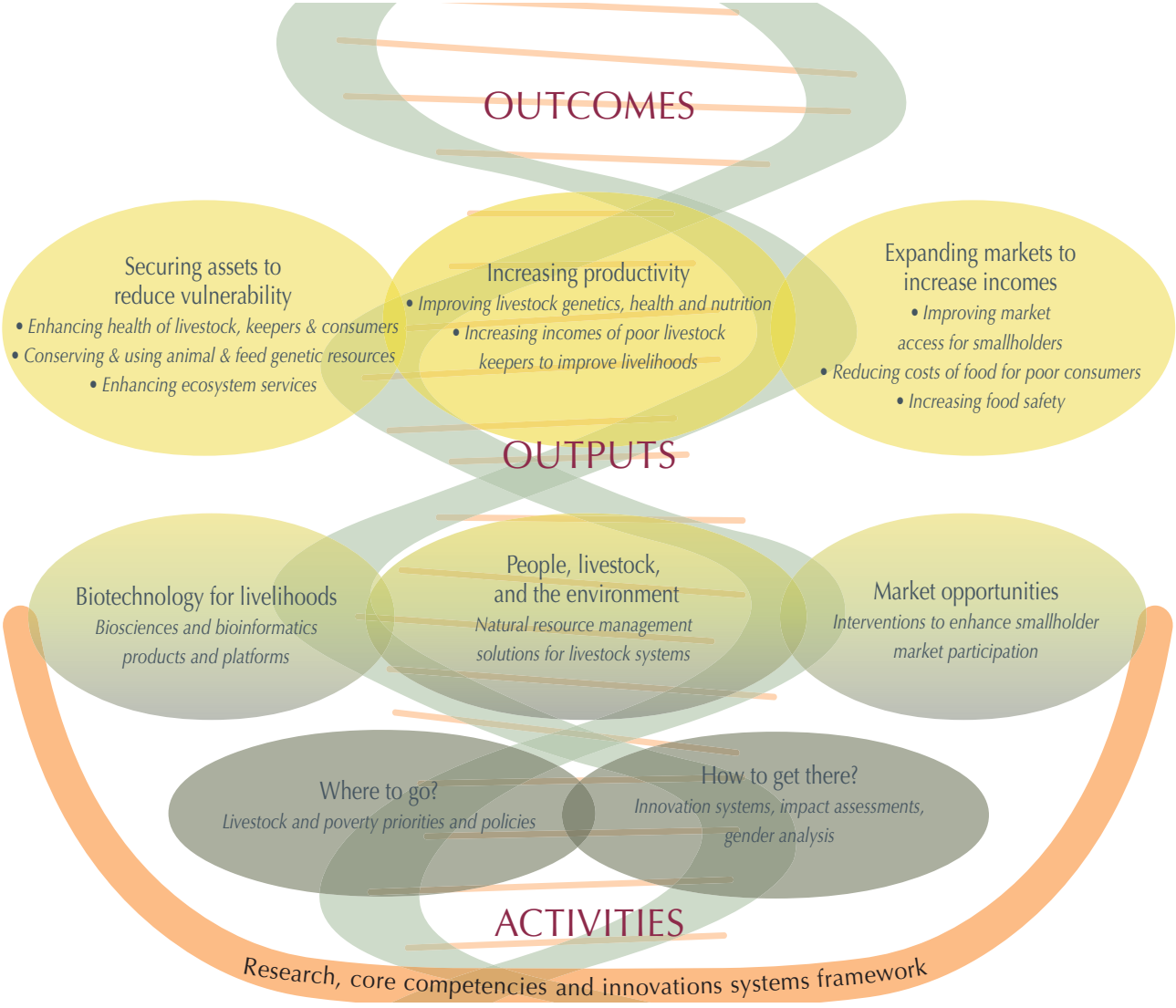
ILRI is guided by a board of trustees comprising 12 leading professionals in relevant research, development and management issues. The institute is supported by the CGIAR, an association of more than 60 governments and public- and private-sector institutions supporting a network of 15 agricultural research centres working to reduce poverty, hunger and environmental degradation in developing countries. The co-sponsors of the CGIAR are the World Bank, the United Nations Development Programme, the Food and Agriculture Organization of the United Nations and the International Fund for Agricultural Development.

FUNDING

ILRI is funded by some 80 private, public and government organizations of the North and South. The institute's expenditure for 2007 was US$38.4 million. Some donors support ILRI with core and program funds; others finance individual research projects. In-kind support from national partners such as Kenya and Ethiopia, as well as that from international collaborators, is substantial and vital. This mix of generic, specific and in-kind resources is essential for the partnership research we conduct.

KNOWLEDGE TO ACTION

REDUCING POVERTY, HUNGER AND ENVIRONMENTAL DEGRADATION



DYNAMIC LIVESTOCK SECTOR

Increasing demand in developing countries ● More complex pathways and longer market chains ● Supermarket revolution ● Food safety demands ● Pressure on natural resources to double livestock production

ILRI's value proposition

ILRI and its partners conduct collaborative research to create and integrate knowledge that enables diverse stakeholders to develop and use innovative, livestock-based pathways out of poverty.

Special section

Record-high food prices

2007

Sven Torfinn/PANOS

New options with animals
ILRI on the high prices of livestock foods

With the rising prices of staple foods, many poor people in developing countries face an immediate crisis, as nutritional foods from livestock and other sources are now largely out of their reach. As the politics of food grow ever more complicated, the danger exists that the globe's poorer South will be pitted against the relatively wealthy North.

New results of research conducted by ILRI and four of its partners in the CGIAR Systemwide Livestock Programme (IFPRI, CIMMYT, IWMI and ICRISAT; see their 2008 draft report on 'Drivers of Change in Crop-Livestock Systems and their Potential Impacts on Agro-ecosystems Services and Human Well-being to 2030') shows that the increasing diversion of grains and oilseeds to produce ethanol and biodiesel, a promising first step toward reducing the world's dependence on petroleum, will raise the price of food grains globally, directly causing greater human malnutrition in the South.

Africa is—and will continue to be—the region hardest hit by rising food prices. It therefore deserves special attention. There are no simple solutions; addressing these threats depends on collective will and action.

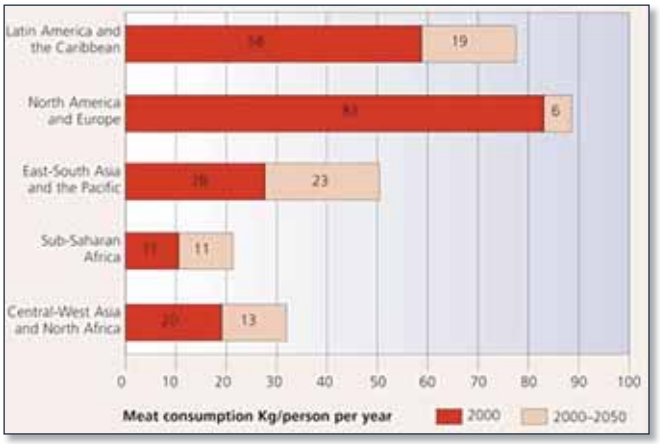
Dramatically rising consumption of milk and meat in developing countries is a major factor in global food price rises. The price of milk has more than doubled in just a few months in some countries. The price of meat has risen less dramatically but will continue to increase. A surge in demand for livestock products in China and India is driving the increase in livestock prices. Other factors include rising oil prices, diversion of agricultural resources to produce biofuels and bad weather that hurt cropping, particularly in Australia and New Zealand.

Some of the negative implications on the poor of the rising prices of milk and meat are explored in the joint ILRI-IFPRI (International Food Policy Research Institute) article 'Do higher meat and milk prices adversely affect poor people?' (id21 insights, 2008). The key finding of the study reported on, which produced new projections for global food demand using IFPRI's 'IMPACT' model linked to ILRI's 'SLAM' livestock allocation model, is that although

higher prices can benefit agricultural producers, a larger number of poor consumers will have reduced access to food.

As the growth in food consumption shifts from developed to developing countries, the model (see figure below) projects that under a 'business-as-usual' scenario:

- annual meat demand will increase by 6 to 23 kilograms per person worldwide by 2050
- the absolute increase will be fastest in Latin America, East and South Asia and the Pacific, with demand doubling in sub-Saharan Africa
- the demand for maize and other coarse grains for animal feed will increase global cereal demand by 553 million metric tons between 2000 and 2050—nearly half of the total increase in demand for that period.



Projected per capita consumption of meats, 2000 and 2050
Source: International Food Policy Research Institute – International Model for Policy Analysis of Agricultural Commodities and Trade (IFPRI IMPACT) projections, September 2007.

With this strong demand, the model projects that livestock populations will also increase rapidly. Between 2000 and 2050:

- the global cattle population will increase from 1.5 billion to 2.6 billion
- the global goat and sheep population will increase from 1.7 billion to 2.7 billion.

IMPACTS OF GROWING FOOD DEMAND AND SUPPLY

These changes will progressively constrain food production, causing adverse impacts on food security and the environment. The rising demand for meat and milk is expected to contribute to increased prices for maize and other coarse grains and meals used for animal feed.

The expected growth in demand and supply will also mean profound changes for livestock production systems. Expanded market activity could threaten food safety and increase the risk of animal disease transmission. Declining resource availability could lead to the degradation of land, water and animal genetic resources in livestock systems.

Considerable opportunities for livestock growth exist, but there is a danger that smallholder producers and other poor livestock-dependent people may be unable to take advantage because of their lack of access to markets and technologies. Long-term policies will be necessary to ensure that the development of livestock systems plays a role in reducing poverty, as well as mitigating negative environmental impacts, encouraging income equality and supporting progress in reducing malnutrition.

A crisis is a terrible thing to waste, say some, and many will seize new opportunities in the rising food prices. Many of the 1 billion poor people who rely on livestock for their livelihoods could benefit from rising livestock prices. Dairy and other livestock enterprises offer new opportunities to climb out of poverty. Rising livestock prices mean small-scale farmers and pastoralists can now earn more from their milk and meat. And because ruminant animals reared in developing countries feed mostly on grass, forages and crop residues rather than grain, they do not compete directly with people for nutrition.

TEN PROMISING LIVESTOCK OPTIONS

For these and other reasons, farm animals of developing countries are powerful but underutilized instruments for poverty alleviation and food security in this new era of food scarcity and high prices. The following are some promising options for using livestock to reinforce food and nutritional security.

The first five options are relatively straightforward scientific issues that require mostly technical innovations and 'human ingenuity'.

1 Further refine the integration of crop and livestock systems to raise and sustain whole-farm productivity.

2 Expand animal production by expanding feed resources, in particular away from cereal crops.

3 Engineer the same plant to generate food, feed and fuel.

4 Use biosciences to accelerate smart breeding for more productive and robust breeds of livestock and forages tailored for the tropics.

5 Focus on producing more livestock products for regional trade, which is less susceptible than wider international trade to the impacts of global food prices.

Five other livestock-based options for better food security can be viewed as being primarily about new kinds of 'human integration' in one form or another:

6 Exploit among new philanthropists and other aid organizations the fact that the new prices make many livestock technologies developed over the last 30 years financially feasible.

7 Develop public-private partnerships to supply poor farmers with improved animal feeds and breeding and health services.

8 Improve market access by the poor and thereby help rural people get their perishable, high-value livestock products sold in dynamic urban livestock markets.

9 Interconnect markets and supply systems so that these respond efficiently and flexibly to price signals and put new money into the pockets of the poor.

10 Harmonize trade policies within regions by removing trade barriers and reducing transaction costs so that regions with food deficits are closely linked to those with food surpluses.

SOARING GLOBAL MILK PRICES HELP KENYAN FARMERS BREAK INTO EXPORT MARKETS

From an ILRI Press Release, 8 November 2007
As global milk prices continue to rise, Kenyan small-scale farmers are poised to become major players in the market for milk. In the past, high-quality standards of global producers have prevented countries like Kenya from competing with major exporters. But the steep rise in milk prices worldwide could give smallholder producers an edge in the global market, which is estimated at US$48 billion a year.

In the last 12 months, the world market price for milk has more than doubled from some $28 per 100kg to over $60. In the past, distorted markets and high standards in the international milk market have stopped Kenya from competing with powdered-milk-exporting countries. Today's high dairy prices are forcing some manufacturers to find alternative, less expensive, milk, which is allowing Kenya to enter the export markets at significant levels for the first time.

Small-scale milk producers are big milk producers

Kenya has about 1.8 million rural households keeping some 6.7 million dairy cows. These small-scale farmers and traders handle more than 80% of all the milk marketed in the country. Despite their size, they are prepared to compete with the industrialized world's biggest dairy producers, according to ILRI agricultural economist Steve Staal. 'The small farmers make use of family and other cheap labour and grass, crop stalks and other residues, to feed their cattle, rather than costly grain,' Staal says.

In East Africa, milk production and consumption has always been big business, and in Kenya the dairy industry is the single largest agricultural sub-sector—larger in value than horticulture or tea. Kenyans are amongst the highest milk consumers in the developing world, consuming an estimated 145 litres per person per year on average. Among all developing countries, only Mongolians and Mauritanians consume more milk per dollar earned than do Kenyans. The milk market in East Africa as a whole is estimated at $1.7 billion a year. This excludes the 34% of the region's milk that is consumed on-farm, which is an important source of household nutrition.

Unprecedented opportunities for Kenya's smallholders

Researchers pointed out that higher prices, paired with surplus supplies of milk in Kenya, also could make Kenya a significant player in a growing second market—for ultra-heat treated milk (UHT), which needs no refrigeration until the packages are opened.

Machira Gichohi, Managing Director of the Kenya Dairy Board (KDB), notes that Kenya is the only country in the region with exportable quantities of milk available.

'This year we have seen significant increases in exports from Kenya,' Gichohi said. 'Buyers include major food manufacturers, such as Cadbury. We're already exporting milk powder to other sub-Saharan African countries, including South Africa, as well as to Asia and the Middle East. In addition, the UHT milk market is opening up and we're now exporting long-life milk to Mauritius and South Africa. Private processors are considering building two new processing plants to respond to the increased opportunities.'

The impacts of higher global milk prices on poor consumers

'While the strong demand in the international markets presents new opportunities for producers, we must be cognizant of potential impacts on poor consumers in the region who depend on milk, and who may in time face higher local prices,' said Staal. 'Innovations in packaging to provide low-cost products and to support the improved functioning of the traditional market, which typically provides the lowest cost products, may ameliorate impacts of higher prices on the poor.'

THE GLOBAL FOOD CRISIS: CGIAR SUPPORT TO AFRICA'S RESPONSE

From an ILRI statement developed for the CGIAR, 16 May 2008

Africa is going to be hardest hit by the food crisis and deserves special attention. Success is contingent on collective action among all key players, and especially new African sub-regional and other organizations; regional frameworks such as the Comprehensive African Agricultural Development Programme; and private-sector, new philanthropy and other new actors, with CGIAR Centres embedded and playing a critical 'boundary spanning' role to deal successfully with Africa's heterogeneity and capacity constraints.

There are no simple solutions, the search for silver bullets is counter-productive

Short-term responses (roughly 1–2 growing seasons)

- Remove distorting policy and institutional constraints.
- Promote approaches to target smart subsidies.
- Speed up transfer of existing technology and information for immediate productivity gains, such as use of ensiled sweet potato vines and leaves and other non-cereal feeds to expand animal production.
- Focus on increasing areas where regional trade in local products such as roots and tubers is important; in the short term these commodities will remain less sensitive than globally traded staple grains to the global food price increases.
- Speed up post-crisis recovery with collective engagement of CGIAR centres and relevant humanitarian, international and regional organizations to deliver appropriate information and technology.

Medium- to long-term responses

- Develop markets for pro-poor growth that improve equitable access of the rural poor to markets; buffer the impact of 'thin' international markets on food prices/security; expand the numbers of small- to medium-sized enterprises; better inter-connect markets; and tailor supply systems so that they respond to price signals more efficiently and effectively.
- Alleviate infrastructure, capacity and poverty traps (after Collier's 'Bottom Billion') on food security and poverty alleviation.
- Develop institutional frameworks to buffer climate and other risks, including agricultural insurance and payments for ecosystem services.
- Accelerate breeding of more productive and robust varieties of crops, animals and trees.
- Inform high-level policy dialogues to resolve the energy vs. food dichotomy as well as (global and regional) trade distortions and barriers for developing-country agricultural produce.
- Improved resilience of agricultural production systems and rural livelihoods through targeted development of vaccines and control of new and emerging diseases in crop-, livestock-, fisheries- and tree-based smallholder production systems.
- Adopt innovative approaches to provide smallholders with access to capital.
- Improve use of water resources.
- Select and domesticate new species of trees, aquatic resources, fungi, etc.
- Find viable alternatives to deforestation as a climate change mitigation/adaptation measure.
- Increase the intensity of agricultural production on existing agricultural lands to halt or reverse current land-clearing trends.
- Develop the biomass, energy and carbon efficient agriculture of the future, putting efficient and option-rich use of biomass and biological processes within reach of small-holders.

Collective action on the food crisis:
Food needs to move across borders

New research showing how the global food price crisis is playing out in 17 countries of eastern and central Africa was presented at a roundtable discussion in Nairobi on 22 July 2008.

The research results show that the regional food situation differs significantly from the global one, largely because of this region's exceptional diversity. That regional diversity provides these countries with opportunities to turn the volatile global and local food situations to their advantage.

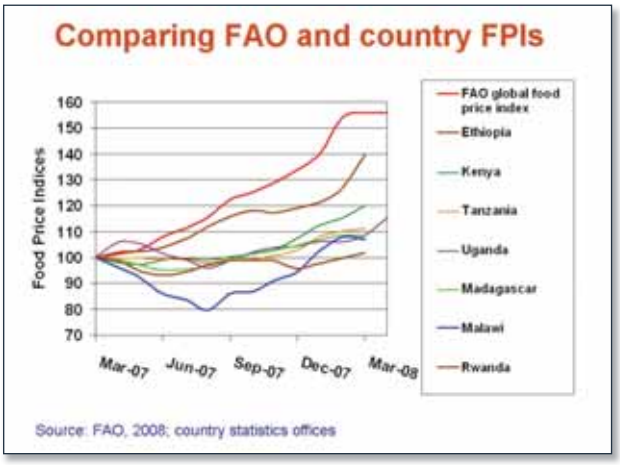
By integrating markets and simplifying trade within the region, policymakers can efficiently link areas with food deficits to areas with food surpluses. This integration will help the region's small farmers get better prices for their crops and livestock while also helping the region's urban consumers get reliable year-round access to staple food items.

The July Roundtable on the Global Food Crisis was organized by ILRI and the Kenya country offices of the World Bank and World Food Program. Fifty key decision-makers in agricultural and rural development met on ILRI's Nairobi campus to discuss interventions that governments, development agencies, research organizations and nongovernmental organizations could make to help poor people cope with the rising prices of staple foods.

Joseph Karugia, a Kenyan agricultural economist, provided an overview of the regional food situation. Karugia coordinates an ILRI-hosted Regional Strategic Analysis and Knowledge Support System for Eastern and Central Africa (ReSAKSS-ECA). His review was based on a study led by the region's leading agricultural research group, the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). Under pressure by policymakers needing to take action to address the food price crisis, a team of 26 researchers within ASARECA and several centres supported by the CGIAR that work in this region, including ILRI, with study activities coordinated by ReSAKSS-ECA, conceived and executed the, 'Responding to the food price crisis in eastern and southern Africa: Policy options for national and regional trade' (draft of August 2008), together and with speed.

'Our regional food prices have generally risen much slower than global ones,' Karugia said. Even the countries within the region are being affected differently by the global food prices, largely because of their different 'food baskets'. Kenya's main staple is maize, but in Uganda it's plantain, in Ethiopia it's teff and in Rwanda it's beans. Those countries that deal in non-traded commodities are buffered from the rising prices of globally traded staples. 'Rice and wheat,' Karugia said, 'two hugely important staples globally, are relatively trivial in this region. Moreover, most of the region's maize needs are met outside the global markets because most people in the region obtain their maize in locally, in informal as well as formal markets.'

One result is that while the food price index (FPI) of the United Nations Food and Agriculture Organization (FAO), which captures trends in major food commodities, rose by 56% between March 2007 and March 2008, the FPI increases in this region were all below 40% and in most cases significantly lower. The FPI increased by 39% in Ethiopia, 20% in Burundi and Kenya, and just 11% in Tanzania. In several other countries in the region, including Madagascar, Malawi, Rwanda, Uganda and Zambia, the increase was less than 10%.



It's not only the staples of these neighbouring countries that differ. Their climate and rainfall patterns differ, and consequently their planting and harvest times differ, too. These within-region variations give policymakers a powerful lever for transforming a global food crisis into a regional opportunity for farm producers and urban consumers alike.

The spatial and temporal distribution of production and staggered harvesting in the countries of eastern and southern Africa offer large opportunities for trade.

By integrating the region's food markets and simplifying its food trade regulations, Karugia said, the region could link up food-deficit to food-surplus areas and thus provide its citizens with staples in an 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.

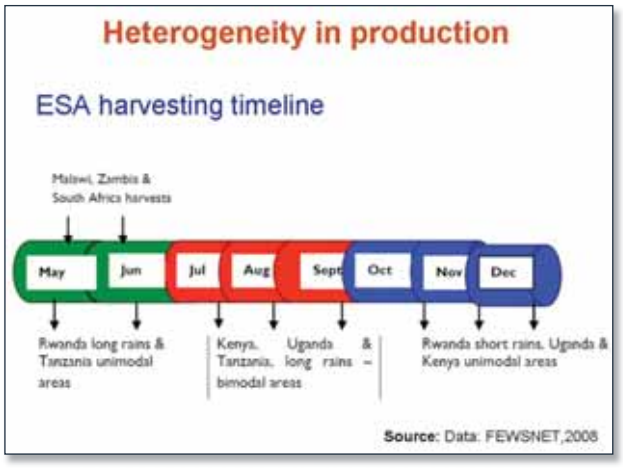
Most of the trade in food in this region is informal. It is wasteful not because it is informal but rather because of the many obstacles the informal traders have to face. Karugia explains: 'At the border between Kenya and Uganda, trucks laden with sacks of grain and other food staples are unloaded, reloaded onto bicycles, bicycled across the border to be reloaded onto trucks on the other side. This is not an efficient way to move food!'

It would be a shame, Karugia said, quoting the economist Paul Romer, for the eastern and southern Africa region 'to waste a good crisis'. 'This global food price crisis provides the 19 countries of eastern and southern Africa with a golden opportunity to promote agricultural-led development through increased domestic production, regional trade and integration.'

The ASARECA research presented at this roundtable discussion was a demonstration of this new networked science. Diverse scientists from ReSAKSS-ECA, ASARECA and the CGIAR worked together for months amassing data from country and regional organizations and consulting with key experts and partners within governments, policy think tanks, research institutions, emergency relief agencies and the private sector. Although their individual perspectives on, and interpretations of, the data they collected vary considerably, the research group reached consensus on several points.

1 The poor in this region are spending 40 to 70% of their income on buying food.
2 The poor are being hit hardest by the rise in food prices, especially the rural net buyers of food.
3 Contrary to popular belief, most of the farming households in the rural areas are net buyers rather than net producers of food if price rather than volume of food is considered. Poverty forces them to sell their grain and other crops at harvest time, when prices are at their lowest, and to buy grain again, several months later, when the households run out of the staple, often at two to three times the price at which they sold their grain.
4 Prices of agricultural inputs are increasing across the 17 countries of the region. (The price of fertilizer rose 200% in Kenya in the last year.)
5 Yields of staple food crops are stagnating or decreasing in 17 of the 19 countries of Eastern and Central Africa (only Egypt and Mauritius are increasing their yields) because farming is moving onto increasingly marginal agricultural lands, causing yield aggregates to fall.

One other salient fact leaped out of the data—the region cannot continue to spend less than 10% (and in some cases as low as 2%) of its national budgets in a sector that provides 25% of the region's gross domestic product, 75% of its citizen's livelihoods, and food for 100% of its people. 'We have neglected our agriculture, our farmers and our food markets for decades,' says Karugia. 'This is the result.'

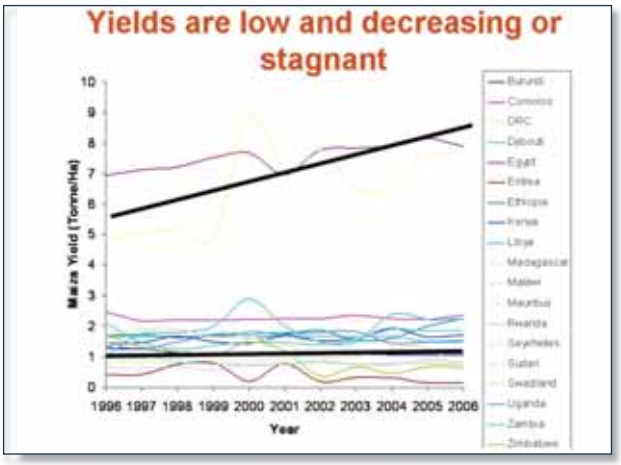


Karugia and his many colleagues in this multi-institutional, multi-disciplinary, and multi-commodity project asked themselves one central question: What levers can we pull to take advantage of the higher food prices? The two conventional answers—increase farm production and control consumer demand—were deemed by the group to be too slow to be useful. This regional group of scientists concluded that a

regional strategy for exploiting the food price hikes offered the best opportunities for the most numbers of people: 'Exploit the regional diversity by facilitating regional trade'.

Priority actions for such a regional strategy would include the following.
Markets: Remove export bans, eliminate non-trade barriers, simplify trade regulations and upgrade infrastructure along the region's main trade corridors.
Farmers: Reduce the high cost of fertilizer and other agricultural inputs and facilitate their trade, widen use of best-bet agricultural technologies, pilot innovative risk-management strategies such as index-based insurance schemes.
Institutions: Strengthen market information and intelligence as well as frameworks for preparedness, response and learning.

Addressing these issues in these ways, with evidence-based policy options, is thus feasible, say the study team, and should lead to lowering the prices of food staples while also raising farm productivity and agricultural livelihoods.



In summing up the day's roundtable discussion, host Carlos Seré, who is ILRI's director general, said that it's not only food we should be moving within the region but also the agricultural technologies that allow greater and more sustainable food production. The current food price crisis also has that silver lining: 'When you have high food prices, you can move those technologies for improved food production. And you can get attention for neglected alternative crops, such as cassava chips for livestock feed, which become viable as the price of grain staples rise.'

'This is something happening now,' Seré said. 'We need smart interventions that target the region's poor consumers and farmers alike. We need to get fertilizers into the region's high potential farming areas. The key thing is to work with markets—to arbitrage across countries and across the region. We must reduce trade barriers within the region, which will greatly improve the efficiency of its markets.'

'We must also think through new crop portfolios for this region,' he continued. 'How, for example, could we continue to support maize production in Kenya without penalizing those farmers pursuing a more diversified system that includes sorghum or millet?'

Seré concluded: 'Climate and other fast-evolving changes affecting developing-country food production will make our problems worse in future. Finding the institutional frameworks for addressing these problems in collective action is our challenge.'

WELCOME ADDRESS BY ILRI DIRECTOR GENERAL CARLOS SERÉ

In welcoming participants to the roundtable forum, ILRI director general Carlos Seré said: 'Global analysis of the food situation is relatively simple. We need to bring the discussion and analysis down to regional levels to increase the specificity, the granularity, of our information.'

'We're in a fast-paced world,' he said. 'One year ago the hot topic here as everywhere was bird flu. Last December it was climate change. Today it's food prices.'

Science, Seré said, is just one input in the complex decision-making processes addressing these and other global threats. With the goalposts changing so quickly and often, the old model of doing science for development—spend years researching an issue, publish the results in peer-reviewed scientific journals, and then transfer the research knowledge and other products to the agricultural development agencies that need them—isn't working.

'We need a much more interactive engagement with all stakeholders in development,' Seré said, 'to constantly assess where we are. We need to co-manage and jointly navigate the future together. We need nimble frameworks and diverse perspectives and nuanced understanding, not scientific silver bullets, to address the complex issues of our profoundly inter-related modern world.'

'New science is networked science,' the ILRI director general said. 'We bring that to the development discourse.'

Interview with Ravi Prabhu, a member of the study team and coordinator of a CGIAR initiative called Collective Action for Eastern and Southern Africa

Let's take a look at what we heard today from Joseph Karugia and his ASARECA, ReSAKSS-ECG and CGIAR team.

We heard that we have opportunities to exploit regional food heterogeneity, capacities and systems that we are not doing a good job of exploiting. We heard that the way to do this is by integrating markets, infrastructure, trade systems and removing policy barriers and distortions. If I were Bill Clinton, I would be tempted to say, "It's the markets, stupid!"—-national, regional and, of lesser interest to us today, global markets. We need to integrate these markets so that products flow along demand and price gradients.

What is damaging are not just the rising prices; it is the volatility and unpredictability of the spikes and troughs. Smoothing these out will require focus on markets, trade and policies. It will also require collective action beyond districts and nations to the region as a whole and the world. Otherwise maize will continue to sell for 50 Kenya shillings in Kenya's northern Turkana lowlands and less than half that in its Eldoret highlands. All evidence indicates that volatility—sudden spikes and troughs in food prices—will increase and intensify as a result of increasing climate change and variability, which means we're going to face many more such crises and probably much severer ones in future. So we had better not waste the opportunity presented by this one.

As Mr Sanjivi Rajasingham, World Bank Country Director for Kenya, Mr Burkard Oberle, World Food Program Country Director for Kenya, and Dr Ephraim Mukisira, Director of the Kenyan Agricultural Research Institute, all pointed out, we need to keep our eye firmly on the rising numbers of food insecure people. Our solutions must be attuned to their response time frames; their survival depends on this. We need palliative measures for the poorest and most vulnerable people as well as measures to enhance our regional food productivity and markets.

Clearly, agriculture in this region is under-performing; indeed, it is sub-optimal. We hear of maize being planted in regions where it should not be; we saw yields for maize stagnating as people inappropriately take new maize technologies into low-maize-yield areas. Increasing investments in agriculture are clearly one part of the solution; appropriate technologies, policies and frameworks are another part.

Because agriculture in this region is intimately linked to other parts of the economy, a focus only on agriculture—crops, livestock, fish, trees—is unlikely to succeed if we do not also address other parts of the economy. It's not just agricultural and food markets that are important, but also labour, finance and other markets.

What we have heard and seen today begins to outline how we might solve the food price rise problem and reduce the number of victims of this global as well as regional phenomenon. But we won't get this done unless we work collectively and share our strengths and resources. The roundtable discussion today is an excellent example of how we might move forward, with regional, national and international organizations and different sectors sharing fragmented information and exploiting their diverse skills and resources.

We shall need to much more of this kind of sharing before we can say we have developed the institutional frameworks necessary for preparing for and responding to increasingly complex and rapidly changing problems. Complex systems such as the small farming and food systems of this region are characterized by uncertainty, which we experience as surprises of the kind we have been discussing today. These surprises have their origins in lag effects, such as the delayed impacts of a long period of low investment in agriculture and agricultural research. They are also caused by multiple interconnections, such as the combined effects of global fuel, financial and food markets.

Our response must follow the advice of Nobel laureate Ilya Prigogine, which is to improve our collective 'adaptive possibilities'. That is the main resource that allows societies 'to survive in the long term, to innovate of themselves, and to produce originality.' The ILRI director general spoke today of trying to 'co-manage' our collective present; I would add that we must do this with a clear idea of our collective future.

I think today's meeting has taken us several steps forward towards outlining several possible course of action. What remains now is to begin to act, using our adaptive possibilities, and to improve as we move ahead by learning together as we act together.

Web Links

Collective Action News: main article in the July 2008 issue: Food price rises: Is regional trade the answer?

ASARECA, ReSAKSS-ECA, CGIAR: slide presentation by Joseph Karugia, 22 July 2008: Responding to rising food prices in eastern and southern Africa: A regional perspective

ASARECA, ReSAKSS-ECA, CGIAR: August 2008 draft brief: Responding to rising food prices crisis in eastern and southern Africa: Options for national and regional action

ASARECA, ReSAKSS-ECA, CGIAR: August 2008 draft report: Responding to the food price crisis in eastern and southern Africa: Policy options for national and regional action

ReSAKSS, ILRI: July 2007 report: Regional trends report for the Common Market for Eastern and Southern Africa (COMESA)

ILRI director general Carlos Seré: August 2008 profile: Unholy Alliances: When livestock research attempts to marry livestock development.

Introduction to ILRI's 'Improving Market Opportunities' Theme

The developing world's rapidly growing and changing livestock markets offer poor farmers real opportunities as well as real challenges. The rapid demand-led growth in livestock product consumption in developing countries presents opportunities but current policies, institutions and structures unfairly favour large-scale livestock farming and poor livestock keepers may be driven out of this expanding business. The problems smallholders face include the increasing integration and complexity of livestock product markets; the increasing demand for food quality, safety and convenience; and, at the producer level, lack of technology, inputs, resources and information.

ILRI's theme on improving market opportunities addresses a range of issues around smallholder participation in markets, from productivity and access to inputs at the farm level to the policies in animal trade and disease control at the international level.

The international public goods generated by this theme emanate from the basic approach applied throughout:

- Analyzing livestock value chains in their entirety (technical, institutional and policy elements).
- From that analysis, identifying sectors and regions with greatest opportunities for the poor to benefit from markets either as input suppliers, producers or market agents.
- Evaluating and demonstrating the transferability of policy approaches learned or innovations developed.
- Influencing the international agenda to embrace pro-poor market approaches that apply risk-based systems with a variety of options for the poor to succeed.

Some consumer segments in developing countries, particularly in Asia, are clearly demonstrating higher demand for Western-style product quality and safety attributes and markets now offer an increasingly integrated modern market chain that places value on food safety, high and uniform quality and increased production volumes to capture economies of scale in collection

and processing. These higher end markets, part of what's known as the 'supermarket revolution', will play an increasingly important role even in poor countries. However, due to demand for cheap products with traditional characteristics, markets for traditionally processed, or unprocessed and informal, products continue to predominate in most developing countries, even while demand for higher quality increases at the higher income end of the market. Because traditional and indigenous products are not easily supplied by larger-scale formal markets, or substituted for by imports, they create unique opportunities for small-scale producers and market agents, many of whom are poor.

The research program encompassed by this theme builds on those unique opportunities, whether in the form of 'raw', or unpasteurized, milk, fresh pork, indigenous poultry or range-fed and organically raised small stock, and across a range of markets, from local to international. In both informal and formal market chains food safety is a concern in terms of the health and nutrition of producers, consumers and market actors and because it is a potential barrier for smallholder access to higher end markets. This research program addresses the dualistic nature (traditional and modern) of livestock product markets and works to help bridge the gap, supporting the role of smallholders in the transition process by providing research support to assist these actors and processes to provide opportunities for the poor.

Because livestock market chains are long and complex, they provide many opportunities for the poor to participate through input and service supply and in myriad ways in the marketing and processing of livestock products. ILRI thus assesses livestock value chains (including inputs and services supply) for pro-poor opportunities, then targets sectorally and regionally the best systems and components where the poor can benefit, with a focus on dairy, small ruminants, pigs and poultry.

Although research shows that many smallholder livestock products remain competitive with output from large-scale farms and with imports, there is considerable scope for helping the poor who might otherwise be left behind to join a market-driven pathway to improving their livelihoods through livestock, hence a focus on smallholder competitiveness. This requires not just improved output market linkages, but also support to increased farm productivity through access to improved technologies and appropriate and reliable livestock services and inputs.

