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Agribusiness Competitiveness
Applying Analytics, Typology, and Measurements to Africa

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ABSTRACT

Agribusiness has a major role to play in the transformation of the agricultural sector in Africa. With the demand for high-value food products increasing around the world, the production and export of these goods represents an opportunity to achieve increases in income and employment. To capture the benefits of this trend and capitalize on this opportunity for long-term agricultural growth, agribusiness in Africa must become more competitive. In addition to improving competitiveness, increasing agricultural productivity and food security are also major challenges in African agricultural development. In this paper, we compare the agribusiness competitiveness of African countries and develop typologies connected with their food security and agricultural productivity status. The typologies reveal various stylized facts on the competitiveness of agribusiness to help nations prioritize issues for agricultural development and growth. We develop the measures of agribusiness competitiveness and apply them to African countries. Additionally, we present policy implications and lessons for increasing the competitiveness of agribusiness in African countries.

Keywords: agribusiness competitiveness, measurements, typology, Africa

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1. INTRODUCTION

Despite strong growth trends over the past decade, the trade competitiveness of African countries is among the lowest in the world. The Global Competitiveness Index indicates that while some countries, such as Côte d'Ivoire and Ethiopia, have made progress through institutional strengthening, others have experienced stagnation or a decline in competitiveness (WEF 2015a). Because most African countries are agrarian, competitiveness in agriculture is a major contributor to this low overall competitiveness.

The agricultural sector in Africa is dominated by a variety of staple food crops (such as maize, rice, sorghum, millet, cassava, yams, and sweet potatoes) and a few traditional cash crops (such as coffee, cotton, cocoa, oil palm, sugar, tea, and tobacco). The sector is also characterized by a high percentage of smallholder farmers (80 percent) cultivating low-yield staple food crops on small plots with minimal use of inputs. Net exports/imports of grains (rice, maize, and wheat) across the various regions of Africa show a rapidly growing dependence on imported staple grains. Despite improvements in agricultural productivity, agricultural imports are increasing, primarily due to the suboptimal functioning of food production, supply, and consumption systems (AGRA 2016; WEF 2015b).

In this context, agribusiness and value chain development can play a major role in transforming the trade potential of Africa. Success in the trade of agricultural products, relative to competitors in the international markets, can help farmers increase their income and improve livelihoods. Agribusiness development can generate employment and help retain youth in the agricultural sector. Although certain African countries have been able to develop some sustainable value chains, most them have a long way to go.

In fact, many studies argue that while farm agricultural output in African countries is competitive, the opportunity for value addition is quite constrained (Esterhuizen 2006; Sefoko, Van Rooyen, and Ndanga 2008). Most crops grown are produced by small-sized farms with limited mechanization and capacity, leading to poor yields. Fragmented markets, price controls, and poor infrastructure also hamper production. Policy makers often focus on ways to increase agricultural productivity, but it is important to ensure that

gains from productivity increases actually benefit the population. Agribusiness competitiveness, which is closely linked to productivity, provides one avenue. Food security is another related issue that concerns developing countries. Most African countries move in and out of food crisis, with vulnerable populations affected the most.

Hence, policy makers face a three-pronged challenge of achieving food security, increasing agribusiness competitiveness, and boosting the productivity of the agricultural sector. Determining the attention and budget allocation for each of these issues often poses a dilemma. Should a country focus on increasing its competitiveness in specific products while it has food insecurity? Is high agricultural productivity a prerequisite for agribusiness competitiveness and food security? How do these issues interact with each other across time? Can we rely on the nonagricultural sector to increase agricultural competitiveness? How can nations sustain competitive advantage for agricultural products?

In this paper, we answer these questions by undertaking a comprehensive review of agribusiness competitiveness in Africa and by applying the micro and macro measures of agribusiness competitiveness to measure the agribusiness competitiveness of African countries. Through our analysis, we explore the relationship between agribusiness competitiveness, agricultural productivity, and food security. The following section presents the conceptual framework of the paper, based on a detailed literature review of the definitions of competitiveness and its relevance to the African agribusiness sector in the context of the Sustainable Development Goals. This section also presents a classification of countries based on its level of agribusiness competitiveness, agricultural productivity, and food security. Section 3 presents an application of our framework and typology to the African context. We present different measures of agribusiness competitiveness, and clarify the distinction between agribusiness competitiveness and agricultural competitiveness. In section 4, we present the results and discuss our findings in detail. Section 5, delves into policy implications and lessons for African countries. In the final section, we conclude by summarizing our findings and highlighting areas for further research.

2. CONCEPTUAL FRAMEWORK AND COUNTRY TYPOLOGY

To analyze agribusiness competitiveness in Africa, we must first understand what a competitive system is. This section builds the theoretical basis for our analysis and presents a conceptual framework to inform our analytical methods and findings.

In economics, competitiveness is defined at both the micro and macro level. *At the microeconomic (firm) level*, the understanding of competitiveness is “the ability of firms to consistently and profitably produce products that meet the requirements of an open market in terms of price [and] quality” (Domazet 2012, 294–295). Competitiveness at the firm level is closely related to the long-run profit performance of the firm and higher return on investment for owners (Yap 2004). Wijnands et al. (2008, 3) define firm competitiveness as the “ability to produce products/services that people will purchase over those of competitors.”

In comparison, at the macroeconomic level, competitiveness is much more poorly defined. Garelli (2012) establishes a link between the two levels by suggesting that firms are responsible for creating economic value, while nations create an environment that encourages firms to achieve this value. The most widely accepted definition today is the one provided by the World Economic Forum (WEF), defining national competitiveness as the “set of institutions, policies and factors that determine the level of productivity of a country” (2015b, 4). It is interesting, however, that an earlier WEF report identified competitiveness as a country’s ability to achieve high rates of growth in GDP per capita consistently (WEF 1996). This old definition reflects the early thinking on competitiveness, though GDP (gross domestic product) per capita is used even today as an index measuring competitiveness in WEF’s reports.

In the context of agribusiness, we define competitiveness at the micro level as a firm’s ability to constantly produce agricultural products to meet the demand of the open market. At the macro level, a nation’s policies, institutions, infrastructure (physical and human), and resource endowment determine its competitiveness in agribusiness. An important caveat here is that competitive advantage can be either absolute or relative. An absolute advantage in agribusiness will enable nations (and firms) to produce a

