Promoting Sustainable Rural Development and Transformation in Africa

Lessons Learned and Policy Directions

A Synthesis of Twenty Agricultural Value Chain Studies in Five African Countries—Burkina Faso, Ghana, Kenya, Tanzania, and Uganda
Promoting Sustainable Rural Development and Transformation in Africa

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Promoting Sustainable Rural Development and Transformation in Africa

A Synthesis Report

Lessons Learned and Policy Directions

From Twenty Agricultural Value Chain Studies in Five African Countries—Burkina Faso, Ghana, Kenya, Tanzania, and Uganda
Agriculture’s share of gross domestic product (GDP) has been declining over the years in many African countries as service sectors have grown. However, agriculture continues to underpin many countries’ economies. The contribution of the agricultural sector ranges from 24% of GDP in Tanzania to about 30% in Burkina Faso. It also accounts for a significant proportion of exports; about 65% of Kenya’s exports and 48.5% of Uganda’s exports come from the agricultural sector.
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I. Introduction

“This paper is a synthesis of the insights obtained through the studies. It highlights the interventions observed that could potentially be scaled up across countries to spur transformation.”
Agriculture’s share of gross domestic product (GDP) has been declining over the years in many African countries as service sectors have grown. However, agriculture continues to underpin many countries’ economies. The contribution of the agricultural sector ranges from 24% of GDP in Tanzania to about 30% in Burkina Faso. It also accounts for a significant proportion of exports; about 65% of Kenya’s and 48.5% of Uganda’s. 

Agriculture also continues to employ disproportionately more people than other sectors. For example, in Burkina Faso, it accounts for 94% of employment, a testimony to the low productivity of agriculture there. Though agricultural productivity has been growing (in Tanzania, it has grown by 20% in the past decade), it remains low, and many people employed in agriculture remain poor.

All the same, the potential for agriculture is huge, especially as a way to drive economic transformation. In Kenya, where agroprocessing is relatively well developed, agriculture contributes a further 27% through manufacturing, distribution, and agricultural services, and provides more than 18% of formal employment. ACET’s African Transformation Report (ATR, 2014) points to agroprocessing as a key pathway by which countries may transform their economies.

At the same time, in order for agroprocessing to drive economic transformation, agricultural value chains will need to be upgraded to ensure a consistent supply of quality raw materials at low prices, which is a prerequisite for developing a vibrant processing sector.

To better understand the potential interventions that can catalyze transformation through agriculture, we studied 20 crop-specific value chains across five countries in Africa, as outlined below.

Table 1.1: Crops/Livestock studied

<table>
<thead>
<tr>
<th>Crop/livestock</th>
<th>Kenya</th>
<th>Uganda</th>
<th>Tanzania</th>
<th>Ghana</th>
<th>Burkina Faso</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum</td>
<td>×</td>
<td>×</td>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Millet</td>
<td>×</td>
<td>×</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poultry</td>
<td>×</td>
<td></td>
<td>×</td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Cassava</td>
<td></td>
<td>×</td>
<td>×</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cow</td>
<td>×</td>
<td>×</td>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Rice</td>
<td></td>
<td>×</td>
<td>×</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td>×</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cocoa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>×</td>
</tr>
</tbody>
</table>

The rationale behind the selection of these crops/livestock was:

i). Importance of crop/livestock to smallholder farmers

ii). Potential for post-production value improvement

iii). Other factors, including market size, import substitution potential, experience with the product, agro-ecological conditions, the possibility of developing agroprocessing clusters and resilience to climate change

The overall objective of the studies was to identify policy measures, institutional reforms, and public investments that could: (a) increase the productivity of traditional smallholders and improve post-production value (storage, processing, and market access—domestic or foreign) in order to increase smallholder incomes and improve food security; (b) support the emergence of small- and medium-scale modern commercial farmers and foster linkages between them and traditional smallholders; and (c) increase agriculture’s contribution to overall economic transformation through linkages with industry, starting with agroprocessing.

This paper is a synthesis of the insights obtained from the studies. It highlights the interventions observed that could potentially be scaled up across countries to spur transformation.
II. Overview of Agriculture Value Chain Challenges

Agriculture’s share of gross domestic product (GDP) has been declining over the years in many African countries as service sectors have grown. However, agriculture continues to underpin many countries’ economies. The contribution of the agricultural sector ranges from 24% of GDP in Tanzania to about 30% in Burkina Faso. It also accounts for a significant proportion of exports; about 65% of Kenya’s exports and 48.5% of Uganda’s exports come from the agricultural sector.
In part, the studies reiterated many already well-known challenges of agricultural value chains in Africa, including low technology uptake, poor extension, poor infrastructure, and lack of finance. These challenges are summarized below.

### Table 2.1: Crops studied

| Africa’s agricultural value chain challenges are well known, but solutions are elusive. |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| **Issues**                                      | **Logistics**                                   | **Processing**                                  | **Marketing and distribution**                    |
|  - Low yields                                   |  - Post-harvest losses (up to 50% reported)     |  - No supply guarantees on quantity, quality, or price |
|  - Saved seeds (fake or costly)                |  - Lack of storage facilities (e.g., for evening milk, posts) |  - Informal market dominance, thus low value addition |
|  - Low knowledge                                |  - Transport challenges                         |  - Low product diversity                        |
|  - Poor quality                                 |  - Middlemen/women’s strangulation and image problems |  - Low-quality products                          |
|  - Lack of equipment                            |  - Payment on quantity rather than quality      |  - Inability to address changing markets         |
|  - Cheating                                     |                                                   |  - Urban poor                                    |
|  - Mixing varieties                             |                                                   |  - Urban rich                                    |
|  - Labor challenges                             |                                                   |                                                  |
|  - Low levels of trust                          |                                                   |                                                  |
|  - Subsistence orientation                      |                                                   |                                                  |
|  - Who to support smallholders                   |                                                   |                                                  |
|  - What to substitute (inputs or information)   |                                                   |                                                  |
|  - What kind of farming ecosystem               |                                                   |                                                  |

### A. Labor

Labor proved to be the most or the second most significant challenge to production in most of the value chains studied. The chart below illustrates this phenomenon using the case of millet production in Kenya.

This finding runs counter to the assumption that there is an abundance of cheap labor to be found in all rural areas of Africa. In fact, in the cassava sector in Ghana, farmers who adopted a low-technology approach saw higher returns than those adopting a high-technology commercial orientation, mainly due to the high cost of labor. Many subsistence cassava farmers in Ghana sell their cassava while it is still in the ground and let the buyer organize harvesting, in order to avoid incurring the huge cost of manual harvesting.

### Figure 2.2: The labor challenge in millet production in Kenya

- Labor seems to be the most important constraint to millet production in Kenya.

<table>
<thead>
<tr>
<th>Land preparation (% reporting)</th>
<th>Planting (% reporting)</th>
<th>Crop care (% reporting)</th>
<th>Harvesting (% reporting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient labor</td>
<td>32.7</td>
<td>20.0</td>
<td>17.1</td>
</tr>
<tr>
<td>Lack of finances</td>
<td>16.4</td>
<td>18.2</td>
<td>12.1</td>
</tr>
<tr>
<td>Improper tillage</td>
<td>16.4</td>
<td>16.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Lack of equipment</td>
<td>12.7</td>
<td>7.3</td>
<td>8.5</td>
</tr>
<tr>
<td>Bad weather</td>
<td>12.7</td>
<td>3.6</td>
<td>10.6</td>
</tr>
<tr>
<td>Poor soils</td>
<td>5.5</td>
<td>1.8</td>
<td>8.5</td>
</tr>
</tbody>
</table>

- Labor seems to be the most critical constraint across all stages of millet production.
- The high cost of inputs is another constraint, compounded by insufficient finances.
Unmanned aerial vehicles (UAVs), otherwise known as drones, have the potential to improve agricultural productivity. Though they are currently already used in mapping lands, monitoring crop development, and remote sensing activities, they also have the potential to be applied to managing one of Africa’s greatest agricultural pests—the quelea bird.

The birds, which are endemic to large parts of the African savanna, number in the range of 2–5 billion. While the quelea consumes many crops, small-seeded grains, especially millet and sorghum, are the most vulnerable. Queleas can travel 30 to 40 miles in a single day to feed and then return to their roosts at night. By eating intensively, queleas can gain sufficient weight to allow them to migrate to new feeding areas. Queleas are capable of destroying entire crops over areas of up to 1,000 hectares (ha). Their breeding and feeding habits have given this species the nickname “the feathered locust.” Our studies in Kenya and Uganda pointed to the quelea bird as presenting the biggest challenge to sorghum and millet farmers in those countries.

The future of sorghum and millet farming will largely depend on how well the quelea bird is managed.

- The quelea is known as “Africa’s Most Hated Bird.” These birds can eat 50–100% of a 1,200 ha crop in half an hour (a flock can number up to 50 million birds).
- Farmers have traditionally managed queleas by guarding the crop continually for two months and using catapults and making loud noises to scare them.
- Industrial-scale control measures are largely unaffordable. Most small-scale farmers have no access to aircraft, fuel, chemicals, dynamite, or flamethrowers.
The impact of the birds is such that many farmers have simply stopped growing these traditional grains and shifted to other crops—maize—, in particular, because it is more resistant to quelea attacks. Therefore, changing the fortunes of traditional grains largely relies on developing new cost-effective technologies to manage the quelea menace.

The current method farmers use to repel the birds is guarding the crops for about two months. This entails using catapults and making loud noises to scare the queleas. Traditionally, this has been done by children; however, most children now go to school, so farmers must instead employ labor to fend off the queleas. Hiring labor is costly and is the reason many farmers have opted to stop growing traditional grains altogether.

An innovative approach now being evaluated by researchers at RAND Corporation/Pardee RAND Graduate School and ACET would use drones to manage the bird threat. Drones can be made to look like the birds’ predators, namely, eagles and falcons. Further, drones can be equipped to emit scary noises, such as those of the above-named predators or the sounds birds make when they are distressed.

**Figure 2.5: Bird Shaped Drones**

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Some bird-shaped UAVs are already in use and can help evaluate the potential of drones to combat the bird menace.

- **EPP Peregrine**
- **BirdXPeller**

The EPP Peregrine, a Remote Controlled Aircraft (RCA) designed to look like a peregrine falcon when flying above, can be used as a tool to scare away pest birds.

The BirdXPeller Predator Drone integrates an auditory bird-scaring system with the visual features of a predator and the mobility of an RCA.

**Source:** National Geographic, Weaver Research Unit

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### B. Trust

While the high cost of inputs deters uptake for many resource-constrained farmers, a larger challenge is the preponderance of fake inputs. Governments are unable to police the input supply sector, which has created space for unscrupulous traders to sell fakes. In Ghana, poultry farmers have to contend not only with fake inputs, but also with quacks posing as veterinary officers.

Trust issues plague farmer-based organizations (FBOs) despite their benefits, due to the governance challenges (i.e., corruption) they tend to face, especially as they grow. Contract farming faces challenges due to some farmers’ practice of side-selling and processors’ rejection of farmers’ products on dubious claims of low quality—usually when they simply do not want to honor the contract, particularly when they are overstocked. There is also mutual distrust between farmers and middlemen (traders); farmers complain that traders cheat them on weight, and many farmers refuse to use weighing scales, feeling that traders have tampered with them. Meanwhile, traders are also wary of the possibility of farmers cheating them by offering poor-quality products. For instance, in Tanzania, traders complain that farmers mix sand with their cotton and sell wet cotton to cheat on weight. Similarly, in Uganda, millet...
traders complain that farmers deliberately mix sand with their millet. The result is that cotton from Tanzania is now blacklisted on the world market, while affluent consumers in Uganda are no longer interested in buying millet due to its perceived poor quality. This has forced processors to invest in expensive cleaning equipment and to employ people specifically to clean millet.