A key area of attention for ILRI's Improving Market Opportunities Theme is the application of risk-based approaches to understanding food safety and the animal disease implications of livestock and livestock product markets. Such approaches are required to go beyond simple rule-based, no-risk policies to understand potential tradeoffs in risk vs. livelihoods among various participants in market chains, from consumers to livestock producers themselves. This work is generating international public goods in several areas, including methodology innovation to adapt the approach to

developing-country settings, new institutional and regulatory options to best balance risks and livelihoods and, in the future, new understanding of policies to allow poor countries to apply equivalent risk-control measures to meet sanitary and phytosanitary (SPS) standards in livestock exports.

This theme is also developing the use of participatory techniques to better adapt epidemiological surveillance and research methodologies to the realities of developing countries and smallholder communities. These tools are also being developed as more sustainable methods for use by national governments to comply with SPS requirements and enhance access to markets.

OVERVIEW OF ILRI'S MARKET PROJECTS

Smallholder competitiveness in changing markets

ILRI's project on 'Smallholder competitiveness in changing markets' identifies, tests and adapts technical, institutional and policy options that enable smallholder livestock producers to remain competitive in the face of changing market requirements and increased competition from imports. The initial focus of this work has been on smallholder dairy systems in Africa and Asia. ILRI is now increasing emphasis on smallholder poultry and pig enterprises in Asia and Africa.

This project works to enhance competitiveness of poor producers through research on mechanisms that improve farmer access to the inputs, services and knowledge products needed to increase productivity and profitability of their livestock activities as well as to improve their ability to capture better value for their marketed livestock products. Market-oriented production relies not only on feeds, breeds and drugs but also on information and knowledge regarding appropriate technologies and market opportunities. Emphasis is placed on identifying technologies, institutions and policies that will sustainably support market-oriented production by smallholder farmers. The focus is farm-level and action-oriented and recognizes the complex, multi-objective nature of poor farm households and the particular constraints that they face in gaining access to the relevant public services and private-sector markets. The work typically involves low-income livestock keepers, service and input suppliers, development actors in smallholder settings, and buyers and integrators in mixed crop-livestock systems and intensifying peri-urban systems.

There are two main areas of attention: institutions and strategies to support sustained uptake of improved production technologies and contractual and organizational arrangements to support smallholder participation in markets. Even the most competitive small farms, however, may not be viable if they cannot respond to the challenges of changing demand for food safety, quality and standardization. Design of better marketing institutions and strategies would allow smallholders to meet new requirements, hence ILRI's focus on

changing demand structures that motivate the need for new institutions. These need to be implemented in the context of the continued dominance of the traditional, informal markets that resource-poor producers and consumers chiefly rely on, so that bridging the gap between formal and informal markets, in terms of quality and safety, must be one objective.

Changing demand and market institutions

The purpose of ILRI's project on 'Changing demand and market institutions' is to better understand the nature of demand for livestock products in the developing world in terms of quality, safety and convenience and to identify appropriate market institutions that allow smallholders to access markets for livestock inputs and outputs that meet consumer needs. This project focuses on the changing nature of demand for livestock products in major urban markets of developing countries. ILRI pays particular attention to the changes in demand for product uniformity, convenience, quality and safety as well as changes in the prices that consumers are willing to pay for livestock products.

The project on changing demand and market institutions addresses the drivers of change in livestock markets supplied by the poor, including potential changes in demand for better quality, increased safety and higher levels of processing. It considers private sector and collective responses to new market opportunities and requirements, the impact of changes in industrial organization through the supply chain on small-scale producers and the means for helping the latter and small-scale market agents to respond. It also assesses the impact of these changes on access by poor urban consumers to low-cost livestock-source foods. This project increasingly examines the actual safety characteristics of livestock products in alternative market channels and applies a quantitative risk analysis approach to understand potential food safety livelihood synergies or trade-offs to inform decision makers.

The primary targets are institutional options for smallholder livestock producers and the supply chains that serve them. A secondary target is options for appropriate levels of food safety and enhanced risk mitigation strategies in local markets. Some of the work is action-oriented and includes pilot testing technical and institutional options where appropriate with development partners. The project incorporates the public health dimensions of food safety and risk analysis to complement the existing focus on market standards related to food safety. Some of the new work within this project focuses on new and innovative tools for diagnosing livestock value chains and guiding development interventions within those.

Beyond these domestic markets, global procedures for control of animal disease face major challenges from changes in the global configuration of livestock production and consumption and from significant changes in technology options for disease control. Because the costs of compliance with these standards are often too high for small-scale operators in developing countries to meet, this project focuses on animal health for trade.

Animal health and food safety for trade

ILRI's project on 'Animal health and food safety for trade' combines risk analysis, from veterinary epidemiology, with cost-benefit analysis to identify, test and adapt options for animal disease control and food safety assurances appropriate to developing countries. The project focuses on assessing the costs of compliance with safety standards for livestock product export to developing countries and examines equivalence of standards as well as options that help small-scale producers meet those standards.

This animal health for market access and trade project addresses the animal-health related barriers to the access of poor and small stakeholders to local, national, regional and/or international markets. Through the identification, development and evaluation of animal disease control, surveillance or livestock and livestock commodity certification methods, this project helps stakeholders meet animal health and food safety standards restricting their access to various markets. This work draws attention to the high costs of compliance with existing SPS and other standards facing producers in developing countries who wish to sell into rising export markets. It also evaluates in selected cases the costs and benefits of alternative procedures for equivalent levels of animal disease control proposed for developing countries. Risk analysis from veterinary epidemiology is combined with analysis of the costs and benefits of different options and policies, including the implications for both direct and indirect impacts on the incomes of the poor.

Such methods further provide the basis for improved pro-poor decision- and policymaking through assessment of cost-effective animal health alternatives and means allowing stakeholders to respond effectively to zoonotic and emerging diseases that could reduce market opportunities, such as highly pathogenic avian influenza (HPAI) and Rift Valley fever. The increasing attention to emerging diseases is a result not only of immediate threats to human health from avian flu, but also the awareness of longer term strategies to mitigate ongoing risks of these 'public bads' that are tied to intensifying production and marketing systems. This area will be a key focus over the medium term and is expected to grow.

PARTNER ROLES

ILRI's Markets Theme is one of the institute's most geographically diverse, with staff based in several regions of sub-Saharan Africa, South Asia and Southeast Asia. Mirroring the variety of locations, the range of partners that this theme works with is similarly diverse. A key focus of this theme is building on the strengths of partners who offer development-outcome platforms for generating strategic learning and international public goods.

South and Southeast Asia

South and Southeast Asia are areas of increasing attention for the Markets Theme. In Vietnam, an on-going project on improving the competitiveness of pig producers is being implemented jointly with the Institute of Policy and Strategy for Agricultural and Rural Development (IPSARD), Ministry of Agriculture and Rural Development, IFPRI and the University of Queensland. Oxfam GB and HK and a newly formed group, the Prosperity Initiative, play a critical role in supporting policy advocacy to increase likelihood of policy outcomes. Other Vietnamese partners playing roles either as stakeholders or collaborators in this project are the Ministry of Agriculture and Rural Development and its relevant departments and institutes and the Vietnam Animal Feed Association. In Cambodia, research on livestock market chains is led by the Center for Livestock and Agricultural Development (CelAgriD) with support from Srah Takoun Farmer Association, Lok Farmer Association and Prash Punlear Slaughterhouse. Heifer Project International is a stakeholder in that project.

Southeast Asia

In Indonesia, ILRI is coordinating a project evaluating a suite of interventions against highly pathogenic avian influenza (AI) in backyard poultry production systems, including preventive mass vaccination and culling with compensation fully provided. Collaborators include the Ministry of Agriculture (MoA), FAO, John Snow Inc. and the Community-Based Avian Influenza Control Project. ILRI is developing the study design as well as systems for monitoring and evaluating levels of uptake/coverage of interventions and their impact on AI incidence. The MoA, in collaboration with FAO, is implementing the vaccination campaigns and developing culling compensation systems. JSI Deliver provides logistical support for vaccines and equipment. CBAIC conducts community mobilization and tracks AI outbreaks in the target areas. ILRI expects this and related work to expand in Indonesia and other countries in Southeast Asia, given the strong demand for options to address emerging infectious diseases in the region.

South Asia

Another important node for ILRI's partnership in research is in India, where much of the research attention has been on smallholder dairy systems but is now paying increasing attention to smallholder pig systems in northeast India and plans to address small ruminant systems. A central part of this work is through the ILRI agreement on joint research with the Indian Council for Agricultural Research (ICAR). Key ICAR institutions that this project is working with are NCAP, NDRI, and IVRI, addressing a range of issues from livestock value chains, to breeding services, to livestock trade, to epidemiology and control of foot-and-mouth disease among smallholders, with IVRI and the Ministry of Agriculture. Working collaborations also exist with collective and development agencies, such as the milk co-operative federation of Punjab and Hind Livestock Development Foundation in Uttar Pradesh in a study addressing smallholder compliance and food safety issues in livestock trade. In Assam, ILRI has been providing research support to the State Government of Assam Dairy Department to guide significant investment in dairy in that state for the next few years. Other local NGO partners in Assam play key roles in implementing and disseminating the research, thus contributing to joint learning and capacity building. In new efforts starting in 2009, FARMER, a local NGO, will play a lead role in implementing new dairy development efforts, which will also include the private sector represented by Brihattar Guwahati Gopalak Sangstha (BGSS), a Dairy Producers cum Traders Association.

Africa and Southeast Asia

In a multi-country project focused mainly on sub-Saharan Africa but including Indonesia, ILRI is collaborating with IFPRI and FAO on an action-oriented, multi-disciplinary research project on avian flu (HPAI) control and prevention strategies. The aim is to aid decision-makers in developing pro-poor HPAI control and prevention strategies that are not only cost-effective and efficient but also livelihood enhancing. The project is being

implemented in Asian and African countries that have recently experienced HPAI outbreaks, including Ghana, Nigeria and Indonesia, as well as Ethiopia and Kenya, countries in which there has been no outbreak of disease. This international research consortium comprises risk analysts, veterinarians and social and economic scientists from ILRI, IFPRI, FAO, the Royal Veterinary College of the University of London and the University of California at Berkeley. National partners include EIAR (Ethiopia), Bogor Agricultural University and Gadjah Mada University (Indonesia), and the University of Ghana and University of Cape Coast (Ghana). RVC leads research on the epidemiology and risk elements of avian flu in close collaboration with ILRI while IFPRI leads work to assess the socio-economic and livelihood impacts of the disease.

Southern Africa

The theme's work in southern Africa continues to expand, building on a core project on market participation of smallholder livestock producers funded by the EU that is being implemented jointly by ILRI and ICRISAT in collaboration with national partners in Mozambique, Zimbabwe and Namibia. The work includes diagnostic studies on constraints for smallholder participation in livestock markets using a value chain approach and identifying and testing alternative input delivery and output marketing systems for enhancing smallholder participation in markets. National partners include the Agriculture Research Institute of Mozambique, an NGO and private-sector partners; the Department of Agricultural Research and Extension, the Department of Livestock Development, Practical Action (an NGO) and private-sector partners in Zimbabwe, and the Directorate of Agriculture Research and Training, the Directorate of Extension and Engineering Services, Namibia National Farmers Union, MeatCo (a private company) and DRFN (an NGO) in Namibia.

West Africa

In West Africa, ILRI is leading a project on drug resistance that allies two German universities, two regional research centres (CIRDES and ITC), and national veterinary research agencies (Direction Nationale d'Elevage in Guinea, Laboratoire Central Vétérinaire de Bamako, Institut National de Recherche Agronomique de Benin), veterinary services (Departement de Services Vétérinaires de Sikasso in Mali, Laboratoire Régional d'Elevage de Tenkodgo in Burkina Faso) and tsetse control projects (Tsetse and Trypanosomosis Control Unit in Ghana, Projet de Lutte contre la Mouche tsé-tsé in Mali, Unité de Lutte contre la Trypanosomose in Burkina Faso) in five countries. This work looks at effectiveness of market-mediated supply of veterinary inputs and mechanisms to support that.

East Africa

A major geographical area of many and layered partnerships is in East Africa. Key development partners continue to be both public (Ministry of Livestock and Fisheries Developmnt, Kenya Dairy Board, Kenya Bureau of Standards) and non-governmental (Heifer International, SITE, Terra Nuova). Some large-scale private-sector players have contributed to understanding market constraints and opportunities (Brookside Dairy) and many small-scale individual entrepreneurs have helped pilot-test market options for raw milk. Key research partners are found at both national level (KARI, NARO, Sokoine University and Tanzania Bureau of Standards, University of Nairobi, Ethiopian Ministry of Agriculture, Ethiopian Institute of Agricultural Research and Ethiopian Standards Authority, among many others) and regionally (ASARECA, PAAP). ILRI's market work in the region has many links to other CGIAR centres and international agricultural research institutes, including IFPRI in the area of smallholder industrialization and competitiveness and IFPRI and Cornell in providing methodological support in value chain and livelihood analysis in smallholder livestock systems. The theme is also linked to the Japan-based FASID in jointly analyzing changes in dairy systems and technologies in several East African countries.

Petterik Wiggers/PANOS

Improving livestock export services in Somalia

A study was conducted to help improve livestock trade and marketing in Somalia through rural institutional support for effective and efficient marketing support services. Key findings of the study were published in April 2008 in a report, 'Improvement and diversification of Somalia livestock trade and marketing'. This study of issues within Somalia should be complemented by information of the demand for livestock in the importing countries.

Somalia is one of the great livestock keeping nations of the world. The livestock sector has huge impact on food security and poverty and is an important source of foreign exchange, much of which is used to finance imports of food and basic necessities (about 80% of foreign exchange earning from livestock export is used to import food staples). In the East Africa region as a whole, trade in livestock and livestock products is of considerable social and economic importance. The share of livestock in the agricultural gross domestic product of Somalia, Ethiopia and Kenya in 2000 was found to be 88.2%, 32.5%, and 52.4%, respectively.

The Somali livestock sector is principally export oriented, with exports going mainly to the Middle East and neighbouring Kenya. Remarkably, even after the collapse of the Somali central government in the early 1990s due to civil war, the livestock trade was continued by traders with support from local authorities and informal institutions. Indeed, stateless Somalia is one of the largest exporters of live animal in the world. Although the trade mainly involves live animals, export of chilled meat to some Middle East countries has been gaining importance. But there is as yet underexploited potential for Somalia's livestock sector.

Somali livestock and livestock product marketing chains

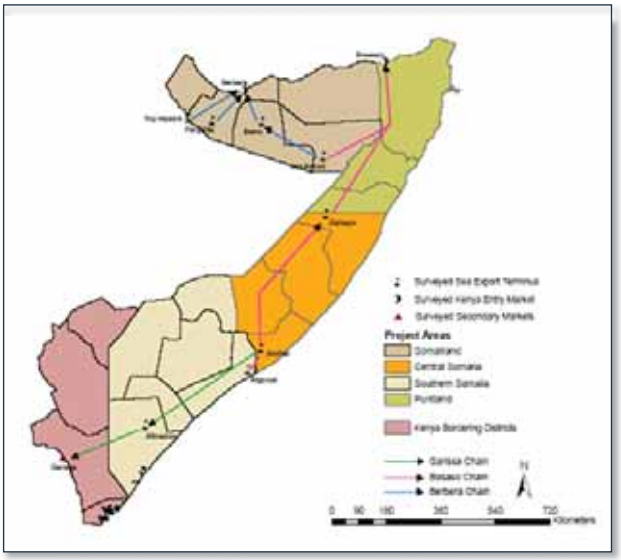
Four types of traders were mainly involved in the value chains being considered in this study: export traders, agents of exporters, petty traders (Gaadley, Gedisley, and Jeeble) and brokers (Dallaal).

Types of Somali livestock traders

A *Gaadley* is a small-scale livestock trader who buys animals at low cost in a market and then sells them latter at a profit in the same market, usually a district market. A *Gaadley* may also try to add value to the purchased animals through supplementary grazing and feeding or by offering treatment for health problems.

A *Gedisley* is a small-scale livestock trader who buys animals at low cost in one place/market and then sells them latter in a different market(s) so as to exploit price differences between the two.

A *Jeeble* is a petty trader operating at a village level. He/she gathers animals from local villages and sells them later at a profit in satellite markets. He/she is usually the supplier for the *Gedisley* in the rural areas. The terminology is commonly used in Somaliland and the areas of Puntland bordering it.



Brokers, *Dillaal,* are central features of livestock trade throughout Somali. They play a role in virtually all transactions that are concluded in markets as well as outside markets. They help sellers find buyers and also play an active role in negotiating the price. There is always a broker involved in a transaction. If buyer and seller have each engaged a broker, then two brokers are involved. Brokers are paid a fee for their services, which is usually a fixed amount for each livestock in the transaction. The fee in any marketplace appears to be uniform, differing only according to species.

Many Gulf countries including UAE, Yemen and Egypt demand an animal health certificate by the government of the exporting country stating that the animals are free from disease before they are imported to these countries. All of the exporters operating in Bossaso and Berbera chains are aware of the government health certificate while none of the exporters in Garissa market chain mention any health requirement for export, perhaps because none is required or enforced in the porous border. (Officially there is no cross-border trade between Kenya and Somalia. All animals traded in Garissa are considered of Kenyan origin.)

All of the exporters indicated that they do not buy any sick animals. Many say they do not buy cattle from disease areas. The cattle traders use different ways to ascertain health and quality of animals purchased but there is no well-established formal means to ascertain the quality of animals for export that meets the OIE requirements for global livestock trade.

Somalia livestock marketing constraints

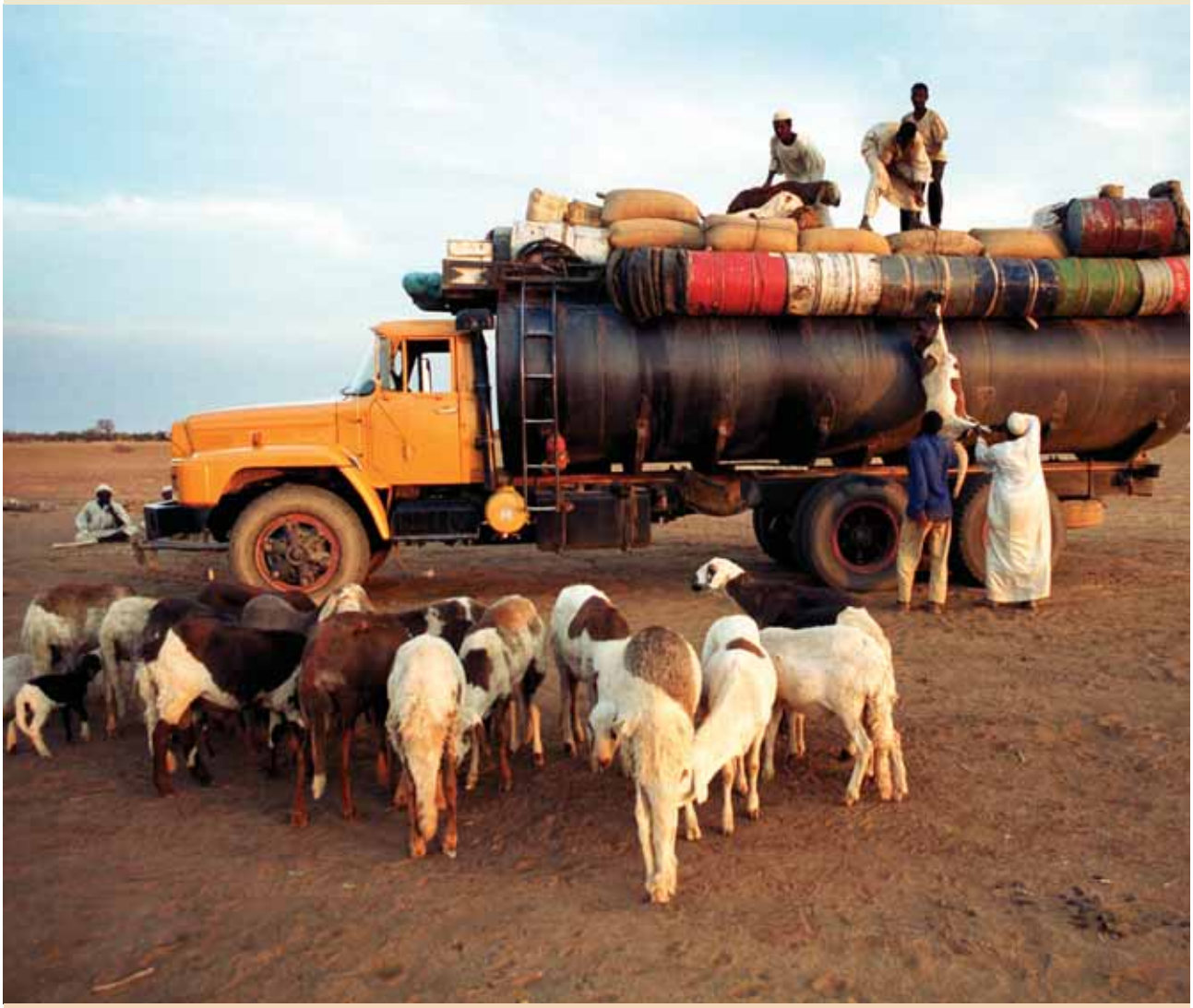
- Lack of veterinary services/ limited vigilance on veterinary inspection and clinical examination/trans-boundary diseases.
- Lack of systems for formal quality assurance, traceability, internationally recognized animal health certification, animal welfare standards.
- Limited provision of services and infrastructure by local authorities.
- Poor condition export facilities.
- Unregulated brokerage services, excessive export charges and little awareness and enforcement of animal welfare standards and regulations.
- Unstable prices, especially for the export-quality livestock, lack of banking and insurance institutions, poor access to market information, delay of payments by the buyers, poor grading of animals by traders.
- Drought that caused the closure of near markets, lack of grazing schemes, water shortages.

Recommended actions

- Provide market information services
- Develop a system of certification for health and quality assurance
- Provide short-term training to traders
- Empower livestock traders through strengthening trade associations
- Organize regular trade missions to Middle East markets
- Harmonize taxes and fees charged
- Characterize Somali livestock breeds able to survive harsh environments

Partner *Terra Nuova*

Funder *European Union*



Sven Torfinn/PANOS

Improving small ruminant health and market opportunities for smallholders in the Near East and North Africa

In January 2004, ILRI and ICARDA started a project to assess the animal health situation in countries in the Near East and North Africa region. They then identified ways to help solve the major problems. The project, called 'Small Ruminant Health—Improved Livelihoods and Market Opportunities for Poor Farmers in the NENA Region', worked to improve the health of small ruminant animals to increase farmer productivity and improve their access to local, national and regional livestock markets.

This partnership, conducted with national agricultural research systems in Jordan, Sudan, Syria and Tunisia, determined how health problems constrain market access by owners of sheep and goats and what can be done to overcome these constraints. Diseases that afflict the ubiquitous herds of small ruminants in these countries hurt the livelihoods and development prospects of millions of livestock farmers, whose biggest constraints are ineffective disease control and surveillance, poor access to veterinary services and a high cost of veterinary drugs. The project assessed ways to improve animal health and marketing services throughout the market chain, from farm/flock to export points.

A lack of effective disease control, poor access to veterinary services, high cost of drugs, and a lack of skills in mounting effective disease surveillance complicate matters for these farmers. Small-scale farmers are also unable to effectively compete against the more market-oriented medium- to large-scale livestock entrepreneurs, who are able to successfully capitalize on the growing demand for meat and animal products.

Surveys assessed farm-level constraints to small ruminant health that impede access to markets, health constraints in the market chain from farm to local consumers, and the organizational structure and regulatory environment of health delivery systems. At the national and regional levels, the project worked to increase market efficiencies and access by the poor through new policy options. The project supported capacity at all levels to improve disease diagnosis and control, including epidemiological and socioeconomic analyses to determine disease risks. A total of 58 staff members of national organizations were trained in livestock marketing, survey techniques or the principles of disease surveillance.

Partners *International Centre for Agricultural Research in the Dry Areas (ICARDA)*
National agricultural research systems in Jordan, Sudan, Syria and Tunisia

Funders *International Fund for Agricultural Development*
Organization of Petroleum-Exporting Countries.

Crispin Hughes/PANOS

The emerging exporter's dilemma: Beef exports from Ethiopia

Global beef markets are dynamic and constantly evolving, with new and emerging actors participating in export markets, including several countries in Africa such as Botswana, Ethiopia, Namibia and South Africa. Much of this market access has been sparked by the promise of high prices engendered by preferential trade arrangements, particularly from the European Union, as well as growth opportunities in emerging markets in Asia and the Middle East. Ethiopia has set its sights on becoming an important player in international beef markets in the future.

Data of the Food and Agriculture Organization of the United Nations reveal that Ethiopia maintains sizable and growing stocks of cattle, estimated at over 38 million head in 2005. Through the assistance of an ongoing project funded by the United States Agency for International Development, Ethiopia is in the process of developing a credible sanitary and phyto-sanitary (SPS) system for disease-free meat that it hopes, within the next 10 to 20 years, will allow it access to high value markets in North America and the European Union.

This focus on investments in meat exports echoes the findings of recent research conducted by the World Bank and IFPRI that highlights the strong economic growth and poverty reduction implications from higher beef exports. At present, Ethiopia primarily exports live animals (beef, sheep and goats) to regional markets in the Middle East and in 2005 exported approximately 10,000 metric tons of meat products to the Middle East and North Africa in the form of sheep and goat carcasses. However, the government has set a target to triple meat exports to 30,000 tons by 2008.

Given resource constraints on available sheep and goat stocks, such an increase in exports would need to come from beef products and imply the processing of approximately 140,000 head of cattle for beef export. The near-term plan is to first improve access into the Middle East and North Africa, with target export markets including the GCC countries of Saudi Arabia, United Arab Emirates, Kuwait, Qatar, Oman and Bahrain, as well as Egypt, Lebanon, Jordan and Yemen. Special attention is to be given to the Saudi market because it has the most stringent requirements of all GCC countries,

and the demand for Borana cattle from southern Ethiopia is very high.

While the export focus taken by Ethiopia is in line with its potential competitive advantage in beef products, a key question that arises from this plan is whether Ethiopia is correctly targeting markets in its quest to expand exports. Middle Eastern markets for beef are highly competitive, with significant inroads already made by India, Brazil, Australia and Argentina. While Ethiopia has a price advantage in some markets (e.g., Dubai), in many cases, Ethiopian beef must be marketed as Indian or Pakistani meat to be successfully sold. Moreover, as Middle Eastern SPS requirements increase and become more formalized, particularly with the recent accession of a number of Middle Eastern countries to the World Trade Organisation, the demands and potential costs of these markets may increase relative to alternatives.

To assess this question, a 2007 paper by ILRI scientists Karl Rich and Simeon Kaitibie, 'The emerging exporter's dilemma: A model and case study of strategic product innovation for beef exports from Ethiopia', looks at the potential for Ethiopian beef exports through the lens of the 'innovator´s dilemma' framework, which illustrates how new innovators can potentially enter and flourish in markets in which the current product offerings of existing firms have overshot the market needs of consumers for specific attributes or performance of a product. (See Clayton M Christensen, 1997, *The Innovator´s Dilemma: The Revolutionary Book that Will Change the Way You Do Business,* Cambridge, MA: Harvard Business School Press).

In such cases, this allows innovators to capture specific consumer segments that are unwilling to pay premium prices for specific attributes and are willing to accept lower quality products that meet their needs in other areas. New entrants may develop product offerings that may lack the performance of existing models but are 'good enough' and may offer additional attributes that are attractive to this segment of consumers. Moreover, existing firms tend to eschew such opportunities since the pressure to continually add value drives them towards increasing the performance of existing products rather than developing new ones. However, as the performance of these new products improves, existing firms find it difficult to compete in this new sector and are forced to try to catch-up with such entrants.

Viewed from this perspective, Ethiopian beef products could find a niche by meeting certain attributes of particular lower-income consumer segments (or markets) that are unwilling to pay higher prices for beef from other sources. One such attribute could be in the form of food safety standards: lower-income segments may be satisfied with buying meat from sources that are 'good enough' from the standpoint of SPS standards, but unwilling to pay premium prices for certified beef from Australia or Brazil, for example. This suggests that a potential marketing strategy for Ethiopia is to target the under-served lower end of the market rather than try to compete in high-value, high-standard ones.

This paper develops a conceptual model to demonstrate the mechanics of this argument. Preliminary results from the analysis show some potential for Ethiopian exports into the Middle East among specific market segments that are less willing to pay price premiums for higher quality beef. However, one should be cautious with this recommendation, particularly as standards and demand for higher quality beef rise in such markets. Indeed, Ethiopia will need to weigh the increased costs with trying to match market needs with the potential volumes it expects to sell. On the other hand, the analysis also shows considerable potential in other under-served markets within Africa in which demand is growing and quality standards are less stringent than those elsewhere. The paper suggests that Ethiopia pursue such markets as a precursor to raising its own SPS standards aimed at tackling other export destinations in the future.

ILRI scientists Asfaw Negassa and Mohammad Jabbar made a final report in 2008 on 'Livestock ownership, commercial off-take rates and their determinants in Ethiopia'. A major challenge facing the meat export abattoirs in Ethiopia has been the inadequate supply of quality live animals for meat processing, resulting in the existing meat processing facilities operating at less than 50% of their operational capacities. This has increased the fixed costs of operations, thereby decreasing the export abattoirs competitiveness in the domestic and export markets. This study was conducted to assess the commercial off-take rates for cattle and shoats in the highland and pastoral areas of Ethiopia.

The study found very low commercial off-take rates of cattle and shoats among smallholder Ethiopian farmers and pastoralists. Furthermore, a large proportion of the few animals sold are also of such age and body conditions that many of them are unlikely to meet the needs of meat export abattoirs. The low commercial off-take rate and market participation is likely due to small herd and flock sizes, low fertility and high mortality rates, and poor nutrition and weight gain.

Thus, even though there are large livestock populations in Ethiopia, the size of livestock holdings at the household level is very small and does not support stable and sufficient commercial off-take. About 80% of the smallholder farmers in Ethiopia own cattle while only about 31% to 38% and 21% to33% of them own sheep and goats, respectively. Smallholder farmers own only few heads (usually 3 or less) of cattle and shoats while the pastoralists on average own 13, 5, and 2 heads of cattle, goats, and sheep, respectively. The livestock holdings of smallholder farmers and pastoralists both are barely self sustaining.

Few farmers and pastoralists participate in the livestock market and among those that do, the size of transaction (sale or purchase of cattle or shoats) is very small. For example, in 1999/2000, about 61% of the smallholder farmers in the highland areas of Amhara, Oromia and Tigray neither sold nor bought cattle while only 23% sold cattle. In the case of shoats, about 49% and 55%

of the smallholder farmers neither sold nor bought sheep and goats, respectively. The main purpose of keeping cattle in the highland areas of Ethiopia is for draft purposes.

National consumption absorbs a large share of the already observed overall low net commercial off-take rates or market supply from smallholder farmers and pastoralists, leaving a small share of marketed supply for the live animal and meat export activities. Significant livestock transaction is among the livestock producers themselves for breeding, replacement and draft purpose. With growing domestic supermarkets and increased demand for high-quality meat, the demand for high-quality live animals for domestic consumption is expected to increase, which increases the competitive pressure on export abattoirs.

Partners *Texas A&M University*

Funders *United States Agency for International Agricultural Development*


ZERO GRAZING
UNIT

Evolution of Uganda's dairy systems: Popular 'zero-grazing' dairying doesn't suit all

Other methods may make better use of cow manure to fertilize the country's impoverished soils.

Is Uganda outgrowing its popular zero-grazing dairy model? Reports from a 2007 ILRI research study, 'Dairy farming in Uganda: Production efficiency and soil nutrients under different farming systems', suggest that Ugandan policymakers may want to revisit their policies supporting the country's booming dairy sector to sustain increasing yields of smallholder mixed crop-and-dairy production over the long term.

Before the 1980s, milk production in Uganda occurred largely in two contrasting production systems. There were the large, mostly government-owned, commercial dairy farms located in the wetter parts of the country on which exotic and cross-bred dairy cattle were kept and grazed on natural pastures. Then there were the pastoralists, who kept large numbers of local cattle under traditional management systems in the drier eastern and northeastern parts of the country.

From the mid-1980s, development agencies in Uganda began introducing zero-grazing systems, in which high-yielding genetically improved cows (pure or cross-bred with local cattle) are kept in stalls and fed with fodder cut and carried to them daily. These more 'intensive' dairy systems were promoted among Ugandan farmers along with training on managing dairy breeds and growing fodder. This gave many smallholders an incentive to buy exotic dairy cows or to upgrade their indigenous cows by cross-breeding them with exotic stock. Some of Uganda's small farmers adopted strict zero-grazing practices while others combined grazing paddocks with stall feeding, a hybrid dairy production system that came to be known as 'semi-intensive'.

As a result, the numbers of improved dairy cows in Uganda's national herd have steadily increased over the last two decades, with concomitant increases in national milk production yields, smallholder contributions to national milk production, dairy's contribution to the national economy, and per capita milk consumption.

Ugandan dairy support

Sixteen years ago, in 1992, the government launched a Milk Master Plan to improve (simultaneously) rural incomes, farm living standards, national self-sufficiency in milk production and yields of surplus milk for export. With the liberation of the sub-sector in 1993, when the government's monopoly on milk processing was broken, many medium and small-scale private milk processors emerged on the scene. To realize the objectives of its Milk Master Plan, Uganda in 1998 established a Dairy Development Authority.

With the rapid rise of dairying among smallholder farmers, people began to question whether intensification was the best option for Ugandan farmers and whether these mixed dairy-crop production systems could be sustained.

The study, conducted from 2001 to 2005 and focusing on dairy economics and nutrient cycling, was carried out in three districts—Mbarara, in southwestern of Uganda; Masaka, in southern Uganda; and Jinja, in the southeast, which is much smaller than the other two districts but with the highest human population.

Results of the research study indicate that Uganda may be 'outgrowing' its successful, and ever popular, zero-grazing model. The results show that Uganda's booming dairy farming is profitable regardless of the level of intensification that farmers employ through use of feeds and other inputs. This finding suggests is that a high-input / highly intensified production system such as Uganda's heavily policy-supported 'zero grazing' system is not necessarily the best option for all of the country's small-scale crop-and-dairy farmers. Even the country's most progressive dairy farmers, who have adopted zero-grazing en masse, may want to revisit their choice of production system to sustain their crop as well as dairy production over the long term.

Another finding of the study is that all of Uganda's dairy farmers, whether intensive, semi-intensive or agro-pastoral, tend to under-use their animal manure as organic fertilizer for their crop fields. The study found the quality of the soils on Uganda's mixed dairy-crop farms already below a level considered critical for crop production and continuing to drop. This deteriorating situation is fast eroding the long-term sustainability of these farming systems; if nothing is done, food insecurity and poverty in the country are likely to worsen. This is despite these farmers having adequate amounts of manure from their dairy cows to use as fertilizing soil amendments. It is likely that Uganda's dairy farmers are under-using their livestock manure to fertilize their crop soils because they lack the labour needed to save, transport and apply the manure.

Future research needs

This study revealed how surprisingly little research can yet tell us about the advantages and disadvantages of African farmers applying livestock manure as fertilizer on their mixed-production farms. We still lack, for example, sufficient comparative data on its effects on small-farm economics, nutrient cycling, practicability and labour trade-offs.

We don't yet know enough about these matters to recommend best-practice manure management and application methods for Uganda's many small dairy producers. We ought to. We need to research manure management in the context of Africa's complex small farming systems so that we can offer the continent's farmers recommendations validated by research.