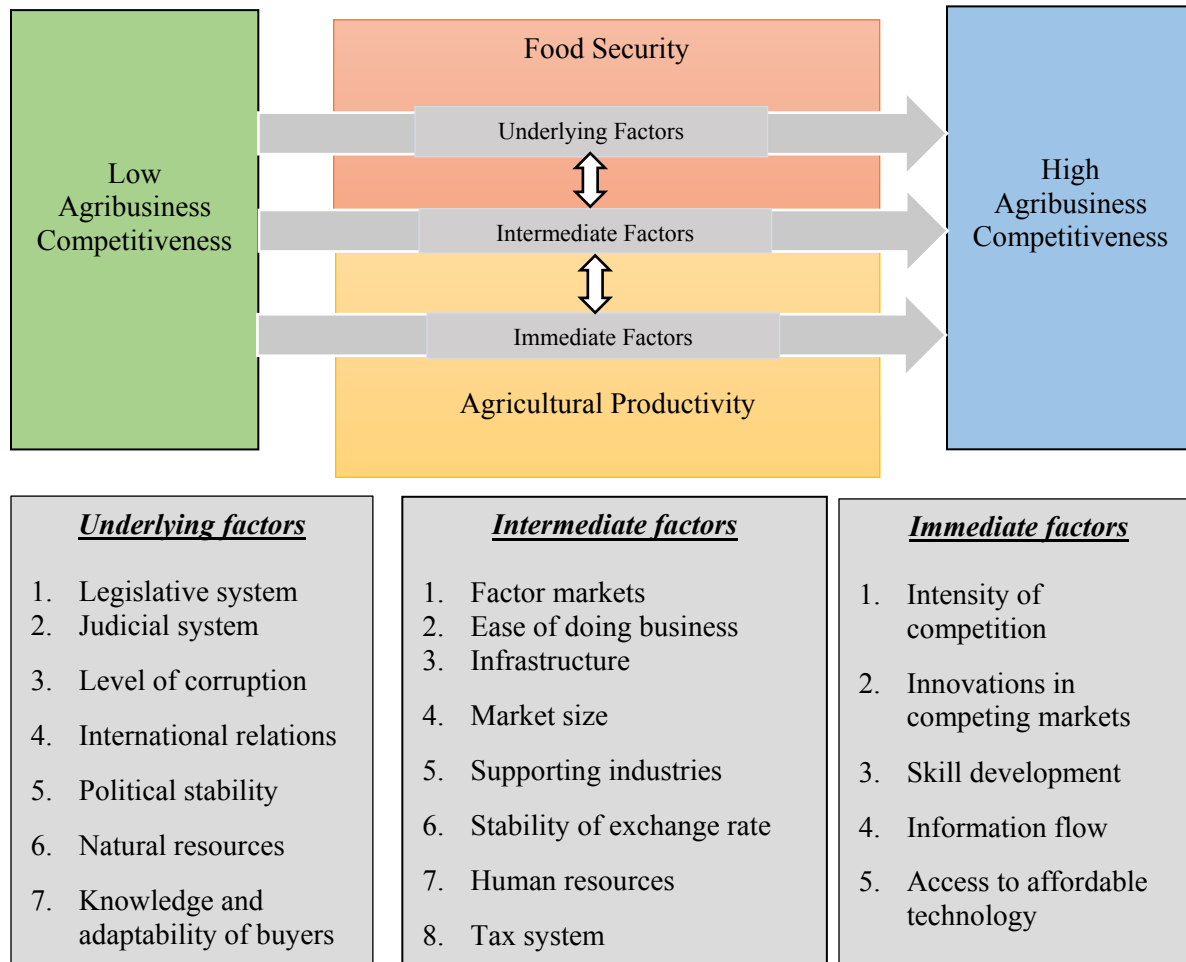
greater quantity and quality of goods, using the same stock of resources, whereas a relative advantage would mean nations (and firms) have an advantage only because of their ability to produce certain crops. For instance, Ethiopia is the largest producer of teff in world and hence has a relative advantage. With the grain gaining popularity, other countries such as the United States have started developing teff production domestically (World Grain 2015). As Ethiopia lifts its export ban on the grain, it will need to develop the productivity of the teff value chain to have an absolute advantage in production (Demeke and Marcantonio 2013). In this paper, we are interested in understanding how countries can increase the absolute competitive advantage of their agribusiness sectors. With greater competitiveness, nations can increase their income, growth, and employment, because a transformed (commercialized) agricultural sector can contribute to the structural transformation of a nation.

In this paper, we look at the interplay between agribusiness competitiveness, food security, and agricultural productivity. Further, we analyze the factors that move nations from low competitiveness in agribusiness to high competitiveness. Figure 2.1 illustrates the transformation process.

We argue that a nation can transform its agribusiness sector from one with low competitiveness to one with high competitiveness through three categories of factors: underlying factors, intermediate factors, and immediate factors. Based on our experience working in developing countries, we find that *underlying factors* are those that take about 10 or more years to change. Factors such as a country's political economy, governance, and buyers' sophistication belong to this category. This category includes the legislative system, the judicial system, the level of corruption, international relations, political stability, natural resources, the knowledge and adaptability of buyers, and trust in the political system. *Intermediate factors* include those that take about 5 to 10 years to change. Factors such as the labor market, input-output markets, ease of doing business, infrastructure, market size, supporting industries, the stability of the exchange rate, the competence of human resources, the tax system, enforcement of legislation, and investment in research and innovation fall into this category. *Immediate factors* include those that take about 2 to 5 years to change. Factors such as intensity of competition, innovations in competing markets, skill development, information

flow, access to affordable technology, regulation, and access to finance are included in this category. The intensity with which each factor affects competitiveness differs with the country and context.

Figure 2.1 Transformation of agribusiness competitiveness of nations



Source: Authors' compilation based on Jambor and Babu (2016).

These factors have an influence on each other and on the entire food system. Further, food security and agricultural productivity are important facilitators for these factors that can transform the agribusiness sector. In other words, it is important for a nation to have food security and high agricultural productivity in order to realize its full agribusiness potential. Most studies analyze agribusiness competitiveness by applying Porter's model to the experience of different value chains. While this model is useful in understanding subsectors, it often overlooks the idea of making the entire agribusiness system more

competitive. Through our framework, we examine the causal links and identify policies that target the competitiveness of the entire agribusiness system.

Another way to think about measuring competitiveness is to identify the theoretical relationship between agribusiness competitiveness, agricultural transformation, and structural transformation. We argue that the competitiveness of the agricultural sector is an important ingredient in enabling the economic transformation of a country. Once the agricultural sector has achieved its potential, it provides a solid base to grow the manufacturing and services sectors, allowing for a smoother transition to economic prosperity.

Currently, due to the large number of smallholder farmers, subsistence agriculture is the mainstay of the majority of African countries' agricultural sectors. Subsistence farmers usually have few resources and use traditional technology with a high level of manual labor. This leads to low productivity, low agricultural yields, and a low standard of living. Subsistence farmers are often the most vulnerable to weather changes and fall in and out of poverty throughout the year. At the same time, African food systems are also experiencing a "quiet revolution" in their supply chains, with an increase in the number of agribusiness enterprises across the continent. Several examples, such as Karuturi Global Limited for production and export of cut roses from Kenya and Ethiopia, Bakhresa grain millers in Tanzania, Pioneer Foods Group selling cereals and juice products in South Africa, and Zartech chicken producers in Nigeria, testify to the success of agribusiness enterprises in Africa (Badiane and Makombe 2015).

With increasing urbanization and the creation of a large middle class, the potential for agribusiness growth is enormous. Further, Diao et al. (2010, 1) argue that "there is little evidence to suggest that these [African] countries can bypass a broad-based agricultural revolution to successfully launch their economic transformations." In fact, the authors show that immediate growth in the industrial sector is unlikely to be substantial or inclusive for most African countries. Because agricultural growth cannot be bypassed, transformation of the agricultural sector is essential. Transformed agriculture is characterized by specialized production, technology-intensive practices, and commercial farming systems. We argue that for agricultural transformation, a focus on agriculture competitiveness is necessary. Countries must leverage returns from agricultural products that they have a comparative advantage in producing. If many other countries can

produce the same agricultural product, the home country should invest in developing its value chain for processing or using such agricultural produce in making other products. Another option in this case could be to export surplus agricultural produce to other countries that have competitive value chains for it. This would enable countries to specialize in products they are good at producing, and import the others to remain food secure.