Perhaps the most perverse example of this lack of trust was found in our study of the beef value chain in Uganda. Thirty percent (30%) of the cows slaughtered at abattoirs were found to be pregnant. This is because the value of a cow is assessed by measuring its girth with a tape to estimate the weight; farmers thus offer cows that are pregnant, unbeknownst to the buyer, as they will fetch a higher price. The trader realizes the truth only at slaughter, and since the fetus has to be thrown away, the trader loses. Though the farmer gains in the short term, in the longer run this means that the stock of available cows dwindles. The reason the practice can be termed perverse is that the farmers are thus essentially cheating themselves!

C. Quality

Our studies found that attention to quality is very low. Farmers use rudimentary tools for harvesting and, in the process, often contaminate the product. Significant value is lost due to poor harvesting and threshing techniques. Yet simple interventions, like tarpaulins for drying millet and simple threshers, can greatly improve quality.

Quality is also greatly impacted by inadequate storage facilities, which can cause further deterioration due to pests, humidity, and other challenges. Transport to markets also leads to deterioration when poor transport and handling methods (e.g., carrying milk in non-food-grade plastic containers) are used. This is further compounded by the fragmentation in the value chain, with many traders handling the product. Another major reason we found for the quality challenges was that sellers are not paid based on quality and thus have no incentive to raise quality.

A more fundamental challenge to quality relates to the subsistence orientation of farming. It was observed that many farmers grow crops primarily for food and sell only the surplus to markets. This means that farmers grow the varieties best suited to their palates rather than the varieties that buying consumers or processors may demand. For instance, cassava farmers in Tanzania tend to shy away from cassava varieties that have high starch content, due to their bitter taste, yet this is the starch that industrial processors want.

The farming practices employed by subsistence farmers also affect quality; for example, the rice farmers surveyed in Tanzania mixed the rice varieties they grew, producing grains that matured at different times.

The result of all of these factors is a landscape characterized by low yields and poor quality of produce, as well as high prices, making many of the agricultural value chains we studied unable to support the emergence of strong processing sectors.

Quality is rapidly becoming important in segmentation of markets. In Ghana, for instance, there are basically two rice markets, a rural market and an urban market. The rural market is served by locally grown rice, which is fairly low in quality, while the more lucrative urban market is served by imports of high-quality rice that is sold at a premium.
Interventions/Innovations Observed

Apart from identifying these problems, we obtained some interesting insights into the many interventions being applied to address the challenges of farm systems. Some examples are described below.

- We observed millet processors in Uganda supplying farmers with simple technologies, like tarpaulins and moisture meters for drying millet, allowing them to achieve significant improvements in quality. The success of this approach has been such that the processing company NUMA Feeds pays its contracted farmers a 54% premium compared to the market price due to the higher-quality millet they supply.

- A cassava processor in Ghana has been leasing part of its land to farmers and providing them with support to grow the varieties optimized for its processing needs. Meanwhile, farmers can continue to grow the varieties they want to consume on their own plots.

Innovations and interventions to improve quality can be noticeably effective in upgrading and increasing value. They are of paramount importance to developing a domestic agricultural sector that can compete against the food imports now dominating urban food markets.
Greater attention must also be paid to the role of indigenous methods of improving fertility.
A. Yields

In all the value chains we studied, yields achieved were below potential and showed significant variation across farmers. For instance, the benchmark numbers for Uganda indicate a significant challenge that must be overcome before Uganda can achieve its ambition of exporting beef to emerging markets in the Middle East.

Figure 3.1: Ugandan beef productivity compared to potential and EU benchmark

The Ugandan beef sector’s productivity is low compared to potential and to global benchmarks.

<table>
<thead>
<tr>
<th>Farm-level productivity metrics</th>
<th>Weight at slaughter (kg)</th>
<th>Years to reach slaughter age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salable Cattle/yr</td>
<td>EU 0.67</td>
<td>EU 2</td>
</tr>
<tr>
<td>Weaning Rate</td>
<td>Uganda 0.7</td>
<td>Uganda 5</td>
</tr>
</tbody>
</table>

Source: Nortura 2007, field study

- Aggressive management can improve the weaning rate by almost 50%, and, when combined with better farm management, can almost double the number of salable cows per year.
- Better feed management can increase body weight and reduce variation in weight.
- There is also an opportunity to increase body weight through better breed selection and management.

Low productivity continues to be a challenge, despite the fact that farmers are generally aware of the presence of better varieties, indicating that lack of knowledge is not the key obstacle to increasing yields. Farmers consider many factors when choosing what varieties to grow, as our study of the cassava value chain in Ghana indicated. The reasons for choosing one of the popular cassava varieties were many, and, indeed, only 30% of farmers made their choice based on the yield potential of the variety.

Figure 3.2: Farmers’ decisions on cassava varieties to grow

Yield is only one of the factors cassava farmers consider important.

Factors cited in literature as important in selecting varieties:
- High dry matter and good food quality
- Good mealiness
- Good storability
- Tolerance to weeds, diseases, and pests

In our Ghana cassava value chain study, Bankyehema was preferred, mostly for its commercial value. At least 50% of the responses (profitable, high quality gari, cassava dough and gari, high starch content) are related to selling to market.

Why Bankyehema?

Source: ACET field survey, 2014
As pointed out earlier, high-yielding varieties do not necessarily translate to higher returns. Higher-yielding varieties require more technology and inputs, particularly fertilizers. While fertilizers may boost yields, economics may not favor their adoption. For instance, using fertilizers was found to raise yields for sorghum farmers in Uganda; however, the higher yields did not necessarily translate to higher returns, as Figure 3.3 below shows. Farmers may therefore be making a reasonable decision in declining to use fertilizers. Nevertheless, it was found that using a combination of animal manure and fertilizer resulted in very high returns for sorghum farmers.

For this reason, combining crop cultivation and livestock rearing can be very beneficial, in two ways. Livestock diversifies income for farmers and lowers farmers’ risk. It can increase farmers’ uptake of modern inputs while also providing manure for improved yields. Livestock such as cattle can also be fed residues from the crops, e.g., sorghum stover. This shows that there can be a positive beneficial relationship between crop and livestock farming. However, livestock and crops are essentially seen as two separate sectors in most countries, and in some places are handled by different ministries.

Greater attention must also be paid to the role of indigenous methods of improving fertility. In Burkina Faso, sorghum farmers who adopted traditional conservation methods using zai pits4 doubled their yields of sorghum, outperforming even those who farmed with fertilizers (Figure 3.4). Note also that micro-dosing uses less fertilizer and generates higher yields than the normal application of fertilizer.

4 Zaï is a planting pit with a diameter of 20-40 cm and a depth of 10-20 cm. Pits are dug during the dry season. After digging the pits, organic matter is added at an average, recommended rate of 0.6 kg/pit and, after the first rainfall, the matter is covered with a thin layer of soil and the seeds placed in the middle of the pit. The advantages of Zaï are that it: (i) captures rain and surface/ run-off water; (ii) protects seeds and organic matter against being washed away; (iii) concentrates nutrient and water availability at the beginning of the rainy season; (iv) increases yields; and (v) Reactivates biological activities in the soil and eventually leads to an improvement in soil structure. (see more at http://www.worldbank.org/afr/ik/iknt80.htm).
Sorghum farmers in Burkina Faso report a gross profit margin\(^5\) of 78% on red sorghum without using any fertilizer, lending credence to the common assertion that “sorghum can fend for itself.” Therefore, while 55% of farmers apply fertilizer to maize, only 1.2% reported applying fertilizer to sorghum. Their rule of thumb may in fact be the more sensible decision, given that while yields may go up with fertilizer use, it is not likely that returns could reach as high as 78%. (However, higher yields would mean more money in the farmers’ pockets even if profit margins are reduced, which is important for poverty reduction.)

While fertilizer is one important component, there is clearly a need to think more broadly about the design of subsidy programs. For instance, supporting Burkinabe farmers to establish zai pits may be an easily achievable step. It is also important that the support given to farmers of crops and of livestock be synchronized so that it can achieve greater impact. If fertilizer subsidies are distributed, for example, they could be combined with subsidies for animal feed or artificial insemination (AI) in one package to help realize the potential synergies between crop cultivation and animal rearing.

Box 3.1: The DONATA example: An incremental approach to increasing yields

Cassava yields in Ghana currently range from 15 metric tons (MT) per hectare (ha) to 25 MT/ha when farmers adopt best practices, including ridging and fertilizers. Thus, moving farmers toward best practices can improve yields by about two-thirds. One intervention in Ghana, the Dissemination of New Agricultural Technology in Africa (DONATA) project has managed to raise yields from 12–15 MT/ha to 30–35 MT/ha in its intervention areas.

DONATA interventions have included the introduction of high-yielding varieties, planting in rows, and better weed management. However its flagship intervention has been an innovation platform that gives information to solve specific problems, rather than the generalized approach that is used in the farmer field schools where farmers are usually taught; developing linkages to transporters and markets; and working with equipment fabricators on modifying machines to make them easier for female processors to use.

Note that the DONATA project used an incremental approach to its interventions. Farmers are asked to devote only a small portion of land to DONATA interventions, and the difference the farmers see between the intervention portion and the rest of the farm becomes the motivation for further adoption. One innovation that has proved useful is packaging and distributing sprouted planting materials in small bags, an approach that has increased uptake of improved varieties by women. Using processors to disseminate information on improved varieties was also found to be an effective approach.

While an incremental approach is beneficial, more fundamental changes in the agricultural landscape are needed. We observed interesting interventions that have the potential to be scaled up, including new models for input provision, new types of FBOs and innovations in contract farming as discussed below (in Sections B and C).

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\(^5\) Gross profit margin = Sales (revenues) – Variable costs. In this case it just sales for sorghum less any inputs farmers had bought e.g. seeds, fertilizers. It was not clear where own labor costs were imputed in calculating input costs.
B. Rethinking Input Provision

From micro and small-scale input suppliers (agrovets) to chain-based agrovet shops

One of the challenges that farmers face in adopting recommended inputs is the fear of poor-quality and counterfeit products. This fear is compounded by weak government regulatory capacity. Trust in input supply systems is greatly lacking, and unless it can be built, smallholder farmers are unlikely to increase their use of high-quality inputs.

Another major concern is the high cost of inputs, which can vary by as much as 100% between suppliers due to market inefficiencies. For instance, Kenya’s input supply business is largely run by over 10,000 agrovet shops, most of which are run like informal street kiosks by powerful, often poorly educated informal middlemen. Due to difficulties in regulation, some dealers sell fake or counterfeit inputs, discouraging many farmers from adopting modern inputs. An intensive effort is needed to educate these dealers on the needs of farmers (seeds, chemicals, etc.) and to create trust in the system in order to overcome the present market failures.

Supporting the development of bigger suppliers with a chain or network of stores, rather than the growth of many small input providers, is one way to increase trust in the system and lower input costs. Small businesses are harder to supervise and regulate and may not have the scale to attract the skills needed, not only to supply quality inputs but also to provide advice to farmers, which can be furnished by bigger input providers. Indeed, it has been observed that the Kenya Farmers Association (KFA), one of the oldest chains of input suppliers in Kenya, offers better prices on animal feed and was less opportunistic about increasing prices following the VAT increase in 2013. Further, KFA has taken the lead in warning farmers about fake products on the market. This makes sense, as bigger suppliers have an image or brand to protect.

Supporting some of the more successful agrovet shops to scale up and open more branches (and also take over other shops) is one approach, and can be done through tax breaks and subsidized financing. A more promising method is to bring existing shops under an umbrella franchise, as the Farm Shop initiative in Kenya proposes to do (see Box 3.2).

Box 3.2: The Farm Shop model: franchising agrovets

Farm Shop’s solution to challenges of fake inputs and poor services from input dealers is to leverage the existing network of agrovets in Kenya by franchising them. In this way, agrovets can be upgraded to provide high-quality products, services, and information, which should translate to increased productivity for subsistence farmers. The cornerstone in a franchise concept is the assurance of a certain standard.

Farm Shop aims to position itself as a chain of clean, modern, and professionally managed shops. It has started in the areas around Nairobi, the site of Farm Shop’s headquarters, and plans to expand to cover the entire country and eventually move into other countries. The company’s three-year target is 500 franchisees reaching 250,000 households.