Partners *Ugandan National Agriculture Research Organization (NARO)*
Makerere University
Danish Institute of Agricultural Sciences (DIAS)

Funder *Danish International Development Agency (DANIDA)*

Improving livestock marketing and regional trade in West Africa

Livestock are the highest valued agricultural commodity in intra-regional trade in West Africa. Livestock trade historically links Sahelian countries, such as Burkina Faso, Mali and Niger in the arid and semi-arid parts of the region, as exporters of livestock to the humid coastal countries in the south, such as Côte d'Ivoire, Ghana and Nigeria, as net importers. It is a thriving intra-regional trade in live animals in which the value of traded cattle increased in real value terms from US$13 million in 1970 to $150 million in 2000; the cattle population in the region has grown from 29 million in 1970 to 47 million in 2000.

Within this period, three major factors impacted livestock marketing and trade in West Africa. First, the severe droughts of the late 1960s, early 1970s and early 1980s significantly disrupted the flow of animals from the Sahel to the coastal countries, opening up the regional markets to substantial extra-regional imports of frozen meat from Argentina and the European Union. Second, inappropriate policies pursued by countries in the region, including currency overvaluation, price controls, restraints on private-sector involvement in processing and an array of tariff and non-tariff barriers that hurt intra-regional trade, caused rapid declines in incomes of importing countries and consequent falls in meat demand. In two major importing countries, Côte d'Ivoire and Nigeria, consumption fell from 12.2 and 8.4 kg per capita in 1990s to 11.0 and 4.2 kg, respectively, by 2000. Third was the availability in the West African coastal markets of subsidized imports of meat and dairy products from the European Union. The price ratio between Sahelian beef and imports from Europe rose from about 0.5 in the early 1980s to 2.0 by the end of the decade as import prices for European Union beef fell by about 29%. Consequently, livestock exports from Sahelian countries to coastal countries, particularly to Côte d'Ivoire, dropped significantly and imports of frozen beef from countries outside the region, mainly from the European Union, increased three-fold from a low of 16% in the mid 1970s to 44% by the end of 1980.

Beginning in the mid-1980s, most countries in West Africa implemented macroeconomic stabilization and structural adjustment programs, including

currency devaluation, abolition of commodity marketing boards, lifting controls on livestock markets and reducing trade taxes. These changes initially made Sahelian beef more competitive in coastal countries and promoted expansion of intra-regional trade in livestock. At the same time, the sharp decline in intervention stocks enabled the European Union to reduce subsidies on beef exports to West Africa by as much as one-third between 1993 and 1995. However, recent increases in meat imports indicate that the situation is dynamic and countries in the region need to establish policies that take into account changes in terms of trade and supply and demand. In this regard, Côte d'Ivoire introduced an import tax (compensatory duties) on European beef to cushion the effects of subsidies by EU on domestic economy.

Most of the livestock are produced by smallholder pastoralists and farmers and marketed by private entrepreneurs operating a marketing chain involving collection, regrouping and terminal markets. Although the marketing chain is well-known, the economic and institutional barriers to livestock marketing are often underrated, at considerable cost to livestock-sector development and the welfare of the large population of smallholder producers and others who depend on the livestock sector for their livelihoods. For example, this study estimated that transportation and handling costs for cross-border livestock trade are three times higher than costs for equivalent transfers within West African countries and trans-Atlantic shipments.

Lack of credit to livestock traders and risks and disappearances associated with cross-border livestock trade raised marketing margins by up to $11.9 million per annum (for cattle exports from Burkina Faso and Mali alone, in 2001) compared to domestic livestock trade. Inadequate and uncoordinated livestock market information systems to empower producers with knowledge of buyers' preferences also take a toll on the economy. In this case, producers are denied the premium attracted by high-grade finishing while the incremental beef that could have accrued from greater attention being paid to breeding and finishing is lost. These latter losses are estimated to amount to more than $50 million annually for export cattle trade alone. The potential, therefore, exists for improving rural livelihoods and economic development by overcoming economic and institutional barriers to well-functioning markets and intra-regional trade.

The project

To enable smallholder livestock producers to benefit more from regional trade, Comité Permanent Inter-Etats de Lutte contre la Sechèresse dan le Sahel (CILSS) and ILRI started a project in 1999 with national and local-level organizations. The study involved six countries: Burkina Faso, Mali and Niger as examples of livestock-exporting countries and Côte d'Ivoire, Ghana and Nigeria as net importers of livestock.

ILRI's objective was to provide a basis for new policy interventions to improve

market efficiency and intra-regional livestock trade, specifically to:

- use three frontier markets as case studies to identify the sources and magnitudes of inefficiencies and measures to reduce them
- determine policy strategies to reduce the sectoral and trade policy constraints to intra-regional livestock trade
- develop and disseminate an appropriate framework to streamline livestock trade policies among participating countries.

Livestock market operations

With livestock trade in West Africa being based on live animals, the major value-added activity of collectors, intermediaries, market associations, small and big traders and other participants in the livestock marketing channel is to facilitate the transfer of live animals from one location or owner to another. Within Sahelian-producing countries, this usually involves trekking trade animals from farm gates and collection markets to major frontier markets by smaller traders. The cross-border segment mostly entails trucking animals from frontier livestock markets to terminal markets by big livestock traders capable of sponsoring at least a truckload of about 35 cattle per trip. Each trip costs from $7,300 to $9,100, which bars entry to smaller livestock traders and lowers competition. The high transportation and handling costs are exacerbated by official and unofficial taxes and other transactions costs.

Private entrepreneurs operating through a marketing chain involving collection, regrouping and terminal markets carry out the trade in live animals. While all traders (small, medium and large) participated in the domestic segment of the marketing chain, only large-scale traders were involved in the export segment. The capital investment of small-scale traders ranged from $835 to $2,730, whereas large-scale traders invested between $4,732 and $14,000. These sums enabled small-scale traders to purchase 6–8 cattle, medium-scale traders 11–16 cattle and large-scale traders 25 to 37 cattle during each trip. Road transportation by truck is the most important mode of transporting trade cattle across borders in West Africa.

The markets encountered in this study are similar to other markets for live animals in other parts of sub-Saharan Africa. Typically, information on market prices, sources, demand and objective standards for selling and buying animals are unavailable. Livestock pricing is characteristically highly personalized and is not based on formal, pre-established standards. This compels traders to travel long distances to transact business at higher costs than would have been necessary in a standardized pricing/marketing system. Moreover, the search for animals with qualities that appeal to the buyer, the negotiations, payment and transfer of ownership are time consuming and there are many cases of failed transactions because the transactions costs are so high.

Traders also identified as constraints cumbersome formalities, exorbitant fees and taxes (both legal and illegal) collected along the trade routes, lack of well-demarcated cattle corridors for trekking animals to frontier markets,

occasional shortage of trucks for moving animals to terminal markets, a system of selling on credit (particularly to butchers) and lack of market information. When transactions costs are high, brokers, market associations, social networks and other market institutions emerge to lower costs and facilitate exchange, such as, in recent years, local-level COBAS in Mali and UNACEB in Burkina Faso. Members of these market associations find the associations most valuable for arranging transport and credit and for administering the markets. Organized transport reduces the time traders spend searching for trucks, thus giving them more time for bargaining, and lowers costs incurred in feeding and caring for animals whose shipments are delayed.

A source of strength of the West African livestock marketing system is the lack of regulations compelling producers to sell or buy from particular markets (farm gate, collection or frontier) or through particular participants (e.g. the small itinerant trader, agent, broker or big export trader). The volume of livestock flows through the various channels reflects attempts by smallholder producers to get the most for their animals and competitive efforts on the part of traders to secure the best possible deals.

Conclusions

- Although the large number of producers, intermediaries, traders and buyers in the domestic segment of the livestock marketing channel create a near-perfect market condition that allows this segment to function reasonably well, better price transmission and market information systems are needed.
- A premium for animals in excellent body condition is emerging; livestock producers could therefore increase their earnings by marketing animals in excellent condition rather than selling all grades of animals. Fattening and properly finishing animals before presenting them for sale would increase returns to the producers as well as help produce an exportable surplus and increase the value of livestock trade.
- Provision of credit facilities for cross-border trade would enable aspiring traders overcome market-entry limitations posed by lack of own-capital and thus increase the number of traders and volume of trade, especially in the export segment.
- The uneven pace of policy reforms aimed at liberalizing livestock trade in the participating countries continues to hamper intra-regional trade.

Policy recommendations

- Strengthen market institutions such as livestock producers' associations, livestock traders' associations and farmer-pastoralist associations to enable them to support their members and provide them with services such as facilitating access to credit (e.g. by acting as guarantors of bank loans),

advocating better marketing conditions (e.g. ending illicit taxation), adjudicating conflicts between farmers and pastoralists over the use of grazing resources, and promoting sustainable use of natural resources.

- Reduce high transportation and handling costs incurred in cross-border trade and eliminate illicit taxation. Maintain well-demarcated stock routes to facilitate the movement of animals from the farm gates to the collection markets in a cost-effective way and minimize conflicts between farmers and pastoralists.
- Provide well-functioning market information systems capable of reaching the widely dispersed producer populations with information on buyer preferences, animal prices, livestock supply and demand levels in the region.
- Help producers engage in fattening schemes to produce animals in excellent body condition; this should benefit regional trade and pave the way for regional participation in the expanding global red (tender) meat market.

ILRI published these recommendations in four policy briefs in English and French:

- Brief 1. Regulatory and administrative issues and options for livestock marketing in West Africa
- Brief 2. Lowering cross-border livestock transportation and handling costs in the central corridor of West Africa
- Brief 3. Livestock marketing channels, flows and prices in West Africa
- Brief 4. Promoting livestock marketing and intra-regional trade in West Africa.

Partners Comité Permanent Inter-Etats de Lutte contre la Sechèresse dan le Sahel (CILSS)
Union Nationale des Associations de Commercants et Exportateur de Bétail du Burkina (UNACEB)
Cooperative de Commerce de Bétail du Sikasso (COBAS)
Livestock traders associations in Ghana and Nigeria

Funder *Common Fund for Commodities*

Improving pig and pig meat marketing in Vietnam

Poverty remains widespread in most of the Mekong Delta of Indo-China, where the per capita gross domestic product remains just one dollar a day. Despite rapid economic growth in some countries in the region, rural poverty here, especially among women, remains high. Agriculture is still the main source of rural livelihoods and small-scale mixed farming dominates the sector. Most smallholders raise pigs and poultry for home consumption as well as a source of cash to meet family needs. Many of these producers are not yet market oriented and sell their products as and when they have a need for cash.

Most of the region's smallholders have failed to exploit the expanding markets for livestock and livestock products. Market infrastructure in the region generally provides inadequate information and signals to producers through the marketing chain regarding the types of products in high demand or fetching premium prices. An increasing length of food chains, growing concerns about food safety and economies of scale in intensive production systems are threatening the participation of small livestock farmers in the increasingly complex markets for livestock.

Both Vietnam and Cambodia have been making a transition from central planning towards a market orientation. High rates of economic growth are creating increased demand for high-quality foods and increasing diversification of farm activities towards livestock. Livestock production activities are still undertaken predominantly by smallholders not well connected to markets. The supply of domestic pig meat is still largely dependent on small and medium-sized farms, although the commercial sectors around larger cities are expanding.

Pigs are raised throughout Vietnam and Cambodia on small farms mixing crop and livestock production. Nearly all households in Cambodia have at least one pig. Livestock marketing in Cambodia and Vietnam, especially in North Vietnam, is highly fragmented, with many marketers operating. Small traders typically buy one or more animals direct from farmers, transport the pigs in cages attached to the backs of motorcycles or bicycles to sell them to other

farmers and/or traders or to supply the urban markets or abattoirs. Both product quality and producer returns are severely constrained by this informal transportation, which stresses the pigs and often leads to diseases, which either reduce the quality of the animals or kill them outright. With scarce storage facilities available, pigs are commonly slaughtered in the early morning on the day their meat is sold. Although high-income urban consumers in the region are beginning to demand better quality, leaner and safer pig meat, the market mechanisms transmit this demand information inefficiently to producers, who therefore fail to respond. Even so, small amounts of chilled and frozen meat, mostly imported, have begun to appear in the urban supermarkets of the region.

The demand for pork has increased faster than poultry meat during the recent past as a result of the highly pathogenic avian influenza crisis in Southeast Asia. This caused the retail prices for pork to rise by 15%. The farm-gate price of pigs, however, has remained low because it is heavily dependent on negotiations that fail to reflect demand and supply conditions in the urban markets. With small farmers having little information on market prices and little knowledge about animal diseases, traders and middlemen are able to squeeze the profit margins of the small producers.

This project linked smallholder pig producers with consumers through market channels. It provided small producers and processors and their rural communities with ways to become more competitive and better able to benefit from emerging commercial opportunities. It helped market-oriented farmers and rural meat processors to identify appropriate markets, to supply market demand and to access inputs, services and raw materials. As a result, small producers and sellers were able to negotiate for better input and output prices and other services, to access information on prices and technologies, and to cost-effectively process their produce to meet market demands. The project also explored ways to enhance market participation by women.

Pig meat accounts for three-quarters of the total meat produced and consumed in Vietnam and Cambodia, where a dual market structure is emerging—a small commercial sector consisting of large-scale production and processing enterprises operating side-by-side with a large sector comprising many small-scale producers raising pigs in mixed farming systems. The large farmers and processors are capturing the high-end market that can pay a premium price for high-quality products while small farmers and processors have little access to this market. While government agricultural extension services have provided improved technology in the form of higher yielding cross-bred pigs and feed packages, these intervention programs have not addressed the problem of how to give smallholders and women better access to markets. Strategies to improve market access for small producers are essential to complement such technology interventions.

Improving pig and pig meat marketing in Vietnam

This project set out to answer the following questions:

- What existing and potential market opportunities can be accessed by smallholder pig farmers and what are the conditions for their participation?
- How can we ensure the active and remunerative participation of small operators in these markets?
- What demand aspects of these markets can be addressed through interventions in technology, institutions and policy?
- What innovations can be employed to develop sustainable pig commodity chains that help link smallholders to markets?
- How can we stimulate new market opportunities for smallholders?

The project helped generate better incomes and jobs, especially for women, in Cambodia and the Red River Delta in North Vietnam. It enhanced livelihood opportunities and improved rural income through diversification of household activities into production and marketing of pigs as a high-value commodity. The project built capacity and strengthened institutions serving women. It improved the competitiveness of local enterprises. And it established information sharing mechanisms between Cambodia and Vietnam that are facilitating cross-country learning and trading opportunities and enhancing stakeholder dialogues within and between the two countries.

Partners *Vietnam Agricultural Science Institute (VASI)*
Centre for Livestock and Agricultural Development at the University of Tropical Agriculture–Cambodia
Heifer Project International–Cambodia
Prash Punlear Slaughterhouse
Srah Takoun Farmer Association
Lok Farmer Association
Women's Union of Nam Sach District
Nam Sach Animal Production Cooperative
Long Co Company Limited
Markets and Agricultural Linkages for Cities in Asia (MALICA)
CIRAD

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Global Fund for Agricultural Research (GFAR)
Ministry of Foreign Affairs
Project Duras (Promoting Sustainable Development in Agricultural Research Systems)

Enhancing beef productivity, quality, safety and trade in Central America

An ILRI project to enhance beef trade for the poor in Central America ended in 2007 after five years. Focusing on beef value chains in Costa Rica, Nicaragua, Guatemala and Honduras, the project supported the integration of small farmers into formal beef markets through increased farm productivity, improved animal health systems, improved institutions and regulations dealing with food safety, quality and trade promotion.

This project led to:

- Public knowledge goods addressing key aspects of beef value chains.
- Improved technologies that increased the quantity and quality of animal feeds within the reach of small producers.
- Methods to control cattle diseases.
- Methods to analyze investment alternatives for cattle production farms.
- Institutional systems for marketing cattle through auctions.
- Application of innovative technologies in beef processing and handling.
- Restructuring of the small-scale beef industry in rural areas.
- Information on prices, cattle trade and international trade of beef.
- Strategies to ensure quality, safety and marketing for the supermarket sector.

Cattle forage feeding technology

The project pilot-tested approaches to increasing the uptake of improved pastures that employ mixed grass and legume systems. Adoption of the improved forages increased beef production by 15% in collaborating farms in Nicaragua, 46% in Honduras and 74% in Costa Rica; milk production rose by similar ratios. This led to lower costs of production of both milk and beef in the participating farms. Milk production costs decreased by 16% in Guatemala, 42% in Honduras, 7% in Nicaragua and 31% in Costa Rica. Beef production costs decreased by 7% in Guatemala, 46% in Honduras, 9% in Nicaragua and 23% in Costa Rica.

Partially as a result, along with increased milk and beef prices during the period, the interventions generated extraordinary increases in income. From

2003, when the project started, to the project's close in 2007, family net income increased by 32% in Guatemala, notwithstanding the damage caused by Hurricane Stan, and by 288% in Honduras, 177% in Nicaragua and 238% in Costa Rica.

Information system for herd management and sanitary control

The project introduced software, 'Veterinary Automated Management Production Program' (VAMPP), adapted to the Central American conditions by a local university to manage dairy, dual-purpose and beef herds. This program is based on analysis of registered data on standards of security, reliability and information quality. The VAMPP is easy to apply and is sufficiently flexible to be adjusted to the broad range of management systems in the region. Project staff trained more than 50 individuals in use of VAMPP, which is now being used by trained technical staff within the producer associations and on most of the farms where this project's research was conducted. This work underscored the need for entrepreneurial vision and high-quality, as well as systematic access to, information.

Other outputs of the project include development and dissemination of cattle price information systems, development of guidelines and systems for better management of rural slaughterhouses disseminated through the Central American Agriculture Council, and development and dissemination of practical strategies to increase interregional beef trade, to link smallholder beef supply to the growing supermarket sector, and systems for carcass grading and the promotion of quality with the supply chain to tap into high end markets.

Partners *Centro Internacional de Agricultura Tropical (International Center of Tropical Agriculture) (CIAT)*
Servicios Internacionales para el Desarrollo Empresarial (SIDE)
Instituto Interamericano de Cooperación para la Agricultura (Interamerican Institute of Cooperation for Agriculture) (IICA)

Guatemala: *MAGA-ICTA (Ministerio de Agricultura, Ganadería y Alimentación, Instituto de Ciencia y Tecnología Agropecuaria)*
ASOBrahman (Asociación Guatemalteca de Criadores de Ganado Brahman y Derivados)
FEGAGUATE (Federación de Ganaderos de Guatemala)

Honduras: *DICTA (Dirección de Investigación y Tecnología Agropecuaria)*
FENAGH (Federación de Agricultores y Ganaderos de Honduras)

Nicaragua: *IDR (Instituto de Desarrollo Rural)*
FAGANIC (Federación de Asociaciones Ganaderas de Nicaragua)
CONAGAN (Comisión Nacional de Ganadería de Nicaragua)

Costa Rica: *CORFOGA (Corporación Ganadera)*

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GTZ
National partners

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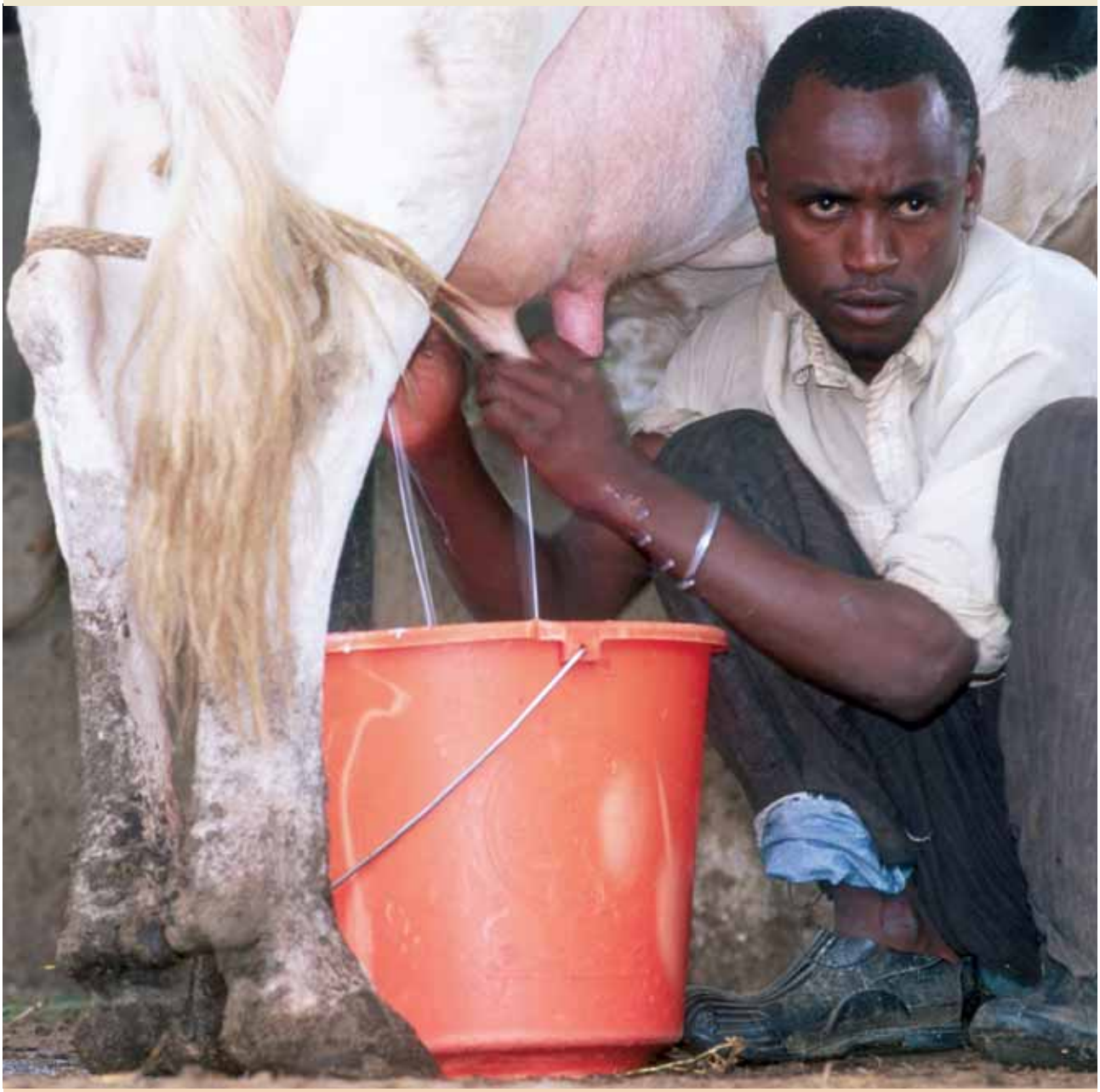

Dairy development in East Africa and South Asia

The great differences in the different milk markets in the developing world are generally underappreciated. For example, whereas most milk is consumed in the form of fresh milk in East Africa, 40 to 50% of India's milk goes into production of added-value products such as 'dairy sweets', ghee (clarified butter) and lassi (soured milk). Approaches to improving the dairy value chain must differ for each region. For this reason, ILRI conducted a study for the Pro-Poor Livestock Policy Initiative (PPLPI) of the United Nations Food and Agriculture Organization (FAO) to examine dairy development in two key regions in the developing world: East Africa and South Asia. The study identified key determinants in dairy development in these two regions, assessed the impact of policy interventions on those trends and identified impacts of dairy development on the poor.

The study was reported in three parts: Part 1 presents a conceptual framework for dairy development, followed by a section presenting a regional analysis of dairy development trends across all the countries in the two regions and a synthesis of the outcomes of the case study analyses, highlighting implications for policy interventions and investment, including proposing a model for pro-poor dairy development. The second two parts consist of in-depth case studies and analyses of dairy development trends, determinants and outcomes in Kenya and Ethiopia (Part 2) and India and Pakistan (Part 3).

CONCEPTUAL FRAMEWORK FOR DAIRY DEVELOPMENT

Two stylized representations of dairy systems are used. The 'traditional system', also known as the small-scale subsistence or Southern tropical model, reflects the farm-household milk production and informal market systems that predominate in most developing countries. The 'commercial system', also known as the large-scale industrial or Northern cold-chain model, represents the industrialized production and integrated marketing observed in developed countries. Elements of both models often occur simultaneously in both high- and low-income country settings. The characteristics of these models are described below and reflect both farm and market differences.

The following definitions are helpful.

PRODUCTION
Characteristics of 'traditional' milk production systems include:

- multi-objective household model of farmer behaviour
- low levels of inputs and outputs
- nutrient deficits in both farm and household

Characteristics of 'commercial' milk production systems include:

- single objective enterprise model of farmer behaviour
- high levels of both inputs and outputs
- nutrient surpluses in both farm and household

MARKETING
Characteristics of 'traditional' milk marketing systems include:

- diffuse market structure consisting of many small-scale market agents
- artisanal processing, labour-intensive handling and transport methods
- low-cost products, mostly liquid and limited in diversity
- great diversity in market behaviour and roles
- no voice or role in dairy-sector policymaking

Characteristics of 'commercial' milk marketing systems include:

- concentrated market structure consisting of relatively few, large-scale, vertically integrated market agents
- industrial processing, based on capital-intensive technologies at all market levels
- value-added products, mostly non-liquid and diverse
- little diversity in market enterprise types
- strong voice and large role in dairy-sector policymaking

At the heart of this process of dairy development is a shift from a multi-objective farm-household activity to a focused objective enterprise activity. The conceptual framework postulates factors that drive this shift. These include:

- Demand levels and consumption patterns, which are closely associated with income and urbanization and with local consumption traditions.
- Opportunity costs of labour and land, which tend to bring about a substitution of capital for both of these factors and a general shift towards commercial systems.
- Market access, infrastructure and institutional development, which condition the structure and performance of production systems for a highly perishable product.
- Technology and policy interventions, which can alter the opportunities and incentives for dairy system change and development. Generally, improved technology will reduce production costs and induce shifts towards more commercial systems. Policies can partially determine the winners and losers of structural changes in the sector, determine market participation of smallholders versus larger producers and employment generation and incomes at both farm and market level.

ILRI's conceptual framework has at its core the shift from labour-intensive practices towards more capital-intensive practices, both on farm and in market, due to increased opportunity costs of labour. That shift also implies

higher productivity of labour. The stages of change between traditional and commercial systems can thus be measured in terms of labour productivity; if we equate that change with 'dairy development', we can use labour productivity as a general proxy for dairy development, reflecting changes in all parts of dairy systems.

IMPACTS OF DAIRY DEVELOPMENT ON THE POOR

While 'development', meaning a shift towards commercial systems, of the dairy sector is favourably viewed by policymakers, it should be understood in the context of the contribution of livestock production to livelihoods and income generation for smallholder farmers through the production of higher value products compared to most crops.

Elements of the outcomes for the poor include income and employment generation, which includes not only self-employment of farmers and market agents but also hired labour on farm and in the market. Less tangible returns to milk production include the value of livestock assets for finance and insurance functions.

Dairy development is also linked to better nutrition not only for farm families and resource-poor consumers of dairy products but also for farm soils. Consumption of even small amounts of milk can have dramatic effects on improving the nutritional status of poor people, especially for children and nursing and expectant mothers. Further, as long as infertile soils remain a major constraint to agriculture in most developing countries, manure from dairy cows can provide a critical source of organic matter and nutrients, boosting smallholder crop yields on farms with little access to chemical fertilizers or with little money to purchase them.

Policy interventions, as well as market forces, can help to determine whether dairy development follows more or less equitable development paths.

COMPARATIVE TRENDS IN DAIRY DEVELOPMENT AMONG COUNTRIES IN EAST AFRICA AND SOUTH ASIA

East Africa and South Asia represent some of the most important dairy development zones among poorer countries globally. Within them occur countries where dairy production and consumption has a long historical tradition and has been an important part of agricultural systems. In other countries in the same regions, however, dairy production has been a less significant enterprise, often for cultural reasons but also due to limited potential for dairying. These regions thus present an excellent choice for understanding both the driving factors and the pro-poor implications of dairy development and of related policies and interventions. Data used from five South Asian countries and ten East African countries, based on FAOSTAT and the World Bank's World Development Indicators database, is used in a regional analysis of comparative trends in milk production. Milk production is used as a proxy for dairy development. Explanatory variables include proxies

for various aspects of demand and market development, inputs and labour markets, technology and human capital, infrastructure and transaction costs and policy.

RESULTS OF REGIONAL ANALYSES

East Africa. Demand-related factors play a key role in explaining development of the dairy sector in East Africa, as shown by the significant contribution to growth of demand-related factors in the three countries with the fastest growth in milk production (Sudan, Kenya and Uganda). Development of formal milk markets, input markets, technologies and policies do not explain the differences between fast-growing countries and the rest. This suggests that expanding demand by reducing consumer prices and reducing transaction costs should be a necessary condition to expand the dairy sector in East Africa.

South Asia. The dairy sector in South Asia is following a different path. Consumption of dairy products is higher on average than in East Africa and demand-related factors have been contributing to growth in the dairy sector for the past 30 years in all countries. Differences in growth are more related to the possibility of expanding supply to match the growing demand of dairy products. India and Pakistan were able to link the transformation in agriculture originated in the Green Revolution to successfully expand production and output; this is reflected in the contribution of input markets and technology to growth in milk production. In the case of countries with slow growth in milk production, such as Bangladesh and Nepal, development of cereal production, feed markets and a growing demand did not translate into technical change in the dairy sector, as was the case in India and Pakistan. The policy environment in these countries is also less favourable than in the fast-growing countries. Sri Lanka's constraints to growth in the dairy sector appear to be mainly on the supply side. As in East Africa, development of formal milk markets in South Asia is not associated with increased growth rates.

COUNTRY CASE STUDIES FROM SOUTH ASIA AND EAST AFRICA – Kenya, Ethiopia, Pakistan and India

Kenya, Ethiopia, Pakistan and India represent a range of production conditions, histories and policy environments related to dairy development. While India and Kenya are also held up as examples of 'successful' dairy development, the results exhibit more similarities than differences. Of importance to dairy development in all cases are the roles of demand growth, the traditional market and availability of improved dairy animals. Policies related to investment and trade show mixed results.

Synthesis of regional and country results

Demand for dairy products: The analyses highlight the importance of growth in consumption and demand, brought about either through growth in GDP per capita or exports or through increased urbanization.

- A clear understanding of potential market trends and opportunities is needed for policy and planning in the dairy sub-sector. Because demand is highly conditioned by local perceptions and traditions regarding dairy consumption, this understanding should be pragmatic and based on local realities, not on assumed replication of trends observed elsewhere.
- Where poor people play a large role in the consumption of dairy products, interventions to support the provision of low-cost products are likely to simulate dairy development.
- The Indian milk revolution, for example, may be largely a result of demand-side forces, although the technical and agricultural-sector factors discussed below played a key role as well. Unless these facts are understood, there may be overemphasis on supply-side interventions that have not been demonstrated to bring about development.

Improved dairy animals and other farm technology. A consistent and clear result of the analysis, both at the regional and country-case levels, is that nearly all strong dairy development growth scenarios are associated with technical change in terms of yield per animal. Genetic improvement has obviously had dramatic impact on development and growth.

- Clearly, use of exotic cattle genetics is a rapid and potentially sustainable path to higher productivity, even among small-scale and resource-poor farmers and in warm, semi-arid or humid climates. At the same time, failures caused by importing high-grade animals should be noted and avoided.
- National and local breeding strategies need to address the realities of climate and disease risk. Given appropriate breeding strategies and disease-control measures, however, it is possible to develop and sustain cross-bred dairy production systems; such systems have often played a key role in dairy development.
- Although it is difficult to capture the role of fodder technology in the aggregate analyses in this study, for the Kenya case it was possible to demonstrate that planted fodder technology played a key role in growth in dairy productivity.
- Research has shown that the 'appropriateness' of intensive fodder production is much more likely to depend on availability of cheap labour, scarcity of land and good access to milk markets, than it is on agro-climatic setting. Where labour is scarce, evidence shows that intensive fodder cultivation practices and feeding of crop residues to cattle, unless mechanized, are unlikely to be taken up. Interventions to promote those should pay very close attention to labour opportunity costs.
- Where relative land and labour values constrain uptake of specialized fodder technologies, a potential avenue for increased productivity is through improved 'food-fodder' crop varieties, bred to increase the fodder quality and digestibility of the straws and stovers they produce.

Agricultural sector growth. In some regions and countries, general agricultural sector growth and transformation was shown to play a role in dairy development; for example, India and Pakistan were able to link the transformation in agriculture originated in the Green Revolution to expand milk production. The link with the agricultural sector is not as evident in some other South Asian countries or in East Africa. Productivity change in those cases may continue to rely on fodder technology, given the low opportunity costs of labour.

Traditional milk and dairy product markets. One of the key findings of the study is that traditional/informal milk markets have apparently played a key role in dairy development in both regions and in most countries. In countries with the strongest growth, such as Pakistan, India, Sudan and Uganda, traditional small-scale markets control over 80% of marketed milk; there is no evidence that this basic structure will change significantly in the next few decades. These facts, which are often overlooked because traditional markets are generally not reflected in national dairy industry statistics, pose several important implications for dairy policy and development.

- All the evidence suggests that the traditional market dominance is not a result of lack of investment in formal market channels or of non-enforcement of national milk standards; rather, they are the result of continued strong demand for the products and services that they offer. As a consequence, in many cases investment in formal dairy processing facilities, both in the private and public sectors, have failed, leading to underutilized capacity surviving on subsidies or abandoned milk processing plants and cooling facilities.
- In some cases there is strong demand for traditional products by high-income consumers as well as the resource poor; growth in disposable income may not necessarily significantly reduce demand for traditional products.
- The analysis in this study does not support the view that formal market structures are required to stimulate dairy development. One of the countries in this study with the strongest growth, Pakistan, displays a negligible formal market share. In East Africa, the analysis suggests a negative association between formal market share and dairy development, as measured. This is likely to be because formal market share in that region was less a result of market forces than public investment decisions. Also, poorly managed formal market institutions provided a much less effective link between farmers and consumers than the traditional informal market.
- Traditional informal markets have clearly provided an effective, functional link between farmers and consumers that responds to consumer demand: they should not be regarded as market failures. Moreover, such markets are generally those most often serving the needs of small-scale farmers and resource-poor consumers. The analysis has also demonstrated the large and positive employment implications of such markets.
- Public policymakers should engage constructively with traditional markets rather than oppose them directly, particularly as demand for food safety may grow with increases in disposable income. Policies that allow the continued functioning of such markets while also supporting increased quality and food safety are likely to be pro-poor in nature. Policies that simply oppose and attempt to police such markets are likely to hurt poor consumers and small-scale farmers and market agents.

Dairy co-operative development. Mixed messages emerge from the analysis of the two countries where cooperatives have played a significant role in dairy development: Kenya and India. In Kenya, evidence suggests that dairy cooperatives played a significant role in fostering dairy development, primarily by providing a stable market environment and delivering services to farmers. In India, there was no empirical evidence that cooperative development was associated locally with dairy development as measured, although it was found to be associated with genetic improvement in dairy animals.

- Dairy co-operatives may play an important role in providing a base for service delivery to farmers, stable agricultural knowledge systems for uptake of improved technology and increased management skills among farmers.
- There is no empirical evidence that dairy co-operatives are more effective than other market channels in linking poor farmers to output markets. Pakistan illustrates dramatically that strong market growth can occur in the absence of dairy co-operatives.
- The mixed experience suggests that dairy co-operative development is heavily dependent on good cooperative management, honest and effective investment of resources and accountability to the interests of the farmer members. Political and governmental influence in cooperatives needs to be minimized.
- Further, many dairy cooperatives cannot easily tap into the strong demand for traditional products and raw milk and generally remain tied to demand for formally processed products. While traditional demand remains the driving force, dairy cooperatives face the same growth impediments as the formal private sector.
- Investment in dairy cooperative development can be effective and pro-poor when well managed, placed outside strong political forces and linked to strong demand. Because of these constraints, dairy cooperative development should not be the primary focus of dairy development efforts; rather, it should be part of a mix of market channels, including formal private sector and small-scale traditional.
- Other less formal forms of farmer groups, such as self-help groups, could play important roles in some local cases.