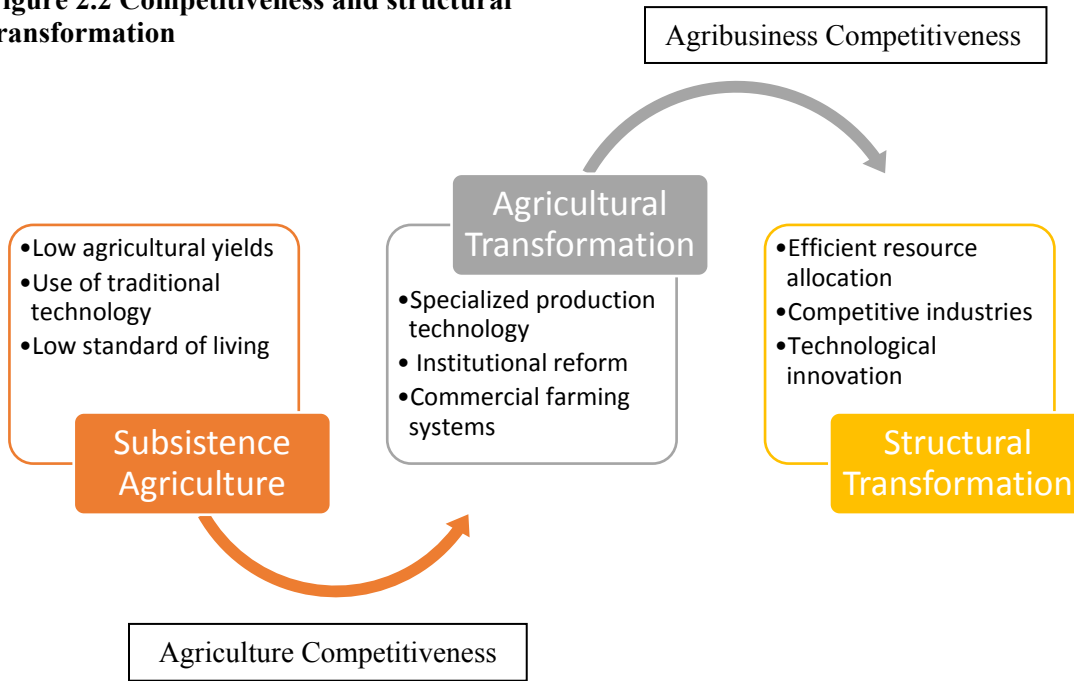
A strategic focus on building competitiveness is very important for countries making these decisions. A focus on competitiveness also helps achieve other outcomes—such as increasing productivity, improving livelihoods, and increasing stability in markets—that facilitate agricultural transformation. Additionally, productivity and competitiveness require efficient allocation of resources. Finally, focusing on competitiveness also forces countries to collectively maintain internal peace, for the stability of international markets. These benefits of agriculture competitiveness are all necessary to achieve agricultural transformation.

As a country moves from agriculture to industry, and finally to a service-sector-driven economy, the competitiveness of the agribusiness sector must be improved. Developing agribusiness competitiveness provides for a natural progression toward development of the industrial and service sectors.

Figure 2.2 shows how structural transformation takes place in agriculture-based economies (like those of most developing countries) and what role agricultural and agribusiness competitiveness play in enabling it. A country starts with subsistence agriculture, which is characterized by low agricultural yields, use of traditional technology, and a low standard of living. To experience agricultural transformation, the country must gain *agriculture competitiveness*. This second stage is characterized by specialized production technology, institutional reform, and commercial farming systems. During this stage, countries typically produce a few agricultural products that are competitive on international markets. For further development and structural transformation, countries need to increase their *agribusiness competitiveness*. In this third stage, countries tend to move beyond agriculture, toward manufacturing and services. During this phase, agribusiness development plays an important role in paving the way for the manufacturing sector, and thus enabling structural transformation. As shown in this figure, agricultural and agribusiness competitiveness

are important facilitators of economic transformation. It must be noted, however, that although the competitiveness of the agricultural sector is an important facilitator of the transformation process, it is by no means the only factor enabling it.

Figure 2.2 Competitiveness and structural transformation



Source: Authors' compilation.

In Africa, most countries are at the first and second stages described in the framework. This means there is both scope and need for the agricultural sector to develop further before African countries can experience structural transformation. It should be noted that the same country can be at different stages for different agricultural products. For instance, Kenya's flower agribusiness is competitive but its dairy value chain is not. Measuring agribusiness competitiveness can help policy makers understand the gaps in the agricultural sector and highlight the areas in which there is potential for growth.

This conceptual framework, which provides an understanding of the pathway toward structural transformation, forms the basis of our analysis. The framework describes the importance of agribusiness competitiveness; however, to apply it, we need to develop a way to measure and compare the

competitiveness of different countries. Below, we review various methods of measuring competitiveness and develop our own measure of agribusiness competitiveness and apply it to the African context.

Typology of Countries

Based on the conceptual framework introduced above, in this section we present a classification of African nations based on their agribusiness competitiveness, using existing data. The typologies presented below shed light on the relationship between agribusiness competitiveness, food security, and agricultural productivity. We measure agribusiness competitiveness using evidence from existing literature. Each of the components has been measured using the latest secondary data available.

To measure agribusiness competitiveness, we take the average of each country's global competitiveness score, measured using WEFs Global Competitiveness Index, the Ballasa index for agriculture competitiveness (Jambor and Babu 2016), and the aggregated distance-to-frontier score of the Doing Business indicators (World Bank 2016). A simple average ensures that all subcomponents are given equal weight, resulting in a comprehensive measure for agribusiness competitiveness (Babu and Shishodia 2017). For food security, we use data from the Global Food Security Index prepared by the Economist Intelligence Unit (EIU 2016). The index scores countries based on three pillars: affordability, availability, and quality and safety of food, as per the internationally accepted definition of food security established at the World Food Summit in 1996. Finally, we use the results presented in a recent book that ranks agricultural productivity in African countries using World Bank data (Benin 2016). The countries' rankings are based on partial and total factor productivity.

Table 2.1 ranks African nations' food security and agribusiness competitiveness on a relative scale of low, medium, and high based on terciles. We find that seven countries have low agriculture competitiveness and low food security, while only South Africa has both high agribusiness competitiveness and high food security. We find that medium agribusiness competitiveness and low food security accounts for the largest number of observations in the table. Some countries, such as Botswana, Tunisia, Ghana, Uganda, and Algeria, have medium food security and medium agribusiness competitiveness, thus

demonstrating immense potential for increased agribusiness competitiveness. Other studies have shown that even though Botswana is competitive in beef production, there is great potential to increase the sector's profitability by reducing feed prices and other input costs (Bahta and Baker 2015). Nations in this category must transform their agricultural sector by increasing mechanization and commercialization. These countries need greater investment in both food security and agribusiness competitiveness. They need to strategically decide the composition of crops that should be grown to improve food security and agribusiness competitiveness and implement policies to promote the cultivation of these crops and value chain development.

Countries such as Rwanda and Kenya exhibit low food security and high agribusiness competitiveness. Although Rwanda has made considerable socioeconomic progress since the 1994 genocide, challenges with household food insecurity and malnutrition remain. More than 43 percent of childhood deaths in the country are attributed to malnutrition, and 44 percent of children under the age of five years are stunted. The major cause of children's chronic malnutrition in Rwanda is the inadequate quantity and quality of food consumed at the household level. Similarly, Kenya faces challenges in ensuring adequate food availability and access. Seasonal difficulties in accessing adequate food persist for both Kenya and Rwanda. At the same time, Kenya is highly competitive in horticulture and dairy, while Rwanda is competitive in coffee and tea production. Food insecurity along with relatively high agribusiness competitiveness shows how gains from trade are not used effectively to improve the welfare of the nation. Hence, countries in this category need greater government intervention to improve the allocation of resources.

Table 2.1 Food security and agribusiness competitiveness

Food Security				
Agribusiness Competitiveness	Degree	Low	Medium	High
	Low	Guinea, Niger, Burkina Faso, Burundi, Democratic Republic of the Congo, Nigeria, Togo		
	Medium	Senegal, Madagascar, Côte d'Ivoire, Tanzania, Zambia, Ethiopia, Nigeria, Benin, Mozambique, Mali, Malawi, Cameroon	Botswana, Tunisia, Ghana, Uganda, Algeria	
	High	Rwanda, Kenya	Morocco, Egypt	South Africa

Source: Authors' compilation using Economist Intelligence Unit data (EIU 2016).

Table 2.2 ranks countries based on their agricultural productivity and agribusiness competitiveness. Most African countries have low agricultural productivity and low agribusiness competitiveness, showing that these nations have a long way to go in these areas. For countries with low agricultural productivity, gains from agribusiness competitiveness will be limited. Productivity gains through increased mechanization and commercialization of agriculture are important for countries in these categories. However, increases in agricultural productivity must come from intensification rather than exploitation of additional natural resources. Agricultural systems must use natural resources more efficiently and repair past damage to ecosystems.