Farm Shop spends 12 weeks on screening each potential franchisee in order to carefully assess its capabilities. Existing agrovets are selected based on criteria including purchasing power, willingness to work, interest in the concept, and financial discipline. Moreover, franchisees must have social standing in the community for the shop to become a popular hub for everything new and innovative. The selected franchisee then takes a loan through Farm Shop of about $4,000, with a repayment period of 24 months, for working capital and inventory, for which Farm Shop provides a competitive flat interest rate of 15%.

The franchisee is subsequently capacitated to provide farmers with the right products and services through training (sales skills, business skills, etc.), tablets with Internet access, price lists, and a branded shop. Franchisees are also equipped to deliver soil testing and spraying to farmers. Farm Shop facilitates a network between franchisees and holds demo days, training sessions, and farm visits to ensure productivity enhancement. A comprehensive community education program has been designed to help farmers understand the products, services, and methods on offer, which in turn is expected to stimulate demand for the local franchise.

From inputs as a product to inputs as a service

Lowering the cost of inputs for subsistence farmers should be a priority. Successful models now focus more on providing services rather than just providing inputs. The success of some cassava enterprises in West Africa, in which processing machine fabricators offer grating services to farmers rather than trying to sell equipment to farmers, has shown that business models that provide total service delivery to farmers make technology more available.

Nigeria has promoted a model by which groups of young people are organized as weed killers and contracted by input suppliers to go from farm to farm spraying herbicides for a fee. The groups have proper equipment and are linked to genuine input suppliers in order to guarantee quality. The suppliers are, in essence, selling a weed-killing service rather than the herbicides themselves.

In Ghana, the government has established Agricultural Mechanization Service Enterprise Centres (AMSECs) where tractor services can be hired. However, AMSECs have not demonstrated the intended impact due to the political economy issues that take precedence over purely economic considerations to dictate where to locate the centers and which machinery to stock. Further, certain prerequisites to making machinery use widespread have not been met, especially removal of tree stumps and getting farmers to practice planting in rows and ridging. All the same, the model has the potential to make more mechanization services available to resource-poor farmers.

The service model as a way to deliver inputs is especially powerful within the context of the current desire to engage youth in agriculture as a means of mitigating youth unemployment. It may be more cost-effective and could improve the productivity of the current generation of aging farmers, in addition to employing the youth in agriculture without the further fragmentation of land plots due to large numbers of youths taking up farming and families have to further sub-divide their already small plots.

C. Rethinking the Farming System

Reinventing the FBO

FBOs have been seen as a game changer toward achieving higher levels of productivity and improving farmers’ incomes. FBOs give farmers more bargaining power and provide a vehicle for access, knowhow, and finance. However, the promise of FBOs has proven difficult to fulfill, mainly because FBOs tend to be plagued with governance problems. These include corruption within the groups and political interference, as the leaders of FBOs that become especially large start to be perceived as political threats.6

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6 Indeed, FBOs, especially in Kenya, were historically seen as a key stepping-stone to politics, and the elections held within cooperatives were a very competitive affair. The threat that FBOs posed to central power in the mid-1980s and 1990s led to great interference from the central government, to the extent that many are now only a shadow of what they were in their heydays.
FBOs should be the ideal vehicle for providing services needed to upgrade value chains. However, we have yet to come up with governance models that work.

**Advantages of Millet Cooperatives**

<table>
<thead>
<tr>
<th>Service</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk reduction</td>
<td>2.2</td>
</tr>
<tr>
<td>Lump sum payment</td>
<td>5.6</td>
</tr>
<tr>
<td>Better prices and party</td>
<td>6.7</td>
</tr>
<tr>
<td>Cheaper farm inputs</td>
<td>7.8</td>
</tr>
<tr>
<td>Ready market</td>
<td>13.3</td>
</tr>
<tr>
<td>Capacity building</td>
<td>14.4</td>
</tr>
<tr>
<td>Source of finance/credit</td>
<td>23.3</td>
</tr>
<tr>
<td>Access to information and extension services</td>
<td>26.7</td>
</tr>
</tbody>
</table>

**Challenges of Millet Cooperatives**

- Exorbitant charges: 6.3
- Hard to change prices/loss of individual bargaining power: 14.1
- Delay in payments: 18.8
- Mismanagement, disputes and corruption issues: 60.9

Source: Field survey, 2014

Strengthening farmers through the development of strong FBOs that can integrate backward to supply inputs and extension, as well as forward to processing and marketing, is key to developing stronger processing sectors. Our case studies showed fairly dynamic FBO landscapes, as displayed in Figure 3.6.

**New models of FBOs now under experimentation could change the processing landscape.**

- **FBO – fully integrated**
  - The Githunguri Dairy Farmers Cooperative Society (GDFCS) is a full-fledged processor and a leading innovator in the sector, with BPO products.
  - DFCS also supplies inputs and extension services to farmers.

- **FBO/processor**
  - Some cassava enterprises are based on groups of strong women that do farming and processing. Usually each farmer contributes both products and labor.
  - Soroti Sorghum and Sweet Potato Processors Association (SOSSPA) in Uganda is a group of farmers that has been successful and innovative in developing novel products for sale.

- **FBO/logistics provider**
  - Kapchorwa Commercial farmers’ Association (KACOFA) in Uganda is focused on providing logistics services to ensure that farmers supply quality sorghum to East Africa Breweries.

- **FBO specialization**
  - Maendeleo Mashinani in Kenya has a model whereby farmers in the group offer specialized services to other members, such as:
    - Breeding day-old chicks (DOCs)
    - Growing and manufacturing poultry feeds
    - Producing eggs

Source: Field survey, 2014

Stronger FBOs will be critical to the establishment of commercial farming. In Uganda, the success of sorghum as a brewery feedstock was largely due to the emergence of a strong FBO, Kapchorwa Commercial Farmers’ Association (KACOFA), which provides a range of services to farmers, including inputs, mechanization hire, extension support, and logistics services (such as storage and cleaning). The FBO has essentially taken over the governance of the sorghum value chain, helping to upgrade it from its previously fragmented state.
Table 3.1: KACOFA FBO services

<table>
<thead>
<tr>
<th>Value Chain Activities</th>
<th>Activities Undertaken by KACOFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input supply</td>
<td>X</td>
</tr>
<tr>
<td>Production</td>
<td>X</td>
</tr>
<tr>
<td>Harvesting</td>
<td>X</td>
</tr>
<tr>
<td>Credit</td>
<td>X</td>
</tr>
<tr>
<td>Extension</td>
<td>X</td>
</tr>
<tr>
<td>Quality control</td>
<td>X</td>
</tr>
<tr>
<td>Logistics (transport and storage)</td>
<td>X</td>
</tr>
<tr>
<td>Processing</td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td></td>
</tr>
</tbody>
</table>

A more interesting innovation may perhaps be observed in the Maendeleo Mashinani Savings and Credit Society, a poultry farmers’ FBO in western Kenya. Under this model, poultry farmers are developing an integrated operation that incorporates feed production, poultry production, and marketing. The most notable feature of this model is that different members focus on different activities, thus creating specialization within the FBO. They have also registered as a company which has the advantage that government interference is low compared to registering as a cooperative (see Box 3.3 below).

Box 3.3: Toward a cluster feed processing model: Maendeleo Mashinani Savings and Credit Society

Maendeleo Mashinani Savings and Credit Society (a savings and credit cooperative, or SACCO) in Busia, Kenya, was established in 2012 with funding from the Western Kenya Community Flood and Hunger Mitigation Project. It has a membership of over 110 indigenous chicken farmers and functions as a limited-liability company.

The main objective of the SACCO is to supply day-old chicks (DOCs), pullets, and processed feeds to members. It also trains members on good poultry husbandry practices, provides loans to support poultry production, and buys eggs and chicken from members.

The Maendeleo Mashinani SACCO has a hatchery and a feed mill and also serves as a business hub, with three main functions: input supply, purchase of raw materials from farmers, and marketing of poultry products.

The SACCO has had good success in:
- Supply of DOCs and pullets
- Buying feed inputs from farmers, processing poultry feeds, and supplying feeds to the society’s members
- Supply of drugs and vaccines
- Buying eggs from members and farmers in the community
- Marketing of mature chickens

Membership in the group is contributory through buying shares; members pay a monthly contribution of KSh300 and can borrow based on the number of shares. The accumulated savings enable shareholders to invest in bigger enterprises that in turn build up capital.

The key advantage SACCOs have over traditional cooperatives is that they are registered under the Companies Act and so have simpler governance structures than cooperatives, which are registered under the Cooperative Societies Act. SACCOs can make rapid decisions, and, being smaller, they are more easily held accountable to members. This model is leading to a revival of feed crop farming and poultry farming, diversifying farmers’ incomes and establishing an infrastructure for processing and lending.

FBOs become transformative when they are big enough to mobilize resources to invest in backward or forward integration, or even to diversify into new businesses. Therefore, it is necessary to find ways to design FBOs with governance structures that allow them to grow without (i) becoming corrupt, or (ii) becoming political platforms for those with political ambitions (and thus running the risk of being destroyed by political incumbents).
Useful lessons can be learned from the study of some FBOs that have managed to negotiate this path and are now large and powerful enough to manage the political forces. One such organization is the Burkina Faso cotton farmers’ FBO. Over the years it has grown and stayed true to its mission, and so has become a force due to the great trust it enjoys from its formidable membership. It is instructive that the cotton farmers’ FBO was able to push through legislation to introduce GMO cotton at a time when GMO approval stalled in most other countries, where the debate tended to be controlled by activists rather than farmers (see Box 3.4 below). Indeed, powerful FBOs can be a significant force in managing the political economy, which is often the bane of agriculture in Africa, mainly due to their grassroots nature.

Managing the political economy is key to agriculture-driven transformation and, in particular, to the emergence of a strong agroprocessing sector. It is a country’s industrial policy, coupled with its trade policy, that determines whether the sector grows or not. Traders generally have greater political power than farmers, and the declining poultry industry in Ghana is due to imports of poultry, often from countries where agriculture is heavily subsidized, making local producers unable to compete.

Figure 3.7: Challenge of Ghana Poultry Sector

Box 3.3: Toward a cluster feed processing model: Maendeleo Mashinani Savings and Credit Society

Established in sub-Saharan Africa (SSA) during the colonial period in the form of cooperatives, FBOs became a means of promoting production and facilitating the collection of cash crops such as coffee, cocoa, tobacco, cotton, and vanilla for export. Although farmers had already organized in groups to address social and community constraints, the colonial period leveraged these indigenous institutions to introduce market orientation functions and formalized them by establishing bureaucratic links with local and central authorities.

The post-independence experience of FBOs has been mixed. In countries such as Ghana, governments used FBOs as preferential channels for the provision of credit, often linked to the distribution of agricultural inputs. Farmers were often coerced, or at best induced, to join these grassroots institutions (GRIs), and membership in GRIs was usually a prerequisite for obtaining credit from the government.

However, in Burkina Faso, cotton farmers’ organizations were strengthened, as cotton quickly became the main source of export revenue and organization was necessary to ensure the welfare of farmers on political grounds. Today, Burkinabe cotton farmers’ groups are well organized from the village level all the way up to the national level. They are heavily involved in the yearly price-setting negotiation between the government and cotton companies and are used as the main conduit for cotton production education. Burkina Faso is one of the few SSA countries, if not the only one, that has adopted GMO cotton, and the Union Nationale des Producteurs de Coton (UNPC) was pivotal in facilitating this advance. Leveraging the trust that farmers give the union, even at the grassroots level, UNPC was able to quickly address the worries that farmers had about GMO cotton, an important action that greatly reduced the risk associated with GMO adoption in other African countries today.
Contract farming: a new kind of contract?

Contract farming is one way to guarantee supply for processors. However, contracting models are plagued with the challenge of side-selling by farmers. Legal avenues to enforce contracts can be very expensive and attract unwanted publicity, so greater trust is needed to ensure ethical behavior.