Smallholder competitiveness. There is ample evidence to suggest that smallholder dairy producers are generally competitive and are likely to endure for some time, particularly where the opportunity costs of family labour and wages remain low. The most compelling evidence towards this is the continued dominance of smallholders in all the countries studied, even where there is steady economic growth. Furthermore, dairy as an enterprise is an option available to landless and socially marginalized groups.

- Policymakers and development investors should resist the often-heard assumption that the role of smallholders is ending and that efforts should now be made to support larger scale, 'more efficient' milk production to meet growing consumer demand. Instead, that growing demand should be used as a mechanism to help continue and sustain smallholder dairy enterprises.
- Smallholders may, in some cases, face increased barriers to participating in changing markets; alternative options, such as contract farming, should be explored and promoted where appropriate.

Public investment. While the analysis was unable to show a link between agricultural R&D and growth in dairy development, due to data limitations, it is reasonable to assume that investment in dairy R&D and provision of appropriate credit to smallholder producers will grow in importance, particularly as producers shift towards greater commercial orientation, increasing their demand for improved technologies and investment.

Trade policy. Imports and exports, as well as macro policy and levels of openness of the economy, show mixed results and cannot be demonstrated to play a consistent role in the pace of dairy-sector development.

- Exports, as demonstrated in South Asia, may play a role in dairy development. Export opportunities might increase if, for example, EU export subsidies are

curtailed as is expected, although barriers to entry remain significant.

- Countries with no strong tradition of milk production and consumption, such as Sri Lanka and Bangladesh, are particularly susceptible to import competition. Supporting the development of traditional markets takes on the added feature of helping buffer domestic producers from imports.
- Even though trade in dairy products tends to receive a disproportionate amount of attention, perhaps because of issues of national pride and self-sufficiency, little evidence exists that trade issues are of major importance for the welfare of the large majority of producers, market agents or even consumers. Projections for the Livestock Revolution show that the demand growth and opportunities in milk are going to happen domestically rather than across borders.
- Policymakers and planners should focus their attention on the much larger and more dynamic domestic markets rather than on the smaller and less welcoming international markets.

AN AGENDA FOR PRO-POOR DAIRY POLICY AND DEVELOPMENT

The lessons learned from this and other analyses suggest the following elements of an 'agenda for pro-poor dairy policy and development'.

- employment creation in rural and peri-urban areas, both on farm and along market distribution and value chains
- reliable income generation and asset accumulation for resource-poor farmers and provision of low-cost and safe dairy products to resource-poor consumers
- improved natural resource management and sustained farming systems through nutrient cycling mediated through dairy cattle
- improved child nutrition and cognitive development in resource-poor households

Implementation of such a model would incorporate the lessons and recommendations outlined above and include the following main elements.

- Build on traditional dairy-product consumption habits and preferences at the same time as promoting demand for new products.
- Support development and evolution of traditional domestic markets for milk and dairy products at the same time as promoting appropriate formal market development.
- Emphasize and support the role of smallholder dairy production as primary means of generating rural incomes and sustaining the intensification of mixed crop-and-livestock systems through:
  (1) appropriate improved animals and the systems required to deliver these to smallholders
  (2) fodder technologies and exchange mechanisms for fodder and crop residues
  (3) institutional mechanisms for enhancing smallholder participation in growing local markets—meaning cooperatives, contract farming and other forms of farmer groups.

Funder Pro-Poor Livestock Policy Initiative (PPLPI)—
http://www.fao.org/ag/pplpi.html—
of the United Nations Food and Agriculture Organization (FAO)

Working Papers:
http://www.fao.org/ag/againfo/projects/en/pplpi/docarc/wp44_1.pdf
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TJAHYANI

New methods for integrated models of animal disease control

In a paper for the 2007 American Agricultural Economics Association Meetings in Portland, Oregon, in August 2007, ILRI scientist Karl Rich argues that accurate assessments of the epidemiological and economic impacts of an animal disease require the incorporation of feedbacks between disease spread and production incentives. His paper, 'New methods for integrated models of animal disease control', proposes a new 'integrated system dynamics' modeling framework sensitive to the dynamics of disease, production decisions and incentives, different livestock production systems, and their interactions.

Integrated analyses of the epidemiology and economics of disease are of critical importance to capture the behavioural implications of proposed animal health interventions. The proposed methodology simultaneously captures responses to a disease outbreak from both the standpoint of the disease itself and the responses to it made by producers and markets. This adds value to previous analyses that viewed either the epidemiology or the economics of the disease as an exogenous 'shock' to the other and failed to realize the feedbacks between each that have policy ramifications.

Economic analysis plays an increasingly important role in animal disease control models. To date, the most sophisticated assessments of animal diseases have combined a form of benefit-cost analysis with epidemiological models of disease spread to assess the costs and benefits of alternative control strategies. These tools have become increasingly sophisticated over the past several years, particularly on the economics side, with models evolving from relatively simple accounting frameworks towards analyses utilizing social accounting matrices, computable general equilibrium models, multi-market approaches and spatial analysis. Consequently, such approaches have increased the diversity of information available to decision-makers, incorporating spatial, dynamic and poverty impacts for example, and allowed for a greater tailoring of analyses to meet the needs of diverse stakeholders.

While the integration of epidemiology and economics is becoming recognized as an increasingly important approach in conducting economic impact assessments of animal disease, several important methodological

considerations remain under-researched. In particular, the true integration of epidemiology and economics requires the incorporation of actual feedbacks between economic and disease spread models in a manner that captures how the evolution of disease affects behaviour and incentives and vice versa. Consider, for example, the implementation of a stamping-out policy in which diseased animals are slaughtered to prevent the further spread of disease. In most analyses, shocks from an epidemiological model, such as the number of animals culled, are translated into an economic model to assess its impact. However, at each period of time, policies to control disease will influence economic incentives to control and producer behaviour, which subsequently will affect the evolution of disease over time. Such incentives will differ on the basis of the production system as well. These feedbacks have potentially important (and overlooked) implications, particularly in terms of assessing the impact of alternative control programs and in the design of appropriate compensation programs to promote compliance with control measures.

Relatively few models in the animal health economics literature, however, have considered these feedbacks. The simulation models cited above, for example, only highlight the one-way impact of disease on the economy (production, etc.) without considering how changes in production decisions engendered by the disease might influence how the disease itself evolves and is eventually controlled. This is particularly important in dynamic analyses where the evolution and outcome of an outbreak will have both short- and long-run impacts on future production decisions and second-round effects on feed and input demand. An exception to this is another paper, by Rich and colleague Winter-Nelson, 'An integrated epidemiological-economic analysis of foot and mouth disease: Applications to the Southern Cone of South America', 2007, that addresses dynamic economic feedbacks based on the outcome of a foot-and-mouth disease outbreak in cattle in South America, but do not analyze discrete changes in production choices while the outbreak is taking place. The latter point is especially salient in the context of poultry and pig systems, where marketing and re-stocking decisions take place at more frequent time intervals that correspond directly with the evolution of the disease.

A second category of models in the literature utilizes linear programming and optimal control theory to characterize producer decisions to market, test and screen animals for disease subject to the dynamics of animal stocks and the process of disease evolution. Linear programming approaches generally come from the animal health economics applications found in the veterinary epidemiology literature. While the optimal control framework better characterizes the interactions between producer incentives and animal disease, four limitations are inherent in these present approaches. First, current models do not fully characterize the dynamics of livestock production itself, in terms of the progression of animals from gestation to maturity and producer decisions to hold back inventories for breeding, for example. These complex interactions are an important consideration in the development of policies that induce producer compliance with disease control measures. Second, the models do not endogenize price changes that would occur during

an animal health outbreak, considering how producer incentives might change in the wake of a price change in the steady state as well as the process of price changes that both the disease itself and producer responses to it might cause. Third, optimal control programs assume that producers operate with full knowledge about the environment they operate in, especially in terms of the evolution of disease. In reality, however, and particularly among resource-constrained smallholders in developing countries, agents may instead make their decisions and expectations on the basis of past actions and those of agents around them, with incomplete knowledge of how the disease may evolve. Finally, optimal control approaches focus primarily on the steady state rather than the evolution of either the disease or its response, which might be of importance to policymakers in the design of control measures.

This paper develops a novel modeling framework that embodies and integrates both the evolution of disease and the production behaviour of producers over time. The conceptual framework of the model is rooted in a system dynamics simulation approach to fully and explicitly model the dynamics and interactions between disease and livestock production. The evolution and impacts of disease are directly linked to production and demand in a manner that allows for the analysis of the impacts of disease and strategies to control it. The framework is applied in the context of poultry production and a hypothetical disease outbreak, though the principles can be broadly generalized to other types of animal diseases. Preliminary simulations are conducted to demonstrate proof-of-concept of the approach, with the discussion and conclusions motivating extensions in future settings.

The preliminary results from this integrated framework illustrate both the multi-faceted impacts of animal disease and the need to understand the close synergies between economic behaviour and disease evolution. Future research and extensions of this approach will enrich this platform and provide greater insights on the relative importance of specific parameters that might have policy relevance during disease outbreaks.

The presented model was necessarily simplistic and would be augmented by a number of important extensions and calibrated to actual outbreaks. Most critical among these extensions is to model household production systems with more precision and in a manner that recognizes the multi-faceted contributions of livestock to livelihoods and behavioural responses of household shocks to income. For instance, one could conceive extending this system in a manner that looks at the asset decision patterns of households and that takes into account the production dynamics of livestock, market relationships and feedbacks, and the evolution of specific diseases on these decisions. The interaction of household systems with industrial production could likewise be included. Additional extensions would look into the interactions in livestock production with other goods, including feed, and the substitutability of diseased livestock products with other non-impacted meat products, such as substituting beef for poultry during an avian flu outbreak.

Sven Torfinn/PANOS

Food trade–fair trade:
Food and safety regulations and trade

Are there opportunities for greater trade of livestock products from developing countries without increasing the risk of spreading animal diseases? An ILRI study suggests that there are and lays out a series of recommendations as to how they might be achieved.

In today's globalized, highly competitive and stringently regulated markets, exporters of livestock products must meet animal health standards imposed by importing countries and guided by the Sanitary and Phytosanitary (SPS) agreement of the World Trade Organization (WTO). Fulfilling an increasingly stringent array of veterinary requirements will be difficult for many developing countries that don't yet meet the standards of quality described in the International Animal Health Code of the World Animal Health Organisation (OIE)

Many developing countries still harbour animal diseases that present a risk to the West, which protects itself against re-introduction of diseases such as foot-and-mouth disease and classical swine fever, which in recent years have had disastrous economic and environmental consequences.

So how can developing countries make better use of their livestock resources through greater market access in the world without putting developed countries at greater risk? This topic was the subject of a study undertaken by ILRI on behalf of the Food and Agriculture Organization of the United Nations (FAO). The report, *'An appropriate level of risk: Balancing the need for safe livestock products with fair market access for the poor'*, questions some of the ground rules for safe international trade in livestock commodities while also identifying specific capacity building needed to safeguard the animal health and food safety integrity of livestock commodity value chains. The study analyzes market successes and failures, drawing from them lessons of global significance.

Generally speaking, the higher and larger the market scale, the greater the technical barriers to accessing those markets, particularly in terms of meeting the demanding SPS standards set by OIE, WTO and other organizations. These

regulations present a barrier to developing countries in general and poor livestock keepers within them in particular.

This project sought policy options and institutional changes that would promote greater participation by poor countries and poor livestock keepers in global markets while ensuring high-quality livestock products and minimal risk of disease transmission. The study recommends various mechanisms to increase international livestock trade safely.

Case studies were carried out in four regions: Southeast Asia, the Horn of Africa, southern Africa and Latin America. The study evaluated SPS rules and regulations and other non-tariff trade barrier regulations on different strata of livestock producers and poor consumers. SPS issues were evaluated on three main market categories: export, domestic (divided as appropriate into premium and standard) and local/backyard domestic markets.

The project reviewed and identified current WTO rules, SPS regulations and other non-tariff trade barrier regulations relating to trade in livestock and livestock products. It determined the effects of changes in international trade rules on domestic policies, livestock development and trade, and consumer access to livestock products. It also assessed impacts of particular issues on market participation, income, vulnerability and livelihood diversification opportunities. It proposed policy options and institutional changes at domestic and international levels that support pro-poor outcomes of globalizing livestock markets and international trade rules. And it identified suitable entry points for interventions leading to the adoption and implementation of the policy and institutional changes identified.

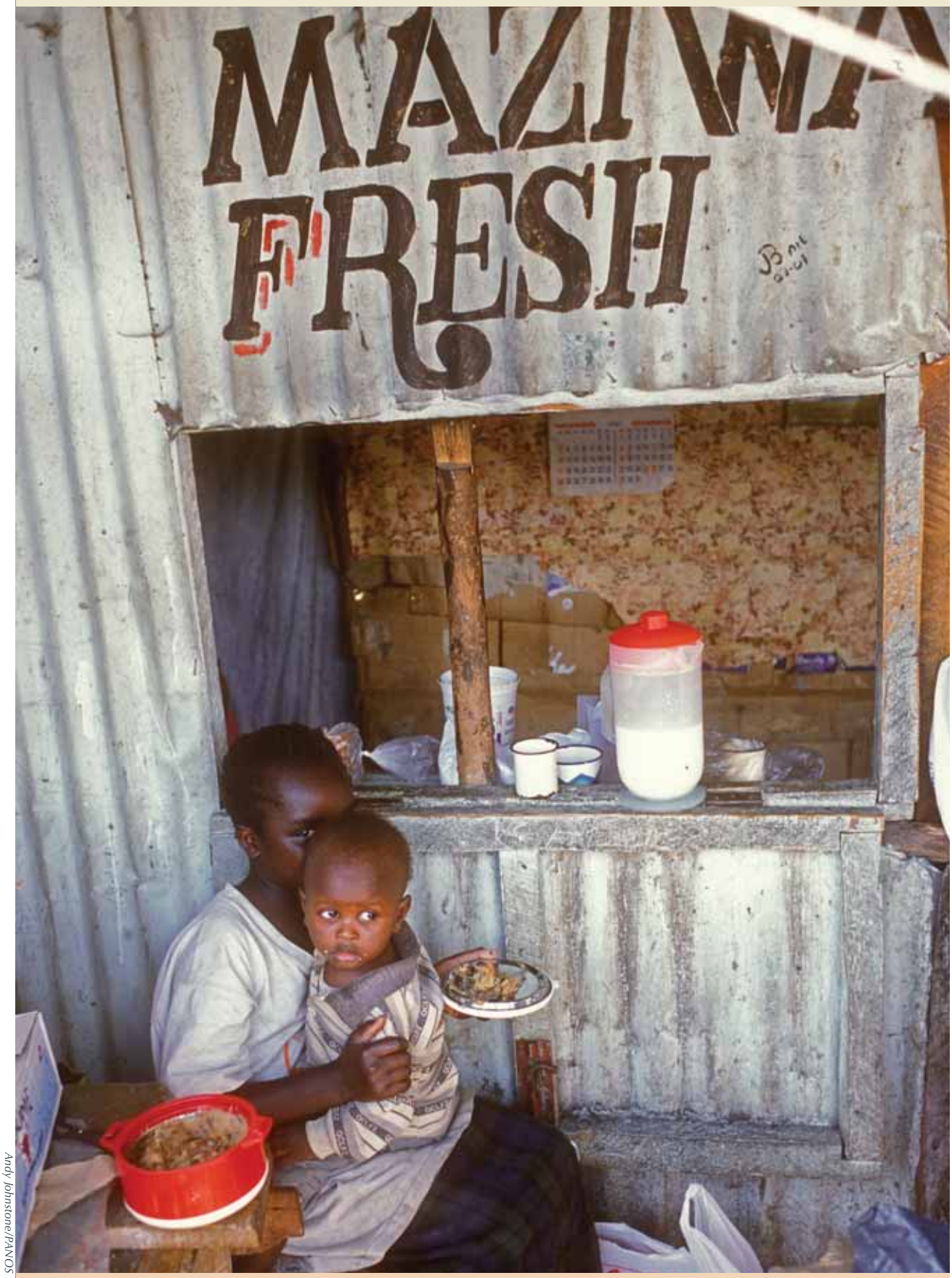
The animal health standards within the SPS agreement are determined by OIE, whose delegates include the chief veterinary officers of developing as well as developed countries. Food safety standards are determined by the Codex Alimentarius, which is jointly managed by the FAO and the World Health Organisation (WHO). The OIE until recently has emphasized national or regional eradication of a list of serious transboundary animal diseases, or disease-free zones or production compartments (such as a poultry unit). All this requires high-quality and highly expensive disease surveillance and veterinary services. In May 2008, ILRI scientist Jeff Mariner presented at the 76th General Session of the OIE, in Paris, a technical brief on 'The role of small farmers in animal health'. This OIE-commissioned survey of all member-country veterinary services led to the drafting of a resolution by a working group, subsequently passed by the general session. The resolution recommends, among other things, that 'the OIE review international standards, definitions and guidelines to identify opportunities to encourage small farmer participation, under the supervision of veterinary services, and enhance equity and efficiency in animal health and trade'.

Other ILRI research is looking into what is known as 'commodity-based' livestock trade. Selling processed livestock products is far less risky than selling live animals. Low-value cooked canned meat presents few food safety risks as long as basic hygiene requirements have been met. Higher quality cuts of meat have replaced the ubiquitous tins of corned beef that were the staple of the meat trade 50 years ago. Such commodities can be completely safe for consumption, even if coming from areas where endemic diseases are still prevalent, as long as certain processing procedures are followed. Those at the UK Department for International Development (DFID) and elsewhere proposing a commodity-based approach to trade argue that safe trade does not require (expensive) disease eradication but rather sanitary guarantees and risk mitigation strategies. Such an approach would improve developing-country access to international markets while also usefully encouraging commodity processing in those countries and therefore local capture of value-added benefits, all while reducing the risk of transmitting disease pathogens. For more on the subject of commodity-based trade, see DFID's Research4Development website (http://www.researchfordevelopmet.info/caseStudies.asp?ArticleID50278) and *Livestock disease, trade and markets: Policy choices for the livestock sector in Africa,* by Ian Scoones and William Wolmer, Institute for Development Studies, 2006.

Partners Southeast Asia Foot and Mouth Disease Campaign Program (SEAFMD)
FAO's Pro-Poor Livestock Policy Initiative (PPLPI) regional office in Bangkok
African Union Inter-African Bureau of Animal Resources (AU-IBAR)
Central American Beef Project
Directorate of Animal Health in South Africa
Namibian Meat Board

Funder Pro-Poor Livestock Policy Initiative of the United Nations Food and Agriculture Organization (PPLPI of FAO)
World Animal Health Organisation (OIE)
Association of Southeast Asian Nations (ASEAN)
Common Fund for Commodities (CFC)

Chapter 1
East Africa



Andy Johnstone/PANOS

Impacts of Kenya's Smallholder Dairy Project

A decade of collaborative dairy research is transforming Kenya's informal milk markets, generating food, incomes and jobs for millions

A collaborative dairy research project conducted in East Africa from 1997 through 2004 is bearing fruit. Its research findings persuaded Kenyan regulators and policymakers to engage and support, rather than disregard and harass, Kenya's predominantly informal milk market, which trades in 'raw', or unpasteurized, milk.

Economists assess the direct impacts of the research-based policy changes on the Kenyan economy to be at least US$33.5 million per year. The new training and certification schemes recommended by the research project are now helping the country's small milk producers and traders to provide safe as well as cheap milk products to millions of Kenyans poorest citizens. The methods this project used to upgrade informal dairy chains are now being taken up in other major milk-producing countries of East Africa and South Asia.

This award-winning collaborative Smallholder Dairy Project (SDP) was funded by the UK Department for International Development with support from the CGIAR. It was implemented by the Kenya Agricultural Research Institute and the Kenya Ministry of Livestock and Fisheries Development. Other key partners included the Kenya Bureau of Standards and Ministry of Health, along with livestock farmers, small-scale milk vendors, and milk processors and packagers from the private sector; the international development organization Land O' Lakes; and the non-governmental organizations Action Aid, the Institute of Policy Analysis, and Strengthening Informal Sector Training and Enterprise.

IMPACTS OF PRO-POLICY DAIRY POLICY CHANGES IN KENYA

Beginning in 2004, policy reforms in Kenya's dairy sector have enabled many of Kenya's nearly 40,000 small-scale milk vendors to enter formal milk markets. An independent panel of experts in 2008 estimated that these reforms are annually delivering to the Kenyan economy direct benefits of $33.5 million as well as a further $130 million a year in indirect benefits,

such as the new jobs generated by the newly enabled smallholder dairy sector and the better nutrition achieved in millions of poor households through greater consumption of highly nourishing, but cheap, milk products. These returns were produced from a total investment of just $4.8 million ($0.6 million over each of the eight years of the research project).

Kenya's new dairy policies recognize and regulate the activities of informal milk vendors, allowing them to operate more efficiently, at larger scale and with greatly reduced transaction costs. The impact assessment report determined that by 2006, Kenya had 1.8 million smallholder dairy farms, 39,650 milk hawkers and 6.7 million dairy cattle and the country was producing 4 billion litres of milk each year. Nearly half the benefits of the policy changes went to producers, with the remainder going to consumers ($8 million), small-scale milk vendors ($4.1 million) and input suppliers ($5.1 million).

SPILLOVER EFFECTS

Such pro-poor changes in the dairy sector are now being taken up by other countries. The Association for Strengthening Agricultural Research in Eastern and Central Africa has initiated a program on Dairy Policy Harmonisation in East Africa that recommends that regulators throughout the region implement similar policy changes. In July 2007, dairy regulators in Kenya, Rwanda, Tanzania and Uganda agreed to promote the training and certification schemes for milk hawkers that the collaborative research project had advocated. Hundreds of thousands of other small dairy farmers across East Africa could thus benefit from these reforms. And beginning in 2007, the governments of India's northeastern states began demonstrating strong interest to adopt similar pro-poor dairy policies.

You may download ILRI's 2008 *Report for the Standing Panel on Impact Assessment of the Science Council of the Consultative Group on International Agricultural Research: Policy change in dairy marketing in Kenya: Economic impact and pathways to influence from research,* which is summarized below.

Summary of the Impact Assessment of the Smallholder Dairy Project in Kenya

Between 1997 and 2005, ILRI and its partners initiated and implemented a Smallholder Dairy Project (SDP) as a collaborative and integrated research and development initiative aimed at supporting the sustainable development of Kenya's smallholder dairy sub-sector. The initial phase of SDP focused on the development of 'best-bet' technologies to overcome farmers' problems and to improve their livelihoods. The final phase developed policy-level outputs and actively engaged Kenyan government and policymakers, leading to change in the Kenyan Dairy Policy by September 2004. The new policy recognizes and regulates the activities of Kenya's many small-scale milk vendors.

Among the research results SDP used as evidence to support policy change are the following data (recalculated by SDP in 2005).

- 1.8 million smallholder households in Kenya depend on dairy livelihoods.
- Some 86% of the milk marketed in Kenya is sold through the informal sector as raw, unpasteurized, milk.
- The informal market pays significantly higher prices to farmers than dairy companies and sells milk to consumers at half the price of processed milk.

- Kenya has about 40,000 people earning their living as milk hawkers.
- Kenya has a dairy herd of about 6.7 million, with total annual milk production reaching 4 billion litres.
- Kenyans drink on average 145 litres of milk each year.
- Kenyans typically boil milk before drinking it, usually in the form of tea, a national habit that significantly reduces public health concerns over the sale of raw milk.
- The milk quality of Kenya's licensed milk traders and outlets differs insignificantly from that of its unlicensed traders.
- Kenya's informal dairy sector generates over 70% of the 40,000 jobs in the country's dairy marketing and processing sectors.
- Kenya's smallholder dairy farming also supports over 350,000 full-time wage positions in the wider economy.
- It is safe to licence the operations of Kenya's small-scale milk vendors after they have been trained in milk handling and hygiene.

In 2007/8 ILRI assessed the impacts of Kenya's research-based dairy policy change on the country's economy and determined the following.

- The overall decline in market margin attributed to the policy change is about US$0.01 per litre of milk (equivalent to a 9% decline in market margin after the policy came into effect).
- While the cost of the research that led to the change in Kenya's dairy policy was about $0.6 million per year between 1997 and 2005, the benefits the dairy policy change is providing the Kenyan economy amount to at least $33.5 million each year, with nearly half of that going to producers and the remainder to consumers ($8 million), small-scale milk vendors ($4.1 million) and input suppliers ($5.1 million). Less conservative estimates put annual benefits to Kenya as high as $131 million.

Overall, these research findings showing the high dependence of farmers and consumers on informal milk marketing and the jobs it creates proved crucial in influencing behavioural and policy change in the Kenyan dairy sector. The findings on employment generation, for example, attracted the interest of government agencies and people involved in designing Kenya's poverty reduction strategy paper, some of whom, as a result, later became strong advocates for legalization of the country's small-scale milk vendors.

THE PROBLEM

Although most milk produced in Kenya is bought and sold informally, government policies since colonial times had inadequately addressed the concerns of the farmers, traders and consumers who make up the country's informal market channels. Informal milk markets dominate Kenya's dairy sector for three main reasons: (1) farmers get higher prices for their milk in informal markets than they do in formal markets, (2) the raw milk they sell reaches and satisfies the traditional tastes of poor consumers and (3) consumers pay less for the raw milk than they pay for commercial packages of pasteurized milk.

Before 2004, Kenya's small-scale dairy producers and traders were regularly harassed by officials. Small-scale milk vendors found themselves in a 'catch-22' situation: they could not trade in milk unless licensed and the existing regulations made no provisions for licensing or engaging them. The country's

main regulatory body, the Kenya Dairy Board, believed itself mandated to stamp out small-scale marketing channels as unsafe. The existing regulations in effect recognized only a Western industrial model of processing and packaging milk, allowing small-scale milk producers to act only as suppliers of milk.

THE SMALLHOLDER DAIRY PROJECT

DFID provided the SDP with $2.5 million over its eight years of operation, from 1997 to 2005; the project's research and development partners contributed an additional $2.5 million in staff time, staff resources and other in-kind contributions over the life of the project. The Ministry of Livestock and Fisheries Development appointed a project manager for SDP, ILRI provided a technical research team, and the community service organizations were active in the latter advocacy phase of the project. A steering committee was established with members from ILRI, the Kenya Agricultural Research Institute, the Kenya Dairy Board, Kenya's Bureau of Standards, the Kenya ministries of Health and Livestock and Fisheries, and representatives of some informal markets.

ASSESSING THE PROJECT'S IMPACT

Beginning in 2007, an ex post evaluation of the impacts of SDP was commissioned by the Standing Panel on Impact Assessment, an arm of the Science Council of the CGIAR. The study area included the town of Nakuru, in central Kenya, and Nairobi and Kiambu and Thika, towns on the outskirts of the capital.

The 'high milk density' area of Nairobi is dominated by small-scale milk producers and a large collection of trader groups, some of whom, particularly transporters and mobile traders, travel from as far as 100 km away. The Thika area supplies parts of Nairobi and Machakos and is dominated by milk bars and small-scale mobile traders. These traders supply a competitive, urban and relatively sophisticated market. Milk is collected in the morning before 0600 hours and transported by public vehicles, arriving at the market by 0900 hours. Some of the traders act as middlemen, selling their milk to other traders who then transport their consignment to the market. Women make up a large proportion of small-scale milk traders serving the Nairobi market.

Nakuru town, on the other hand, situated two hours drive northwest of Nairobi in one of Kenya's most agriculturally productive regions, is surrounded by large-scale farmers who deliver their milk directly to processors. Small-scale milk traders are left to collect milk from as far as 40 km away from the town. The area is dominated by small-scale milk bars and mobile milk traders, most of them men, who transport milk by bicycle.

HOW THE PROJECT'S INFORMATION WAS USED

In workshops, seminars, conferences and meetings with policymakers, SDP advocacy partners used the project's research evidence of the import of small-scale dairying for Kenyan livelihoods, the domination of Kenya's milk sector

by informal markets, and the significant number of jobs the informal milk sector create jobs to reform policy, which began to change in September 2004, when subsidiary legislation was published that allowed small-scale milk vendors to be trained and licensed.

RESULTS OF ASSESSING THE PROJECT'S IMPACT

Although the Kenyan dairy policy and bill have been in a parliamentary process for more than a decade, written ministerial subsidiary regulation plus reorganization by the Kenya Dairy Board has provided ample regulatory authority for engaging small-scale milk vendors, which helped shift dairy regulation beginning in 2004. The study found that significant behavioural change occurring among regulators and small-scale milk vendors led to significant economic benefits across Kenya.

Results show that, overall, milk marketing margins in Nairobi declined by 9%—equivalent to 0.54 Kenya shillings per litre (Kshs65 = US$1.00)—when the revised policy came into effect, reflecting reduced costs in the supply chain, and a significant number of small-scale milk vendors are now operating under licence.

Welfare benefits arising from the policy change were high and captured by consumers as well as producers. A cost-benefit analysis revealed that the policy change was highly profitable, with a high positive net present value and all costs being quickly recouped. The very high internal rate of return value suggests that many actors in the dairy sector will continue to gain positive net benefits for years to come.

For small-scale milk vendors operating in local markets, milk trade channels had been severely limited by non-tariff trade barriers and high transaction costs. SDP research and development activities lowered market entry barriers through training and licensing. The effect of the new policy was to lower transaction costs and reduce overall costs of marketing services, particularly to poor dairy producers and consumers.

Before the new policy, untrained and unlicensed vendors were regularly arrested and made to appear in court; today, these vendors get advice on how to obtain training and a license. And legalization of activities of small-scale milk vendors has made political rents and other illegal payments less likely.

ADDRESSING PUBLIC HEALTH CONCERNS FOR SAFE MILK

Kenyan consumers tend to boil milk before they drink it—whether they purchase it raw or pasteurized—thereby significantly reducing public health concerns. SDP research found that the quality of processed milk from large-scale processors differed little from milk from unlicensed traders; both, in fact, were failing to meet quality standards set by the Kenya Bureau of Standards. Training the small-scale traders in testing and handling of milk and use of appropriate containers led to improved milk quality.

THE ROLE OF ADVOCACY

Analyses conducted during the initial research phase of SDP (1997–2000) provided a comprehensive overview of the Kenyan dairy sector at that time and raised the profile of SDP as an informed contributor to on-going discussions to influence changes in the Kenyan dairy policy. One of SDP's major findings was just how important the informal milk sector was to milk producers, traders and consumers alike.

In the final phase of SDP (2000–2005), project members engaged policy-makers directly and produced policy friendly outputs. A 'snapshot review' in 2000 recommended that SDP develop a strategy for the reform of dairy policy using evidence-based research findings. The Kenyan dairy policy, because it prohibited milk sales through the informal sector into urban areas, was actively discouraging the predominant section of the market, which hurt all those whose livelihoods depended on the informal sector. To tackle some of the identified informal market issues, SDP piloted the training of small-scale milk vendors in basic milk testing, hygiene and handling.

Part of SDP's policy-influencing strategy was to foster links with civil society organizations and to have them advocate support of small-scale traders and farmers. Together with the KDB, these civil society organizations partnered ILRI in organizing a high-level dairy policy forum held in Nairobi in May 2004 to present the project's research results and their policy implications.

The advocacy phase of the SDP had become very active by 2003. Paid advertisements placed in local newspapers touting the benefits of legalization based on the SDP research were met with rebuttals in the same media by large-scale processors, culminating, by late 2003, in what became known as the 'milk wars'. At the 2004 dairy policy forum, where SDP and partners officially launched a series of dairy policy briefs and screened a video entitled 'Unheard voices from Kenya's dairy industry', stakeholders, including ministers, members of parliament and other government officials, agreed in principle to support a policy of engaging Kenya's small-scale milk vendors.

While the bill and policy change processes continued in parliament, ministerial authority allowed the Minster for Livestock and Fisheries Development, on the advice of the Kenya Dairy Board, to issue a set of dairy industry regulations (Legal Notices 101, 102 and 103) in September 2004. While they were all updated versions of sub-sections of the revised 1958 Act, the most pertinent one was Legal Notice 102, also known as the Dairy Industry (Sales by Producers) Regulations, 2004. These regulations streamlined the license application processes and, more importantly, clearly enumerated the types of licenses that were now available in the dairy sector (e.g. primary producer, processor, mini dairy, cottage industry, milk bar and cooling plant), some of which clearly focused on activities compatible with small-scale informal operations. Kenya Dairy Board officials used the impetus provided by the issuance of these regulations to engage and institute training, certification and licensing requirements for small-scale milk vendors.

Since the policy change, the Kenya Dairy Board has worked to train and certify these vendors while licensing their milk outlets and premises that meet requirements in milk handling, hygiene and quality control. In addition, the Board has trained and employed business development service providers to train and certify vendors whose businesses would then be licensed by the Board. While progress is being made on these fronts, more service providers are needed to train, certify and license all the vendors requesting this. The Kenya Dairy Board is also working with non-governmental organizations such as SITE Enterprise Promotion to encourage milk consumption on the premise that quality is being greatly improved by training and licensing. The Board has also started branding milk outlets and premises to improve consumer confidence and promote recognition by regulatory authorities. Anecdotal evidence suggests that milk sales are increasing in these branded outlets and premises.

CONCLUSIONS AND LESSONS LEARNED

The research and coordination efforts of SDP continue to contribute to the policy implementation phase, producing policy briefs, training manuals and sessions on milk handling and quality control. Lessons learned about what helped the SDP succeed in getting its empirical evidence to inform dairy policy changes are highlighted in a 2006 study by Leksmono et al. These lessons include: (1) good collaboration among the partner institutions; (2) rigorous research and production of a set of pertinent technical research results by the time of the advocacy phase; (3) conceiving the project from the beginning as a 'research and development' (rather than a 'research' or a 'development') project and (4) empowering farmers and small-scale milk vendors to speak out on issues affecting the sector at the May 2004 policy forum and elsewhere.

Kenya's dairy sector today is moving ahead with the training and licensing of small-scale milk vendors so that they become fully engaged in the formal sector. Although reform of Kenya's dairy policy is still in parliamentary process, much progress toward that reform has already been made and Kenya now leads a noteworthy regional effort to harmonize dairy policies and liberalize trade in dairy products among countries in East Africa.

Partners

Kenya Agricultural Research Institute
Kenya Ministry of Livestock and Fisheries Development
Kenya Ministry of Health
Kenya Bureau of Standards and Ministry of Health
Land O' Lakes
Action Aid
Institute of Policy Analysis
Strengthening Informal Sector Training and Enterprise

Funder

UK Department for International Development (DFID)

Sven Torfinn/PANOS

East Africa Dairy Development Project

In January 2008, Bill Gates, co-chair of the Bill & Melinda Gates Foundation, announced at the World Economic Forum in Davos a four-year grant of US$42.8 million to Heifer International for an East Africa Dairy Development project. The goal of the project is to help one million people—179,000 families living on small 1-5-acre farms—lift themselves out of poverty through more profitable production and marketing of milk. The project will develop 30 strategically located milk-collection points as the means for small farmers to join the growing dairy industry in East Africa. The project targets women and includes training for 10,000 farmers to become growers of nutritious animal fodder to sell to dairy farmers as supplementary livestock feed.

The project is working in districts in Kenya, Rwanda and Uganda with the goal of doubling the incomes of the participating families by enabling them to increase their milk production and to gain access to markets to sell their surplus. By connecting small farmers—most of whom are women—to more formal markets where they can sell their milk, this project has the potential to dramatically increase incomes and improve lives. In addition, the 'dairy value chain' approach the project is taking aims at expanding opportunities for farmers, traders, transporters, processors and consumers alike.