Table 2.2 Agricultural productivity and agribusiness competitiveness

Agricultural Productivity				
Agribusiness Competitiveness	Degree	Low	Medium	High
	Low	Seychelles, Zimbabwe, São Tomé and Príncipe, Liberia, Guinea, Burundi, Algeria, Chad, Djibouti, Mauritania, Democratic Republic of the Congo	Chad, Central African Republic, Togo	Niger, Burkina Faso
	Medium	Lesotho, Senegal, Namibia, Madagascar, Tunisia, Uganda, Mozambique, Mali, Botswana	Egypt, Gabon, Nigeria, Gambia, Malawi, Côte d'Ivoire, Zambia, Tanzania	Benin, Cameroon, Ghana, Ethiopia
	High	Morocco, Mauritius	South Africa	Kenya, Rwanda

Source: Authors' compilation using Benin (2016).

Although most countries with low agricultural productivity show low agribusiness competitiveness as well, it is important to note the case of countries such as Morocco and Mauritius. They show high agribusiness competitiveness with low agricultural productivity. This is plausible, as agricultural productivity accounts for all the crops grown in a country, using a given amount of land and labor resources. That said, one cannot deny that that two concepts are closely interlinked, and increased agricultural productivity contributes to agribusiness competitiveness.

Low productivity in the agricultural sector discourages private investment and value chain development for certain crops. Kenyan wheat production is one such example. Due to low agricultural productivity, the country relies on wheat imports, limiting the scope for agribusiness development in the wheat value chain. Similarly, low productivity of indigenous crops also provides an opportunity for agribusiness development.

It is important to note here that the rankings presented are relative. Hence, they do not imply that countries like South Africa, with high agribusiness competitiveness and food security, are perfect in these dimensions. It only means that they are better off relative to the other African nations.

The typology presented above shows that most African nations have low agribusiness competitiveness, food security, and agricultural productivity. In fact, low food security is a more widespread issue than low agricultural productivity. While some value chains, such as dairy, horticulture, coffee, and tea, have played a major role in improving agribusiness competitiveness in certain countries, low agricultural productivity will limit the gains.

3. AN APPLICATION TO AFRICAN COUNTRIES

Despite strong growth over the past decade, the trade competitiveness of African countries is among the lowest in the world (WEF 2015a). The Global Competitiveness Index created by WEF indicates that while some countries, such as Côte d'Ivoire and Ethiopia, have increased the competitiveness of their economies, while others have experienced stagnation or decline. Much of Africa south of the Sahara, for instance, has been on a steady decline in this regard (WEF 2015b). Infrastructure deficits, low levels of health and education outcomes, and weak institutions emerge as the common reasons for low competitiveness in global agricultural trade by African countries. Since agriculture employs more than half of the continent's population, greater competitiveness in agriculture and trade would not only boost economic growth but also support the needed structural transformation. It will allow factors of production to move away from agriculture to the service sector (Labaste and Webber 2009).

Agriculture in Africa is dominated by staple crops such as, maize, rice, sorghum, millet, cassava, yams, and sweet potatoes, and a few traditional cash crops such as coffee, cotton, cocoa, oil palm, sugar, tea, and tobacco. However, there are large variations in competitiveness across crops and countries. Furthermore, the African agricultural sector is characterized by a high percentage of smallholder farmers (80 percent) cultivating low-yield staple food crops on small plots with minimal use of modern inputs (Rapsomanikis 2015). Additionally, postharvest losses in Africa south of the Sahara are worth more than US\$4 billion each year (WEF 2015a). Among other things, a high percentage of smallholders and high postharvest losses make the continent's food production, supply, and consumption systems function suboptimally. African countries import staple food valued at about US\$25 billion annually (Byerlee et al. 2013). Value addition and processing of agricultural commodities crops are also quite low across the continent (Lopes 2014).

In this context, agribusiness and value chain development can play a major role in transforming African agriculture. Success in trade of processed agricultural products, relative to competitors in the international markets, can help farmers increase their income and improve livelihoods. Increased

competitiveness would also push farmers to innovate and find ways to increase their productive capacity. Although some African countries could develop competitive value chains, most of them have a long way to go. Many studies argue that while farm-level agricultural output in African countries is competitive, the opportunity for value addition is quite constrained (Esterhuizen 2006; Esterhuizen et al. 2008).

While there have been several efforts to measure agribusiness competitiveness, they have been restricted to country-specific or value-chain-specific analysis. The World Bank's Enabling the Business of Agriculture project has developed a cross-country measure on the business environment for agriculture; however, it focuses primarily on measuring the extent of regulations and laws affecting agribusiness. Agribusiness competitiveness is a broader concept and depends on the productivity and efficiency of agricultural value chains.

Increasing the agribusiness competitiveness of developing countries is key to the growth of their economies, but this issue raises several questions. What makes agribusiness competitive in a country? How does it relate to food security and poverty within the country? How can we measure agribusiness competitiveness? How can policy makers use measures of agribusiness competitiveness for strategic decision making? We address these questions by developing an understanding of competitiveness in the context of Africa and measuring it.

In what follows we develop an indicator for agribusiness competitiveness that enables objective comparisons across countries and time. This indicator could also help policy makers make strategic decisions on value chain development. Applying it to the African context, we rank countries on their agribusiness competitiveness scores and suggest ways in which their position can be improved.

Methods for Measuring Agribusiness Competitiveness

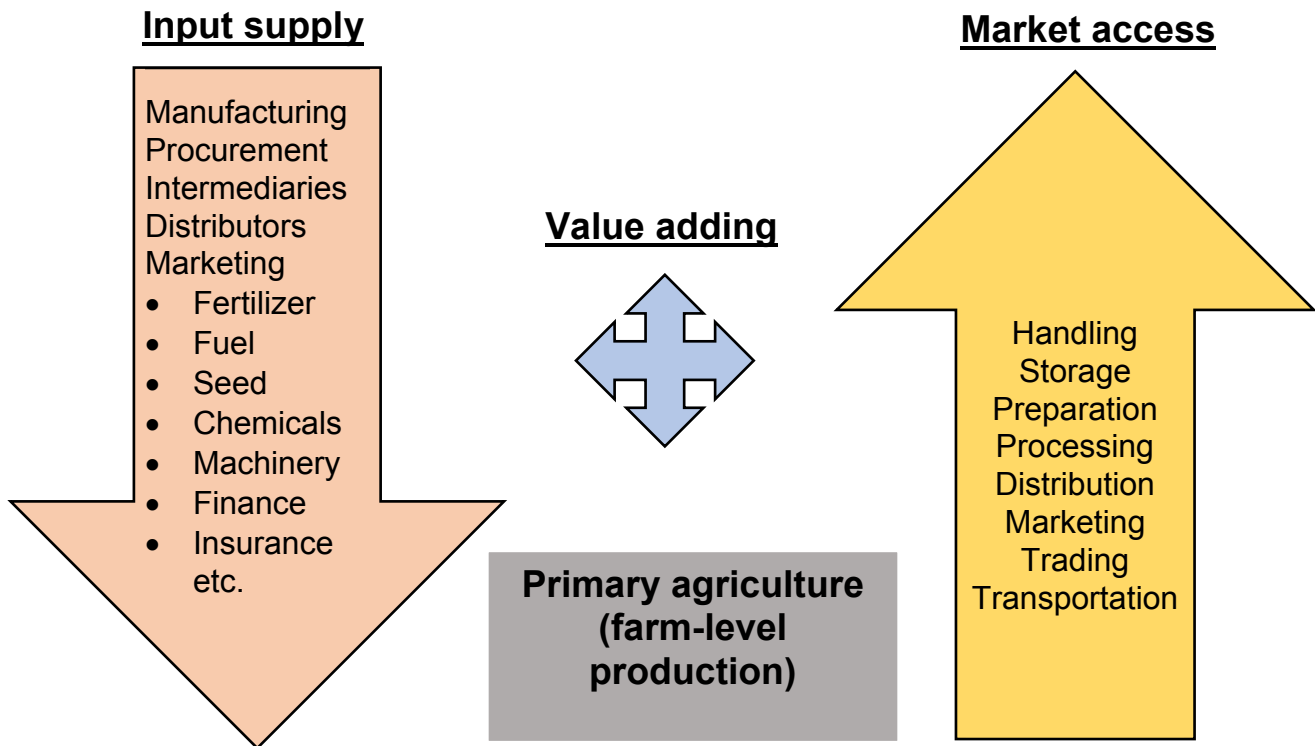
Because the concept of competitiveness lacks a universally accepted definition, its measurement remains a contentious issue. Siudek and Zawojka (2014) provide a comprehensive overview of the various methods of measuring competitiveness at the global, macro, meso, and micro levels. The Global Competitiveness Index, developed by WEF, is the most comprehensive multidimensional measure of competitiveness,