One way of building trust that is being used in Western Uganda by NUMA feeds, a sorghum and millet processor, is to create a denser relationship with contracted party. Not only NUMA buys sorghum and millet from contracted farmers but NUMA also sells them animal feeds for their livestock farming activities. This two way relationship creates more opportunities for interaction and building trust. At the same time selling feeds is a new line of business for the processors while raising livestock helps sorghum and millet farmers diversify their livelihoods. This symbiotic relationship is key to building trust.

As noted earlier, integrating crop raising and livestock farming has many benefits for farmers. One example of this approach could be the development of a livestock–sorghum project in which sorghum, dairy, and poultry industries are developed jointly. This could be particularly transformative in resource-poor communities that grow sorghum. Striga weed, a key challenge to sorghum production, can be effectively managed through intercropping with the Desmodium intortum plant, which also makes good fodder. At the same time, manure has been found to be very effective at increasing yields of sorghum, especially when combined with fertilizers. These are a few of the clear complementarities resulting from combining livestock with sorghum production.

Figure 3.8: Services and trust-building in contract farming

Services can help build the trust needed to make the contracting model work.

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop</td>
<td>Food products</td>
</tr>
<tr>
<td>Livestock</td>
<td>Animal feeds</td>
</tr>
</tbody>
</table>

- Buy crop
  - When farmers engage with processors as buyers and sellers, a deeper relationship is established. More importantly, this intimate relationship provides opportunities to provide extension services and inputs to farmers so as to improve quality and increase demand.

- Sell animal feeds

If farmers are able to diversify their incomes and spread them out more evenly across the year—and livestock raising, unlike crops, has the potential to offer a constant flow of money, e.g., through dairy production—they will have the means to deal with small emergencies and will not resort to side-selling to raise immediate cash. Repeated transactions and interdependency create the trust that makes contracting models work. Further diversifying income also reduces farmers’ risk aversion, thus increasing uptake of technologies and raising yields.

7 These stories are likely to be seen as David-and-Goliath battles, with the processor seen as using its power to tread on the rights of smallholders.
Another model being applied to overcome the challenges of side-selling and the prevalence of non-optimal varieties is block farming, used by Caltech in Ghana. Caltech contracts farmers on its own land and provides them with inputs and extension support. In this way, farmers can grow the cassava desired by Caltech on its land and grow the cassava that suits their palates on their own land. Thus, farmers can act as subsistence producers on their land and commercial producers on the contracted land. The fact that Caltech is the owner of the land also reduces side-selling, as Caltech essentially owns the cassava.

Toward a holistic farming ecosystem

While the farming landscape across the countries studied was characterized by smallholder farmers, we also observed significant variation among farmers, which created an ecosystem of producers who in some cases supported each other in symbiotic relationships. Perhaps the most interesting development has been the emergence of a sector of medium-sized commercial farmers with the potential to drive the transformation of the agricultural sector.

As profiled in Box 3.5, a medium-sized commercial farmer in Eldoret, Kenya, has experimented with breeding and feeding technologies and yielded impressive results. Beyond that, the farmer has started consulting for other farmers, thus becoming the potential vanguard of a dairy revolution. This class of medium-sized farmers is ideally positioned to drive transformation, as they are not too far removed from small farmers (and are thus able to assist in technology transfer), but can also successfully interact with and draw knowhow and technologies from very large commercial farmers. They are the glue in an ecosystem that combines the specific capabilities of smallholders and medium-sized and large commercial farmers. In Uganda, for instance, the emergence of medium-scale commercial sorghum farmers has made it possible for smallholder farmers to access modern farming machinery, including harvesters and threshers, as the commercial farmers make them available for hire.

Box 3.5: Profile of a medium-sized commercial farmer: Willy Kirwa

Willy Kirwa, a farmer in the Rift Valley, is an example of the emerging class of dynamic medium-sized commercial dairy farmers. He employs a scientific approach to managing his dairy farm, combined with use of technology and well-thought-out investments. Kirwa has managed to raise a herd of 68 high-quality pure breeds from a herd of three over a period of 10 years on his 50-acre farm. The highlights of his approach are below.

- Kirwa uses sexed semen, which guarantees a heifer (note that this semen costs KSh7,000, while ordinary semen costs KSh1,000), combined with a strategy of mating cows with better and better bulls to increase genetic diversity and improve milk production.
- Kirwa has constructed a spray race to control East Coast Fever. He points out that a spray race is better than a conventional dip and that cows produce less milk when they jump and swim in the dip. Kirwa also regularly monitors cows for mastitis.
- Kirwa shifted from grazing to zero-grazing after observing that zero-grazing cows’ diet of dry matter led them to drink more water and thus produce more milk. To this end, he grows high-quality Boma Rhodes and Lucerne feeds that are rich in protein and uses fertilizer to nourish his kikuyu grass (many farmers do not). He also grows maize to make silage, which guarantees him a constant supply of feed even during drought. By making his own high-quality feed, he has managed to save 50% of the cost of commercial feeds.
- Kirwa segregates cows and feeds them differently depending on their milk production. Cows producing less than 15 liters per day are given 2 kg/day of dairy meal; cows producing 15–25 liters per day are given 4 kg/day; and those producing more than 35 liters per day are given 5 kg/day.
- As milk in Kenya is paid on quantity rather than on fat content, Kirwa has chosen to raise the Friesian breed, which produces a greater quantity of milk than other breeds but has less fat.

Beyond selling milk, Kirwa has diversified his income in the following ways:

- He has invested in a biogas digester, producing manure that is used to grow vegetables that are sold to hotels.
- Besides the milk from his herd, Kirwa now sells about 10 pedigree heifers a year.
- Kirwa has set up a training facility on his farm that hosts up to 100 farmers a year.

Another interesting development observed was the emergence of cooperative relationships between large-scale farmers and smallholders. In the Kenyan dairy sector, a growing trend among large-scale farmers is a move toward specializing in breeding and away from milk production. These farmers are now a major source of breeding stock for the smallholders. At the same time, smallholders have become highly specialized, focusing on milk production only. Calves of both sexes are either reared for beef or disposed of immediately after calving. The farmers source replacement heifers from breeders, mostly medium- and large-scale dairy farmers. The interdependent relationship between the two groups is a good indication of the potential for specialization.

In Uganda, ranchers are also moving away from rearing beef cattle and focusing on fattening beef cattle obtained from pastoralists. The pastoralists can raise huge herds at low cost, but the cows are of very poor quality and require intensive feeding before being sold. Ranches can grow the fodder they need for fattening. For instance, Banuti Ranchers buys 100–300 immature steers from nearby smallholders in March, at the beginning of the rains, raises them on good-quality pasture, and sells them after four months, at the end of the rains. An ecosystem of both smallholders and medium-scale commercial farmers is beneficial to the sector, as it allows for specialization based on the strengths of each.

Figure 3.9: Cooperative farming ecosystem

While smallholder farmers will continue to be the bedrock of agriculture, the objective should be to achieve an ecosystem with a mix of farmers.

- Very poor; farming is focused on providing food for family. Taste rather than yield is key in variety choice.
- Do they need welfare support or agricultural support?

- Commercial orientation makes it easy for them to:
  - Enter into contract farming
  - Form strong FBOs that can provide many services and even integrate forward to processing

- Have the means and enthusiasm to adopt new technologies
- Can easily diffuse technologies to smallholders, as they are not too far removed from them

- Able to bring new technologies and developed markets, e.g., export markets
- Can provide highly specialized capital-intensive services, e.g., breeding
- Farming system benefits from the infrastructure they provide

There is potential to create a highly symbiotic ecosystem with each type of farmer specializing, e.g., in the dairy sector in Kenya.

A new kind of sharecropper may emerge if the middle class invests in smallholders.
Box 3.4: A New Kind of Middle Class Farmer?– The Case for Cocoa Farming

The primary challenge of low productivity in cocoa farming in Ghana is the low level of inputs used, as many resource-poor farmers cannot finance high-input agriculture. At the same time, the small group of farmers who use significant inputs have very high yields.

Figure 3.10: Ghana Cocoa Farming System

Ghana’s cocoa productivity remains below potential, as poor farmers cannot make the needed investments.

Cocoa Yield (kg/ha)
- Malaysia: 735
- Cote d’Ivoire: 541
- Ghana: 424

Ghana Disaggregated Yields (kg/ha)
- High Technology: 1400
- Medium Technology (20–50% of Farmers): 650
- Low Technology (50–65% of Farmers): 400

Production Constraints
- Cocoa production is constrained by aging, illiterate, poor farmers who have few resources to rehabilitate farms and cannot take up new technologies.
- Inputs are not reaching all farmers.
- Gold mining is taking over farmlands.

The question, then, is how to move the many low-yield farmers into higher-yield categories. This is possible with creative thinking and good incentive systems. The potential exists to use the principles of traditional sharecropping to try to mobilize resources for farming. Under the traditional methods, namely abusa and abunu, poor sharecroppers offer their labor and in return get a share (a third and a fifth) of the produce, which means that resource-constrained farmers need not pay for labor. However, this approach does not address current yield challenges, as resource-poor farmers cannot afford the expensive inputs. To make these methods work, a third player could be brought in to finance inputs using the same principle. This farmer–investor would then get a share of the output above what the farmer would have gotten. The farmer–investor could be a middle-class worker in the city, or even a social entrepreneur, via various websites that allow people to invest in others through loans (e.g., kiva.org).

We simulated returns from such an investment and found that the investor cash flows could be very good. Implementing this new type of sharecropping would require new understanding and institutional arrangements, in addition to the involvement and blessing of traditional authorities in order to lower the costs of monitoring and enforcement.

Figure 3.11: Cashflow For Farmer Investor

Can we create a new cocoa sharecropper by enticing the Ghanaian middle class to invest in cocoa production?

<table>
<thead>
<tr>
<th>Year</th>
<th>Farmer</th>
<th>Farmer–Investor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(733)</td>
<td>(1,111)</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>(552)</td>
</tr>
<tr>
<td>3</td>
<td>366</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>614</td>
<td>250</td>
</tr>
<tr>
<td>5</td>
<td>945</td>
<td>S81</td>
</tr>
<tr>
<td>6</td>
<td>945</td>
<td>S81</td>
</tr>
<tr>
<td>7</td>
<td>945</td>
<td>S81</td>
</tr>
<tr>
<td>8</td>
<td>945</td>
<td>S81</td>
</tr>
<tr>
<td>9</td>
<td>945</td>
<td>S81</td>
</tr>
<tr>
<td>10</td>
<td>945</td>
<td>S81</td>
</tr>
</tbody>
</table>

- The farmer absorbs half the cost of land preparation, seedlings, planting, and harvesting.
- The investors assume the full cost of maintenance, herbicides, and fertilizer.
- Harvesting starts in Year 2, when yields are only 400 MT/ha. Full yield of 850 MT/ha is reached in Year 5 and stays there. Cocoa is sold at GH¢3,125/MT.
- Costs used are as follows: planting, GH¢160/ha; seedlings, GH¢450/ha; maintenance, GH¢576/ha; herbicides, GH¢140/ha; fertilizer, GH¢398/ha; harvesting, GH¢150/ha; drying, GH¢24/ha.

This could be an extension of the abunu and abusa traditional systems, whereby the investor gets the extra yield due to his investment.

Note that many middle-class workers in Ghana are already involved in financing artisanal and small-scale gold mining. Thus, this would not be an unusual arrangement, though it would be much longer-term.
IV. Opportunities for Improving Post-Harvest Logistics

A. Post-Harvest Losses

Post harvest losses are a significant challenge for farmers, for instance, in Burkina Faso, where sorghum farmers have reported significant losses on the farm and also during storage. Tackling post-harvest losses can improve the productivity of white sorghum cultivation by almost one-third. This challenge warrants serious attention, perhaps even more so than improving yields.
The greater share of post-harvest losses occurs on the farm, mainly due to the manual harvesting methods employed, a form of drudgery primarily borne by women. Without a solution to these harvesting challenges, farmers may not be willing to plant higher-yielding varieties of crops. Yet simple machinery fabricated locally can greatly reduce losses. Cassava graters fabricated by roadside artisans have been partly responsible for uptake of higher-yielding varieties of cassava, as they allow farmers to easily process their crops. Thus, supporting local fabrication sectors to make available simple machines, such as manual threshers and raised platforms for drying, can greatly reduce post-harvest losses. It is likely also to be more cost-effective to address post-harvest on-farm losses before addressing yield challenges. Indeed, for sorghum farmers in Burkina Faso, subsidizing harvesting and threshing machinery has probably resulted in a greater payoff than fertilizer subsidies.