ILRI is a partner in this project. ILRI is helping to identify suitable hub sites and is responsible for the research aspects of the project and its monitoring and evaluation. ILRI is interested in gleaning lessons learnt across the many sites of this project, identifying, for example, the feeding options and breeding services most appropriate for which circumstances. ILRI is doing the baseline research needed to ensure that the impacts of the project can be monitored and lessons learned. ILRI staff will interview both participating and non-participating partners.

Other partners in this project are ILRI's sister CGIAR centre, the Nairobi-based World Agroforestry Centre, which is providing expertise on fodder tree species; TechnoServe, a U.S.-based nonprofit that fights poverty by encouraging business development, which is providing expertise in marketing and chilling plant operations; and the American Breeders Service, which is overseeing artificial insemination work of the project.

THE PROBLEM AND OPTIONS TO SOLVE IT

Although demand for dairy products in developing countries is projected to double by 2020, East African dairy farmers who would like to tap into this growth face several constraints. First, because they don't have access to the latest agricultural methods, their cows don't generate as much milk as they could. Second, to prevent their milk from spoiling, they must sell it within a few hours.

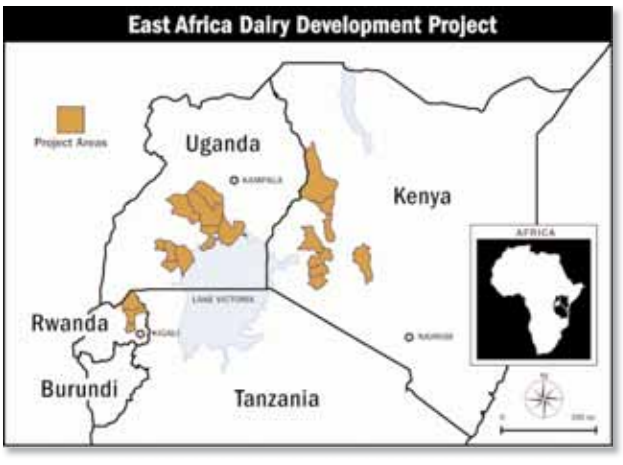
Cross-bred cows can produce up to 17 times more milk than local breeds, and with better fodder and other interventions, even the local breeds can produce almost twice the amounts of milk they are currently producing. In addition, if farmers have access to chilling plants where their milk can be preserved, they can sell more of their product in the growing formal market. These chilling plants can also be designed to become hubs of business activity where farmers can get training and services for their cows, including artificial insemination and veterinary health care.

The project is also focusing on improving milk quality through better animal nutrition and health care. And it will provide extensive training in the animal agriculture and business practices needed for farmers to be successful in the business of producing and storing raw milk.

MILK CHILLING PLANTS SERVING AS 'INNOVATION HUBS'

The project will develop 30 milk collection hubs, including chilling plants (with their own backup power generators) for bulking and holding milk for pickup by refrigerated commercial dairy delivery trucks. Project staff will work with farmer groups to form farmer business associations that will own and manage the plants and develop hubs of dairy business services.

Farmer groups will be organized into associations of at least 2,000 farmers from the local areas around each chilling plant. The participants will be trained in managing the chilling plants and other hub-related businesses as well as in dairy farming. The chilling plants are expected to become hubs of activities linking input (feeds, semen) and output (liquid milk) markets, places where farmers not only deliver their fresh milk but also conduct other farm-related businesses. Envisioned as 'innovation platforms', these hubs are being designed to provide a nexus of knowledge inputs and information providers for farmers to access—a place where feed salesmen, micro-credit lenders and milk buyers all come together.



Animal breeding can help small farmers exploit the growing milk markets
Dairy productivity per cow will be increased through use of artificial insemination services that upgrade the dairy herds in terms of milk yields. ILRI director general Carlos Seré says the project must be careful to conserve

valuable local breeds, which are better able to survive harsh conditions than are high-producing cattle imported from industrialized nations. 'In Kenya, for example, the familiar black-and-white Holstein dairy cow is a status symbol among smallholders, who want to own this high-milk-producing exotic animal. Smart and sustainable breeding strategies that conserve local breeds can bring about higher smallholder milk production without sacrificing hardiness.' He noted that new science-based breeding technologies and policies will help raise smallholder dairy yields in sustainable ways, pulling millions out of poverty while conserving valuable local cattle breeds.

ILRI economist Steve Staal says these 'smart' breeding strategies for the region need to be two-pronged. 'The agriculturally high-potential highlands of Kenya, for example, are already "densely dairied". One out of four households here already owns at least one cross-bred dairy cow. But dairy cattle in East Africa are currently low milk producers, averaging about 7 litres per day. We expect dairy expansion thus to happen on two fronts. We need higher-producing cross-breeds for the high-potential areas as well as hardier cross-breeds for less-favourable agricultural areas, particularly the region's vast drylands where water, feed and veterinary services are scarce.'

For ten years scientists at ILRI's Nairobi-headquarters worked with the Kenya Agricultural Research Institute, the Kenyan Ministry of Livestock and Fisheries Development, and civil society groups in a Smallholder Dairy Project that is helping transform the country's 39,000 informal 'raw' milk sellers into legitimate milk marketers. This has led to gains for Kenyan dairy producers and consumers—through improved market efficiency—of an estimated $33.5 million per year. This research also helped to deliver improved livestock technologies, including breeding strategies designed for poor farmers.

Farmers participating in the new East African Dairy Development project who receive breeding services will be asked to follow Heifer's signature practice of 'Passing on the Gift' by paying for insemination services for other farmers' cows, spreading the benefits throughout the project regions.

WOMEN TARGETED TO SHARE IN BENEFITS, LEADERSHIP

Because women perform most dairy-related work and many female-headed households are involved in smallholder dairy production, reaching and interacting with women is critical to impact. This project targets women. It is working to ensure that women share in the direct benefits of the project and that the burden of work required to care for the livestock and to collect the milk is distributed equitably among men, women and youth. Both women and younger people will be brought into dairy production and business activities and promoted as leaders within dairy farmer associations.

By expanding dairy markets and increasing market access for small farmers, the project should help improve both modern and traditional markets and market suppliers, increase profit participation by smallholders in the dairy value chain, increase milk quality and demand, and maintain price levels as

production volumes increase, all the while building the business skills and confidence of the farmers to undertake additional income-generating activities.

This project should, in this way, establish a competitive environment that positions East Africa as a major player in the global dairy industry.

EAST AFRICAN DAIRY DEVELOPMENT PROJECT INCEPTION WORKSHOP

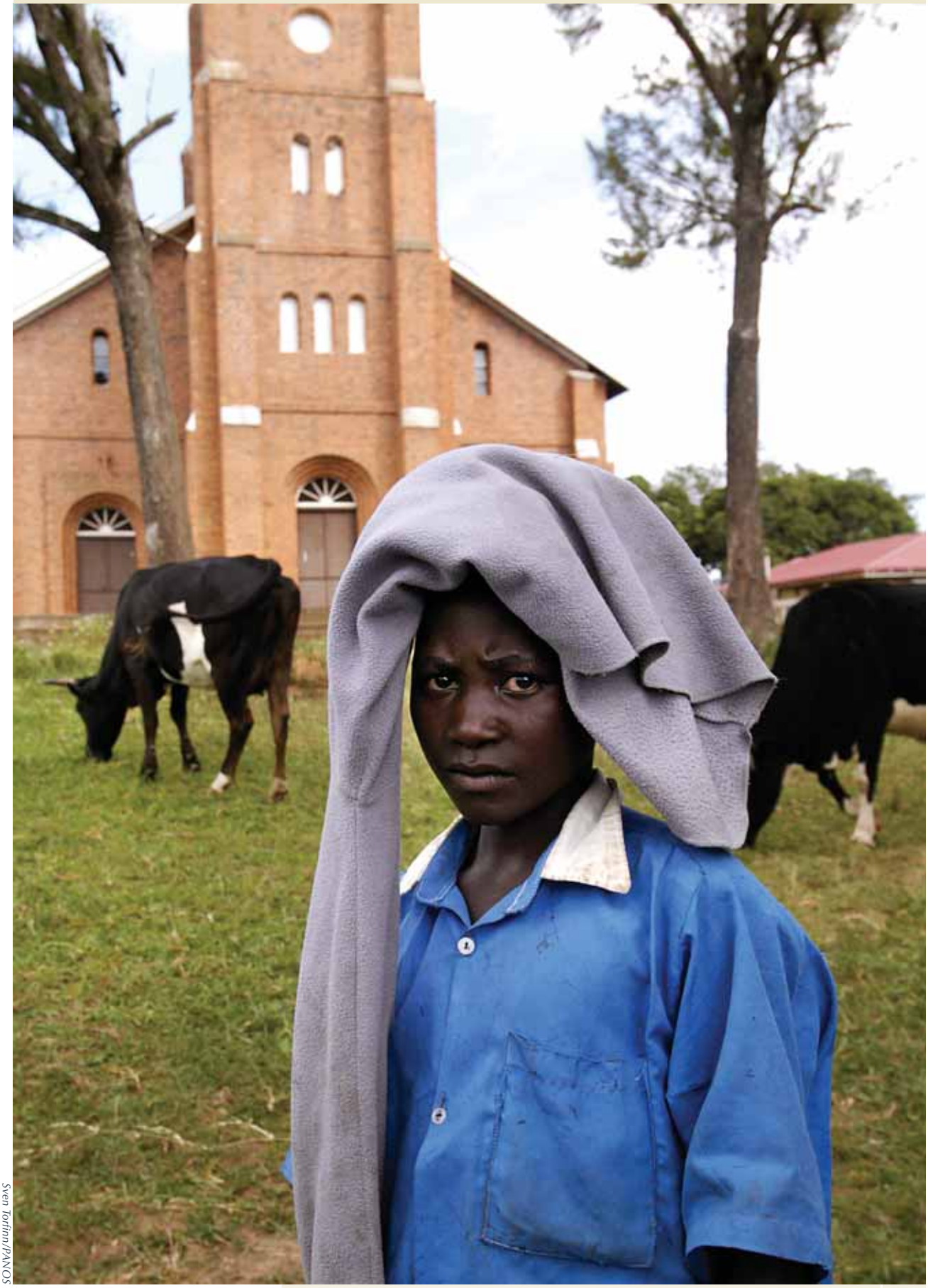
The inception workshop for this project was held in Nairobi 28 April–2 May 2008. Fifty project participants based in seven countries worked closely together for a week on joint strategies and approaches for achieving the project vision of transforming the lives of 1 million people by doubling household dairy income over the next 10 years through integrated interventions in dairy production, market access and knowledge application. A key strategy fleshed out at this workshop was that of building the business skills of female as well as male farmers within local 'business hubs' where farmers' milk is bulked and cooled and farmers can access credit, knowledge and inputs through farmer-owned enterprises.

Partners

Heifer International
World Agroforestry Centre
TechnoServe
American Breeders Service

Funder

Bill & Melinda Gates Foundation



Sven Torfinn/PANOS

Index-based livestock insurance

An exciting option for pastoralists in northern Kenya

Index-based insurance products are an exciting option for helping the world's most vulnerable households manage the climate-related risks to which they are regularly exposed. Such insurance markets are starting to be provided to poor agricultural communities in developing economies. One of the most promising forms of index-based risk financing is weather insurance, which can be used to help farmers, pastoralists and others protect themselves from weather-related risks.

While traditional insurance has been used to insure against crop failure, index-based insurance insures for a specific event or risk, such as rainfall deficits. This reduces costs since there is no need for an in-field assessment of damage; rather, payouts are triggered by weather data directly. Such products are easy to understand and thus to design, develop and trade.

Index-based insurance schemes obviate two problems associated with traditional crop insurance: what is known as 'moral hazard', where, for example, insured farmers have an incentive to neglect a crop to get an insurance payout, and 'adverse selection', where more (or less) risk-prone individuals self-select into (or out of) the contract.

Kenya is among the countries in sub-Saharan Africa best suited for index insurance. The agro-meteorological climate is moderate; the availability and quality of weather data—including historical data essential to the construction of an index—is high; there exists a large and dynamic set of insurers and delivery channels such as banks and micro-finance institutions available to distribute the product; and the market is sufficiently large to attract the interest of reinsurers. Preliminary work has already been undertaken in Kenya on the development of a contract to partially insure loans for maize farmers against weather risk in the environs of Eldoret, Kitale and Nakuru towns.

Over the past year, ILRI and partner organizations have pursued a substantial research program to design, develop and implement market-mediated index-based insurance products to protect livestock keepers, particularly in Kenya's drought-prone arid and semi-arid lands, from the devastating losses of livestock they regularly incur. In these regions, drought is the most pervasive hazard, natural or human made. For most households in these regions that rely solely or largely on livestock (because these arid lands don't support other kinds of agriculture), the high losses of stock in times of drought render pastoralists among the most vulnerable of Kenya's communities. And as the consequences of climate change continue to unfold in this region, strengthening links between drought, vulnerability and poverty, the case for providing new kinds of insurance gets stronger.

The partners chose Kenya's northern remote Marsabit District for their pilot study. Running the preliminary models built gives encouraging results, which show strong correlations between a function of the climate/forage variables and livestock deaths, with a high degree of accuracy using only readily available and continuous satellite-based data. Importantly, the actuarially fair premiums that such contracts generate are reasonable—ranging from 2–5% of the insured value.

One of the challenges of this project is to introduce the idea of index-insurance to clients generally unfamiliar with the concept of traditional Western-style insurance schemes and to ensure that they understand the value and limitations of the insurance contract. The project partners thus introduced the idea to Marsabit communities by way of a game structured on pastoral production systems common in these communities. The game illustrates how index insurance works and how it could benefit the players. Participants came away from the game (which takes a whole day to play and requires two facilitators per game) with relatively clear understanding of key aspects of an index insurance product: they would have to pay for the insurance before the season began and for each season of expected coverage, the insurance

Giacomo Pirozzi/PANOS

would not cover non-drought-related livestock losses, indemnity payments were triggered as a result of covariate climate response, and if climate response did not trigger payments, the premium was not returned.

As both an extension and a marketing tool, the game was hard to beat. Community members enjoyed as well as understood the game and were eager to have the product introduced.

ILRI and its project partners conducted a workshop in March 2008 for both technical and private-sector representatives to plan the next two years of work. Potential opportunities were assessed from a technical standpoint and matched against the market demand that exists among farmers, banks, micro-finance institutions, insurers, technical service providers and other agencies. Participants identified opportunities for piloting index insurance products and discussed the interest that exists among the institutions positioned to implement them. All parties were acquainted with the technical resources that exist to support the development of such products.

Partners *Columbia University International Research Institute for Climate and Society*
Cornell University
Equity Bank and Financial Sector Deepening Trust
Kenya Livestock Marketing Commission
Kenya Meteorological Department
Pastoralist Development Network of Kenya
UK Department for International Development Hunger Safety Net Program
University of Wisconsin
World Bank Commodity Risk Management Program

Funder *Rockefeller Foundation*

Combating elephant grass diseases crippling East Africa's dairy farmers

The dairy sub-sector in Kenya is dominated by smallholder farmers, who are estimated to produce an astonishing 80% of all the milk marketed in the country. These are family farms keeping 1 to 2 milking animals on a small piece (about 1 hectare) of land. Dairy production is especially important to women because milk and other dairy products make up one of their primary sources of both personal income and nutrition for their children. An ILRI survey conducted in 2002 in Central Kenya, where 73% of agricultural households had dairy cattle, found that in most districts dairy households ranked dairy as the most important source of income (75% in Nairobi district). Even where annual income from crops and other enterprises is greater, farmers value the even distribution of income offered by dairying, the capital asset represented by the animal and the manure produced, the latter of critical importance in smallholder production of vegetables, maize and other crops.

The principal source of livestock feed on about half a million of Kenya's smallholder dairy farms is Napier grass *(Pennisetum purpureum)*, commonly known as elephant grass. Napier is highly nutritious, grows well, even in poor soils, and produces seven times more herbage biomass than traditional grasses. This among other factors makes it a favourite of dairy farmers. In some parts of the region, Napier takes up as much acreage as that planted with maize, Kenya's staple food crop. Napier is generally higher yielding than other cut fodders and is also easier to propagate and manage.

In East Africa, Napier is threatened by two diseases: smut and stunt.

Head smut attacks elephant grass in Kenya

Although Napier grass is high yielding and can withstand frequent and repeated harvesting, a fungal disease called Napier head smut is now threatening the livelihoods of smallholder dairy farmers. When the disease attacks the plant, biomass yield is drastically reduced, resulting in less feed for cattle. In a production system where feed shortage is a major constraint to production, and with no alternative crops with such high biomass potential, this is devastating the dairy industry and the livelihoods of the resource-poor households which depend on it.

A Napier grass accession with resistance to Napier grass head smut was developed by the Kenya Agricultural Research Institute (KARI) and partners. The Napier grass accession has been evaluated in participatory on-farm trials in Kenya's Kiambu and Thika districts. Although the new accession does not perform as well as other local varieties unless it is well manured, it considerably out-performs diseased material.

What farmers lack is a system for obtaining planting material of the smut-resistant cultivar. An intervention proposed by ILRI would scale up the dissemination of the already existing resistant varieties and any 'new' resistant accessions that emerge from the current research work. What's needed are field bulking sites that provide planting materials to farmers in collaboration with community-based and non-governmental organizations, public extension agents and private distribution channels such as agrovets.

Elephant stunt attacks Napier in Uganda

Elephant stunt, a new disease of Napier, has been confirmed in over 90% of Napier grass fields in Uganda, most of whose zero-grazing dairy farmers rely on Napier grass for animal feed. The disease is spread by phyto-plasma bacteria transmitted by leaf hoppers. This disease retards the growth of the plant and curls the leaves, progressively turning them yellow and drying them out. The disease cuts herbage biomass by more than half, creating a feeding gap that is not only hurting dairy farmers but also compromising the quality and quantity of milk and meat products.

The first sighting of this infection was in Uganda's Masaka District. Many fields since then have been wiped out. As most Ugandan dairy farmers have tiny plots of land on which they have room only to practice 'zero-grazing', in which they daily hand cut and carry feed to cows kept in stalls, the country's smallholder dairying could decline drastically.

Farmers have been reduced to harvesting much larger portions of their Napier fields to get enough grass daily to feed their milk cows. The quality of the herbage is poor and where, as common, farmers fail to get supplementary feeds, milk yields have been reduced by almost half.

This feed shortage has led to the price of a bundle of Napier more than doubling in districts badly affected by stunt. Unless controlled, both smut and stunt will continue to undermine efforts to develop East Africa's smallholder dairy industry, putting economic as well as food security at risk in the region.

Research to combat smut and stunt

Scientists from several institutions have been working together to halt the spread of these diseases of elephant grass. They are raising awareness of the diseases, providing information on how best to control them and determining clones of Napier that are genetically resistant to the diseases.

Because the main source of infection of both diseases is believed to be through distribution of infected planting material, the project is working to ensure that only clean planting material is multiplied. It is also training farmers of the need to inspect their Napier crop regularly to remove diseased plants and to keep the crop healthy by regular weeding and manuring.

A longer term disease-control strategy is to identify Napier clones able to resist the diseases. The researchers have identified two such clones resistant to smut: Kakamega 1 and 2. But because these are less productive than the local varieties, scientists continue to look for high-yielding disease-resistant clones.

Knowledge sharing is key to the success of this project, whose partners are working to ensure that most farmers in the region become knowledgeable about the diseases, share with each other the best ways to keep their Napier plots disease free, and know when disease-resistant clones have been identified and how to get hold of them.

Partners *International Centre for Insect Physiology and Ecology (ICIPE)*
Kenya Agricultural Research Institute (KARI)
Rothamsted Research (UK)
Tanzania's National Biological Control Program
Uganda's National Livestock Resource Research Institute

Funder *Association for Strengthening Agricultural Research in Eastern & Central Africa (ASARECA)*

Diversifying pastoral livelihoods

Debates about the future of pastoralism are re-emerging in the Greater Horn of Africa. Are there too many people and too few livestock? Should pastoralists pursue alternative market-based livelihoods. Can better policies help maintain pastoral systems?

Ian Scoones, at the Institute of Development Studies, University of Sussex, argues in an article in *id21 insights,* 'Is pastoralism a viable livelihood option?', that pressure on pastoral livelihoods in the Greater Horn of Africa has been increasing. Challenges include weather-related crises (such as drought or floods), conflict, livestock disease, disrupted access to markets and the loss of grazing land to agriculture. These problems leave many communities dependent on food aid and other relief.

Some researchers argue that pastoralists need a certain number of animals per person to meet income and nutritional needs. As the human population in the region is growing at 2.5% each year, more animals are needed. However, herd sizes are limited by the amount of forage available and the loss of grazing land to other uses.

This argument concludes that there is an urgent need to reduce the number of people dependent on pastoralism, with an 'exit' from pastoralism a good option for some and diversified income-generating activities needed by many to make at least some part of their livelihoods independent of rainfall.

New challenges, new livelihoods

While in some purely pastoral systems there may be a minimum viable herd or flock size, says Scoones, this assumes a closed, isolated system; in reality, pastoral viability depends on wider economic and livelihood conditions, as well as mobility patterns. Today, many pastoralists across the Horn of Africa combine livestock keeping with agriculture and trade, and many also receive money from relatives living overseas. Assessments of 'viability' based simply on people to livestock ratios are therefore inappropriate.

Alternative options to 'traditional' semi-nomadic pastoral livelihoods include commercialization (making more money from their existing herds, for example by exploiting local trade and export opportunities) and diversification of their livelihoods by, for example, trading in livestock by-products or selling clothes or charcoal.

The future for pastoralism

Revitalizing pastoral economies requires further support to encourage commercialization and diversification.

Dave Watson and Joop van Binsbergen in an ILRI research report published in 2008, 'Livelihood diversification opportunities for pastoralists in Turkana, Kenya', describe such pastoral livelihood diversification in Turkana, the largest yet least developed district in Kenya. This lack of development can be partly explained by Turkana's harsh arid and semi-arid northern lands. Livelihoods in Turkana are primarily based on extensive livestock production, with some 70% of the people being nomadic or semi-nomadic pastoralists. However, the impact of drought, increasing insecurity and famine has led to a growing emergence of sedentary Turkana and experimentation with alternative livelihoods. Unfortunately, the poor transportation and communication infrastructure in Turkana restricts trade and opportunities for generating incomes.

This study, which characterized the extent of livelihood diversification in Turkana, illustrates through a case study approach the strengths and weaknesses of existing activities and the opportunities and problems of expanding them.

How have pastoralists in Turkana diversified?

Among the activities the Turkana people employ to supplement their pastoralism are sedentary agriculture, particularly along the Turkwel River, where settled farmers and agro-pastoralists grow maize, sorghum, sukuma (kale), oranges, mangoes, bananas and vegetables. Fishing in Lake Turkana is another, long-standing, form of diversification. Fishermen along Lake Turkana migrate to follow fish movements. The pastoralists also supplement their livelihoods by selling the fish. Many pastoralists have also taken up weaving mats and baskets, particularly near the lake, where weaving material is readily available from the doum palm. Other natural resource-based livelihood diversification activities include

Crispin Hughes/PANOS

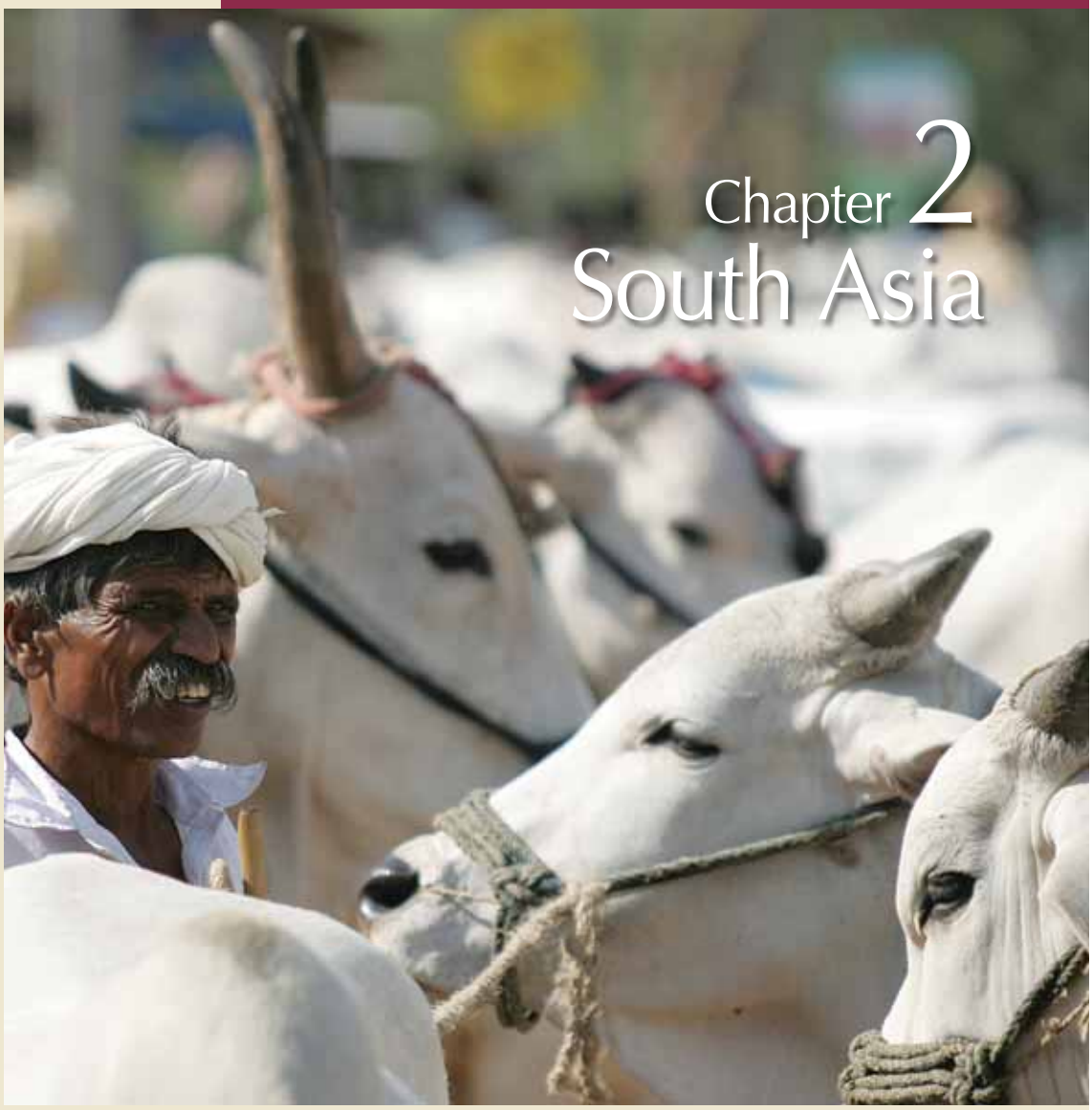
collecting and selling aloe, gum arabic, honey, wild fruits and firewood and making and selling charcoal and alcohol. There is also increasing emphasis on processing and selling animal skins and hides. Attempts have also been made to diversify into chicken production, gold mining and kiosk-based trade. While there is considerable debate over the importance of the market in pastoral diversification, with some condemning and others applauding it, most pastoralists have attempted to tap into, or even create, markets for their products. There is little evidence that pastoralists have diversified into service provision.

Recommended interventions

- Assess the whole commodity system / value chain associated with the selected livelihood option, particularly for aloe, gum arabic and charcoal production, irrigated agriculture, basket-making, fishing, honey and poultry production, and the hides and skins sector.
- Improve marketing and opportunities for adding value. Focus on developing links with national markets in Kenya as well as export markets. Explore the potential for fair trade opportunities for the European markets.
- Organize exposure visits and promotional events/craft fairs.
- Improve access to credit for organized groups interested in investing in alternative livelihood activities.
- Provide training in both business and technical skills and develop innovative capacity / entrepreneurship.
- Investigate the viability of a wider range of alternative livelihoods, including production and selling of vanilla and healthy and nutritious camel's milk.
- Investigate ways to reduce the arduous and tedious nature of some of the work, particularly in basket-making and irrigated agriculture.
- Consider piloting grants to facilitate entry by extremely poor pastoralists into alternative livelihood activities.

Partner *Veterinaires sans Frontieres Belgium (VSF-B)*

Funder *UK Department for International Development*



Chapter 2
South Asia

Comprehensive study of the Assam dairy sector: 2007 action plan for pro-poor dairy development

Located in India's remote mountainous northeastern region, Assam shares its borders with six Indian states and two countries (Bangladesh and Bhutan). Cut off from the rest of the subcontinent by all but a narrow strip of land and ethnically more closely related to Tibetan, Burmese and Mon-Khmer cultures (the latter brought the earliest known civilization to southeast Asia) than to Indian Hindu and Moslem (Assam has large Christian and animist populations), Assam to this day maintains elements of its rebellious frontier Himalayan heritage. Historically, tea has been the most important agricultural factor in the development of Assam.

Dairying is not a practice of the indigenous (tribal) peoples of Assam but rather has been imported over many decades by land-starved peasants immigrating here from other states and cultures. In recent years, an insufficient supply of local milk and dairy products to meet local demand has led Assam to import dairy products from other states of India.

Only 2% of Assam's dairy markets today are classified as 'formal'. Almost all Assamese are thus depending on traditional 'raw' milk markets, although insufficient hygiene is a problem in these informal markets (common quality problems within the formal milk markets are less well known.) This lack of indigenous dairy production is notwithstanding Assam's favourable setting for dairy, including plentiful rainfall (Assam has the highest rainfall in the world) and adequate land and fodder resources to support a vibrant dairy industry.

The percentage of poor people in Assam is the highest among the seven sister states of the northeast: 36% of Assam's population continues to live below the poverty line, a figure considerably above the national average of 26% (1999–2000). Most of the poor live in rural areas.

To understand the full dimensions of this supply gap, its determinants and the opportunities at hand so as to develop a strategy to exploit this opportunity to improve rural development and livelihoods of the poor, ILRI began in 2005 to collaborate with Assam's Directorate of Dairy Development and other state and national partners to carry out a comprehensive study of Assam's dairy

sector. The findings of this study, *Comprehensive Study on the Dairy Sector of Assam,* were published in 2006 and led the next year to ILRI and partners developing a draft action plan.

Dairy production in Assam is practiced mostly with local cattle and buffalo. Increasing farm-level production and productivity will require more improved animals as well as improved fodder/feed technology and access to livestock services and reliable markets to absorb more milk at remunerative prices. Organized milk marketing in Assam remains relatively insignificant, despite past efforts to develop and promote collective market mechanisms. The traditional markets for fresh liquid milk and traditional dairy products such as sweets account for most of the market opportunities for farmers.

According to ILRI director Steve Staal, who heads the institute's theme on Improving Market Access, no dairy development is possible in Assam unless it addresses the problems facing the traditional dairy sector. 'Any development plan that focuses mostly on pasteurized milk is unlikely to be successful,' he says. 'Our idea is not to set up a parallel system to compete with, and maybe beat, the traditional sector, but rather to strengthen the predominant existing dairy system and help it to evolve into a system that blends modern practices with the best traditional practices.'

The comprehensive study on the dairy sector in Assam, begun in 2005 by ILRI and Assam's Directorate of Dairy Development, aimed to generate sufficient information and joint learning to allow subsequent preparation of a pro-poor dairy development action plan.

The specific objectives of the study were to find ways to:

- improve performance of the traditional market in terms of milk and dairy quality and marketing services and access for small producers
- contribute to the evolution of the traditional market towards the more formal milk market and create conditions for convergence of the two
- facilitate the evolution of smallholder producers to meet new opportunities and address new threats posed by changing traditional and organized milk markets
- contribute to the overall growth and pro-poor development of the dairy sub-sector in Assam

The findings of the study and a draft action plan were presented in May 2007 at a final stakeholders' meeting held in the Assam capital of Guwahati. The subsequent *Action Plan for Dairy Development in Assam* is based on surveys of 1,500 consumers, 600 traditional and formal market agents and 3,000 dairy producers in eight districts of Assam. The data were gathered and analyzed with local partners in Assam.

In 2008 ILRI submitted a proposal to the UK Department for International Development's Research-into-Use Programme for a collaborative project that would address the issues raised in the Study and Action Plan. The proposal was approved in mid-2008.

This new project, 'Knowledge to Action: Enhancing the Traditional Dairy Value Chain in Assam', which started in June 2008, addresses that fact that milk production in Assam is low compared to demand. This large gap is currently met through adulteration of milk or importation. This gap, together with steadily increasing consumption of milk and dairy products in this state, represents an opportunity for dairy development. Production inefficiencies, wastage, spoilage and lack of consumer confidence in milk quality and safety are major bottlenecks for promoting local dairy demand and supply. There is poor knowledge and awareness among Assam's milk producers, traders and consumers about the importance of high-quality and clean milk. Increased efficiency in milk distribution and handling is expected to create more demand for milk, leading to a demand-driven production system that will further stimulate investment in other technologies, such as artificial insemination, feeding systems, credit provision and veterinary services, that are available but underused.

THE APPROACH

A three-pronged approach is being used in the project to address demand for milk, supply of milk and quality of milk. The approach aims at both boosting the image of marketed milk generally as a healthy product and assuring its quality, thus promoting milk consumption and economic benefits to suppliers. The project aims to benefit dairy farmers, traders, vendors and consumers.

ILRI's three-pronged 'Knowledge to Action' Dairy Project in Assam

Increasing consumer demand for milk

- Dairy promotion campaign
- Building confidence in the quality of milk
- Improving the quality of milk
- Decreasing the costs of producing milk

Improving efficiency of dairy sector

- Business development linked with business service providers
- Training in practices to decrease spoilage, spillage, waste and environmental contamination
- Technologies to preserve milk so more reaches the market

Improving the quality and safety of milk

- Tools to detect adulteration
- Better control of hazards in milk
- Incentives to produce safe, pure milk
- Pilot-testing a quality-assurance scheme involving training and certification

In this project, ILRI is partnering the Assam Directorate of Dairy Development, BASICS Ltd (a national NGO), FARMER (a local NGO), a local dairy producers association, Assam Agricultural University, and the State Agricultural Management and Extension Training Institute, in Bihar.

The rest of this article provides an overview of the Assam Study and Action Plan, which have laid the foundation for the new project.

FINDINGS

- Local fresh (raw) milk forms the most important part of dairy product consumption and is supplied to consumers either directly from producers or through vendors.
- Any dairy development plan must, therefore, constructively address the local fresh milk market.
- Urban consumers are particularly concerned about the quality of local fresh milk, especially that sold by producers and vendors and so buy milk only from well-known suppliers. Any plan to increase consumption of milk must, therefore, address local fresh milk quality in a standardized manner that builds consumer confidence in suppliers. Quality will have to be addressed to raise consumption of fresh milk among existing and new consumers.
- Pasteurized milk forms a small proportion of total milk consumption and is limited almost entirely to the urban areas, making it unlikely that a development plan focusing on pasteurized milk supply will benefit many producers and consumers.
- Urban households that buy pasteurized milk depend on it significantly, which suggests that if awareness of, and preference for, pasteurized milk is developed, demand will grow substantially.
- Urban consumers spend significantly more money on milk and dairy products, particularly on milk sweets and other high-value products, than on other foods. This indicates good opportunities for value-addition and associated quality and safety assurance in small-scale dairy processing of these traditional products. Such initiatives would also help generate small-scale employment opportunities.

Costs and returns in milk marketing

The returns from milk and dairy product trading (either fresh or processed) appeared high compared to the alternatives. On average, the surveyed milk traders earned a profit of Rs.259 per day. The returns per unit of milk handled from fresh milk trade were significantly lower than those from value-added traditional products, but the latter require a higher capital investment and management of greater risks. Small traders turned out to be the most efficient raw milk marketers in terms of profit per unit of output but their household income was meagre because of the small scale of their businesses.