comprising dimensions such as institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation. More details on the Global Competitiveness Index will be presented later in the chapter. Further, competitiveness can be measured as a static concept or a dynamic one (WEF 2015b). As a static concept, it is measured at a point in time, and in its dynamic form it involves assessment of competitiveness over time. Additionally, competitiveness indicators can be positive or normative. While positive indicators are based on observable evidence, normative indicators involve some level of value judgment. Similarly, competitiveness measures can be ex post or ex ante. Ex post measures are based on past performance and include market share and current account balance. Ex ante measures determine the capacity for competitiveness based on technology, prices, and cost (Siudek and Zawojaska 2014). Hence, competitiveness measurement involves many different approaches that vary with the unit of analysis. A range of indicators have been devised to measure competitiveness; however, comparing them is a serious challenge.

In the case of agribusiness competitiveness, it is important to have a supply chain focus. This means that competitiveness should be measured at every stage at which value is added to the agribusiness product (Esterhuizen 2006). There are several instances in which the agricultural product may be competitive at one stage of the supply chain but less competitive at another.

The first step in measuring the competitiveness of the agribusiness sector involves defining what comprises the sector. This is important to ensure that all related firms that add value in producing the final agro-product are included in the calculation. Esterhuizen (2006) provides a good overview of agribusiness definitions. Figure 3.1 defines the agribusiness sector based on its varied functions. This definition can be used as starting point for analysis of agribusiness competitiveness.

Figure 3.1 Functions of the agribusiness sector



Source: ABC (2000).

Below we present some of the traditionally used methods of measuring competitiveness and discuss their application to the agribusiness context. The macro- and micro-level measures presented below have been adapted from a forthcoming publication by Jambor and Babu (2016).

Micro-Level Measures

The simplest way to measure the competitiveness of a firm is based on *traditional financial indicators* such as profitability growth; return on assets (ROA); return on equity (ROE); and earnings before interest, taxes, depreciation, and amortization (EBITDA). The comparison of these widely known and accepted indicators gives a comprehensive picture of the competitive positions of selected firms.

In line with the concept of competitiveness on the micro (or firm) level, another popular group of measures is related to *production costs*. The domestic resource cost (DRC) ratio, for instance, compares the opportunity cost of domestic production with its associated value added (Gorton and Davidova 2001). In

other words, the DRC compares the value of domestic resources used to produce one unit of good with the value of the good if exported. It is defined as follows:

$$DRC_j = \frac{\sum_{l=k+1}^n a_{jl} P_l^D}{P_j^B - \sum_{l=1}^k a_{jl} P_l^B}, \quad (1)$$

where a_{jl} is the quantity of the l -th traded input, if $l = 1$ to k , or nontraded input, if $l = k + 1$ to n , used to produce one unit of the j -th commodity; P_l^D is the domestic price of the l -th input; P_j^B is the border price of the j -th commodity; and P_l^B is the border price of the l -th input (Latruffe 2010). If the DRC is greater than 0 and less than 1, it means production of that commodity is internationally competitive. In other words, the opportunity cost of domestic production is less than the value added of output at world prices. Some researchers also suggested the use of bilateral resource cost (BRC), private cost ratio (PCR), and social cost-benefit ratio (SCB) indexes to measure firm-level competitiveness. More on this can be found in Masters and Winter-Nelson (1995). Unit labor costs (ULC) are also widely used in the literature, and are defined as the cost of labor required to produce one unit of output (Felipe and Kumar 2011). On the whole, cost ratios assess cost differentials among firms, and they vary based on the structure and strategy of the firm (Latruffe 2010).

Another group of measures that captures firm-level competitiveness relates to *profitability*. Although the ways profitability is defined vary from study to study, Harrison and Kennedy (1997) suggest that profitability and competitiveness are closely related due to market shares. *Productivity* and *efficiency* are also often cited as indicators of firm-level competitiveness in the literature, although no explicit reference in the papers is made to competitiveness. The most comprehensive measure used in this regard is total factor productivity (TFP), defined as an index of total outputs over total inputs. As its definition suggests, TFP is used to measure how efficiently a firm uses total inputs to produce its outputs. Latruffe (2010) provides an excellent overview on the various methods of measuring productivity and efficiency

related to firm-level competitiveness. Bahta and Malope (2014) use efficiency measures to assess the competitiveness of livestock systems in Botswana.

Macro-Level Measures

Macro-level competitiveness is usually measured using international trade indexes. There are various basic measures that capture simple export and import values and the trade balance, such as terms of trade, unit values, trade concentration, net export index, and so on.

However, the index most widely used in measuring the agribusiness competitiveness of nations is *revealed comparative advantage* (RCA), calculating a country's export share of a single agro-commodity to all agricultural commodities compared to the similar share of a group of countries. Balassa (1965) expressed this as follows:

$$RCA_{ij} = \left(\frac{X_{ij}}{X_{it}} \right) / \left(\frac{X_{nj}}{X_{nt}} \right), \quad (2)$$

where x stands for export, i for a given country, j for a given product, t for a group of products, and n for a group of countries. If the RCA index is greater than 1, the given country has a comparative advantage in a given product group.

The RCA index is criticized because it neglects the effects of economic policies and provides asymmetric values. Trade structures are distorted by various government interventions and trade limitations. The asymmetric value of the Balassa index extends from 1 to infinity if a country has a comparative advantage, and between 0 and 1 in case of a disadvantage, resulting in an overestimation of the sector's relative weight.

To tackle the problems cited above, Vollrath (1991) suggests three different specifications of RCA, namely, the index of relative import advantage (RMA), the index of relative trade advantage (RTA), and the index of revealed competitiveness (RC). The RMA index is like the RCA, but taking imports rather than exports into account:

$$RMA_{ij} = \left(\frac{M_{ij}}{M_{it}} \right) / \left(\frac{M_{nj}}{M_{nt}} \right) \quad (3)$$

Unlike the RCA, an RMA index of less than 1 indicates revealed comparative advantage and thus higher competitiveness. The second index proposed by Vollrath (1991) takes the difference between (2) and (3), giving a more complex view:

$$RTA_{ij} = RXA_{ij} - RMA_{ij} \quad (4)$$

A positive value for RTA shows revealed comparative advantage. As a third index, Vollrath (1991) proposes taking the logarithm of RMA and then calculating their difference, resulting in the index of revealed competitiveness (RC):

$$RC_{ij} = \ln RXA_{ij} - \ln RMA_{ij} \quad (5)$$

A positive value for RC means revealed competitiveness, and this indicator, compared to Vollrath's other indexes, is symmetric to the pole.

Another way of treating the asymmetric value problem of the RCA index is developed by Dalum, Laursen, and Villumsen (1998), who transform the original index as follows, thereby creating the revealed symmetric comparative advantage (RSCA) index:

$$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1) \quad (6)$$

The RSCA takes values between -1 and 1, with values between 0 and 1 indicating a comparative export advantage and a disadvantage otherwise. Yu, Cai, and Leung (2009) also transformed the original index to treat asymmetric values and to assess the dynamics of comparative advantages. Their normalized revealed comparative advantage (NRCA) index is defined as follows:

$$NRCA_{ij} = \frac{X_{ij}}{E_i E_j X_{ij}} - \frac{(E_i X_{ij})(E_j X_{ij})}{(E_i E_j X_{ij})^2} \quad (7)$$

where X_{ij} represents actual exports and $(E_i X_{ij})(E_j X_{ij})$ stands for the comparative-average-neutral level in exports of commodity j for country i . For positive NRCA values, the country would have a comparative

advantage. The distribution of NRCA values is symmetric, ranging from $-1/4$ to $+1/4$, with 0 being the comparative-advantage-neutral point.