Storage is a much bigger challenge due to the greater investments needed to build good storage facilities. Solutions are emerging, such as hermetically sealed bags and metal vacuum containers, though these require large up-front investments. There are also storage providers emerging to provide these services. Perhaps the most innovative solution is the warehouse receipt system now being piloted in a number of countries, including Ghana, Tanzania, and Burkina Faso.

**Box 4.1: Warehouse receipt system**

The warehouse receipt system (WRS) has now been adopted in a number of African countries, including Tanzania and Ghana. The Tanzanian system is much more advanced than the Ghanaian version, which is still in a fledgling stage and not yet sufficiently used. Among the reasons behind this is the inability of smallholder farmers to benefit from the infrastructure. Unless smallholders act collectively as an FBO to leverage economies of scale, their participation in the WRS will remain costly and therefore less attractive. To remedy this, the government of Ghana has introduced the Ghana Commodity Exchange (GCX), which uses the infrastructure established by the WRS and improves market access by reducing the influence of oligopolies created by market queens. The objective of introducing the GCX is to address the transaction costs preventing smallholders, among other players, from participating in the WRS by offering them the opportunity to attract higher prices through a competitive market, as has proved successful in Ethiopia.

**B. The Middleman/Trader: From Value Chain Bogeyman to Value Chain Upgrader**

The challenge of poor road conditions that impede access to markets is well documented, but the challenges of a highly fragmented supply system with many brokers and actors have not received adequate attention. Some of these challenges are described below.

- Many small actors translate to higher transaction costs, and because only so much of the cost can be pushed onto consumers, the farmers tend to get less. The tendency to demonize middlemen/brokers as exploiting farmers seems to result from a misguided analysis. The price difference from farm gate to consumer can indeed be very large (100%, in some cases), but this margin is often shared by up to four brokers, who must
also overcome the challenges of poor roads, adulterated products, spoilage, and other marketing risks. When all the risks are taken into account, each broker’s margins are modest and can indeed be very small; as observed in the egg trading market in Kenya, they can be as low as 9%.

- Small brokers with a small scale of operations cannot invest in logistics to lower costs and improve quality. For instance, milk tends to be transported by bicycle, using plastic containers that are prone to contamination. Better-resourced brokers can invest in better transport modes, aluminum containers, and even dry ice facilities to keep milk cool.

- Regulation and enforcing quality standards among numerous small brokers is also notably difficult. Cutthroat competition between brokers can lower standards and destroy trust in the system, which may also explain the low level of contracting in all value chains. Contracting can help stabilize markets and reassure producers, thus increasing market participation, as well as increasing supply stability.

Middlemen are crucial to the functioning of all the value chains studied. The middleman coordinates, finances, and finds markets. He or she is the most entrepreneurial person in the chain and is key to making it work. Therefore, concerted efforts to strengthen and upgrade the much-demonized middleman may improve the functioning of the value chain and create value for all players. Note that the success story of using sorghum to brew beer in Kenya and Uganda was tied to the development of strong, well-resourced logistics providers who can handle bulking, quality control, and provision of storage facilities, among other services. These are essentially the upgraded version of middlemen.

In Ghana, rice value chain middlemen were found to be the main source of financing for rice production. Meanwhile, Nerica rice’s success in Benin was due solely to the efforts of a middleman who propagated the new seeds and convinced farmers to use them. Middlemen are likely to convince farmers to take up new technologies, as the farmers believe that middlemen have critical knowledge of what the market wants.

Figure 4.2: The growing importance of the middleman

<table>
<thead>
<tr>
<th>Input providers</th>
<th>Logistics providers to make contract farming work</th>
<th>Financing</th>
<th>Quality control</th>
</tr>
</thead>
<tbody>
<tr>
<td>• More likely to be trusted by farmers, as they are perceived to have a better understanding of the market. In Benin, the success of Nerica rice was largely due to the efforts of one trader/middleman.</td>
<td>• Repeated interaction translates to deep understanding of and insights into what works.</td>
<td>• Intimate knowledge from repeated interactions means middlemen have a better understanding of the creditworthiness of various farmers.</td>
<td>• Have a stake in increasing quality, as they are the link to the market.</td>
</tr>
<tr>
<td></td>
<td>• Traders can use the same infrastructure to buy and supply inputs, e.g., Pwani Feeds in Kenya.</td>
<td>• Note that 70% of rice farmers in Northern Ghana get financing from middlemen.</td>
<td>• In Uganda, middlemen supply tarpaulins to farmers for drying.</td>
</tr>
</tbody>
</table>

E.g., they may upgrade from bicycles to motorcycles or to new motor transport systems.
In many industries, powerful traders become manufactures or processors once they have gathered enough resources (see Box 4.2 on Pwani Feeds), and tend to be very successful at it because they understand the business and have built the needed logistics chains. For crops like millet and sorghum, where many small traders-cum-processors-cum-retailers occupy the value chain, the emergence of strong traders can do a lot to improve the processing sector. The growth of traders should be deliberately promoted so that they can scale up and transition into processing, input supply, or farming—they may even become diversified entities that deal in all three, taking over the governance of production. The ultimate aim should be to develop them into commodity trading houses.

**Box 4.2: Pwani Feeds: from middleman to industrialist**

Shem and Cynthia Mwaura started a grocery shop in Mombasa in the coastal region of Kenya, where demand for eggs was high due to the many tourist hotels. To better guarantee his supply of eggs, Shem Mwaura went to the Central Province of Kenya, the largest egg-producing region, and opened a shop in Thika to serve as a collection point for regionally produced eggs before they were transported to Mombasa.

To encourage more producers to supply eggs, Mwaura started stocking his shop with poultry feeds from diverse manufacturers. The farmers would come with eggs and leave with feed. Seeing an opportunity from the success of this approach, Mwaura ventured into manufacturing feeds, and Pwani Feeds was established in Mombasa.

To develop a market for his feeds, Mwaura cultivated a high level of trust between the company and the farmers. A marketing team was chosen carefully to include field officers trained in animal health. The marketing strategy entailed visiting farmers and giving free advice on the best available farming practices, including required vaccinations, standards for housing, and record-keeping. Pwani also began delivering feeds to farmers rather than having farmers come for their feeds, which again gained it market share.

Another Pwani Feeds innovation was a demonstration farm where farmers could learn practical lessons and develop as egg suppliers in the coastal region. The farm would also be used as a testing ground for new feed combinations to ensure high standards before they were introduced onto the market. In time, the farm’s flock increased to 10,000 birds—all consuming Pwani products. The demonstration farm became popular, with both farmers and educational institutions from the coastal region visiting it frequently.

In the Central Province, Pwani Feeds also introduced a new business model, taking its feed products to farmers’ doorsteps and purchasing eggs directly from the farm. The farmer thus did not have to leave his farm to purchase feed in the urban centers, nor locate a market for the eggs. Another advantage to the farmer was that the costs of breakage occurring after the eggs were collected were borne by Pwani Feeds. Further, Pwani bought eggs from the farmer at exactly the same price as the farmer would have gotten from brokers and other middlemen in town.

Although Pwani’s core business was the production of poultry feed, it saw that the majority of its customers also kept dairy cows or pigs, and a few also kept rabbits. This presented an opportunity for diversifying the feed market, and today Pwani’s non-poultry feeds are more profitable than its poultry feeds.

Pwani Feeds is now among the top 10 animal feed manufacturers in Kenya. Its current plan is to acquire hatcheries in order to deliver chicks to customers, rather than feeds only. Eventually its goal is to internalize this part of the value chain in order to reduce costs both for farmers and for the company.


**C. Transport**

Efficient transportation is key to the proper functioning of value chains. However, in all value chains studied, transportation remains a significant challenge even beyond the well-known example of very poor roads. The structure of ownership and the need for investment come out as key issues.

Significant value is lost due to lack of appropriate transport, as is significant opportunity. One case in point is the beef sector, in which proper transportation and handling of animals is crucial. In Burkina Faso, where investment in transportation is very low, the majority of cattle are transported to market on foot. This can result in significant loss of weight during transport.
In Uganda, the main challenge observed was overcrowding of cows in trucks, resulting in serious trauma to the cows and even death during the gruelling journey to markets. Significant violence is used in the process of packing them in, including piercing them with sharp objects that destroy the value of the hides. Yet an analysis of profit margins indicates that the truck owners made good profits. One assumes that if the traders were also the truck owners, they would care about the quality of the cows as well as profit margins, and would likely care better for the animals and avoid overloading the trucks.

The beef value chain is also challenged by the lack of refrigerated trucks, which can have a substantial impact on rural transformation. With refrigerated trucks, beef can be processed in the same areas where it is produced, with significant value captured.

Another challenge of transport is the high cost of transport from villages to local markets, compared with the cost of travel from local markets to urban markets. This reflects poorly on the quality of rural roads, but also reflects a lack of competition due to low investment in this first mile of transport.

More attention must be given to developing transporters or logistics providers. It may be possible to entice local youth to engage in this first mile of transport. There are now cheap transport modes, such as the three-wheeled motorcycle (Motorking), that can provide this crucial link and lower costs. Providing finance to help the youth acquire this cheap means of transport will not only increase competition and lower costs but also provide much needed youth employment.
V. Opportunities for Strengthening the Processing Sector

The key policy instrument used by the governments in this endeavor has been incentives, which, even as they increase domestic processing, have also meant significant loss of tax revenue.
Processing is probably one of the most challenging stages of the value chains studied. Processing sectors suffer from unreliable and low-quality supplies, coupled with a lack of resources to develop new products and to acquire the needed equipment to bring these products to market. This tends to confine food manufacturing largely to the artisanal and SME sectors, and thus to a narrow product range.

All the same, governments have been trying to promote large-scale industrial processing and have developed industrial policies to promote agroprocessing focused on exports. Ghana has been very active in this respect. The Ayensu Starch Company (ASCo) was founded under a presidential special initiative (PSI) to process and export cassava starch. Ghana has also been promoting more domestic processing of cocoa beans before export. In Kenya and Uganda, active government support through the removal of excise duties has allowed sorghum to be adopted as a substitute for barley in modern commercial brewing. The key policy instrument used by the governments in this endeavor has been incentives, which, even as they increase domestic processing, have also meant significant loss of tax revenue. Indeed, last year the government of Kenya removed the excise duty exemption for sorghum based on this argument. ¹⁰

However, the government need not sacrifice taxes in the name of industrial policy. Though controversial and against the cannons of orthodox trade policy, Nigeria has demonstrated that mandates can achieve similar ends. Nigeria banned the use of imported barley, which forced breweries and the food processing industry to adopt sorghum as their main feedstock. Today Nigeria has the biggest sorghum malting plants in the world and is using similar mandates to increase the industrial processing of cassava. The current policy has established a target of 40% cassava flour in domestically produced bread.

In a further argument against the use of tax incentives, it has also been pointed out that these generous incentives are usually given to rich multinational corporations, yet these companies create few jobs. Indeed, the bulk of the products studied were processed by traditional artisans, who operate mostly in the informal sector with very little government support.

All the same, a vibrant informal processing sector independent of government support has been growing, using novel approaches to solve some of the challenges pointed out in Figure 5.1. We describe some of these new approaches below.

¹⁰ This led to East Africa Breweries’ decision to stop using sorghum, which in turn led to a public outcry. There are now plans to restore the tax exemption.
A. Linking Artisanal Processors to Urban-Based Small- and Medium-Scale Food Manufacturers

One model that is proving versatile in resolving these challenges involves tighter integration between rural, artisanal processors and urban SME processors. Rural processors have solved the problem of supply (as they are also farmers), but lack skills in product development and navigating food marketing regulations. SME food manufacturers have skills in market and product development and in managing regulations, but have difficulties sourcing consistent supply. A model in which an artisanal processor is able to supply a product in bulk to an SME, which then packages and markets it, is mutually beneficial.