Assam's formal dairy processing units have made insignificant impact on the marketing of milk and milk products despite several attempts by the state government. The dependence of consumers on the informal sector is likely to continue for the foreseeable future because of factors such as tastes / preferences, costs and prices. However, as consumer awareness about milk quality and safety issues increases, quality assurance measures through branding, labelling, licensing, regulation and monitoring should be considered to link these traditional milk market agents with their formal market counterparts. Such an approach would enhance the credibility of the milk market agents by assuring customers of the quality of their milk and milk products as well as dispelling the generally perceived notion that these agents exploit dairy farmers and are bad business practitioners.

Marketing through the formal milk sector

Since 1963, eight dairy processing plants have been established in different parts of Assam with a total installed capacity of 109,000 litres of milk per day. Of these processing plants, seven are functional, though not operating at full capacity. Two more plants with combined capacity of 55,000 litres per day are under construction. Nearly all of 15 chilling plants established in the state, with total installed capacity of over 30,000 litres per day, are non-functional. Three more are under construction.

Among the functional processing plants, capacity utilization varies from just 4 to 34% and there is a long-term decline in overall capacity utilization. Moreover, there are significant losses due to handling and curdling. Market returns of packaged products range from 10–27%. All these problems lead to high costs per unit output, low labour productivity and large overall losses subsidized by the government.

Any plan to continue operation of these plants or establish new plants under any kind of reorganized ownership and management (private, public-private partnership or cooperative) should address these issues and consider alternative low-cost and reliable institutional and infrastructure arrangements.

Implications of the study

- The study confirmed the predominance of traditional market agents in Assam, who form the key link between local milk producers and consumers and focus nearly exclusively on local milk products. Any dairy development plan to address the needs of the producers, market agents and consumers should fully address the traditional sector, particularly if the aim is to increase the share of demand that is supplied by local production as opposed to imports from other states and regions.
- Most traditional traders operate on a small scale (handling less than 60 litres per day), have been in business for an average of 12 years and rely solely on their dairy market activities for income. This implies important small-scale employment opportunities along the dairy value chain, indicating that dairy development activities can be highly pro-poor if they focus on small-scale traditional agents.
- Few traditional milk market agents have received any type of training; poor hygiene and milk adulteration are commonly encountered in the informal milk market. Training milk market agents in proper hygiene, milk quality and best business practices should be an essential part of a dairy development plan, to be linked with a branding system that would be easily recognized by consumers.
- Average returns to labour in raw milk trading are Rs.3.3 per litre of raw milk and Rs.14 per litre of milk in traditional processing (sweets, channa, etc.), showing strong value addition in traditional processing. However, poor people experience barriers to entering the local traditional processing business due to their generally low levels of education and poor access to credit. Access to formal micro- or small-scale credit may alleviate this problem.

HIGHLIGHTS OF MILK PRODUCTION SYSTEMS IN ASSAM

Cattle are an integral part of the livelihoods of most rural Assamese households. Of the households surveyed, 1,910 (64%) kept cattle, 126 (4%) buffalo and 65 (3.4 %) cross-bred cattle. There is an emerging dairy industry based on milk produced by low-yielding local (desi) cattle and increasingly by high-

yielding dairy cross-breds, which are currently managed by only a few cattle-keeping households. In response to the increasing demand for milk in Assam, expanding the dairy cross-bred herd, improving the productivity of local dairy cows and putting in place good access to input and output markets are the major challenges for sustainable pro-poor dairy development in the state.

About 23% of the households ranked dairy as their first or second source of farm income, with food crops generally being the most important source of farm income.

Key action-oriented implications of the dairy producer survey

- There is demonstrated strong potential and incentive for increased milk production across rural areas of Assam, although with significant spatial variation. Many farmers reported a desire to increase marketed milk production and indicated that market opportunities were not the most critical of their constraints. Thus at a basic level, the outlook for investment in dairy production is positive.
- Dairy production was demonstrated to be a feasible option for increased income and improved livelihoods across Assam's communities.
- Lack of access to improved, mainly cross-bred, dairy cattle was the main barrier to increasing the marketed milk surplus on smallholder farms. Farmers with cross-bred cattle demonstrated ability to generate much higher levels of milk sales. However, there was systematic under-use of artificial insemination. Farmers also reported limited access to credit to procure improved cattle. Improving access to improved cattle must be a primary aim in the dairy development plan. More in-depth analysis of semen production and AI delivery systems will be required to identify bottlenecks to effective services.
- Selection of best-performing local breed cows is another route to increase milk productivity, especially in areas where there is high demand for dual-purpose cattle.
- While feeding systems appeared to present no major constraints, common grazing and grasslands are getting scarcer. Interventions will need to focus on enhancing producer ability to intensify fodder production.
- Insufficient milk markets may not be a major constraint in many areas, except in pockets where milk production is high or where the road network to urban markets is still poor.
- Cooperatives and SHGs play a small role in Assam's dairy systems; alternative milk collection and marketing options should be explored, including links to private market agents.

ACTION PLAN FOR DAIRY DEVELOPMENT IN ASSAM

Recent dairy development strategies in Assam have focused on two main tracks: (a) increasing productivity through improved cattle produced under government-run semen production and artificial insemination schemes and (b) increasing milk collection through dairy cooperative societies and SHGs, mainly linked to formal processing channels. This study showed that these efforts have met with little success. Assam's dairy systems may be too diverse to have a singular policy thrust.

The real challenges are the following.

- Increase the intensity of smallholder dairy activity among poor households by providing access to improved production means and associated support systems centered, though not exclusively, around improved cattle.
- Bring the low-level surplus generated by poor households to the market.
- Boost demand for milk through improved hygiene and quality of local products and diversified dairy products made from local milk.
- Recognize the traditional system in place, which incorporates milk collectors and many other small actors, and build a more modern and professional system around it.

The proposed action plan covered the key areas where the analysis identified constraints and opportunities to development of the dairy industry in Assam. These key areas are: milk consumption, milk marketing, milk quality and milk production.

RECOMMENDATIONS

Low demand for dairy products

The current level of per capita consumption of milk of less than 1 litre a week is still far below the national average of about 1.57 litres per capita per week but there are indications of strong demand, although consumers are not able to judge milk quality accurately.

Recommendation: Invest in a state-level campaign to increase demand for fresh milk and dairy products derived from local production.

Variable milk quality and product mix in formal milk processing

Nearly half of urban consumers and about one-quarter of rural consumers are generally unsatisfied with the present level of hygiene and quality of milk available in the market. Locally processed milk was the main problem and was generally of inferior quality to milk and dairy products from outside the state.

Recommendation: Support local dairy processors in improving the quality and mix of their products.

High levels of adulteration with water and low bacteriological quality

Urban consumers appear willing to pay a premium for milk that is guaranteed to be safe and hygienic, presenting opportunities for market agents who can deliver what these consumers want. Priority should be given to the 99% of informal milk agent respondents who indicated they had not had any training in milk processing and handling.

Recommendation: ILRI has demonstrated in East Africa and Kenya in particulr, that a program to address small-scale traditional milk market agents through a combination of training in hygiene and small enterprise skills leading to certification, combined with development and enforcement of appropriate standards, can improve milk quality and market performance. It is recommended that this approach be tested and applied in Assam.

Capturing opportunities in traditional value addition (processing)

There appears to be increasing demand for local traditional milk sweets, with households in urban areas spending on average some 3 of every 10 rupees spent on milk on these sweets (this is about 25% higher than what rural consumers spend on milk-based sweets). Rising demand for these products will generate new employment opportunities but some sweets producers and vendors do not follow good hygiene practices.

Recommendation: Design and implement a program of basic training in hygiene and processing for traditional milk sweet manufacturers and vendors, with attention also given to innovation in product packaging and presentation to increase preservation, quality and consumer satisfaction.

Insufficient coordinating and information gathering and sharing mechanisms in the Assam dairy industry to support private-sector investment

The complex involvement of many departments, agencies and organizations in dairy development in Assam is ineffective in harnessing the complementarities. While there are many players, both small and large, in Assam's dairy industry, there exists no effective coordinating mechanism or central repository of information or mechanism for regularly updating that information. Existing coordinating agencies are focused on public and cooperative actors, with less attention paid to the private sector, which will be critical in driving dairy development in the state. Small-scale agents have little voice and no clear support in the form of services such as micro-credit and other kinds of business support.

Recommendation: Invest in the resources and organizational mechanisms required to support greater information sharing and private-sector investment in Assam dairy.

The areas identified as priorities for support to pro-poor dairy development, which the Action Plan will ensure are addressed, include:

- improved access to milk markets
- availability of more cross-bred dairy cows
- increased capacity of milk producers to manage the breeding, feeding and health of their dairy cows
- public and private support services better equipped to satisfy the needs of their small-scale dairy producer clients

NGOs as key development partners

A key ingredient for success for all of the recommended activities below is the active participation of a key national non-governmental organizations (NGOs) with significant experience in smallholder dairy development. The experience in Assam suggests that interventions driven by public agencies alone are unlikely to achieve the desired outcomes, and so an experienced NGO or consortium of NGOs with experience from other parts of India will be needed to serve as the lead agency in all the cluster development efforts described below.

Increase the availability of dairy cross-bred cows

Recommendation: Simple crosses of dairy breeds (Jersey or Holstein-Friesian) with local desi cattle are recommended, as opposed to more complex mixes involving a third breed, which has sometimes been proposed. The organizational requirement for delivering in a sustained manner 3-way cross-breeds are high and may be beyond the capacity of existing services.

Help resource-poor producers better manage their dairy animals

Recommendation: Staff in dairy and rural development departments, their NGO counterparts and partners and the members of interested households should work together to improve current feeding and health management practices.

Support small-scale milk market development

As production increases, markets for milk will be critically important. Because the formal processed milk market is so small, the largest opportunities over the medium term are likely to occur in traditional markets serving urban areas and even small rural market centres.

Recommendation: Each cluster group should determine the best among many market development options for their own needs.

Partners *Assam Agricultural University College of Veterinary Science*
Assam Directorate of Dairy Development
Assam Institute of Management
Centre for Humanistic Development
Indian Institute of Entrepreneurship
BASICS Ltd.
FARMER
State Agricultural Management and Extension Training Institute (in Bihar)

Smallholder pig systems for a 'forgotten corner' of India

Northeast India consists of 'seven sister states' that are home to 38 million people. The region is linguistically and culturally distinct from the other states of India and officially recognized as such. ILRI is working in two of these states—Assam and Nagaland—where poverty is extreme and common. More than half a million of Assam's 27 million people and some 400,000 of Nagaland's 2 million people live below the poverty line. (In India as a whole, more than 300 million people live below the poverty line.)

Both Assam and Nagaland counter India's vegetarian reputation. 'These are meat-eating states,' says Steve Staal, director of ILRI's Enhancing Markets Theme. 'Fresh pork is a major part of people's diets here, especially among the "tribal" peoples, who are traditional pig keepers.'

Pig keeping is an integral way of life to most people living in these remote northeastern states. Over a quarter of all India's pigs are found in this region. Nagaland has 700,000 pigs, the highest density of pigs per capita on the sub-continent. Pig production in the northeast is invariably a backyard, market-oriented enterprise that uses home-produced forages and tubers for pig feed rather than expensive grains. Pigs are raised and sold to generate household incomes, accumulate capital and fulfill socio-cultural obligations.

This small-scale pig production is practiced mainly by people belonging to what is known in official government terminology as 'Scheduled Tribes', 'Scheduled Castes' and 'Other Backward Classes'. These people tend to be not only India's poorest but also its most severely marginalized society, with little access to government and other services and the lowest levels of literacy in the country. Sustainable ways of generating an income using local resources and skills are critically important in raising human welfare here. With a rapidly growing demand for animal-source foods in this as well as all regions of India, pig keeping could be an important pathway out of poverty for many in these communities.

Smallholder pig systems for a 'forgotten corner' of India

The low productivity of pig production in India's northeastern region, matched with an increasing demand for pork and other animal-source foods in that region and India generally, suggests that interventions to improve pig production in the northeast could significantly improve the livelihoods of the region's tribal and other marginalized peoples.

Local demand for pork and piglets until recently was so great that it was profitable for local businessmen to import large numbers of commercial white pigs from producers in India's grain states—some two to three thousand kilometres to the west— at a transport cost of almost US$2000, or up to $40 per pig. As feed and transport costs both recently escalated, people in Assam and Nagaland began finding the costs of these imported white pigs prohibitive. A new market is growing fast for the local black and cross-bred pigs. Because these native animals can be fed mostly on low-cost feed crops and crop wastes, they are an ideal solution to filling the new pork and piglet supply gap.

This short-term opportunity is ready-made for success. The pigs are here, the demand is here and the farmers ambitious to grow their pig enterprises are here. What is missing is knowledge about how to produce and feed increasing numbers of local pigs on small farms, how to access local and regional livestock markets and how to market meat hygienically. All this is preventing small-scale pig-rearers from benefiting from the new markets. Without such knowledge, these poor farmers will be left behind as big producers step in. If the small farmers can be given appropriate knowledge and training quickly, up to 80 or 90% of all tribal households could raise their incomes substantially over the next 5–10 years.

ILRI's representative for Asia, Iain Wright, says, 'We are working with national partners to gain support for helping poor people seize this big pig marketing opportunity in Nagaland, Assam and other northeastern states. In mid-2008 we started a project with the Indian Council of Agricultural Research and the School of Agricultural Science and Rural Development, in Nagaland University, to implement a program of research to improve the production and marketing of pigs in selected villages in the Mon District of Nagaland. We're also looking at working on similar projects with national partners in other northeastern states.'

Although the current opportunities for smallholder pig systems in northeastern India are huge, they won't last long, perhaps only 5 more years or so. If the smallholder sector doesn't take advantage of these new opportunities, large-scale industrial systems will step in and take over. The solutions ILRI can help develop now are a response to specific outside forces working on the market at the moment; some poor pig keepers could generate enough money from their enterprises to leave agriculture altogether in future.

PIG SYSTEMS APPRAISAL

ILRI and other organizations conducted a Pig Systems Appraisal in several districts in Assam and Nagaland towards the end of 2006. The Appraisal examined the entire value chain in pig production and so interacted with consumers, market agents and services providers as well as producer households and district- and village-level key informants.

The study found that pig production is gaining a foothold in communities with no tradition for rearing pigs. Despite being small in scale—households typically keep no more than one to five cross-breds—pig production in these states contributes significantly to the livelihoods of most of the pig-rearing households. The income from pig sales meets essential household and farming expenses and provides some financial independence to the women in the family, who play a large role in household pig production.

The study found that demand for slaughter pigs and fresh pork had increased greatly over the last five years, causing a 20% increase in the price of pork in real terms, an increase that is expected only to continue. The appraisal also found, however, that small producers attempting to tap into this expanding demand for pig and pork had problems producing sufficient feed, obtaining piglets and, perhaps most importantly, accessing credit. The appraisal recommended ways to address each of these constraints in smallholder pig production.

USE OF STRATEGIC COMMUNICATIONS

To leverage action for interventions that would help poor producers capture the new opportunities in pig production and marketing, the appraisal team took a first step of raising awareness of the study results among local and regional stakeholders, decision-makers and investors. Knowledge was shared right from the start of the project, during its design and through its implementation. Project members worked closely with local authorities, NGOs and researchers. In 2007, the project team supported the local authorities in convening workshops involving a range of players in pig production and marketing to discuss what the appraisal team had learned and what interventions were most likely to be successful.

Employing strategic communications with stakeholders in all parts of the pig value and marketing chains helped bring about the following useful outcomes.

- The Government of Assam committed new funds to smallholder pig development.
- Rastriya Gramin Vikash Nidhi (RGVN), a national NGO, is using the results of the appraisal in its development programs, which will be funded by Government of Assam.
- Assam's Animal Husbandry and Veterinary Department is using the report of the appraisal as a foundation for designing piggery development projects under the World Bank-sponsored Assam Agricultural Competitiveness Project.
- The study attracted the attention of major funding agencies such as the World Bank, the International Fund for Agricultural Research and the International

Fertilizer Corporation, which expressed interest in financing implementation of the study's recommendations.

- The appraisal's findings are guiding the design of interventions in Nagaland's pig sub-sector in Mon District in a National Agriculture Innovation Project launched by the Indian Council for Agricultural Research Complex for Eastern Region.
- The Assam and Nagaland governments agreed to jointly organize a Northeastern India regional workshop on pigs in April 2008, at which participants designed a regional policy for pig sub-sector development based on the needs and interests of the people of the region.

MARKET CHANGES

Given that there has been an increased demand for slaughter pigs from both within and outside the states, small-scale low-external-input production must have been expanding during recent years to satisfy the increased demand for pork. These changes have resulted not only in more pigs being produced from the hundreds of thousands of small-scale units, with benefits to the livelihoods of the producer households, but also in many more people earning a living from the marketing of pigs, piglets and pork.

Although pig producers were happy with the income they generated, they said that they were unable to increase the size of their pig systems because of a paucity of household feed and financial resources. Hence the conundrum: the market continues to demand more pork but the input constraints faced by most producers—the hundreds of thousands of resource-poor households—limit their capacity to respond.

GUIDING PRINCIPLES

The results of the appraisal show that some guiding principles will be critical for making successful interventions in the pig sub-sector in this region. First, improved efficiency and profitability of production should be achieved by incremental changes to better utilize existing resources through innovative community-based programs implemented by client-oriented staff. Second, participatory methods to identify and target high-priority problems and to develop and test interventions for specific locations will be essential to ensuring ownership and acceptability among the communities. And third, a key element will be to identify and promote current best practices of the most successful community members.

Work addressing the new pig-based production and marketing constraints and opportunities in these two states should have a strong component of capacity building in participatory methods for local institutions and the target producer groups through hands-on training and exposure visits. Services should be provided only on a paid-for basis; program components that are free or highly subsidized should be avoided and any subsidy provided should be reduced in a phased and scheduled manner over a short period. At the same time, all public interventions should build in staff incentives for pro-poor pig systems work. Lastly, projects should establish ways of objectively monitoring and evaluating their results.

The base of locally relevant knowledge should be substantially increased through regular and high-quality information sharing within local pig-keeping communities and between those groups and their R&D partners. Processes employed in projects in this area should explicitly work to strengthen institutional links and, in this way, R&D effectiveness. Organizations that will be key to the success of this work are the agencies within the region giving credit; without credit, it is unlikely that most of the region's smallholder producers and marketers will be able to take advantage of technical innovations to scale up their pig businesses to take advantage of the new market opportunities.

Pig producers reported that agricultural extension programs were ineffective and limited in their reach and thus unable to help the producers make more effective use of available feed resources, maintain their pigs in good health and breed productive crosses.

Partners *Animal Husbandry and Veterinary Department*
Assam Agricultural University
Centre for Humanistic Development
Commissioner and Secretary to the Government of Nagaland
District Rural Development Agencies
Indian Council of Agricultural Research National Research Centre on Pig

Funders *Assam Livestock and Poultry Corporation Ltd.*
International Fund for Agricultural Development
Nagaland Empowerment of People through Economic Development
Nagaland Veterinary and Animal Husbandry Department
Nagaland University School of Agricultural Science and Rural Development
National Agricultural Innovation Project

Milk quality in the traditional dairy systems of Assam, India

Food-borne disease is an emerging health problem and contaminated milk and dairy products are important contributors to the associated health burden. Most surveys of informally milk marketed show unacceptable levels of hazards. Pasteurization is an effective mitigation but has been effective only where farmers are few, large, concentrated and well linked to milk plants; in the developing world, more than 90% of milk continues to be sold raw.

For some years, ILRI has been addressing the triple challenge of ensuring the safety of milk and milk products while promoting small-scale traditional dairying as a pathway out of poverty and protecting the natural resources that make such dairy production possible.

ILRI learned lessons about balancing such societal objectives (health, wealth and social and environmental sustainability) during the design of a project to better manage milk-borne disease that started in Assam, India, in June 2008. This work involved evaluating the impacts of improving milk safety in the traditional dairy sector on excluded groups and on the ecosystem. Based on the results, ILRI developed strategies to mitigate unwanted effects.

HIGHLIGHTS OF MILK-QUALITY ANALYSIS

A cross-sectional survey that covered six administrative areas (wards) in Assam's capital, Guwahati, and three types of milk vendor (shops, distribution points and traders) revealed the following.

Milk quality

Most milk, both raw and pasteurized, did not meet standards of milk quality. None of the milk samples, including those of very poor bacteriological quality, had visible or olfactory abnormalities. Raw milk had substantially more added water while UHT (ultra-heat treated) milk had higher bacteriological quality (because of the method of processing) and higher fat (presumably because it originates from states with a higher proportion of dairy buffaloes).

Associations between quality and sales points

Most adulteration occurs in milk bought from hawkers.

- Milk sold from an insulated van was sold at a premium price compared to milk from the same dairy sold from a pickup: presumably customers had more confidence in its quality. Surprisingly, it was actually of poorer bacteriological quality, indicating a perception-reality gap in this van's clients.
- Milk from local dairies contained significantly less fat and significantly higher levels of total bacteria and coliforms than milk from dairies outside Assam.
- But among dairies producing pasteurized milk, milk from local dairies had substantially better bacteriological quality than the pasteurized milk from dairies outside Assam.

Key findings

- All raw, pasteurized and UHT milk samples were unsatisfactory according to the relevant standards for composition and bacteriological quality.
- Organoleptic properties of milk (clots, colour and smell) were not a good indicator of quality.
- Perceptions that certain products are of higher quality than others are often misperceptions.
- The quality of pasteurized milk from different dairies varies widely.

Summary of key findings on consumer quality perception

Results of the study suggest that consumers are poor judges of milk adulteration, over-estimate their ability to detect adulteration and have little insight into their own ability to detect adulteration. That said, consumer concerns over the quality of milk and milk sweets are justified. Most samples do not meet bacteriological standards, and so are a potential risk to human health. Further studies are needed to identify and quantify specific health risks so as to better target interventions. This can be done through 'participatory risk assessments' and other methods adapted to the context of developing countries.

There is already enough evidence to warrant interventions to improve milk quality. These should address both the raw and pasteurized milk sectors. In particular, UHT milk (produced elsewhere in India) is generally of much higher quality than local pasteurized milk. Development of demand for locally processed milk will depend heavily on the quality of local formal processing.

The high level of coliform bacteria in both pasteurized and raw milk as well as milk sweets is worrying. Coliform bacteria are found only in the intestines of humans and animals and their presence indicates faecal contamination. Some coliforms cause serious and sometimes fatal disease and their presence, moreover, is an indicator of the many human and zoonotic pathogens spread via the faecal-oral route (such as bacteria, viruses and intestinal parasites). Further bacteriological testing is needed to identify the origin of coliforms (human or animal) and identify critical control points for coliforms. Pathway analysis suggested that problems of raw milk quality could be attributed to two main causes: poor hygiene along the chain and delays between production and consumption. Interventions and training packages should address both hygiene and distribution systems.

Adulteration with milk is widespread and appears to be standard among some actors in Assam dairying. Some pathways are free of adulteration, but not the predominant private-sector model. However, adulteration with water does not seem to represent a major health risk in terms of adding bacteria.

Consumers are poor judges of adulteration and have unfounded confidence in their ability to judge milk quality, creating a market failure in

the provision of pure milk. The same applies to bacteriological quality, which was often poor but indiscernible to consumers. Customer willingness to pay for quality is obviously contingent on ability to detect quality. Some systems seem to be better at self-regulation but not the traditional private-sector model that predominates. Consumers need to be better informed about the quality problems of milk, both raw and pasteurized, and their own inability to assess these. Simple tests for quality and institutional mechanisms for their adoption need to be developed and disseminated.

The manufacture of milk sweets can reduce the health risk of poor-quality raw milk, but only if sweet-shop hygiene is adequate. The quality of Assam's milk sweets correlates strongly with hygienic practices. This study (which was small, non-random and looked at only one type of sweet) identified the practices leading to higher quality milk sweets. The checklists developed for this study are a tool for improving quality and monitoring change. These should be incorporated into training programs for traditional processors and sweet-shop-keepers.

Milk quality in Assam: Questions and answers

What are the quality problems with milk? What is their relevance to Assam?

Adulteration with water and other substances

- Customers lose money when they pay for water instead of milk.
- Customers who distrust the quality of a product will buy less of it: increasing the quality of milk will increase demand.
- Some adulterants are harmful to health; adulterants commonly found in milk in India include dirty water, urea and soap: all substances not fit for human consumption.

High numbers of spoilage bacteria

- 20% of milk in developing countries is lost due to wastage and spoilage; this corresponds to 85 million litres of milk a year lost in Assam.
- Decreasing spoilage opens new markets because milk can be transported over longer distances and times.
- Decreased spoilage reduces temptation to add antibiotics, hydrogen peroxidase, caustic soda and other substances to 'correct spoilage'.

Hazards to health

- Dairy products are an important cause of food-borne disease, causing at least 10% of all food-borne disease.
- Many diseases are also spread by contact or aerosol and can affect those who work with cattle or handle raw milk.
- Many diseases also cause sickness, death and lowered production in cattle.
- Other risks to human health commonly found in milk include veterinary drug residues (e.g. antibiotics, de-wormers), fungal toxins (e.g. aflatoxin), pesticide residues (e.g. DDT) and heavy metals (e.g. lead, cadmium).

Additional quality problems

- High cell counts cause lowered yields of curds and cheese for milk; it is also an indicator of mastitis, which decreases milk production.
- Early lactation milk (colostrum) has a high bio-burden that reduces processing efficiency and dairy-product quality.
- Off-flavours and tastes may be due to cattle feeds, chemicals in the farm environment or bacterial contaminants.

Will boiling or pasteurizing milk make it safe?

- Boiling or pasteurizing is effective at killing most germs (bacteria and viruses); boiling is more effective than pasteurization.
- Heat treatment does not destroy all bacterial toxins; toxins from *Bacillus cereus, Staphylococcus arueus* and *Clostridium perfringens* are important causes of food poisoning and dairy products have often been identified as the source.
- Heat treatment will inactivate some antibiotic residues, such as penicillin, but not others, such as sulpha drugs.
- Heat treatment will not remove heavy metals, such as arsenic and lead.
- Heat treatment will not destroy aflatoxins.

We currently have no information on the presence of these problems in Assam or their effects on human health, but we know they cause serious problems in many developing countries.

Does processing milk into cheese, butter, yoghurt or fermented drinks make milk safe?

Processing that involves cooking at high temperature does eliminate bacteria; fermenting milk to yoghurt or lassi and processing into soft or hard cheese, curds or butter does not remove all bacteria; processing is not as effective as boiling or pasteurizing in making milk safe.

What is the best way to manage milk-quality problems?

The first step to better managing problems in quality is to diagnose the problem; this is done by a pathway analysis, which starts at milk production on the farm and follows the movement of milk along the transport chain to the consumer; the solution is then tailored to the problem, which might be one of the following.

Milk adulteration

- Simple, inexpensive tests can detect adulteration in milk; if these are widely available, consumers and traders can refuse to accept adulterated milk.
- Quality schemes allow farmers and traders who have received training and who follow good practices to indicate this by using a special brand or sign.
- Providing information to consumers on the extent and harmful effects of adulteration will increase demand for pure milk.

Spoilage and contamination

- Good agricultural and manufacturing practices decrease losses from spoilage, spillage and waste.
- Secondary contamination of milk can be avoided or controlled through implementation of modern Hazard Analysis Critical Control Points (HACCP) systems; in difficult situations of traditional or semi-traditional systems of husbandry and milk production, applying the HACCP systems can considerably help improve milk production and processing conditions.
- Technologies such as refrigerated containers and lacto-peroxidase can help preserve milk.

Risks to human health

- Food-borne pathogens that cause widespread disease in dairy animals, such as *Mycobacterium bovis, Brucella abortus* and *Brucella melitensis,* require eradication efforts based on testing and aimed at removing infected animals from the human food chain.
- Non-obligate animal pathogens represent most food-borne pathogens and are frequently excreted by healthy cattle (*E. coli* 0157, *Salmonella* spp., *Campylobacter* spp., *Staph. aureus)*. They are best identified and eliminated by a quality milk program that addresses animal health in association with the environment to reduce the pathogen burden on the farm and in foods off the farm.
- Special monitoring programs are required to detect less common infections in milk with severe human health implications; these include *Streptococcus zooepidemicus, Cryptosporidium, Coxiella burnetti* and *Toxoplasma gondii*.
- Treating milk through pasteurizing, boiling or processing into other products often reduces risks to health. However, it does not remove all risk and may introduce other risks (bacteria grow more rapidly in pasteurized milk, for example, and handlers may introduce pathogens to milk sweets). Treated milk should be assessed for hazards and an HACCP system put in place to ensure safety and quality.

Feeding India's booming feed markets

Throughout the tropics, inadequate feed keeps farm animals underweight and underproductive. What's stopping some 600 million poor farmers from meeting a fast-rising global demand for milk and meat is mostly lack of feed. Small producers simply lack sufficient amounts and quality of grass, browse and crop wastes to feed their animals throughout the year. Access to more, and more nutritious, feeds would enable smallholders to build their livestock and other assets by exploiting the livestock revolution.

The single most important ruminant feed resource on many of the small crop-livestock farms of Asia and Africa is no longer grass but rather the stalks, leaves and other remains of crop plants after harvesting, referred to collectively as 'crop residues'. In India, for example, 44% of the feed annually sustaining all the sub-continent's cattle, buffalo, goats, sheep and camel populations is made up of such crop 'wastes'. The rest comes from planted forages or shrinking pastures and other common lands. Expensive concentrates—the mainstay of livestock production in rich countries—are used only very occasionally.

While crop residues, or 'stover', have become a main feed for farm animals of the South, crop breeders until recently continued to focus solely on increasing grain yields. A research partnership ILRI has been leading has redressed this oversight in India's all-important sorghum crop, grown on nearly 10,000,000 hectares on the sub-continent. The partners incorporated fodder quality traits in India's crop breeding trials. Doing so led breeders to identify sorghum varieties with high yields of both grain and stover as well as improved stover quality.

This partnership needed three things to succeed. First, it required biological variation that could be exploited. The quality and quantity of the non-grain parts of the sorghum plant needed to vary among different cultivars, the fodder and grain characteristics needed to be independent of each other so that improving the quantity or quality of one did not jeopardize that of the other, and both traits needed to be under genetic control and sufficiently independent to enable breeding and selection work to improve them.

Second, success depended on developing simple means of assessing the effects of stover variation on livestock growth. Using conventional feeding trials to determine the livestock productivity effects of stover from many thousands of lines of sorghum was out of the question.

Third, success depended on including the potential fodder benefits of different cultivars in criteria of agencies releasing the cultivars, which would allow farmers to choose sorghum varieties based on their stover as well as grain characteristics.

This partnership began by assessing the potential impacts on India's smallholder livestock productivity of planting sorghum and millet varieties with genetically enhanced stover fodder quality and quantity. Remarkably, this indicated that a 1% increase in just one livestock productivity-related parameter—stover digestibility—would result in increases in milk, meat and draught power outputs ranging from 6 to 8%. The net present value of the research was estimated to range from US$42 to 208 million, with predicted high rates of return to the research investment of 28 to 43% and corresponding high benefit:cost ratios of 15 to 69:1.

Partners *India's National Research Centre for Sorghum (NRCS)*
All-India Coordinated Sorghum Improvement Program
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Funder *CGIAR Systemwide Livestock Program*

A new strategy for Asian smallholder dairy

A report by the United Nations Food and Agriculture Organization (FAO) in April 2008 indicates that the recent control of milk prices in several Asian countries could be counter-productive to supporting the dairy incomes of smallholders and rural development generally. With prices at record levels for both dairy outputs (milk) and inputs (feeds, energy costs), fixed and administered prices tend to hold back big as well as small dairy producers from responding quickly to the changing price signals.

Price controls particularly hurt dispersed smallholders, who often lack social networks to help them find and sell to milk collectors offering the highest prices. On the other hand, equitable and remunerative prices for farm-gate milk encourages smallholders to adopt improved and sustainable technologies and management systems that improve their milk quality as well as quantity.

The recent and rapid escalation of commodity prices is the perfect environment in which to test what policies are most conducive to the development of the agricultural sector. Low food prices over the past 20 years led to an underinvestment in agriculture, particularly in smallholder dairying, which, unlike rice and other staples of food security, has been a neglected and relatively unsupported area of research and development.

The sudden rise in dairy prices that took the market by surprise in late 2006 was due to the elimination by the European Union of subsidized dairy exports as well as to drought in many large dairy-product exporting countries and higher feed prices worldwide. Throughout 2007, prices for dairy products rose faster than those for any other agricultural commodity group, finally reaching a plateau in late 2007 and abating only in early 2008.

This recent increase in dairy prices potentially offers an opportunity for hundreds of millions of poor, and in many cases, landless, smallholder dairy producers to benefit from these structural, or permanent, shifts in the global demand and supply of dairy products.

This is particularly true for Asia, where growth in both milk production and consumption has been the strongest in the world; nearly 80% of the 238 million tonnes of milk produced in 2007 was supplied by farmers with 1 to 5 cows.

While developing countries in Asia and elsewhere consume only 40% of global milk production, these countries import nearly three-quarters of global shipments of dairy products, including 80% of milk powder exports from developed countries. With the world's largest net trade milk deficit, Asia is projected to increase its milk production by 3% a year over the next decade, slower than the previous decade but still double annual global growth rates.

This is supported by expectations that, although dairy product prices have been easing in the first half of 2008, increased prices are here to stay. Commodity projections by both FAO and the Food and Agriculture Policy Research Institute indicate that milk prices over the next decade will remain 50% higher than historical averages.

Smallholder farmers have the capacity to respond quickly to higher milk prices because of their ample scope for rapid yield increases. Current average milk yields in developing countries are just one-fifth that in developed countries because most smallholder farmers feed their dairy animals well below their potential.

With enabling pricing policies and technical support to producers on improved feeding, on-farm management and reducing spoilage, milk yields in poor countries could increase dramatically to meet the rising global demand, bringing millions out of poverty in the process.

How policymakers in region have responded to higher commodity prices

To date, most of the policy responses in Asia to escalating food prices have focused on rice, maize, wheat and other food staples. Some countries, such as India in 2007, briefly limited dairy product exports to ensure domestic price stability. Many importing countries reduced import tariffs on both livestock products and feed inputs and many put in place price caps on milk and other dairy products.

Asian policy responses to escalating food prices

- China imposes price caps on meat, milk, eggs, grain and edible oils (Jan 2008).
- China subsidizes meat consumption for the poor (for 6 months).
- Thailand imposes price controls on dairy products, chicken, eggs, beef and pork.
- Pakistani cities set retail fluid milk prices below the cost of production.
- Thailand reduces the tariff rate for soybean meal from 4 to 0% to reduce the costs of feeding local animals.
- Indonesia eliminates import duties on soybeans (for 6 months).
- Indonesia subsidizes tempe and tofu producers.
- Korea cuts import duties on corn and soybeans.
- China reduces the tariff rate for soybeans from 3 to 1% for 3 months (Oct 2007–Mar 2008).
- Indonesia takes a series of measures to stabilize food prices.
- India abolishes the import duty on corn (Jan–Dec 2007)
- India bans the export of pulses (Jun 2006–Mar 2008).
- Vietnam reduces tariffs on meat, offal, eggs, milk products, vegetable oils and animal feeds by 30–50% and reduces the import tax rate for corn used for animal feed from 5 to 2%.

The different policy responses and the way they are implemented alter economic incentives for the different actors along the dairy marketing chain and have differential impacts on food security in urban and rural areas. Policy responses that seek to ensure food security and

access by controlling markets, such as through setting ceiling prices, usually lower prices, preventing potential gains from being realized, and hurt rural livelihoods.