It is also worth mentioning that some economic literature interlinks the model of revealed comparative advantages with new streams-of-trade theories. This approach distinguishes price and quality competition in two-way trade by taking the difference between export and import unit values (Gehlhar and Pick 2002).

The theory of *constant market shares* (CMS) also provides indexes to measure competitiveness at the macro level. The CMS model was first used in the 1950s for trade in industrial products. The method investigates trade trends to determine factors affecting a country's export performance. The basic presumption underlying the CMS model is that a country's export share in a market remains constant at the same level of competitiveness (Ahmadi-Esfahani 2006). Consequently, any change in a country's exports can be traced back to changes in the composition of competitors and/or competitiveness. The traditional CMS model explains changes in exports with scale effect, competitive effect, and second-order effect (Ahmadi-Esfahani 2006).

Another strand of literature focuses on *prices related to international competitiveness*. Some of these indexes (like the well-known producer or consumer price indexes, inflation rates, and purchasing power parities) do not directly measure competitiveness but have an influence on it. The most cited index here is real exchange rate (RER), which is defined as follows:

$$\text{RER} = \frac{p^T}{p^{NT}}, \quad (8)$$

where, p^T is the price index of tradable commodities and p^{NT} is the price index of nontradable commodities. Brinkman (1987) argues that if the demand for the currency of the competitive country is high, it strengthens that currency's exchange rate. However, some literature discusses the use of the real effective exchange rate (REER), which is the nominal effective exchange rate divided by a price deflator or index of costs. If the REER increases (decreases), exports (imports) become more expensive (cheaper), indicating a loss in competitiveness (Latruffe 2010).

In addition to these, the most well-known competitiveness indexes at the macro level come from *world competitiveness reports*. Global competitiveness has been analyzed regularly in IMD's *World Competitiveness Yearbook* (WCYB). Published annually since 1989, the WCYB ranks and investigates the ability of nations to create and sustain a competitive economic environment. The International Institute for Management Development (IMD) groups its 250 measures into eight categories (domestic economy, internationalization, government, finance, infrastructure, management, science and technology, and people) and measures country performance on each dimension. The report identifies approximately 50 determinants of competitiveness, subdivided into the above categories. Considering that the first WCYB published its 25th edition in 2014, these reports are also useful in comparing global competitive performances over the long term.

Another well-known source of global competitive positions is WEF's *Global Competitiveness Report*, which assesses the competitiveness of 144 economies across different aspects captured in its 12 pillars (indicators), relating to institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation. The first four pillars are essential for factor-driven economies, pillars 5–10 are important for efficiency-driven economies, and 11 and 12 are the engines of innovation-driven economies. WEF assumes that the economic development of developing countries is factor driven, where well-functioning institutions, infrastructure, macroeconomic environment, and health and primary education (pillars 1–4) are key for future growth. In the next stage, when incomes and prices rise, quality and efficiency become engines of growth, so factors such as higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, and market size matter (pillars 5–10). In the final phase, differentiation and innovation help in keeping standards of living high, so factors such as business sophistication and innovation (pillars 11 and 12) prove to be central to economic development.

Although IMD's and WEF's approaches provide very similar results, differences exist between them. These differences arise primarily due to the methodology used, the number of countries analyzed, and the number of indicators observed. IMD uses more than 330 criteria in evaluating 61 countries, compared to 114 criteria used by WEF, which analyzes 144 economies. Moreover, IMD focuses primarily on hard statistics, while WEF places more emphasis on survey data. An overview of the comparison between the two reports is provided by Loo (2012).

For the agribusiness sector, the RCA method is most commonly used for measuring competitiveness. While several studies have assessed the competitiveness of particular value chains, very little has been done to measure the overall agribusiness competitiveness of nations. Composite indicators such as IMD's and WEF's approaches can also be applied to the agribusiness sector by modifying some of the sub-indicators to make them agribusiness-specific.

Measuring Agribusiness Competitiveness

As previously noted, the Global Competitiveness Index developed by WEF is the most comprehensive and widely used multidimensional measure of competitiveness. This measure of overall competitiveness is applicable to the agribusiness sector because it indicates the general health of the economy. However, the measure gives a broad picture at best. There is a need to specifically measure the competitiveness of the agribusiness sector to enable policy makers to understand the how resources should be allocated across different value chains—particularly in developing countries that are agrarian in nature.

As discussed above, measuring agribusiness competitiveness across countries and over time is difficult with the existing measures of competitiveness. In this paper, we present a method to measure competitiveness that brings together various existing measures to provide an accurate picture of countries' relative agribusiness competitiveness. Our method combines three measures: the Global Competitiveness Index, agriculture competitiveness, and the Doing Business indicators. We take a simple average of the normalized score of each country to arrive at a measure for competitiveness. A higher number indicates higher agribusiness competitiveness.

The Global Competitiveness Index is a comprehensive measure that combines 114 indicators grouped into 12 pillars, as noted above. The index gives each country a score from 0 to 5, with a higher number indicating greater competitiveness. Our measure also includes the Ballasa indexes for agriculture competitiveness, calculated by Jambor and Babu (2016) using World Bank WITS software with 739 agrifood products for the period from 1991 to 2014. This index also indicates higher competitiveness as the number increases. Finally, we use the distance-to-frontier indicator of the Doing Business Index created by the World Bank Group. In this index, higher rankings (a low numerical value) indicate better, usually simpler, regulations for businesses and stronger protections of property rights. We normalize these three scores and take a simple average, giving each of them equal weight. The aggregate scores of all African countries, using these data, are shown in the appendix.

Table 3.1 Measuring agribusiness competitiveness in Africa

S. No.	Variable	Indicator	Data required	Data source
1	Competitiveness	Global Competitiveness Index	Score on Global Competitive Index, scale from 0 to 5	World Economic Forum (2015b)
2	Agriculture competitiveness	Ballasa index	Exports and imports of country	Jambor and Babu (2016)
3	Ease of doing business	Doing Business Index	Scores on getting credit, getting electricity, and enforcing contracts indicators	World Bank (2016)

Source: Authors' compilation.

We are aware that the methodology developed and used here has limitations. First, the Global Competitiveness Index and the Doing Business Index have several overlaps on measures of infrastructure, financial market development, labor market efficiency, and macroeconomic environment. However, because the aggregated numbers serve as a tool to rank countries, this overlap should not make a difference to our results. Second, the trade data used in the Balassa index are not completely reliable. Countries often report trade data classified in different ways, making the comparison of aggregate values less precise. Further, countries also tend to under- or over-report their trade values, which often do not coincide with those of their trading partners. However, based on the literature review and previous empirical work, our results are plausible.

4. RESULTS AND DISCUSSION

The results generated by the methodology described above reveal some interesting insights. Countries can be classified as having high, medium, or low agribusiness competitiveness. Countries that have low agribusiness competitiveness include Mauritania, Burundi, and Guinea. These countries have serious problems in their agricultural sectors. They are often in a resource crunch and have a large number of smallholder farmers with very limited resources. For instance, 90 percent of Burundi's farmers practice subsistence agriculture. And, in fact, competitiveness is serious issue in the country, as it ranks among the lowest in the world. With good geographic conditions and a suitable climate for production, the country has the potential to be a strong participant in the regional agricultural market. Yet, after years of conflict, the country faces important productivity, infrastructure, and institutional challenges that continue to undermine the development of a market-oriented agribusiness sector, and agriculture remains a primarily subsistence activity, dominated by smallholders with poor knowledge of modern agricultural practices and weak connections to the formal economy. All these constraints have limited the country's ability to participate in the global agribusiness value chain. However, Burundi is experiencing slowly rising incomes, growing domestic demand for foodstuffs, and a need to formalize the country's economy, placing pressure on the agricultural sector to modernize and organize to create productive off-farm employment opportunities, generate revenues, and, importantly for the short term, contribute to the country's food security. Other countries with low agribusiness competitiveness have similar features to Burundi.