Adopting this model, the Ghanaian food manufacturer, St. Bassa, stopped sourcing cassava and now uses a women’s processing group based in rural Ghana to supply its bulk processed product (gari), which it packages and markets to African stores in Europe. It provides support to the rural processing group to help it meet quality standards.

There is a need to rethink industrialization policy and provide incentives to strengthen these types of linkages. Tax breaks and subsidies on equipment should be extended to firms that have developed contracting models with rural processors. Going hand in hand with this should be support for marketing and branding, including directing part of the government agriculture budget to advertising firms, who can help promote products from the more innovative companies.

B. Medium-Scale Commercial Farmers and the Rise of Rural Cottage Industries

Medium-scale commercial farmers are also bringing new dynamism to rural areas by integrating forward through cottage industries. Cottage industries have the capacity to create both demand for products and off-farm employment in rural areas. They require less investment and demand much less of the high-level infrastructure needed to support more formal industry. Perhaps their biggest advantage is that they tend to grow organically as more successful farmers integrate forward to processing. An example of this trend is the rise of home-based cheese production in Kenya, as illustrated in Box 5.1.
This emerging industry bodes well for the dairy sector, as the cheese industry has the potential to absorb a significant amount of milk. Given the right support, the fact that cheese can be made at home using simple equipment could have important implications for rural development. The example below is a testimony to the significant potential of medium-scale farmers to drive rural transformation.

**Box 5.1: Kenya’s emerging cheese cottage industry**

A dynamic cheese cottage industry is emerging in Kenya, with the potential to use up much of the milk that is lost during periods of glut if it is scaled appropriately. Some of the more dynamic players are discussed below.

- The six-acre Brown’s Cheese Farm is home to the only international award-winning cheese maker in Kenya. Located in Tigoni, Limuru, Brown’s is renowned for crafting natural cheeses using traditional methods and ingredients, with no colorings, coatings, or other additives. Brown’s Cheese Farm buys its milk from over 3,000 small-scale farmers around Limuru. It also has 25 cows of its own. Brown’s Cheese puts emphasis on the quality of milk in making its cheese, and all incoming milk is first tested for quality, purity, and freshness. It makes 15 varieties of cheese in small quantities, some of which may be aged up to 10 years. It is also experimenting with new recipes, including a cheese made from traditional fermented murzik. Apart from producing cheese, Delia and Andrew Stirling, who own Brown’s Cheese, also train chefs on recipes for different foods made with cheese. They are key suppliers of cheese to a number of leading hotels, and they also supply to the leading supermarkets.

- Another interesting processor is Sammy Githogo, who accidentally went into cheese-making as a way to use unsold milk from the family milk transport business. Through experimentation, he has created a cheese making business on his homestead that today supplies cheese to 13 hotels in Mombasa (where he has a cold room) and several hotels and international schools in Nairobi. Githogo’s target is to expand to producing about 15 MT of cheese per month, and he believes the opportunity exists to grow even bigger. Sammy currently has a staff of five, and his factory provides income to a number of farmers in central Kenya and the Rift Valley.

Sources:

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6 Indeed, FBOs, especially in Kenya, were historically seen as a key stepping-stone to politics, and the elections held within cooperatives were a very competitive affair. The threat that FBOs posed to central power in the mid-1980s and 1990s led to great interference from the central government, to the extent that many are now only a shadow of what they were in their heydays.
VI. Addressing Emerging Urban Markets

The power of branding in creating value is demonstrated by the price differentiation among different sorghum products offered in Kenyan supermarkets. Despite the fact that all the products are basically flour, mainly used for porridge, marketers have been able to create significant value.
Low productivity combined with low levels of product development has meant that local products are losing their competitive edge in the new urban food markets that are becoming the dominant market for farmers. These markets impose higher standards, especially for quality, convenience, and packaging, and these demands are hard for many rural farmers and artisanal processors to meet due to low knowledge and low levels of technology.

Markets are probably the most important determinants of the productivity and profitability of the value chain. Attempting greater value capture through better markets may be more efficient than efforts at increasing farm-level productivity. Improving markets will require attention to marketing and branding, product development, and market channel development.

A. Marketing

Studies in Senegal have shown that local rice could fetch a 17% premium on the current price through better labelling, which is likely more efficient than trying to increase on-farm productivity by 17%. Another study finds that consumers are willing to pay an average price premium 44 per cent for branded quality Senegal Valley Rice (SRV) rice such as Rival®, the research concludes that that investment in quality tailored to end market standards, and branding can render local rice competitive with imported rice.

Therefore, building the image of products should be a key part of efforts to increase their value.

The power of branding in creating value is demonstrated by the price differentiation among different sorghum products offered in Kenyan supermarkets. Despite the fact that all the products are basically flour, mainly used for porridge, marketers have been able to create significant value. There is also evidence that manufacturers are leveraging branding to broaden sales. For instance, Winnie’s Pure Health offers three different porridge products, priced at KSh70/kg, KSh92/kg, and KSh94/kg.


Social marketing can also play an important role in developing new markets. For instance, in Ghana, some traditional beliefs hold that white eggs are used for witchcraft (as sacraments to the spirits), and therefore many people shy away from eating them. Social marketing can help dispel such myths. The higher nutritional value of millet can also be made a key driver of demand through appropriate social marketing campaigns.

B. Product Development

Our survey of millet in Kenya pointed to the need for greater efforts to develop products to satisfy urban markets. The study indicated that millet is seen as more nutritious than other grains, yet consumption of millet remains low, mainly due to lack of product variety. Millet is largely consumed in the traditional way, as it lacks the range of products needed to address modern markets.
Figure 6.3: Preferences among grains and millet product awareness

Millet is preferred by many to other grains due to its perceived higher nutritional value. However, awareness of millet products is very low.

<table>
<thead>
<tr>
<th>Grain Preference (% Expressing)</th>
<th>Reason for Millet Preference (% Expressing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millet</td>
<td>Affordability</td>
</tr>
<tr>
<td>59.8</td>
<td>62%</td>
</tr>
<tr>
<td>Other starchy grains</td>
<td>taste</td>
</tr>
<tr>
<td>40.2</td>
<td>19.8</td>
</tr>
<tr>
<td></td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>24.4</td>
</tr>
<tr>
<td></td>
<td>Nutrition</td>
</tr>
<tr>
<td></td>
<td>44.3</td>
</tr>
</tbody>
</table>

Market development should be considered more broadly, and regulations should follow markets. While moving from traditional markets to modern markets is important for increasing value, modern products need not be pitted against traditional ones. For example, we observed a modern supermarket selling raw milk in Kenya, in recognition of the fact that its consumers want that milk. Yet the policy of government has been to reduce the supply of raw milk on the market and shift toward processed milk. Markets, rather than policy, should decide what products are offered, and regulation should then follow to make sure these products are provided safely.

Box 6.2: The dawn of African “superfoods”

There is a growing global movement around healthy eating, and foods perceived to be highly nutritious now attract a significant premium. Quinoa is the quintessential example of such “superfoods”; it has become so popular and global demand has grown so high that even the South American farmers who traditionally grow it no longer eat it, as they prefer to sell it. As this movement has grown, the search for new superfoods has begun, and sorghums, millets, and African rice are being touted as some of the next superfoods based on their superior nutritional qualities.

This movement is also strengthening in Africa due to an emerging health-conscious middle class, which presents an opportunity to rebrand traditional grains like millet and sorghum and develop premium products. Consumption by the middle class will not only improve the income of farmers who supply to supermarkets, but will also send an important signal to other consumers who have historically viewed sorghums and millets as food for the poor.

RAND Corporation/Pardee RAND Graduate School and ACET are piloting a project to rebrand sorghums and millets in East Africa as superfoods through a cooking competition, which will showcase different ways of preparing traditional grains, using the skills of top chefs and accompanying messages on the nutritional value of these grains.

Figure 6.4: Traditional Grains Re-Branding Initiative

A key intervention could be a recipe contest to rebrand millet (and sorghum) as East African superfoods and thus improve their images.

1. Formative Research (Months 1–6)
2. Recipe Contest/Product Design (Months 7–12)
3. Recipe Dissemination and Tasting/Product Testing (Months 13–18)

- A contest format has the advantage of encouraging many different groups to be involved, as contestants, spectators, and judges. Contests create drama and have also served as highly successful forms of entertainment.
- The contest will:
  - Solicit both chefs and citizens to develop recipes that use millet/sorghum as a primary ingredient and are delicious, nutritious, attractive, and convenient.
  - Offer prizes for the best recipes, with widely publicized tasting events for judges to pick the best dishes. Judging events will be coordinated with local media to optimize coverage.
  - Create several categories of recipes in order to increase the variety and scope for uses of millet/sorghum.
  - Try to encourage the use of millet/sorghum in processed foods, e.g., as an ingredient in noodles, breads, or crispy snacks, which could potentially stimulate new industries that will produce healthier prepared products.
C. Marketing Channel Development

While traditional markets were found to dominate food marketing, modern marketing channels are becoming increasingly important. These channels can create significant value, mainly due to the improved shopping experience they offer to customers. For instance, in Uganda, beef was observed to sell at a considerably higher price on the supermarket floor compared to traditional roadside butchers.

Figure 6.5: Meat products sold by supermarkets and prices (UGX per kg)

Modern supermarket channels can create significant value.

- At the low end, supermarkets in Uganda can increase the value of beef by almost 75% through mincing, while, at the higher end, cooked meat products can add almost a 400% premium.
- Supermarkets are creating value mainly through their superior shopping experience, in which products are displayed and offered in a hygienic manner.
- Value is also being created through offering an array of products.

Source: Field study, 2014

The role of modern marketing channels, especially supermarkets, should be carefully thought out, as they will become increasingly important in shaping diets. Supermarkets can have considerable influence on what consumers purchase and can thus shape both the agricultural and the processing landscapes. Due to supermarkets' stringent requirements for quality, smallholder farmers and artisanal/informal processors may not be able to participate in this process. Supermarkets also influence processing by producing supermarket brands through contract manufacturing. Further, supermarket chains have a regional reach and can thus easily help expand firms’ access to regional export markets.

D. Urbanization As a Driver of Agroprocessing

As indicated, rapid urbanization is significantly changing the food landscape by introducing new food markets with particular demands around price, convenience, quality, and packaging. Local agriculture has had difficulties addressing these emerging urban markets, as the small local food manufacturing sector cannot meet their demands. The result is that food imports have been rising very quickly in the countries studied. For instance, in Ghana, the local poultry industry has essentially been replaced by imports.
Urban food markets are creating new opportunities for food markets, particularly by creating demand for foods that are well packaged and convenient and stimulating the rise of food marketing franchises and chains. Even among informal roadside sellers, innovations in marketing can be observed. For instance, Koko King in Ghana is now selling well-packaged sorghum- and millet-based breakfast products from well-designed, modern stands on the roadside. In this way, Koko King is introducing new products, traditionally patronized by lower classes only, to the ever-busy middle class.

Food franchises provide perhaps the best opportunity for upgrading agricultural value chains and driving transformation. In Ghana, the local food chains Papaye and Chicken Republic specialize in chicken products; in Kenya, Kenchic has long been in operation, but is now joined by new chains like McFrys. The global franchising chains have seen the opportunity, and KFC is leading the way, with restaurants in Kenya and Ghana. The Subway franchise has also opened stores in Kenya and Tanzania.

This development provides important opportunities for the development of agroprocessing sectors and the upgrading of the agricultural value chains in general. For instance, the fast food chains in Ghana can be incentivized to integrate backward and develop commercial farming using an out-grower model. The government can provide incentives by leveraging some of the funds now used to create employment for the youth. Fast food chains tend to employ many young people, especially young women, so their growth is important for youth employment prospects.