The dairy sector in most developed countries is highly supported through regulated prices and high tariffs to ensure stable and high incomes for dairy producers. This is not the case in developing countries, where dairy policies are less prevalent and price controls are often used to ensure low prices for urban consumers.

A recent FAO review on lessons learned in smallholder dairy development reveals that government interventions in the dairy sector—particularly price policies that create or remove incentives for producers to increase yields—strongly impact rural livelihoods and food security for better or worse, as well as, importantly, the investment climate for the sector.

A key question for policymakers is to what extent the international dairy prices are being transmitted into local economies. FAO's investigation of price movements in a few countries in Asia identifies some of the factors conditioning the transmission of the prices. Domestic policies influence market signals while the costs of doing business determines the extent to which individual producers respond to those market signals.

The Asian Smallholder Dairy Development Strategy and Investment Plan

To facilitate a timely response to this new and big opportunity for the poor, Nancy Morgan, Livestock Policy Officer in FAO's Regional Office in Bangkok, and her FAO colleagues and those at the Animal Production and Health Commission for Asia and the Pacific (APHCA), with the financial support of Common Fund for Commodities, initiated development of a regional strategy for dairy development. They started by holding a workshop in Chiang Mai, Thailand, 26–29 February 2008, attended by over 50 key policymakers and senior executives of some of the largest dairy companies in Asia. Participants included regional experts from 18 Asian countries and from ILRI. (See Nancy Morgan's APHCA Brief: 'Dairy prices, policies and potential opportunities for smallholders in Asia', April 2008.)

At a time of record-high international dairy prices, the workshop dairy experts agreed that Asia needs concerted regional collaboration to enable its tens of millions of small dairy producers to derive the full benefits from the dairy value chain through greater productivity, better milk quality and maximum market access.

To help unleash dairy's potential to transform rural economies in Asia, workshop members and government and private-sector representatives pledged to:

- Strengthen the ability of smallholders, who currently account for 70% of regional milk production, to supply and market quality milk to the region.
- Actively participate in a regional dairy information and exchange network serving as a channel of best practices on smallholder dairy development.
- Support the development of national action plans that build on the pillars of the regional strategy.

In response to the outcome of the workshop, FAO committed itself, under the umbrella of APHCA, to the immediate development of a knowledge networking system on small-scale dairy development, addressing such issues as production, marketing, and processing. The results of this workshop were further elaborated in April 2008 into an 'Asian Smallholder Dairy Development Strategy and Investment Plan', which has as its objective:

'a glass of good-quality, safe Asian milk per day for every Asian child and more efficient, productive and profitable dairy food chains providing dairy producers with higher earnings.'

The strategy and other project information can be found at:
http://www.aphca.org/reference/dairy/dairy.html

In November 2008, ILRI's Enhancing Markets Theme director, Steve Staal, is participating in a follow-up workshop in Bangkok with about 30 other experts, including policymakers, researchers, private-sector agents and global development thinkers on dairy development and chain analysis. This informal expert consultation aims to build a body of practical knowledge on

enabling policies for development of smallholder dairy. It will feed into and support the broader objectives of FAO's regional strategy for smallholder dairy development in Asia, which is to promote investment into Asia's dairy sector.

FAO has been working in many countries in the region to help develop national training centers for small-scale dairy processing and genetic improvement of dairy cattle. Like FAO, ILRI strongly supports pro-poor dairy policy and development. ILRI has been working to enhance smallholder dairying in Africa and Asia since early 1990s through collaborative R&D projects with national partners. ILRI's central interest is the traditional 'raw', or unpasteurized, milk and dairy markets of these regions, which are huge and booming. Traditional markets make up an extraordinary 98% of total milk sold in Tanzania, 90% in Uganda, and 86% in Kenya; in South Asia, these informal markets constitute 98% of milk sold in Pakistan, 76% in India and 40% in Sri Lanka. The dairy products traded in these informal markets are often liquid raw or soured milk and traditionally processed products such as the ubiquitous milk sweets of India.

ILRI's collaborative smallholder dairy projects are looking for win-win options that enhance the welfare of small farmers and market agents while improving the nutritional status of poor households and enriching exhausted soils on smallholder mixed crop-and-livestock farms. A smart way to meet this triple bottom line is to pay scrupulous attention to already vibrant local dairy markets—to what products local people are already selling and buying. As ILRI veterinary researcher Nick Hooten says:

'What all of us tend vastly to underestimate is the huge and growing size and viability of local dairy markets in developing countries, with their traditional products designed for local preferences rather than Western appetites. These local markets should be our starting point for enlarging dairy pathways out of poverty.'

Hooten attended FAO's February 2008 Chiang Mai workshop, where he made a presentation on ILRI's behalf: 'Dairy development for the resource poor: Lessons for policy and planning strategies'.

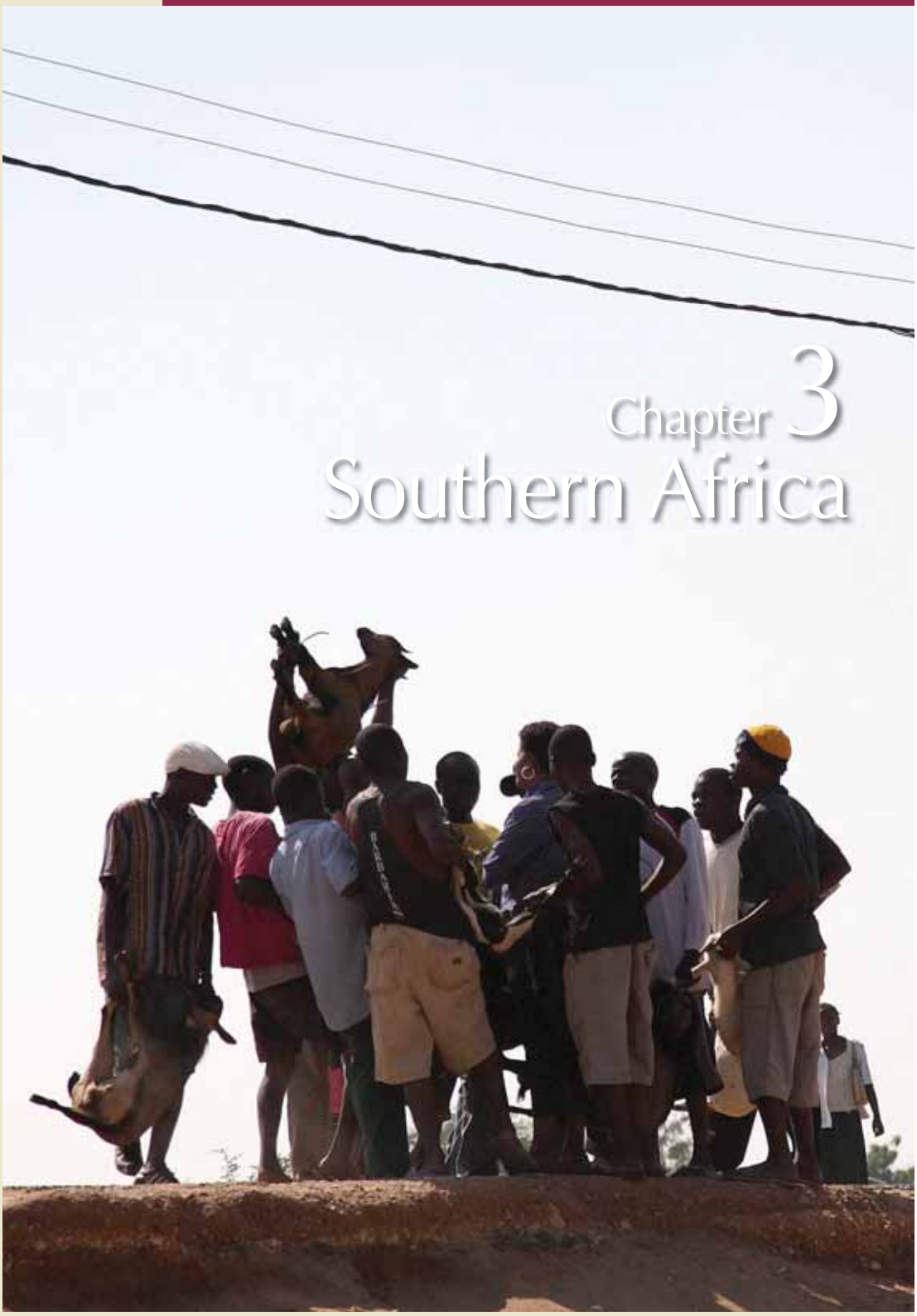
A collaboration path toward action

Embarking on such an ambitious initiative requires collaboration and cooperation between governments, institutions and other local and regional partners. FAO and ILRI have a long history of working together on smallholder dairy development and a regional umbrella supporting dairy development in Asia necessitates partnerships that focus on merging research results into development action in the field.

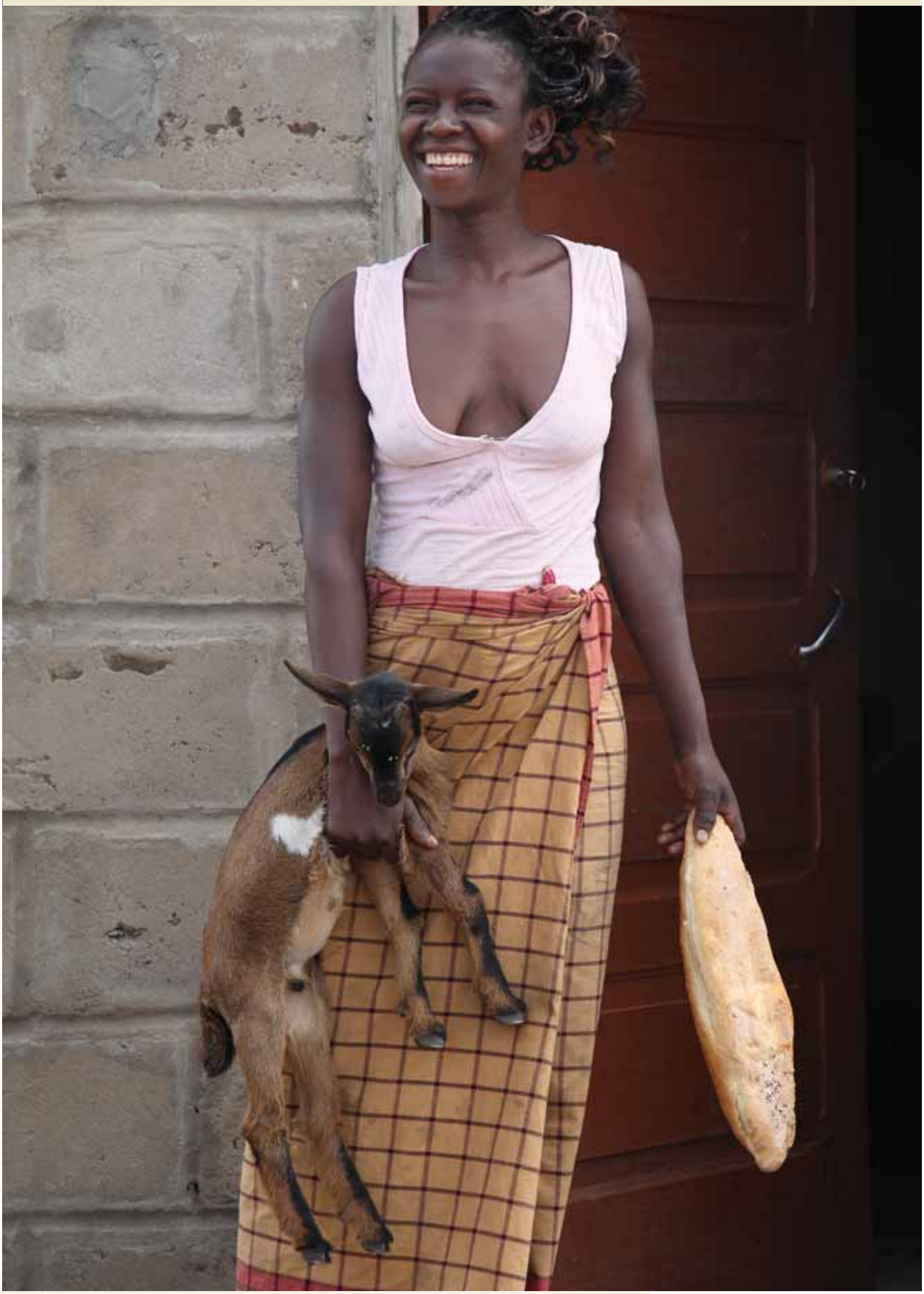
A recent ILRI/FAO publication, *Dairy Development for the Resource Poor—A Comparison of Dairy Policies and Development in South Asia and East Africa*—outlines an agenda for pro-poor dairy policy and development. The authors suggest that, generally speaking, dairy development policies that build on traditional production systems, with a particular focus on employment generation and food safety and quality, are likely to be pro-poor. Solid knowledge of policies and their impacts on the structure of the dairy sector throughout the region will provide the stage for future initiatives.

Partners *Food and Agriculture Organization of the United Nations (FAO)*
Animal Production and Health Commission for Asia and the Pacific (APHCA)

Funder *Common Fund for Commodities*



Chapter 3
Southern Africa



ILRI in Southern Africa:
The context and priorities for engagement

Agriculture is the mainstay of the people of the countries of southern Africa, where 211 million people live. Within agriculture, a high priority is placed on livestock rearing by development groups such as the Southern Africa Development Community (SADC) because of the large role farm animals play in the economies of the region. The livelihoods of some 60% of the region's population depend critically on livestock to some degree.

Among the chief shocks these livestock keepers experience regularly are droughts, which dry up both feed and water resources; floods, which kill stock outright and destroy their pastures; and animal diseases, which not only maim and kill livestock but also stop livestock trade and threaten human health.

All of these events act singly and in concert with each other to hamper development efforts to increase livestock production levels by poor farmers and livestock and livestock product marketing by poor marketers.

Livestock research and development in this region contributes to the United Nations Millennium Development Goals, the Comprehensive African Agricultural Development Programme of the New Partnership for Africa's Development, the Dar-es-Salaam Declaration on Agriculture and Food Security in the SADC region, and SADC's own livestock development strategy.

All of these institutional frameworks recognize the opportunities livestock production and marketing systems offer poor people in terms of increasing food security, providing income opportunities and sustaining farm production. The question is, how do we translate such R&D goals and frameworks into practical implementation plans at national and regional levels and into useful activities at the local level to enhance the contribution livestock make to livelihoods of the poor?

Defining ILRI areas of focus

ILRI opened an office in Maputo, Mozambique, in May of 2006, where Zimbabwean animal scientist Siboniso Moyo serves as ILRI's Regional

Representative by facilitating ILRI's engagement in the region through identification of opportunities, development of partnerships and coordination of activities. The first step of ILRI's relatively new regional office and staff has been to define appropriate areas of ILRI focus in the region for a subsequent research agenda driven by national and regional priorities and determined by stakeholders in pro-poor livestock development within southern Africa. To achieve this, ILRI has been holding ongoing consultations with its national and international partners to better understand the priorities of the region regarding livestock information gaps, challenges and opportunities. With this information and in continued consultation, ILRI is identifying regionally important constraints in southern Africa's livestock sector that it may begin to address with other organizations.

The livestock sector of southern Africa today

The livestock population in the SADC region is largely dominated by ruminants—cattle, goats and sheep—as well as poultry. Recent trend analyses of the livestock industry demonstrate a slowdown in the relative importance of the livestock industry's ability to lead re-engineered growth through generation of wealth in the region. Producers and prospective producers, being virtually without relevant, accurate market information, are disadvantaged in basic decision-making concerning production opportunities and marketing options. This dearth of information makes people cautious about starting, entering or expanding livestock enterprises. Furthermore investments in rural infrastructure, input subsidies, marketing schemes and services such as extension and research have all declined. In the past, most southern African governments provided services to farmers and rural areas through commodity marketing boards and state-supported cooperative movements. The decline of these institutions has hampered economic development as well as farmers' access to local markets.

Figure 1 represents cattle, goat and sheep numbers in millions of head from 1995 to 2005. The figure shows slow growth during these ten years. Cattle numbers increased from 61 million head in 2004 to 64 million in 2005, an increase of 4.5% over the decade. Goat numbers rose from 34 million animals in 1995 to 38 million in 2005, an increase of 10.4%. Sheep numbers are the only sector showing a declining trend over the ten-year period, with the number of sheep in the region declining from 39 million head in 1995 to 36 million in 2005, a decrease of 8.2%.

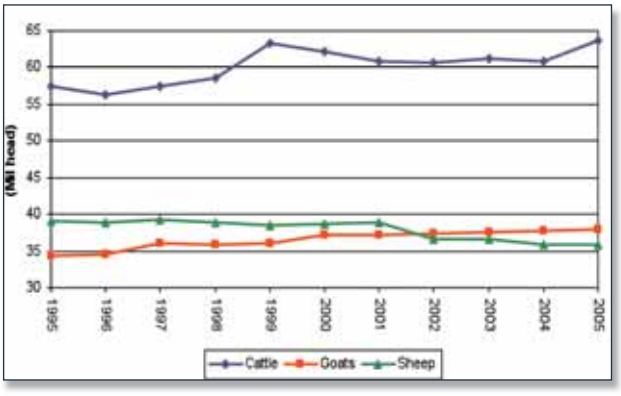


Figure 1: SADC cattle, goat and sheep numbers in million head from 1995 to 2005. *Source: FAOSTAT*

Figure 2 represents the chicken numbers in the SADC region in millions of head for the period 1995 to 2005. From 1995 to 2002, chicken numbers increased by 23.6%, after which the numbers decreased from a high of 345 million animals in 2002 to 320 million animals in 2005.

Policymakers are still emphasizing livestock exports when demand growth and evolving markets suggest that domestic markets may offer greater opportunities, particularly for smallholders. Moreover, while market policies pursue commercialization (strengthening the formal market), most livestock trade occurs between rural households in small transactions in the rapidly developing informal sector. We need to know how these informal livestock markets operate, what opportunities exist in them for the growth of small-scale producers, whether this market can absorb higher numbers of livestock, and, if so, what interventions could stimulate further growth of this market, and how informal markets can be strengthened to complement the formal livestock markets.

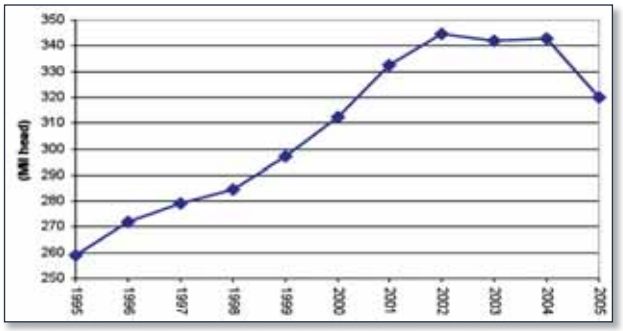


Figure 2: SADC chicken numbers in million head from 1995 to 2005. *Source: FAOSTAT*

Most farming systems in the region are mixed crop-and-livestock enterprises. Growth of the livestock sector will require growth of feed resources. Most of southern Africa already suffers from over-use of natural rangelands. At the same time, land devoted to crop fields is increasing at the cost of grazing. The increased grazing pressure in the remaining rangelands results in further degradation and accelerates livestock feed shortages. The shortages are highest during the late dry season, leading to high rates of livestock mortalities and low-quality livestock products. Southern Africa's feed resources in crop-livestock systems will have to be improved significantly to reduce grazing pressure on rangelands and the subsequent erosion of land, water and biodiversity. We also need to better understand feed / fodder markets so that these may be used more strategically and cost-effectively to maintain livestock productivity throughout the dry season and in times of drought. And we need to understand how feed use trends are influenced by factors such as drought, land degradation, population growth and human population density. While these markets are poorly developed in the small-scale sector of southern Africa, they will become increasingly important as livestock production expands.

Southern Africa 'champions'

One of the approaches ILRI is taking is to obtain the support of individuals agreeing to serve as 'champions' by contributing their different kinds of expertise to an ILRI-Partner Working Group for the region. This group met for the first time with ILRI directors in Gaborone, Botswana, in March 2008 to help identify priorities and opportunities for ILRI's engagement in the region.

Champions Serving in an ILRI/Partner Working Group for Southern Africa

- Southern Africa Development Community: Senior Program Manager for Livestock Bedeeanan Hulman, animal production scientist, based in Gaborone, Botswana.
- South African Agricultural Research Council: Research and Technology Manager for Animal Production Andrew Magadlela, animal nutritionist and specialist in rangeland and forage management and policies, based in Pretoria, South Africa.
- Regional NGO: Regional Director for Practical Action (formerly Intermediate Technology Development Group) Ernest Mupunga, animal scientist and specialist in dairy development, based in Harare, Zimbabwe.

- Private sector / farmer organizations: Betrus Kruger, specialist in rangeland management and livestock and community development, based in Windhoek, Namibia.
- Universities: Senior lecturer in animal and pasture sciences at Fort Hare University of Agriculture Sikhalazo Dube, specialist in GIS, rangeland ecology and management, community-based natural resources management, livestock development and project management, South Africa.

Key research issues for the region

Consultations to date indicate that some of the high-priority research and development issues in the region include the following.

Strategic objective 1: Decrease vulnerability and enhance resilience of people, communities and systems, especially in marginal areas: e.g. develop and introduce local-level decision-making systems, rehabilitate degraded rangelands, promote the use and conservation of adapted indigenous breeds where appropriate, develop and test coping strategies to mitigate the impact of climate change, and facilitate access to markets.

Strategic objective 2: Develop and promote market-oriented smallholder intensification: e.g. promote specialization of selected enterprises such as smallholder dairying where there is comparative advantage, support agribusiness development, promote value addition to primary products, and promote mixed crop-and-livestock production systems, exploring the potential use of dual-purpose food-feed crops.

Strategic objective 3: Improve animal health: e.g. strengthen capacities within animal health institutions, develop infrastructure for improved animal health service delivery (diagnoses, surveillance, control, etc.), support where appropriate any of several on-going initiatives addressing transboundary animal diseases in the region, enhance compatibility between livestock / animal and transfrontier parks, and increase access to markets by promoting food-safety standards.

Cross-cutting Issue 4: Consolidate, maintain and promote use of livestock information systems at local to national to regional levels: e.g. investigate and test the capture and exchange of information and best practices and promote coordination and synergies among different actors in the region while addressing issues of poor access, illiteracy and innumeracy.

ILRI's present portfolio and medium-term plans

ILRI is pursuing two focal research areas. The first area of focus is *improving market opportunities*. This encompasses smallholder competitiveness, institutional analysis and food safety standards. Issues of input supply chains, particularly for animal breeding, feeding and health, will be integrated through this entry point.

The second area of focus is *vulnerability and sustainability*. The region is exposed to a wide range of climatic, economic and disease shocks and also faces global problems such as climate change and emerging diseases. ILRI is partnering other research and development organizations to help identify cost-effective risk-management options that enable poor livestock households to cope with these shocks and enhance their resilience. ILRI also plans to work on conservation and use of animal genetic resources in the region.

Operating principles

ILRI's regional strategy draws from the institute's strategies on key global livestock issues, adapting them to priorities and capacities of the region. The regional agenda is thus an instrument for implementing projects in ILRI's four thematic areas: Targeting and innovation, Enhancing market access, Biotechnology to secure assets, and People, livestock and the environment.

Collaborative mode of operations

ILRI is implementing its research agenda for southern Africa in extensive and on-going consultations and jointly with a wide range of partners, including national research and extension systems, other CGIAR centres, the private sector, NGOs, farmer organizations, universities and regional organizations. ILRI's aim is to develop a livestock research agenda driven by national and regional priorities and determined by stakeholders in the region. The regional agenda is helping advance ILRI's work to fulfill its overarching mission, which is to enhance livestock pathways out of poverty for significant numbers of people.

At the regional level, the Food Agriculture and Natural Resources Directorate in the SADC Secretariat coordinates activities in food security, environment and natural resources management with an overall goal of achieving sustainable access to safe and adequate food at all times by all people in the SADC region. ILRI will continue to facilitate SADC's initiative of developing the region's livestock research and development strategy, following the recommendations of the Livestock Technical Committee in Gaborone, Botswana in April 2008.

Reducing the vulnerability of livestock peoples of southern Africa: Saving lives and livelihoods

In 2006 the Food and Agriculture Organization of the United Nations (FAO), under guidance by staff in its Emergency Operations and Rehabilitation Division, commissioned ILRI to conduct an assessment of the vulnerability of livestock livelihoods in three countries of southern Africa. The report, *Livestock, Livelihoods and Vulnerability in Lesotho, Malawi and Zambia: Designing Livestock Interventions for Emergency Situations,* was finalized in January 2007.

The study identifies drought, animal diseases and declining access to livestock services as key factors contributing to increasing vulnerability to food insecurity in the study areas. These findings are likely to apply to large sections of the population in southern Africa. The study concluded that emergency interventions that help households preserve their livestock assets would have significant payoffs in addressing chronic poverty and vulnerability in southern Africa.

Vulnerability and poverty are key factors in the deepening crisis in food security in many countries in southern Africa. A continuing food crisis in the region, apparent since the early 1990s, underscores southern Africa's food insecurity. A 2005 estimate indicated that more than 10 million people in the region were food insecure. The vulnerability of households to hunger and malnutrition, particularly among the rural poor, is attributed mainly to worsening economic conditions; policy failures; natural disasters such as droughts, floods and crop or livestock disease pandemics; and the devastating high incidence and impact of HIV/AIDS in the region. The cumulative impacts of these shocks threaten the livelihoods of millions of people and reduce the ability of households, communities and governments to manage risks and cope when such shocks occur.

Two things stand out regarding emergency responses to shocks that cause widespread food insecurity. First is that these responses have largely focused on food aid. While distributing food to poor people in crisis is critical in saving lives and reducing suffering, food aid alone provides no long-term development solutions that support the livelihoods of poor people. Second is that donor and

government responses to famines have focused on cropping interventions, often ignoring livestock. This is despite the fact that livestock are crucial to the livelihoods of some 60% of the households in southern Africa. Households that apply negative coping strategies, such as distress sales of livestock assets, to survive a disaster can end up trapping themselves in chronic poverty for years and decades thereafter. Clearly the many central roles livestock play in food security and emergency response have not been fully exploited.

Two factors contribute to the neglect of livestock interventions in emergency response mechanisms. First, there is little systematic research on the role of livestock in household livelihoods, risk management and coping strategies. Consequently, there is little information on the impact of livestock losses on household food security and livelihoods. Second, there remain large gaps between our current understanding of the roles livestock play in livelihoods of the poor and the design of projects and programs to address emergencies.

The ILRI study for FAO aimed to help fill those gaps by assessing the contribution livestock keeping makes to risk management and coping strategies and then identifying livestock interventions that have great potential to save lives and livelihoods in crisis and emergency situations in the selected countries of the Southern Africa Development Community (SADC), where vulnerability to food insecurity appears to be growing with dwindling food stocks and rising prices of staple food.

In assessing the role of livestock in risk management and coping strategies in three countries of southern Africa, this study employed a livelihoods concept that links livestock and other assets to livelihood activities, contexts and outcomes. The study used the widely accepted definition of food security as physical and economic access by all people, at all times to sufficient, safe and nutritious food for an active and healthy life. The study found that livestock play a major role in the livelihood strategies of poor households in the study areas and went on to identify promising livestock-related interventions for emergency situations in southern Africa.

What is 'vulnerability'?

The concept of vulnerability refers to the relationship between poverty, risk and how risk is managed. A household is considered vulnerable if it faces an unacceptability high probability of falling below a socially acceptable benchmark value of welfare such as food consumption or income. Vulnerability depends on household conditions and exposure to risky events. A household's or individual's level of vulnerability is determined by the characteristic of the shock or risk they are facing and their ability to respond to risk over time. Rising vulnerability arises from a combination of increasing occurrence of risky events and diminished ability to cope with adverse trends and shocks. In this study, the vulnerability concept refers to vulnerability to food insecurity, defined as exposure to shocks that undermine access to food.

In many instances, shocks at household level are linked to community-wide shocks, such as when a drought causes widespread crop failure and distress sales of livestock that result in higher food prices and lower livestock prices that turn the terms of trade against rural households. Risk management

activities, such as building livestock herds, growing drought resistant crops or diversifying livelihood activities, can reduce risk or lower exposure to risk. Risk coping activities deal with the losses arising from a shock such as selling livestock, migration and eating fewer meals. The combination of risk and household response leads to outcomes that determine whether an individual or household can succeed or fail to deal with an emergency-induced crisis in food security.

Close connections between household asset positions, their attempts to manage and cope with risks and the resulting outcomes provide the links between a 'livelihoods framework' and emergency response. This conceptual framework is used to identify emergency response options for vulnerable households in emergency situations, drawing largely from case studies in Southern Africa.

Livestock and livelihoods

Lesotho

One of the hotspot districts of Lesotho in this study, Thaba Tseka, lies in the mountains where 80–100% of the population faced income or food deficits of 13–18%. This densely populated area is usually isolated from markets and other services. However, the level of livestock holdings is very high, with less vulnerable households holding fairly large stocks of livestock. Up to 60% of the population is poor, whereas 16% are better off. Lesotho's other hotspot district, Mohale's Hoek, and much of the non-hotspot district of Leribe are located in the foothills, where 80–100% of the population faced food deficit of 8–26% of annual food needs. The area has a higher population density than the mountain regions, and livestock holdings are relatively high, with food-secure households holding large stocks of sheep and goats. Approximately 58% of the population is described by the communities as poor, with nearly 11% considered better off. This area has higher agricultural potential and market access than the mountains.

Malawi

Approximately 348,000 people in the hotspot of Malawi's district of Chikwawa were at risk of having insufficient food to meet their needs from July to September of 2005. At 175,000, the numbers were slightly lower for Nsanje District, the other hotspot district. In the non-hotspot district of Kasungu, the number of people at risk was much lower, at 143,000. In the Lower Shire area, where the hotspot districts are located, land holdings for the 'poor' and 'middle' groups amount to a mere 3–4 acres, with only about 1–3 acres being cultivated. In 2005, household income in this area ranged between Malawi kwacha 10,600 and 11,960. The 'poor' lack farm inputs and they normally subsist on their own farm production through from the harvest in April/May to August.

Zambia

The proportion of household income spent on buying food in Zambia is on the rise, making it increasingly difficult for households to feed themselves. Some 45–47% of the rural population is stunted, while malnutrition affects about 6% of rural households. In 2000, the gross domestic product grew by 3.5%, the agriculture sector by 1.8% and population by 2.9%. In much of the study area, road infrastructure and veterinary infrastructure and services were poor. The poor communications usually constrain access to markets for many of the vulnerable households and communities in this study area.

Who are vulnerable and why?

In southern Africa as elsewhere, some groups are more vulnerable to risks than others. What usually makes the difference are differences in ownership of livestock and other critical assets and differences in the inherent capacity of households, peoples and communities to manage risk. More women than men are vulnerable to food insecurity. Women, particularly the elderly, widowed and divorced women, and female-headed households, were disproportionately represented among vulnerable groups in this study due to lack of key assets such as land and livestock, labour constraints to cultivate their fields, and non-existent or loss of supplementary income from a partner. Such marked gendered differences in asset ownership, asset productivity and livelihood strategies often increase the vulnerability of women to a range of shocks that forces them into chronic poverty. Targeted interventions that provide safety nets and productive fall-back options for such vulnerable groups would enhance the robustness of their livelihoods.

Main sources of risk

Community-wide shocks such as drought, floods, widespread crop failure and animal diseases were ranked highly by households across all locations and in all food security groups.

Drought

The main source of shock facing the sample households is drought. It can be characterized as a slow onset shock with cumulative impacts on household assets and activities that are manifested over time. Community-wide shocks such as crop failure induced by drought can reduce the quantity of assets and productivity. Several countries in southern Africa have set up early warning systems and are now coordinated as a regional system (FEWSNET) under SADC to mitigate the impact of drought. However, taking action or following up on data and information coming out of early warning systems in a timely manner and with the urgency it deserves still remains a challenge in preventing widespread disaster when droughts occur in the region.

Animal diseases

The increasing incidence of animal diseases is an important cause of livestock losses and declining productivity from livestock assets. In each of the three countries studied animal diseases are a big constraint to livestock enterprises, but they often do it in different ways. There are firstly those diseases that affect the fundamental livestock assets of the poor, and some of these can be the cause of shocks while others may exacerbate vulnerability to non-disease shocks. Of particular importance in this category are those diseases that cause high levels of mortality in species of critical importance to livelihoods. This includes, for example, Newcastle disease in poultry: epidemic waves of the disease can wipe out household stocks of poultry. Secondly, there are those that affect market access for livestock products and these fall into two categories: those diseases in which human disease can be caused by consumption of meat or milk products (such as cysticercosis of pigs) and those spread by movement of animals or livestock products, such as foot-and-mouth disease of ruminants and pigs. Thirdly, there are the diseases that constrain improvements in productivity and these include those that are more pathogenic in non-indigenous breeds of livestock increasingly used to

improve performance (such as the tick-borne disease East Coast fever of cattle in Zambia and Malawi).

Lack of veterinary services

Institutional weaknesses in service delivery are a third source of increasing vulnerabilities in southern Africa. In all the case study countries, there was declining public support for livestock advisory and veterinary services and production support for animal husbandry. Where they existed, these services faced serious funding and human resource constraints that reduced their efficacy and accelerated their decline. Limited market opportunity and high transaction costs also meant that private veterinary services were concentrated in areas where risks were low and the returns to investments were high. This uneven delivery of animal health services and production support contributes to the rising vulnerability of large groups of people when there are serious livestock disease outbreaks. What's urgently needed are innovative service delivery instruments that will reduce the cost of access to basic services such as veterinary and animal production services for vulnerable groups. Institutional innovations involving the public and private sector and civil society can provide alternative cost-effective mechanisms for delivering services to vulnerable people. These initiatives, however, should not undermine private-sector response but rather aim at promoting development of private enterprise.

How poor households attempt to recover from shocks

Most households recover from shocks by building up and selling the assets they own and by using their social networks. Households frequently resort to coping strategies that deplete household assets, such as livestock, with severe consequences on their existing and future livelihood. Such negative coping strategies include the distress sale of livestock when a drought hits and the associated loss of access to meat and milk. Distress livestock sales often cause a steep decline in livestock prices and a collapse in household incomes. Food prices also soar because of widespread livestock sales to purchase food. Many households are unable to recover from shocks through replenishing their herds in the aftermath of a drought because livestock prices increase sharply. Female-headed households with limited asset holdings are most likely to suffer from the consequences of negative coping strategies.

Response options to help reduce risk and improve management of vulnerability

Results of the ILRI study indicate that responses made in emergency situations should aim explicitly to help households preserve their livestock assets and avoid coping strategies that deplete critical assets such as livestock. The following more specific recommendations follow from the study findings.

Livelihood analysis and vulnerability assessment

Those designing emergency interventions should consider possible livestock interventions from the perspective of a broad livelihoods framework. This is because households and household members differ in the types of livestock

assets they own or have access to, in how they use their livestock to pursue their diverse livelihood strategies, and in how they use given livestock species to manage risks and cope with crises. Poorer households, for example, rely on chickens to help them cope with disasters while richer households tend to invest in a more diversified livestock portfolio, including small ruminants and cattle to manage risks before shocks occur. Households that depend on migration to cope with emergencies are unlikely to be able to invest in intensive livestock keeping. The design of livestock-based interventions in emergency situations therefore needs to pay detailed attention to household behaviour as well as assets.