The second category in our classification comprises countries with medium agribusiness competitiveness. While most countries fall in the medium category, some are better off than others. Countries such as Nigeria, Mozambique, Malawi, Madagascar, and Ghana fall in the medium-low agribusiness competitiveness category, whereas Ethiopia, Côte d'Ivoire, Zambia, Senegal, Tanzania, Botswana, Uganda, Tunisia, and Namibia fall in the medium-high category. Countries in the medium-low category are competitive in a few agribusiness products but have potential to increase within that subsector and to expand their competitiveness to other products. For instance, Ethiopia is competitive in cut flowers,

but looking at the international market and competition with Kenya, the country needs to improve the quality of its production and packaging. Countries in the medium-high category perform very well in the agribusiness they are competitive in but have the potential to diversify and increase profitability. For instance, even though Botswana is competitive in beef production, it has immense potential to increase the sector's profitability by reducing feed prices and other input costs (Bahta and Baker 2015). Nations in this category need to transform their agricultural sectors by increasing mechanization and commercialization. Attracting greater foreign investment would also help in giving countries in the medium category a bigger push.

Finally, countries with high agribusiness competitiveness include Egypt, Kenya, Rwanda, Mauritius, Morocco, and South Africa. High agribusiness competitiveness has dramatically changed the agricultural sectors in these countries in the past decade. These countries are making significant gains from trade with European countries. Kenya is highly competitive in horticulture and dairy, while Rwanda is competitive in coffee and tea production. For these countries, it is important to ensure that they sustain their competitive position and invest in innovation to diversify into other agribusiness ventures. For instance, Esterhuizen (2006) argues that South Africa's agribusiness has potential to increase in a sustained manner if its business environment can remain dynamic, stimulating, and intensely competitive.

Our typology indicates that most African nations have low or medium agribusiness competitiveness. While some value chains, such as dairy, horticulture, coffee, and tea have played a major role in improving the agribusiness competitiveness of certain countries, low agricultural productivity limits the gains.

5. POLICY IMPLICATIONS AND LESSONS

In the analysis presented above, we find that countries in Africa have low agribusiness competitiveness, productivity, and food security. Strategic investments are needed to tap into the agribusiness potential of these countries. Country governments, at both national and local levels, need to partner with the private sector to enable farmers to afford quality inputs through appropriate programs such as bulk purchasing and local manufacturing.

Most countries need to invest in road infrastructure development that will promote private investment in all areas of agriculture and facilitate the linkage of agriculture to industry. It is important to identify successful models of public-private partnerships and business-to-business alliances to increase value chain competitiveness and scale. Further, investment in transportation infrastructure to link high-potential production zones and major market areas within and across the regions is important for agribusiness competitiveness.

High quality is important for absolute competitive advantage, and African countries should strive to develop and maintain a high quality in agricultural goods. This would require the development of quality management; a certification services system; and harmonized standards, norms, and grades across country and national markets. Countries need to create partnership opportunities to enable small-scale infrastructure investment in rural areas, such as investment in postharvest and other market-related infrastructure, to integrate smallholder farmers into local and export value chains.

Governments should facilitate stronger partnerships between leading agribusinesses in the country with small enterprises and farmers in the county to promote strong technology and market links in existing and emerging value chains. There is also a need to eliminate regulatory and administrative barriers and disincentives that raise the unit cost of the movement of goods across local and cross-border markets.

Finally, the importance of the nonfarm sector in increasing competitiveness should not be underestimated. Because a large portion of rural income comes from nonfarm sources, encouraging

entrepreneurship, increasing access to capital, and building stronger market linkages can play a major role in agribusiness development.

Using the framework presented above, we find that several policy lessons can be drawn for different countries. Table 5.1 presents a summary of the policy lessons for increasing agribusiness competitiveness.

Table 5.1 Summarized policy lessons for agribusiness competitiveness

Agribusiness Competitiveness			
<i>Degree</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>
<i>Underlying Factors</i>	<ol style="list-style-type: none"> 1. Implement political economy reforms 2. Improve natural resource management 3. Develop input-output markets 4. Develop supporting industries 5. Increase knowledge and adaptability of buyers 6. Use natural resources efficiently 	<ol style="list-style-type: none"> 1. Improve factor markets 2. Improve heavy infrastructure 3. Develop market size 4. Develop supporting industries 5. Maintain stability of exchange rate 6. Develop human resources 7. Reform tax system 8. Enforce legislation 9. Develop agricultural research institutions 	<ol style="list-style-type: none"> 1. Improve ease of doing business 2. Create stronger linkages with private sector 3. Sustain competitive position
<i>Intermediate Factors</i>	<ol style="list-style-type: none"> 1. Maintain stable international relations 2. Improve research and innovation 3. Improve extension systems 4. Improve legislation on competitiveness 5. Ensure stability of financial institutions 6. Eliminate redundant institutions and bureaucracy 	<ol style="list-style-type: none"> 1. Improve efficiency of factors of production 2. Increase intensity of competition 3. Track innovations in competing markets 4. Improve information flow 5. Provide access to affordable technology 	<ol style="list-style-type: none"> 1. Ensure representation on international trade forums and platforms 2. Develop partnerships with other countries and multinational agribusiness establishment
<i>Immediate Factors</i>	<ol style="list-style-type: none"> 1. Increase investment in infrastructure for agribusiness 2. Develop effective institutions 3. Improve rural infrastructure 	<ol style="list-style-type: none"> 1. Rebuild trust in political system 2. Encourage mechanization and commercialization of agriculture 3. Support skill development and education 	<ol style="list-style-type: none"> 1. Diversify agribusiness portfolio 2. Increase agricultural productivity

Source: Authors' compilation.

Our analysis also shows that once agribusiness competitiveness is achieved, it has a feedback effect that helps in sustaining food security and agricultural productivity. A competitive agribusiness sector is characterized by efficient land markets, efficient management of agriculture risks, technology adoption and

innovation, sustainable management of natural resources, efficient institutions, effective infrastructure, a conducive economic environment, investment in health and education, and wide market access.

To put these lessons in perspective, see the case study of Kenya's tomato value chain in Box 5.1. Despite Kenya's high competitiveness ranking, much needs to be done to improve specific value chains. Lessons can also be drawn from China, which created scores of research and development institutes and universities focusing on agricultural innovation.

In this paper, we took a detailed look at how countries are placed in terms of their food security, agricultural productivity, and agribusiness competitiveness. The typology developed shows that African countries are lagging in food security. In fact, many countries that have high productivity and competitiveness also have medium or low food security. Hence, food security emerges as a major issue in the African subcontinent. The cases of Kenya and Rwanda show that high competitiveness and agricultural productivity do not necessarily assure food security.

The measures developed here to rank countries based on their agribusiness competitiveness are just the beginning when it comes to comparing countries and guiding the process of setting priorities. Deeper analyses of in-country factors that are context- and commodity-specific should be undertaken to guide the country-specific process of strengthening the competitiveness of the agribusiness sector.