Developing the capacity to supply local fast food chains can later be leveraged to supply global chains, like KFC, that have much higher standards. Currently, these chains get their supplies from the international supply network. In Africa, for instance, KFC has a distribution center in Egypt. One route to increase exports would be to upgrade standards so that local suppliers can meet the requirements of global franchises. The development of local franchises and related supply chains will, in the long run, promote the export of value-added food products.
VII. Toward End-to-End Value Chain Financing

The risk is compounded by poverty and the lack of insurance to cushion farmers in case of family emergencies. Beyond the perception of risk, lending to many scattered smallholder farmers can be very expensive using the conventional banking model. As a result, many smallholder farmers remain unbanked.
Our field surveys found finance to be a critical challenge across the value chains studied. This problem is even more pervasive among farmers who are already poor and thus have few reserves to invest in agriculture.

Banks are generally unwilling to lend to the agriculture sector. In Ghana, for example, the share of agricultural loans in the total loan portfolio of commercial banks was 6.1% in 2010. Difficulty in accessing credit is not confined to producers and rural households; credit access is also severely limited for aggregators, traders, and processors. The cost of credit is also quite high, ranging between 25% and 40%, which makes it not just unattractive but unaffordable. Another limiting factor is the typical requirement of collateral, which smallholder farmers do not have. This largely explains the subsistence nature of farming.

The failure of credit markets to finance farmers has seen traders take on the role of financing to some extent. About 70% of rice farmers we surveyed in northern Ghana got their financing from traders.

Figure 7.1: Sources of finance for rice farmers in Northern Ghana

<table>
<thead>
<tr>
<th>Aggregators (traders) are the key source of rice production financing in Ghana, providing informal and flexible financing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice Production Financing Sources (% Farmers)</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>Money Lenders</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aggregator Contractual Arrangements (% Using)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
</tr>
<tr>
<td>General provision of funds</td>
</tr>
</tbody>
</table>

- Aggregators are the key financiers of rice production. Our survey indicates that only 10% of farmers have links to traditional financial institutions.
- Aggregators use a variety of informal arrangements/contracts. Financing inputs to be paid back after the rice is harvested (i.e., with paddy) and financing production (planting, weeding, harvesting) to be paid back after the rice is milled are the most common.
- Note that aggregators also provide general funds to meet farmers’ other needs.

The biggest challenge to agricultural sector financing is the high risk perceived by lenders, mainly due to weather events and pests. The risk is compounded by poverty and the lack of insurance to cushion farmers in case of family emergencies. Beyond the perception of risk, lending to many scattered smallholder farmers can be very expensive using the conventional banking model. As a result, many smallholder farmers remain unbanked.

Although microfinance has been the primary innovation to increase banking access for the poor, even microfinance has not been very active in agriculture. This is because its models are designed based on consistent loan repayments, while many farmers spend and receive at discrete times (during planting and after harvest, respectively), and thus require more flexible repayment plans that accommodate farming cycles.

14 http://www.agrifinfacility.org/access-agriculture-finance-ghana
15 Dalberg estimates that global demand for agriculture finance is $450 billion, but only 2% of this demand is met.
New Approaches to Agricultural Financing

Nevertheless, the rise of impact investing and social enterprises is starting to change the agricultural lending landscape. New models that are tailored to farming cycles are now being pioneered with success. One such model is that of One Acre Fund, which is providing value chain financing to smallholder farmers in Kenya. Some highlights of this model include:

- Partnering with a seed supplier, Sygenta, to ensure that farmers get quality seeds
- Importing fertilizers and developing a strong logistics operation to ensure that high-quality fertilizer reaches the farmers
- Pairing with an insurer so that farmers are protected against weather events
- Flexibility to allow farmers to keep their produce until the prices are right (as prices tend to fall or collapse immediately after harvest) and pay the loan only when they sell

These interventions guarantee that farmers reap high yields at good prices and thus secure a good income to pay back the loans. An evaluation of One Acre Fund’s intervention in some sorghum-growing areas in Kenya showed a jump in productivity by almost 50%, from 15 bags to 22 bags per acre.16

Beyond flexible lending models, mobile technologies are also being deployed to lower the cost of providing banking services. In Uganda, Opportunity International (OI) is at the forefront of financing farmers through a suite of products tailored to their needs. Its objective is to provide farmers with services to move them from a subsistence orientation to commercial farming. The highlights of the OI model are described below.

- OI pre-selects farmers to receive financing by using household profiles and land mapping data to model the farmers’ ability to make the transition.
- In addition to loans and savings products, it provides payment, money transfer, remittance service, and insurance products (i.e., life insurance and crop insurance).
- It focuses on building low-cost delivery channels, fabricated from containers, to use as mobile banks.
- To guarantee returns, OI links farmers to critical players in the value chain, including input suppliers, warehouse providers, and off-takers. The extensive data collected by profiling helps to create linkages, as OI can tell exactly what inputs and extension the farmers need.
- OI has also tapped into USAID’s Development Credit Authority (DCA), which guarantees 50% of credit risk for loans to farmers (see Box 7.1).

Figure 7.1: Subsidizing credit risk

The main concern for traditional banks in lending to agriculture is the perceived high risk. To encourage the participation of banks in lending to the sector, interventions to subsidize risk are being introduced. One such intervention is USAID’s Development Credit Authority (DCA), which guarantees lending to the agricultural sector by guaranteeing 50% of the credit risk for loans going to rural farming communities. To date DCA has facilitated $2 billion of credit for 100,000 borrowers in 67 countries around the world.

DCA loan or bond guarantees are often complemented by USAID-assisted training, which develops banks’ ability to perform cash-flow analysis, due diligence, and risk management on loans to underserved sectors. The combination of training and partial guarantees has introduced local financial institutions to new lending opportunities in the microfinance, infrastructure, energy, housing, and agribusiness sectors. In addition to mobilizing financing for specific projects, DCA’s partial guarantees help demonstrate to local banks that loans to underserved sectors can be profitable. This fosters self-sustained financing, as lenders become willing to finance projects on a continuous basis without the incentive of guarantees from USAID or other donors. DCA aims to be a powerful catalyst for unlocking the resources of private credit markets to spur economic growth, while advancing development objectives.
Governments are also moving toward new lending models that eschew traditional agricultural banks, which have historically been plagued by governance issues due to the nature of political economies. Ghana has been innovative in establishing a special-purpose fund to lend to agriculture and support processing and export-oriented activities. The Export Development and Agriculture Investment Fund (EDAIF) was established to provide financial resources for the development and promotion of agriculture related to the agroprocessing industry. It is funded by a 1.5% levy on all imports. The fund includes three accounts:

- The Export Development and Promotion Facility (EDPF), which supports the development and promotion of export products and provision of services to the export sector. Activities supported include product development and promotion, capacity building, market research, and development of infrastructure and export trade.

- The Credit Facility, which extends loans through designated financial institutions to individuals, corporate exporters, and producers of export goods that are eligible to access the facility.

- The Agricultural Grant Facility, which supports individuals and institutions in the development and promotion of agricultural and agroprocessing products and the provision of services to the agriculture and agroprocessing sectors. Activities supported by the facility include product development and promotion, capacity building and research, and the development of infrastructure and common user facilities for agriculture relating to agroprocessing.

These innovations can provide new ways of thinking that governments can incorporate into their planning. Using the approaches illustrated above, governments can join hands with banks, social entrepreneurs/impact investors and development partners to channel the funds they use to support value chain actors through programs that are already working on the ground. This is likely to be more efficient than relying on government-run programs, which are prone to the inefficiencies associated with patronage and rent seeking.

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17 First established as Export Development and Investment Fund (EDIF) by ACT 582 of 2000 to provide financial resources and assistance for the development and promotion of the export trade of Ghana, it was amended in 2011 and renamed Export Development and Agriculture Investment Fund (EDAIF) and mandate expanded to include the development and promotion of agriculture and related agro-processing industry.
Cassava has managed to stay competitive in the face of competition from new food products, especially rice and wheat mainly due to innovation. Meanwhile, other traditional crops, such as millet and sorghum, have fared badly. The cassava sector has been able to innovate and stay relevant in changing markets and also deliver technologies and business models to facilitate their uptake.
As observed, innovations are playing important roles in agricultural value chains. Our studies unveiled pockets of innovation that are addressing some well-known agricultural challenges. Some of these observed innovations are shown in Figure 8.1.

Figure 8.1: Emerging innovations in agriculture

![Innovations are starting to play a key role in farm-level production.]

- ICT is addressing information asymmetry and knowledge gaps: iCow, Esoko, M-Farm
- Successful farmers can act as consultants, a new line of business for medium-sized farms
- Development of knowledge platforms, like KAAA

- Use of the franchising model for input supply, e.g., Farm Shop
- Providing inputs as a service, e.g., weed killers
- Smart cards to better target subsidies

- Mechanization centers set up in Ghana and Kenya under PPPs
- Rural fabricators can sell a service rather than selling equipment (key to the success of gari enterprises in Nigeria)

- Finance as part of an input package, e.g., One Acre Fund
- Identifying key places to offer finance, e.g., Root Capital’s model
- Insurance and credit risk, e.g., USAID and rainfall insurance

In all the value chains studied, we observed significant activity in agricultural research, as evidenced by the many varieties of crops that are available to farmers. However, the fact that uptake of improved varieties is still very low means that more needs to be done. Scientific research must be complemented by social science research so that we may better understand how innovations are adopted.

Beyond increasing yields at the farm level, innovations across whole value chains are needed. This is because solving a challenge at one stage of the value chain tends to create a new bottleneck elsewhere. For instance, when high-yielding Tropical Manioc Selection (TMS) cassava varieties were introduced in West Africa, uptake was slow due to the increased processing burden that came with higher yields, as cassava must be processed within 24–48 hours after harvest. Only after mechanical graters were introduced, reducing the drudgery of processing, did farmers embrace TMS varieties. Further, the introduction and uptake of mechanical technology among poor farmers came about only because innovative roadside welders were able to fabricate cheap copies of expensive graters and to introduce a business model of offering grating services rather than trying to sell the machines. In addition to graters, fabricators have also made presses (devised from car jacks), millers, etc. that have helped to automate processing. Higher yields have provided opportunities for women to venture into cassava processing and, in particular, supply ready-to-eat (RTE) cassava products that can compete in food markets. However, further innovations in the processing of cassava into RTE products are necessary.

Indeed, cassava in West Africa provides a good example of how innovation can be instrumental in keeping a crop competitive. As shown in Figure 8.2, cassava has managed to stay competitive in the face of competition from new food products, especially rice and wheat mainly due to innovation. Meanwhile, other traditional crops, such as millet and sorghum, have fared badly. The cassava sector has been able to innovate and stay relevant in changing markets and also deliver technologies and business models to facilitate their uptake.
It is therefore a series of innovations by actors across the whole chain, rather than one innovation, that builds true competitiveness. This occurs when there is a healthy innovation system that is able to link researchers to the private sector, including farmers, ensuring that successful innovations are commercialized and backed by sound public policies. While we see many individual innovations across the value chains, truly sustainable transformation will require strong innovation systems with innovators working in concert. In the value chains studied, most of the innovation systems were highly fragmented.

Ghana’s cassava value chain illustrates the genesis of strong innovation systems. Universities, government research institutions, and the private sector are all involved in innovating. However the innovation system does not yet work optimally. For instance, cassava processing machines are largely produced by roadside fabricators, who, while not part of the formal innovation system are nevertheless its most dynamic part, their machines are of low quality and break down frequently. The materials used to make them also tend not to be of food grade.

There is a need to link the informal sector to the formal innovation system in ways that will exploit the potential synergies between them.

The other, larger challenge of the formal innovation system is a failure to commercialize many of the successful innovations. In Uganda, Makerere University’s Food Science and Nutrition Department has an incubation laboratory that has developed innovative millet and sorghum products, but many of the products remain on the shelf.
Upgrading agricultural systems will require attention to building a strong innovation systems, the so-called “Triple Helix” that can link policy makers, researchers and entrepreneurs, the three key actors needed for a thriving innovation sector that offers practical and affordable solutions. Agricultural and industrial policies should explicitly address how to support the emergence of the Triple Helix.