Linking livelihood analysis to program design

Specific livestock objectives in emergency situations may include:

- Minimize the selling of livestock assets in a slow onset shock, such as drought.
- Reduce household costs of veterinary and other livestock services.
- Promote commercial destocking and other private-sector responses that help maintain the real value of livestock and stabilize livestock/food prices.

In a slow onset shock such as drought, markets are still functioning in the early drought phase but households are experiencing declining incomes and returns to assets; a primary goal in this phase is to ensure that markets continue functioning effectively with appropriate incentive to the private sector to drive commercial destocking activities at relatively stable prices. During the acute phase of a drought emergency, response goals should focus on directly minimizing the risk of distress livestock sales and loss of livestock assets and avoiding irreversible depletion of household assets. In a rapid onset emergency, the primary goal is timely response to minimize the risk of distress livestock sales and loss of livestock assets.

Implications for FAO emergency programs

The study concluded that the following actions would help FAO and its partners strengthen their efforts in responding effectively to food emergencies.

- Preserve livestock assets during emergencies and promote livestock in targeted safety net programs and poverty reduction strategies.
- Institutionalize use of early warning systems to improve the timing and effectiveness of interventions and investigate the feasibility of a weather-based livestock insurance scheme for the region.
- Integrate findings from this analysis into emergency needs assessments; indicators of distress livestock sales and staple food and livestock prices may provide early warnings as to when certain populations are slipping into chronic vulnerability.
- Define relations among livelihoods analysis and emergency program design and implementation. The first step for the stakeholders would be mapping emergency interventions to key livelihood components.
- Attend to the details of how emergency interventions are designed, programmed and implemented.

Livestock interventions to pilot

The following interventions should enable FAO and its partners to improve livestock interventions to save lives and livelihoods in emergencies.

1. Establish index-based livestock insurance to mitigate the impacts of drought

High livestock mortality from drought is a major cause of food insecurity. Traditional mechanisms for ensuring oneself against climatic shocks have collapsed in the face of increasingly frequent and intense climatic shocks. It is expected that climate change will exacerbate these shocks, with severe harm to poorer countries and peoples. Traditional livestock insurance mechanisms can and should be complemented with more robust mechanisms that effectively insure the poor against drought. The creation of insurance markets for events such as drought, the likelihood of which can be precisely calculated and associated to a well-defined index, is increasingly being promoted as a way to offer the benefits of insurance to poor communities. Though index-based insurance is not a novel idea, several attempts have been made recently to design and offer such products in developing countries. Index-based livestock insurance programs have been tried in Mongolia and the World Food Program is testing their feasibility in Ethiopia. The lessons from the Ethiopia pilot study are instructive for gauging the utility of index insurance in protecting vulnerable African populations against disaster. A first step in southern African would be to pilot-test index-based livestock insurance in one of the case study countries.

2. Improve animal health

Development of a more functional classification and prioritization of animal diseases is essential for all three countries surveyed in this study. This classification should be made on the basis of the three major ways animal diseases impact the very poor. These are:

- Diseases that affect the fundamental assets and vulnerability of poor households; these diseases cause either high mortality in species of particular importance to the poor or illness in their keepers.
- Diseases that constrain improvements in livestock productivity or performance.
- Diseases that constrain market access for livestock products; these include diseases that cause human disease through consumption of unhealthy meat or milk and diseases spread by the movement of animals or livestock products.

3. Improve livestock delivery services

Alternative ways of delivering animal health services to poor households is needed because the traditional veterinary service infrastructure fails to meet the needs of vulnerable households. The study proposes development and pilot-testing of voucher systems that would make vulnerable households eligible for free delivery of certain services, such as vaccination to prevent diseases such as Newcastle disease, advice on management and nutrition, and therapeutic treatments for ecto- and endoparasites.

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Coping strategies and endgames

When do livestock enterprises become sustainable pathways out of poverty and when do they trap people in impoverished conditions? That is what a group of scientists set out to learn in an 'integrated assessment' of coping strategies in livestock dependent households in eastern and southern Africa. Integrated assessment combines models to test the likely impacts of different future scenarios on ecological functioning as well as household well-being.

The ILRI and partner authors of this study, 'Coping strategies in livestock-dependent households in East and southern Africa: A synthesis of four case studies', published in *Human Ecology* in 2007, synthesized results of work undertaken in four livestock systems in eastern and southern Africa: pastoralist communities in northern Tanzania, agro-pastoralists in southern Kenya, communal and commercial ranchers in South Africa, and mixed crop-and-livestock farmers in western Kenya.

The results of this study confirm that household capacity to adapt to increasing external stresses is governed by the flexibility the householders exercise in livelihood options. Such options include intensifying one's crop and animal production, diversifying the kinds of plant and animal products one produces on the farm, and working for wages in a job found off the farm. The researchers quantified the likely impacts on households and ecosystems of people taking up such options. The results are being used to better target interventions designed to help poor people manage increasing change and risk.

This paper synthesizes lessons learnt from these case studies and outlines future research needs.

Conclusions

The good news

The four case studies used in this synthesis indicate that households can partially offset the impacts of external stresses by increasing the size of cultivated plots (as pastoral communities are doing in northern Tanzania and agro-pastoral communities in southern Kenya), by diversifying their activities into other agricultural and nonagricultural activities (agro-pastoral communities

in southern Kenya), by using climate forecasts to make stocking decisions (communal and commercial ranchers in drought-prone regions of South Africa), and by intensifying and/or diversifying agricultural production (mixed crop-livestock farmers in western Kenya).

The bad news
Although households are able to offset impacts of increasing stress to some degree through diversification and intensification, implementing these options generates costs such as reduced tourism due to increased cultivation in the Ngorongoro Conservation Area of northern Tanzania, crashing wildlife populations in Kenya's Kajiado District, decreasing grassland productivity in both the commercial and communal sectors of South Africa's Northwest Province, and declining soil fertility in Kenya's Vihiga District.

'What this simply means', says ILRI's Philip Thornton, ILRI systems analyst and lead author of the synthesis, 'is that there are thresholds in these systems beyond which it is unlikely that management options alone can offset increasing system stresses.'

Thornton says the integrated assessment framework is useful in identifying not only what is desirable, in terms of possible impacts on different groups of stakeholders, but also what is feasible. 'Given increasing system stresses,' he says, 'the point may well be reached at which natural-resource-based livelihood options are simply no longer feasible.'

Indeed, a key use of integrated assessment is identifying situations where households are unlikely to be able to sustain current livelihood options based on exploitation of natural resources. In such cases, appropriate livelihood options will likely involve making radical rather than incremental shifts in agricultural and/or livestock productivity, finding off-farm employment, and exiting farming enterprises altogether.

The news for policymakers
All four case studies analyzed in this synthesis have substantial implications for policymaking. Among these are the following.

(1) The new options that poor households need to consider when adapting to change do not impinge merely on one or two economic sectors but rather strike at the heart of national policies for food security, self-sufficiency and the role of agriculture in economic growth and development in general. Such policy debates can be enhanced by research.

(2) Policymakers can profit from demanding, supporting and using broad integrated assessments that apply new approaches to development. Such approaches include those based on the principles of 'integrated natural resources management', 'adaptive resource management' and 'adaptive governance of resilience'.

(3) Poorer people have the most to gain from implementing options that increase household ability to cope with change. Investments in developing and disseminating coping strategies and risk management options thus can help alleviate poverty in substantial ways.

(4) Householders' objectives and their attitudes about, and access to, natural resources vary greatly. The type of household model best suited to each case will thus often differ, requiring that integrated assessments be done on a case-by-case basis. As Thornton says, 'So-called "recommendation domains" for targeting technology and policy interventions are probably smaller than we thought.' Acknowledging that, contrary to conventional wisdom, research impacts cannot easily be generalized across large areas has considerable implications for the way in which research for development can most effectively be carried out.

(5) We need to employ a dynamic framework to assess the ecological impacts of changes, together with their major feedbacks to livelihood systems, over the medium term at the least. There are lags and dampers in the system that need to be elucidated in any even partially integrated assessment.

(6) The assessment framework has to allow the quantification of major trade-offs so that decision-makers and stakeholders can visualize impacts of different actions on different parties.

(7) Although the integrated assessments employed in these case studies have limitations that should be addressed in further work, such assessments have a key role to play not only in quantifying trade-offs but also in identifying what is both desirable and feasible in highly complex systems. Integrated assessments, in other words, can help establish the outer limits within which agricultural research can reasonably be expected to contribute to improving and sustaining livelihoods in given situations.

Sub-Saharan Africa has been called the food crisis epicentre of the world. Global change is likely to add to the burdens of many millions of poor and vulnerable people on the continent. Equipping policymakers and donor agents with tools and information with which to identify the 'bounds of the possible' in natural resource use is likely to become crucial in the fight to help hundreds of millions of Africans dependent on diminishing natural resources escape poverty, hunger and environmental degradation.

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Commercializing livestock markets in drought-prone southern Africa

'Livestock and livelihoods: Improving market participation by small-scale livestock producers' is a collaborative project to improve the incomes and livelihoods of small-scale farmers in the ubiquitous drought-prone mixed crop-and-livestock systems of southern Africa. In these southern drylands, livestock keeping conducted in tandem with crop production is more ecologically suitable and offers better opportunities for poverty alleviation than crop farming alone. This project works to help governments and agencies determine and implement the market incentives that enable subsistence cattle and goat producers to move to a more commercial orientation, with better management of their crop-livestock systems, resulting in higher production and livestock off-take rates.

The project works with farmers, traders and other service providers to encourage such commercialization. It conducts diagnostic surveys to identify the potential for, and constraints to, increasing livestock production in each area. It evaluates alternative systems for livestock marketing and input delivery and selects, refines and disseminates best-bet interventions. Pilot activities are targeting three countries: Mozambique, Namibia and Zimbabwe. This project is being implemented by a consortium of partners including national research and extension services, farmers, NGOs, the private sector, and ICRISAT and ILRI.

Over 60% of the region within the Southern African Development Community (SADC) is semi-arid and prone to drought. Although the drier areas are most suited to livestock production, food security is defined largely in terms of crop yields and research and extension focuses on crops rather than livestock. This project works to strengthen food security and income growth among smallholder farmers through the commercialization of the livestock production within their crop-livestock farming systems.

Livestock farmers: The project focuses on drought-prone areas with high poverty levels. Crop production is important in these areas and contributes to food security. However, crops have limited potential to alleviate poverty in these dry ecosystems; livestock have greater potential to generate and

diversify income, but that has not been fully exploited. Project outputs will feed directly into the investment strategies of the Poverty Reduction Strategy Papers in the target countries and can also be adapted and applied to several other SADC countries with similar agro-ecologies. The project agenda complements the agendas of SADC-RISPD 1 (Regional Indicative Strategic Development Plan) and PRINT 2 (Promotion of Regional Integration in the SADC Livestock Sector).

Traders and market intermediaries: Traders and other market intermediaries are crucial in facilitating increased livestock off-take. In the absence of effective public-sector infrastructure and services, they provide critical services to small-scale livestock producers. For example, traders often reduce transaction costs and thus increase farmers' incomes and profits; they reduce uncertainty and risk by offering market channels. Input suppliers provide information on animal health and nutrition as well as inputs. Traders provide information on standards/grades, price and demand. Increasing the institutional and technical capacity of traders will thus directly benefit farmers and the local economy.

Policymakers: Appropriate, supportive policies are essential to mainstream livestock production in the national and regional development agendas of southern Africa. The project will provide information, technical and capacity-building support to policymakers to assist the development of an enabling policy environment for smallholder livestock producers.

This 'Livestock Livelihoods' project, dubbed 'LiLi by its members, is working to find ways to encourage small-scale livestock producers to shift from extensive production practices towards more commercially oriented intensive practices. What helps make this happen are more direct links between extension and input delivery and marketing strategies. Project staff will match the best available technologies with a series of pilot marketing efforts targeting the commercialization of low-input systems. In the process, they will help empower farmers to choose and find technology options for improving the productivity of their crop-livestock systems while pursuing better prices based on high-quality grades. Public investments in research and extension will be matched with private investments in market expansion.

This project is beginning with experimental 'market-led technology change' programs in three SADC countries: Mozambique, Namibia and Zimbabwe. Two pilot activities linking production technologies and product markets are being implemented in each country by a team of national scientists, NGOs, private traders and international research centres. Continuous and systematic monitoring and evaluation will ensure that the lessons learned during the pilot phase are discussed in a regional forum for potential wider application in other SADC countries.

The following are the specific objectives of the Lili project.

1. Evaluate constraints to, and opportunities for, commercializing smallholder production of goats and cattle

A series of inter-linked diagnostic surveys are being made to identify the constraints and opportunities of commercializing smallholder goat and cattle production in the three target countries. The surveys are measuring current and potential levels of livestock productivity and off-take and identifying the socio-economic and biophysical factors limiting commercialization. They are also helping project staff to identify key stakeholders in selected livestock value chains and to understand their methods of operation, their differing needs, and their demands for information. This will provide a better understanding of the institutional linkages influencing technology flows and marketing decisions. In this work and dialogue, project staff are working explicitly to engage different stakeholders, promote interest in the project, and engender a sense of 'ownership' among farmers, extension agents and traders. Finally, the surveys will create a baseline for measuring the impacts of the project.

2. Test and evaluate alternative product marketing systems

Six pilot programs are being evaluated, two in each target country. The planning, design and implementation of these pilot programs are building on the analysis of institutional relationships to understand mechanisms for engaging different types of stakeholders. Each pilot project is testing strategies for increasing the number and quality of animals sold by improving technology dissemination and product marketing. There will be planned interventions on product markets. Each of the case studies will be facilitated, monitored and evaluated using a value chain approach.

Technical and organizational constraints for each segment of the value chain in these market systems is being analyzed using the framework below.

- Production: farmers' livestock assets, off-take and investment in livestock production (including feed and fodder), accessibility of livestock markets and information, comparative advantages of formal and informal market channels and feed systems.
- Transportation and intermediary services: transfer and marketing costs, transport facilities, types of organization and activities (supply of credit, information, contacts, transport, moderate negotiations, advocacy, linkages to regional/cross-border markets).
- Processing: abattoir standards and capacity, distribution and utilization, links to direct production and sale.
- Wholesaling: establishment of private sector, development of market channels, competitiveness in international markets.
- Retailing: establishment of private companies, development of market channels, information on market trends.
- Consumption: consumer demands (product quality, diversity, service); impact of income, urbanization and population growth; willingness to pay for product development.

3. Evaluate the impact of market-led technology change on incomes and poverty

Input delivery systems are limited in all three target countries. Public and private investments concentrate on farmers who are already relatively commercialized. The costs of reaching the more numerous smallholder community are high and budgets are tight. This project is addressing this constraint by more closely linking extension advice and input delivery with selected product market interventions.

The project is conducting an initial inventory of the range of technologies being promoted for smallholder production systems in each country and then identifying a subset of proven technologies for more intensive promotion. The inventory takes the following under consideration.

- Feed supply, including technologies for drought mitigation: improving quality of rangeland, improving the use and quality of crop residues, dual-purpose crops, fodder crops, agro-industrial byproducts, bio-processing feeds, and the availability and cost of manufactured feeds.
- Animal health: control of diseases that endanger household subsistence, limit market opportunities or limit livestock-based intensification of farming systems.
- Animal genetic resources: conservation of adapted breeds, especially in terms of disease resistance and drought tolerance, as well as improved milk production and meat quality.
- Access to information and know-how: biological processes, management practices (feed and fodder processing, animal husbandry), new technology, markets and prices, institutional processes and requirements.
- Development of social capital: development of local and social structures and innovative social organizations to improve local-level efficiency of input systems.

The final choice of 'best-bet' technologies will be derived from the analysis and dialogue, especially with farmers and traders, but it is expected that the technologies will include a cross-section of feed and veterinary options. There may also be scope for improving genetic stock and strengthening community institutions.

4. Test and evaluate alternative input delivery systems

Two types of impact assessment will be conducted.

- Direct impacts of project interventions on household welfare, institutional arrangements, and the environment will be measured.
- Policy implications of broader commercialization of smallholder livestock systems will be explored with a multi-market trade model.

Household welfare gains will be measured using a range of criteria relating to income growth, food security and equity. Surveys will be conducted to assess the adoption of new technologies and the effect on the level and quantity of animal off-take. Enterprise budget analysis will be used to assess the profitability of the technologies being adopted. The analysis of direct income gains will be linked with assessment of food security benefits. In particular, the distributive impacts of these interventions will be assessed to determine if most of the gains are being captured by a few wealthier farmers or if farmers

with smallholdings are also benefiting. This project is ambitious to target the most gains to the poorer and more vulnerable households and to the women in them.

LiLi's measurement of environmental benefits will consider how the technologies and market interventions contribute to the levels and quality of soil and water resources. The project will determine whether and which farmers respond to improved markets by holding larger numbers of animals in limited areas or whether they make investments to improve their land and water resources.

5. Establish an effective communication strategy

The project will test two sets of communication strategies—one for improving communication with farmers on technology and market opportunities and a second one for improving the quality of policy analysis in government livestock units. These will be developed in collaboration with the SADC Communication for Development Center and other partners.

Partners *International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)*

Namibia: *DRFN*
Directorate of Agricultural Research and Training
Directorate of Extension and Engineering Services
MeatCo
The Namibia National Farmers' Union

Mozambique: *Agricultural Research Institute of Mozambique (IIAM)*
NGOs

Zimbabwe: *Department of Agricultural Research and Extension*
Department of Livestock Development and Practical Action (formerly Intermediate Technology Development Group, ITDG)

Livestock-based adaptations to climate change

In May 2008 ILRI began a transdisciplinary project to increase the adaptive capacity of agro-pastoralists in Africa to climate variability and change. This project proposes to help smallholder farmers and pastoral herders increase their adaptive capacity to climate variability and change. This project is co-generating with many other actors ways to cope with, and adapt to, climate change and variability in Mali and other West African countries and Mozambique and other countries with southern Africa.

The project is estimating the effects of climate variability and change on the primary productivity of crops, rangelands and livestock. It is making an inventory of agro-pastoral coping mechanisms to deal with climate variability and pilot-testing livestock-based technological adaptations. It is identifying policy entry points and increasing awareness of the likely impacts of climate variability and change.

This project is particularly ambitious to understand the wealth of indigenous coping mechanisms employed by agro-pastoral communities and to link this knowledge with other information to derive lessons of what works, what doesn't and what the information gaps are. The project will determine the magnitude of the impacts of climate change on rangelands, crops and livestock and identify hotspots of vulnerability.

Africa is likely to be particularly badly affected by climate change. Nearly a third of the planet's 1.3 billion poor people live there and 60% of these poor people are dependent on livestock for some part of their livelihoods. Most of these people practice forms of 'agro-pastoralism', small-scale rain-fed mixed crop-and-livestock production or pastoralism. Climate change is likely to have major impacts on poor livestock keepers and on the ecosystems on which they depend. These impacts include changes in the productivity of rain-fed crops and forages, reduced water availability and more widespread water shortages, and changing severity and distribution of important human, livestock and crop diseases.

Overall, warming and drying may reduce crop yields by 10 to 20% to 2050, but there are places where losses in yield and net primary productivity may be much more severe. In addition, increasing frequencies of heat stress, drought and flooding events will hurt crop and livestock productivity over and above the impacts due to changes in mean variables alone. Many African countries are more vulnerable to climate change impacts than developed countries because of the more limited capacity of developing countries to adapt to change. And climate change is but one driver of change: human population will increase in Africa by nearly 1 billion people to 2050; rapid urbanization is expected to continue throughout the continent; and the global demand for livestock products is expected to continue to increase significantly in the coming decades. The development challenges that Africa faces are already considerable; climate change simply, and importantly, adds to these.

Livestock are a crucial coping mechanism in variable environments, so as climate variability increases, our domesticated animals become more important. Despite the central role that livestock play in coping with risk and providing livelihood options, there is surprisingly little knowledge about the interactions of climate with other drivers of change in livestock-based systems. There is much more information available on cropping systems' responses. The outputs of this project will help redress this imbalance.

Partners *Africa Union / Interafrican Bureau for Animal Resources*

German Institute for Tropical and Subtropical Agriculture

Institut d'Economie Rurale du Mali (IER)

Instituto de Investigacoes Agrarias de Mozambique (IIAM)

Potsdam-Institut fuer Klimafolgenforschung (PIK)

Funder *GTZ / BMZ*

Early detection, response and surveillance for avian influenza in Africa

Highly-pathogenic avian influenza (HPAI) was first detected in Hong Kong in 1997. Caused by a type A influenza virus (of the subtype referred to as H5N1), the disease was reported sporadically in China and Vietnam over the next few years. In 2003, HPAI spread first across Southeast Asia and then Southern Asia and Europe.

Both the disease and the control measures taken during outbreaks can devastate flocks of poultry kept for family consumption or commercial purposes, hurting the livelihoods of poultry owners. By the end of April 2008, 241 people, many of them from Indonesia, had died of avian influenza infections transmitted from poultry.

The first case of HPAI confirmed in Africa occurred in February 2006 in Nigeria. Since then it has spread to 11 other African countries. Egypt and Nigeria continue to experience active disease, likely indicating endemic HPAI. There has been a widespread distribution of detections in West Africa, so it is likely that the virus continues to circulate there although there have been no reports from the sub-region since December 2007. As of April 2008, AI had killed 22 people in Egypt and 1 person in Nigeria.

Given the rapid spread of HPAI across the globe, and the potential for the disease to transform into a pandemic through transmission from person to person as well as between animals and from animals to humans, a quick response was needed. Identification of HPAI in African poultry flocks was a wake-up call for both veterinary and public health services in the region about the importance of functional animal health surveillance systems. Only these systems can detect transboundary livestock diseases early enough for governments to mount rapid and effective responses. And only these systems can protect the public from zoonotic diseases, which can be transmitted between people and animals.

In response to the global spread of HPAI, several projects were put in place quickly by both international organizations and donors. The Office of Global Health of the United States Agency for International Development (USAID) developed a portfolio of projects to address various issues associated with a potential pandemic. For example, in response to the unclear but increasingly alarming scenario in Indonesia, the United Nations Food and Agriculture Organization (FAO), with the assistance of experts from Tufts University, put into place a program in participatory disease surveillance (PDS) for avian influenza, starting in January 2006. Within months, the PDS Indonesia program brought to light the extensive and endemic nature of HPAI in the country.

ILRI's first response as a research institute was to engage global experts to identify key research needs related to HPAI and to analyze the potential livelihood impacts of disease-control measures in the developing world. Based on these findings, ILRI brought together a multi-disciplinary team for tackling emerging and transboundary diseases. The team takes advantage of ILRI's available expertise in epidemiology, economics and risk assessment. In addition, ILRI brought in new expertise in the area of participatory epidemiology with direct experience in its application to HPAI in Indonesia.

The ILRI team has identified key lessons from experiences with PDS in Indonesia, in the context of over 15 years of application of participatory epidemiology to several transboundary diseases in multiple socio-political contexts. First, it is recognized that PDS has proven to be a useful tool for diagnosing and tracing HPAI outbreaks. Second, the rapid implementation of any approach to disease surveillance without the full participation of national stakeholders can lead to a parallel system of report management. Third, where disease control options are unidentified and unavailable, surveillance systems are ineffective. (And when the system becomes an exercise in disease documentation, leading to no action to control the disease, surveillance practitioners quickly become demoralized.)

In response to these findings, and with USAID Indonesia support, ILRI has implemented a program in operational research with two objectives: to evaluate the feasibility and impact

of the implementation of alternative control strategies for HPAI in the context of Indonesia, and to assess risk factors for Indonesian HPAI outbreaks and collect information on transmission dynamics through targeted research.

This project is contributing to USAID's avian influenza program in southern Africa by supporting surveillance practitioners and by mapping risk factors potentially associated with HPAI.

Knowledge gaps and scale of the problem

There is a dearth of information regarding the epidemiology of HPAI in Africa. Risk factors for disease introduction and spread are hypothesized based on experience from Asia. Yet research is calling into question the conventional wisdom on which these assumptions are based and indicating that knowledge about risk factors for HPAI in Asia is not directly transferable to Africa. Detailed epidemiological intelligence on disease outbreaks and prevalence is scant. An epidemiological understanding of potential sanitary weak links along the poultry value chain will allow for targeted surveillance designed for early disease detection and reporting to local and international animal health systems. Some of the most urgent other knowledge gaps include how best to reduce disease risk, manage disease and reach with communications all stakeholders / decision-makers, from farmers to heads of states.

When HPAI outbreaks occurred in the late 1990s in Asia, it was predicted that it could spread across the world to the Middle East, Europe and to Africa via migrations of susceptible wild birds and/or movements of poultry. In 2003 outbreaks became widespread in Southeast Asia and spread across South Asia into Europe. In early 2006, the

first outbreaks were detected in West Africa, in Nigeria, followed by Niger, Cameroon, Burkina Faso and Cote d'Ivoire. Outbreaks also occurred in early 2006 in Egypt, Sudan and Djibouti. Many of these outbreaks were apparently fairly localized and resolved within a few months, but outbreaks persisted in Nigeria until October 2007. From November 2007 to date, there have been reports of suspected outbreaks, which upon investigation turned out not to be HPAI. HPAI persists in Egypt. In 2007, Togo, Benin and Ghana also experienced outbreaks. It has affected all poultry sectors, from backyard to commercial systems, as well as wild birds.

It has been difficult to establish the mode of introduction of the virus to Africa because of limited capacity in some countries to investigate disease, limited information on illegal movements of poultry or poultry products and delays in disease reporting of initial outbreaks. International trade in live poultry has been implicated as the source of the virus, but recent research suggests that there have been many introductions into Nigeria of strains more common in wild than domestic birds, so the possibility of introduction by migrating wild birds cannot be ruled out. The mode of spread within countries and within regions is most likely to be through formal and informal trade in live poultry and poultry products. The common practice of open live bird (wet) markets is likely to be a major route of spread.

Remarkably, more than 85% of the rural households in sub-Saharan Africa keep one or more poultry species, usually in extensive backyard systems. Unlike other livestock species, poultry are commonly the domain of women. The relative importance of intensive poultry production versus extensive backyard production varies between countries depending on the level of development of the poultry industry. In Nigeria 40% of production is commercial and 60% backyard. For small-scale farmers, poultry are a source of income from sales of birds and eggs and a vital source of protein (20% of meat consumed in sub-Saharan Africa is from poultry), especially for children, pregnant or lactating women and people affected by HIV/AIDs, as well as key to major social and cultural practices. Many actors are involved in the poultry sector along the value chain, from breeders to sellers of roasted poultry meat.

The impacts of HPAI on the poultry sector are not only direct, in the form of poultry deaths, but also indirect, such as when an outbreak lowers demand and thus prices of birds or when farmers must abide by movement restrictions and bio-security measures implemented by control programs. The disease has hit poorer smallholder poultry keepers hardest, particularly those keeping 50 or more birds, for whom income from poultry is an important part of their livelihood; women dependent on sales of eggs and birds for their survival strategies; and children and sick people who need and don't get the essential nutrients poultry provide.

Institutional capacity

National bodies are charged with surveillance and control for a range of diseases, and efforts to reduce the risk of HPAI to lives and livelihoods must compete for limited public-sector human and material resources in developing countries. A recent technical study ILRI conducted for the World Animal Health Organisation (OIE) found that, of the 119 chief veterinary officers out of 172 OIE member countries that responded to the survey, avian influenza ranked third in priority amongst diseases targeted by official nationally mandated programs, coming after foot-and-mouth disease and Newcastle disease. Of zoonotic diseases, avian influenza ranked fifth in importance, after brucellosis, rabies, tuberculosis and salmonellosis.

Veterinary schools and trained veterinarians are a particularly limited resource. The same ILRI survey found that in countries likely to be targeted in this project, the average number of farming households per animal health professional (including all public and private veterinarians, para-veterinarians and community animal health workers) is 4,081. The average number of farming households per veterinarian is 12,897. This compares with 10 farm households per animal health professional and 18 per veterinarian in the United States. Overall, according to the FAO database FAOSTAT, sub-Saharan Africa's 14.9% of the world's farmers and 14.6% of the world's farm animals have, according to the OIE database, only 2% of the world's veterinarians, very few of whom are in private practice.

The focus of many animal health HPAI programs in Africa has been on training of animal health personnel, but because human capacity is

limited, the same very limited set of veterinarians from target countries attend the different training programs. Often, the same individuals will be trained in conflicting methods and approaches by different organizations. Laboratory capacity, in both human and resource terms, is similarly limited, calling into question capacity and timeliness in terms of sample analysis. Regional animal health organizations and institutions, led by the African Union-Interafrican Bureau for Animal Resources (AU-IBAR), are a primary gateway to working with national institutions and must be a partner in any program focused on HPAI surveillance and response. However, as representative organizations of developing countries, their limited resources must also be recognized and supported.

In Western countries there exist public and private monitoring systems for animal, feed and food product quality and safety attributes that might be employed in HPAI detection. This is not the case in Africa, where value chains are more diffuse, generate far less information and do not feature enforceable accountability through mechanisms such as traceability. Moreover, many African animal product handling procedures may pre-dispose to cross-contamination and other problems. In these regards, Asia may be considered an intermediate case. Similarly, border controls, particularly for the poultry and poultry product value chain, are not easily enforced, while capacity and enforcement for sanitary and phytosanitary (SPS) measures in private industry are weak.

Project concept and approach

This transformational project addresses this problem by using risk-based approaches (risk mapping, value chain analysis, risk assessment) to create tools and train decision-makers in their use to achieve national, sub-regional and regional targeting of scarce surveillance resources to areas of greatest risk for HPAI introduction, establishment of endemicity and livelihood impact.

At the national level, ILRI will partner with a range of national, sub-national, academic, community, and/or business organizations. By using a value chain approach, ILRI will work with local partners to strengthen surveillance systems that integrate conventional and participatory methods to provide information usable to a diversity of stakeholders, to inform decision-makers about effective entry points for interventions, and to identify and target high-risk areas for disease control. Since poultry products do not necessarily enter the marketing system, particularly when most owners run backyard operations for family consumption, active surveillance techniques (including participatory disease surveillance approaches) are particularly important.

Using evidence-based risk assessment approaches for targeting surveillance resources is unique and transformational to this project. Risk-based approaches to resource targeting (such as surveillance resources or disease-control resources) allow decisions to be made on the basis of the impact and likelihood of disease rather than fear of disease.

ILRI and its partners are focusing on the following.

- To improve capacity for risk-based approaches to targeting surveillance resources for rapid response to HPAI.
- To improve national surveillance and reporting capacity in general, with a focus on Nigeria and Uganda.
- To enable sub-regional cooperation and coordination, and regional support, to undertake HPAI investigations, report disease and manage HPAI relevant information.

Partners *Africa Union-Interafrican Bureau for Animal Resources (AU-IBAR)*

East African Community (EAC)

Economic Community of West African States (ECOWAS)

Food and Agriculture Organization of the United Nations (FAO)

Regional Animal Health Centers (RAHCs) located in Bamako, Mali; Gaborone, Botswana; and Nairobi, Kenya

Southern Africa Development Community (SADC)

Vétérinaires Sans Frontières-Belgium (VSF-B) West Africa

Funder *United States Agency for International Development (USAID)*

Foot-and-mouth disease global 'roadmap' is launched to help developing-country farmers

A 'Global Roadmap for Improving the Tools to Control Foot-and-Mouth Disease in Endemic Settings' was launched in April 2007 at the headquarters of the United Nations Food and Agriculture Organization (FAO), in Rome. This ILRI study worked towards 'a world in which livestock-based livelihoods, enterprises and trade can flourish unimpeded by foot-and-mouth disease'. The roadmap focuses on the outputs of a workshop held in Agra, India, in December 2006.

Efficacious vaccines, strategically deployed, have revolutionized control of many infectious human and animal diseases. For foot-and-mouth disease (FMD), which severely constrains the welfare of millions of small-scale livestock farmers in the developing world, currently available vaccines do not meet many of the basic requirements necessary for sustainable control. FMD continues to be a persistent constraint to livestock production throughout the developing world. It can significantly reduce production of milk and meat and limits the ability of draft animals to work.

According to John McDermott, deputy director general for research at ILRI, 'FMD is a major obstacle to productivity and market access in many of ILRI's target regions, particularly South Asia, the Horn of Africa and southern Africa. It severely limits market opportunities for poor farmers and nations wishing to access more lucrative markets, both regionally and internationally.'

'FMD also can increase the vulnerability of small-scale farmers in mixed cropping systems where animal traction is important. For example, in Southeast Asia where rice is a staple, people are heavily reliant on water buffalo for ploughing. An FMD outbreak leaves the buffalo open to secondary infections, putting these valuable (and highly valued) animals out of action for a very long time.'

Former ILRI scientist Brian Perry, who collaborates with ILRI on this and other projects, says, 'There is an urgent and long overdue need to address the special research needs of poor people in endemic FMD settings. Current research on vaccines and associated tools for the control of FMD is driven more by the needs of relatively rich FMD-free countries, which are dealing with and eliminating incursions of the disease, than by the needs of relatively poor countries where FMD is endemic, which are interested in longer-term management and control of the disease.'

According to VK Taneja, deputy director general of animal science at Indian Council for Agricultural Research, which hosted the workshop, 'Livestock production in India is growing faster than arable agriculture. The value of output from the livestock sector has risen over the years and is now 26% of the total value of output from agriculture. It is predicted that livestock will contribute more than half of the total agricultural output in the next 25–30 years.'

'One of the biggest impediments to growth of the livestock sector is the large-scale prevalence of FMD', says Taneja. 'In most Asian countries, FMD is endemic and severely limits the region's ability to participate in international trade. Developmental strategies for control and eradication of FMD—including improving existing conventional vaccines and diagnostics for their quality and efficacy—will pave the way for the improved growth and productivity of livestock, especially in small-farm production systems, and for ensuring their participation and access to global markets.'

While the economic losses associated with major outbreaks of FMD in industrial countries, notably in Europe in 2001, grabbed world headlines, the disease continues to cause enormous, recurrent losses across large swathes of Asia, Africa, the Middle East and South America.

'The direct losses alone due to FMD in India are estimated to be more than US$4.5 billion per year; indirect production losses could be much more', says Dr R Venkataramanan, principal scientist at the Indian Veterinary Research Institute, in Bangalore.

The roadmap report recognizes that vaccines currently available for the control of FMD are not

ideal for use in many developing countries. To remain effective, they must be kept under constant refrigeration, so the protection they offer is better suited to the needs of FMD-free countries rather than countries where the disease is a constant and daily threat. It will take considerable time to develop and make available new improved vaccines suitable for developing country-conditions. In the meantime, much can be done with current vaccines and diagnostics, especially if their use is complemented with sound epidemiological and economic decision-support tools to guide and facilitate their effective use.

The Global Roadmap workshop in Agra focused on four areas:

- science needs of novel FMD vaccines
- design of vaccines and diagnostics appropriate for endemic FMD settings
- development of enabling technologies for vaccines and diagnostics
- 'people and processes'—who would be involved and how

The roadmap is the inaugural activity of Program Two of the Global Foot and Mouth Research Alliance (GFRA). GFRA was launched in 2003 by a consortium of six institutions—the Institute for Animal Health, UK; the Plum Island Animal Disease Centre, USA; the United States Department for Agriculture-Agricultural Research Service; the National Centre for Foreign Animal Disease, Canada; the Australian Animal Health Laboratory and Commonwealth, Scientific and Industrial Research Organisation; and ILRI, in Kenya. The aim of the Alliance is to develop new-generation vaccines and associated technologies for the control of FMD. Whilst the main goal of the Alliance's Programme One is to deliver products to better manage incursions of the disease into FMD-free settings, Programme Two aims to facilitate development of technologies for the wider control of FMD in endemic settings.

Partners *Indian Council of Agricultural Research*

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ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE
www.ilri.org P O Box 30709 Nairobi 00100 Kenya