Box 5.1 Case study: Improving the competitiveness of the tomato value chain in Kenya

In Kenya, tomatoes play a critical role in meeting domestic food and nutritional requirements, generating income and foreign exchange earnings, and creating employment. Despite this importance, the tomato industry faces myriad constraints along the product value chain. These include agronomic constraints, such as incidence of pests, diseases, and physiological disorders (cracking, sunburn, or scald); institutional constraints, such as poor postharvest technologies that hasten perishability; and poorly organized rural and urban market infrastructure that causes unpredictable price fluctuations. These constraints adversely affect the production and marketing of quality tomatoes. According to Byerlee and Kelley (2004), an estimated 60 percent of Africa's rural population lives in areas with good agricultural potential but faces poor market access for agricultural produce. Therefore, improving market infrastructure by providing better and more affordable transportation is necessary for enhancing commercialization in Kenya (Shilpi and Umali-Deininger 2008). Kenya's entire tomato production is marketed within and around East African countries, with nothing left for the international market. The key constraints that cause the dismal export market of Kenyan tomatoes include poor quality, poor health standards, and a constant supply of relatively high quantities of the commodity in western markets (Humphrey 2007). If the tomato value chain were to be developed, Kenya could increase its foreign exchange revenues through export of canned tomatoes, tomato paste, and other tomato products.

Source: Geoffrey et al. 2014.

6. CONCLUDING REMARKS

In this paper, we have explored how African countries are positioned in terms of their agribusiness competitiveness. We find that most countries in the continent fall in the low or medium agribusiness competitiveness category, showing major potential to improve and gain from improved competitiveness. Increased agribusiness competitiveness can not only increase income for farmers and owners of agribusinesses but can also help in addressing the food security and natural resource sustainability issues of the country.

Policy makers often focus on agricultural productivity and food security issues in developing countries, placing little importance on increasing the competitiveness of agribusiness. In this paper, we argue that African countries have very high potential to transform their agricultural sectors by increasing the competitiveness of their agribusiness operations. A robust and enabling policy framework could help remove existing constraints on agro-industrialization and encourage investment. African governments should ensure that the right combination of agricultural, industrial, and trade policies is in place to encourage sufficient production of raw material as well as the efficient distribution of produced products. They should strategize and encourage production and processing of agricultural products in which the country has the potential to gain an absolute advantage. Rights to land and natural resources must be recognized and enforced to encourage productive use of land and boost investor confidence. There is a need to improve the general business environment in African countries in order to increase the private sector's investment and involvement in agribusiness. A stable policy, regulatory, and legal framework that minimizes corruption and allows businesses to operate in a fair and equitable manner is needed. These are major bottlenecks that restrict the growth of the agricultural sector and prevent the private sector from entering new agribusiness areas.

Physical capacity in terms of infrastructure (roads and transportation), timely availability of inputs, and market access are also major bottlenecks in the African agricultural sector. Lack of infrastructure for cost-effectively transporting agricultural products excludes most smallholder farmers from gains that could

be obtained from increased competitiveness. African countries should pursue new and alternative sources of funding such as sovereign funds and domestic resources to diversify funding channels and create incentives for the private sector to make initial investments in agribusiness development.

Finally, countries should leverage public-private partnerships to finance agribusiness and facilitate capacity building through technical and entrepreneurial skills training. Capacity must be increased at the individual, institutional, and system levels in order to improve the overall competitiveness of the agricultural sector and, more specifically, of the agribusiness sector. Key actors and institutions in the agribusiness sector need to be identified through a comprehensive capacity needs assessment. This would help in identifying capacity gaps and areas in which the government could increase its investment to strengthen the value chains.

APPENDIX: SUPPLEMENTARY TABLE

Table A.1 Measures of agribusiness competitiveness among African countries

Country	Global Competitiveness Index (WEF 2015b)	Agriculture competitiveness (Jambor and Babu 2016)	Doing Business index* (World Bank 2016)	Normalized comp	Normalized_agricomp	Normalized_doingbus	Agribusiness competitiveness
Democratic Republic of the Congo	NA	0.16	38.14		0.08	0.22	0.30
Angola	NA	NA	39.64			0.25358347	
Chad	3	NA	38.22	0.125		0.22365093	0.35
Djibouti	NA	NA	44.25			0.35075885	0.35
Central African Republic	NA	0.28	36.26		0.17	0.18	0.35
São Tomé and Príncipe	NA	0.21	45.5		0.11538462	0.37710793	0.49
Mauritania	3	0.22	44.74	0.125	0.12307692	0.36108769	0.61
Niger	NA	0.39	46.37		0.25	0.40	0.65
Zimbabwe	NA	0.44	48.17		0.29230769	0.43338954	0.73
Cape Verde	3.7	0.29	NA	0.5625	0.17692308		0.74
Burkina Faso	NA	0.54	50.81		0.37	0.49	0.86
Burundi	3.1	0.36	48.82	0.19	0.23	0.45	0.87
Comoros	NA	0.64	48.22		0.44615385	0.43444351	0.88
Guinea	2.8	0.73	45.54	0	0.51538462	0.3779511	0.89
Togo	NA	0.71	49.03		0.5	0.45151771	0.95
Equatorial Guinea	NA	NA	40.03			0.26180438	
Eritrea	NA	NA	27.61			0	
Gabon	3.8	0.06	45.99	0.625	0	0.38743676	1.01
Nigeria	3.5	0.38	44.69	0.44	0.25	0.36	1.04
Benin	3.5	0.38	47.15	0.44	0.25	0.41	1.10
Mozambique	3.2	0.46	53.98	0.25	0.31	0.56	1.11
Mali	3.4	0.39	50.81	0.38	0.25	0.49	1.12
Guinea-Bissau	NA	NA	40.56			0.27297639	
Côte d'Ivoire	NA	NA	NA				
Algeria	4	0.07	45.72	0.75	0.01	0.38	1.14
Gambia	3.5	0.4	48.99	0.4375	0.26153846	0.45067454	1.15

Table A.1 Continued

Country	Global Competitiveness Index (WEF 2015b)	Agriculture competitiveness (Jambor and Babu 2016)	Doing Business index* (World Bank 2016)	Normalized comp	Normalized_agricomp	Normalized_doingbus	Agribusiness competitiveness
Liberia	3.4	NA	40.19	0.375		0.26517707	
Libya	NA	NA	31.77			0.08768971	
Malawi	3.2	0.63	51.03	0.25	0.44	0.49	1.18
Cameroon	3.7	0.48	44.11	0.56	0.32	0.35	1.23
Madagascar	3.3	0.77	45.68	0.31	0.55	0.38	1.24
Seychelles	3.9	0.1	61.05	0.6875	0.03076923	0.70489039	1.42
Ghana	3.6	0.45	57.69	0.50	0.30	0.63	1.43
Ethiopia	3.7	0.77	49.73	0.56	0.55	0.47	1.57
Cote d'Ivoire	3.9	0.6	50.93	0.69	0.42	0.49	1.59
Zambia	3.9	0.34	60.5	0.69	0.22	0.69	1.60
Senegal	3.7	0.93	48.57	0.56	0.67	0.44	1.67
Lesotho	3.7	0.72	57.69	0.5625	0.50769231	0.63406408	1.70
Tanzania	3.6	0.99	51.62	0.50	0.72	0.51	1.72
Botswana	4.2	0.29	64.98	0.875	0.17692308	0.78773187	1.84
Uganda	3.7	0.93	56.64	0.56	0.67	0.61	1.84
Tunisia	3.9	0.7	64.88	0.69	0.49	0.79	1.97
Sierra Leone	3.1	NA	49.69	0.1875		0.46543002	
Somalia	NA	NA	NA				
Namibia	4	0.77	60.17	0.75	0.55	0.69	1.98
South Sudan	NA	NA	34.78			0.15113828	
Sudan	NA	NA	46.97			0.40809444	
Swaziland	3.4	NA	59.1	0.375		0.66378583	
Egypt	3.7	1.36	54.43	0.56	1.00	0.57	2.13
Kenya	3.9	1.12	58.24	0.69	0.82	0.65	2.15
Rwanda	4.3	0.59	68.12	0.94	0.41	0.85	2.20
Mauritius	4.4	0.36	75.05	1	0.23076923	1	2.23
Morocco	4.2	0.98	64.51	0.88	0.71	0.78	2.36
South Africa	4.4	1.17	64.89	1.00	0.85	0.79	2.64

Source: Authors' compilation.

Note: * Overall distance to frontier.

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