**Figure 8.3: Towards a strong agricultural Innovation System (IS)**

Innovation requires an ecosystems able to address challenges across the whole value chain

- Policy Maker
- Entrepreneur
- Researcher/Innovator
- User

Support — Financing, extension

Different stages of the value chain:
- Farm Production
- Logistics
- Processing
- Marketing and distribution

Impact
Our study of cassava in Ghana also found that while cassava is traditionally considered a woman’s crop, men’s participation in cassava production is considerably higher when labor is paid, as opposed to when labor is provided by household.
Throughout our studies, the role of women was found to be paramount in farm production, trading, and processing. However, this generally seems true only as long as the value chains are characterized by subsistence production and artisanal processing; when the value chains are upgraded, men’s participation tends to increase.

For instance, sorghum is traditionally considered a woman’s crop in Uganda and uses largely human-powered labor, with women dominating. Figure 9.1 shows the labor distribution, based on data from a 2006 survey by the INTSORMIL project. Our survey largely confirmed this pattern of labor supply in the areas where sorghum is grown mainly as a subsistence crop, e.g., in the southwestern highlands.

However, the pattern was found to change as the role of sorghum changed. In the mid-altitudes, where sorghum is grown commercially, the participation of men increases, especially in labor-intensive tasks such as seedbed preparation, planting, and pest and disease control, while women are responsible for weeding, drying, and sales.

Our study of cassava in Ghana also found that while cassava is traditionally considered a woman’s crop, men’s participation in cassava production is considerably higher when labor is paid, as opposed to when labor is provided by household. Further, men were found to receive higher wages than women. The female-designated activities also attract a lower wage; a survey of wages indicated that women’s average wage was 46% lower than that of men. The explanation commonly given was that women’s activities are less labor-intensive.

Artisanal processing, the predominant mode of cassava processing, is mainly done by women, who tend to organize themselves into groups that do both farming and processing. However, our survey found that many of the processing machines are not easily used by women and therefore require help from men; for example, the double-screw presser requires a great deal of strength to operate. As a result, although women typically own the cassava processing centers, which are usually set up as women cooperatives to provide market for their cassava and also income from employment of the members, a significant proportion of the staff are male, basically on account that women members cannot operate the processing machines.
Men dominate in the ownership of small- and medium-scale formal processing plants. The capital requirements for setting up are much higher than for artisanal processing, and advanced skills are needed to navigate formal food market regulations. Many women processors are not highly literate and lack the capital and collateral needed to establish more formal processing firms, which relegates them to artisanal processing and supplying to informal markets. Thus, there is a need to give careful consideration to gender issues when upgrading value chains. Our studies indicate that upgrades tend not to be gender-neutral, and women tend to lose out.

Some positive developments may be observed; for instance, the fabrication sector in Ghana is starting to design more gender friendly machines. The GRATIS Foundation is also designing a hydraulic presser to replace the traditional double-screw presser. However, most rural mechanics are not familiar with hydraulic technology, so a hydraulic presser is much harder to service in rural areas. Making egalitarian machines widely available remains a challenge.

Box 9.1: Whither the artisanal woman brewers?

Modern beer is consumed in Africa by a small percentage of urban dwellers with good incomes, while the continent’s “informal alcohol market” accounts for around 74% of all alcohol consumed. SABMiller estimated in 2009 that the market for African home brew could be worth $3 billion. The home brew market is the domain of women processors and a very important source of income for women, especially in Burkina Faso, where it is called dolo, and in Uganda, where traditional varieties include omuramba.

However, this lucrative market is now under threat, and women processors may lose out, given the resources now being expended. As beer markets become saturated, the low-end beer market has become the new frontier for formal beer makers. This is now the focus of the giant multinationals, including Diageo, Heineken, and SABMiller, that control the global clear beer market. Their main strategy has been to produce cheaper versions of modern beers using local products, e.g., sorghum and cassava, as can be seen in markets in Ghana, Kenya, and Uganda. The multinationals achieve this mainly through generous government incentives on duties, and their strategies are winning over those in these countries who have disposable income and are looking to scale up to more modern beers.
The greatest threat to the women brewers is from SABMiller, the world’s second-largest brewer, which spent $260 million across Africa in 2012 and is attacking on two fronts: It offers cheaper versions of clear beer and, more critically, it has entered the opaque beer market by introducing packaged traditional beer under its flagship beer brand, “Chibuku.” SABMiller has also developed a new variety, “Chibuku Super,” which has a shelf life of 21 days rather than five days, meaning it can be distributed to a wider range of areas. “Chibuku Super” has also addressed other shortcomings, like package efficacy and quality consistency, and has been a resounding success in Zambia. SABMiller has brewing operations in 37 of the 50 countries in Africa, and Chibuku is already sold in 10 African countries, including Ghana and Uganda. Analysts have pointed out that SABMiller aims to focus more on volume growth than on real price increases to capture more of this market.

The traditional beer market has also seen the entry of local SMEs, which are producing new, upgraded varieties of traditional beverages. For instance, in Uganda, obushera, a millet malted drink, is now manufactured by Multiline International Ltd. and sold under the brand name “Bessa” in 330ml cans in Ugandan supermarkets. Ndugu and Mzungu are also manufacturing obushera flour for home brewing.

The future of woman processors is thus in serious jeopardy, given the adversaries they face. These companies not only have more resources, but also have governments on their side. On the one hand, governments are always willing to provide generous incentives to multinationals; on the other, they have traditionally been hostile to woman brewers, who usually operate under threat of arrest, as their brews are usually seen as illegal. Since many do not pay taxes, governments have little incentive to support the growth of the sector.

However, some hope may lie in the strong movement toward craft beer and microbreweries. It is possible that with proper support, these women can upgrade their technologies and reposition themselves as microbreweries that are able to meet food regulations and other standards. This will require significant advances in the traditional brewing value chains and, in particular, the emergence of local brewing innovation systems. This is beginning to happen in some areas. In Uganda, for example, the Makerere University Food Science and Nutrition Department is developing improved versions of local brews that are more hygienic and also shelf-stable. However, it has yet to commercialize these innovations. Perhaps one way to commercialize these products is by working with women processors, who already have market outlets but use low technology.

The emergence of an upgraded traditional brewing sector will require the active support of governments, as brewers will need duty exemptions on equipment, financing (for equipment and further innovations), capacity building, and other types of investment. The support of development partners will also be crucial. This will require a significant lobbying effort to get governments and donors to change their perception of this sector.

Sources:
http://www.theeastafrican.co.ke/business/SABMiller+marketing+chibuku+to+the+rest+of+Africa/-/2560/132206/-/q0k9p2z/-/index.html
Commercial farmers can play a role in smallholders’ entry into specialization, and thus increased efficiency, by taking on some of the more technical and resource-intensive activities. As we have observed in the dairy sector, some commercial farmers are taking on breeding, letting smallholders focus exclusively on milk production.
Traditionally, the production aspect of the value chains has received the most support, mainly through research to develop better seeds and extension. Recently, it has expanded to include the supply of free seeds and subsidized fertilizers. However, other important factors need consideration, as discussed below.

- The key input in livestock production is feed, yet feed is not truly subsidized. The current approach, therefore, tends to favor crops.
- The studies established labor supply is an important constraint to production, and more mechanization technologies are needed. Subsidies on mechanization may be more beneficial than subsidies on inputs. It has been found, for example, that uptake of high-yielding cassava varieties in West Africa is only possible if complementary mechanization was provided to cope with higher yields. Higher yields usually mean more labor is needed, and farm labor is disproportionately provided by women and children.
- Commercial farmers can play a role in smallholders’ entry into specialization, and thus increased efficiency, by taking on some of the more technical and resource-intensive activities. As we have observed in the dairy sector, some commercial farmers are taking on breeding, letting smallholders focus exclusively on milk production. Support to develop such symbiotic relationships should be part of agricultural policy. Commercial farmers are also establishing rural cottage industries, catalyzing rural-based processing.
- Middlemen are playing crucial roles in financing production and in supporting farmers to improve quality.

A. Pathways Toward Rural Transformation

A strong value chain requires a market that works, a processing sector that delivers the right products, and a production sector that can respond to demand. Logistics is the link that makes the chain work as a single entity, and finance provides the grease to make it function. Agricultural, industrial, and budget policies must be aligned if strong and responsive value chains that deliver fair value to all actors are to emerge. A suite of policy options can further strengthen the policy framework already laid down by governments and help focus resources and activities.

True rural transformation will come from rethinking and enhancing the role of various actors in the value chains so that they can govern and guide the chains’ growth. Four potential pathways are possible.

- **Integrated FBO pathway:** Strengthening farmers through the development of strong FBOs that can integrate backward to supply inputs and extension, and forward to processing and marketing. Cassava processing groups have already blazed this trail. Strong FBOs should be identified and encouraged to integrate forward to processing.
- **Processor-Led Contracting Model pathway:** The modest success of contract farming in cassava shows that with innovation, the model can be made to work. It can be further improved if processors focus on diversifying the livelihoods of farmers. For instance, cassava processors can help farmers develop the poultry industry by using cassava to make feeds. This creates a much deeper relationship, as both farmer and processor become buyer and seller to each other. Diversified livelihoods also mean that farmers experience less pressure for cash and need not side-sell to address family emergencies.
- **Emergence of Strong Middlemen pathway:** As shown, middlemen have the capacity to organically grow from buying to providing inputs and support to becoming processors that can upgrade the value chain. Support to help the more enterprising middlemen/traders to become strong actors should be considered.
- **Enhanced Medium-Sized Commercial Farmers pathway:** An emerging sector of medium-sized commercial farmers could lead transformation of the agricultural sector. Beyond the emergence of strong actors, two developments that can be particularly transformative are the development of rural cottage industries and the emergence of clusters that integrate a number of value chains.
The pathways identified here straddle the agricultural and trade and industry policy domains. The critical role of agriculture in industrialization requires a more explicit platform to help coordinate efforts and align agricultural policy, industrial policy, and budgeting processes.

**B. Policy Framework**

A policy framework that employs a range of tools is needed to ensure that opportunities are realized and that rural transformation happens. The framework will need to include a mix of incentives, mandates, and public–private partnerships (PPPs).

**Figure 10.1: Policy Framework**

A holistic value chain approach is needed to ensure that policy does not address a bottleneck in one aspect of the chain only to create another bottleneck in a different part. For instance, higher yields, if not managed well, can create challenges of logistics and processing.

Policies should be keenly focused on making the markets work better so that demand becomes the primary driver of production. Supported production structures should allow the agricultural sector to respond effectively to demand, especially as new markets are being spawned rapidly in the wake of urbanization.

Policy should also use both mandates and incentives as needed. Mandates, such as requiring that flour producers use a certain amount of sorghum in wheat flour, can create significant markets, which can attract investors to set up processing plants. However, producers may also need incentives to develop the supply and logistics needed to effectively utilize the installed processing capacity.

At times, this may require government to become more involved in the form of PPPs, especially where uncertainty around the venture is such that private investors may shy away, even in the face of good returns. For instance, the cotton sector in Tanzania will likely need more active interventions by government.
Box 10.1: Managing the political economy

Because policy is made within a political context inhabited by many competing interests, the importation of food is naturally supported by powerful interests, and any industrial policy that seeks to promote import substitution will be resisted.

Upgrading value chains will require more than an economic analysis and policy recommendations. There is also a need for political-economic analysis to better understand how political forces can be managed or influenced to achieve the needed ends.

Advocacy is one pathway, as well-organized and well-informed stakeholders can make a case for import substitution and engage political forces to encourage the adoption of the right policies. A key ingredient of advocacy is telling compelling stories. The current narrative in agriculture is one of addressing rural poverty, with the result being intense focus on increasing yields and thus the heightened popularity of programs like fertilizer subsidies.

However, current concern over the high youth unemployment rate and its potential to create instability is also relevant. Youth unemployment, combined with urbanization and the rise of slums and informal living accommodations, has created a potent mix for politicians in Africa to grapple with. Thus, a narrative that focuses more on mitigating youth unemployment is taking center stage. If policy advocates can focus attention on how upgrading agricultural value chains can create desperately needed jobs, then that narrative may be able to counter the many political interests that must be overcome.


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