Promoting Rural Sustainable Development and Transformation in Africa

May 2015
Uganda-Country Report
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Uganda

Country Report
About the Study

Policy makers and development partners are keen to find interventions that are effective in improving smallholder productivity and raising the income and resilience (including food security) of smallholders. It is ACET’s view that linking the objective of increasing smallholder incomes and resilience to the broader economic transformation agenda will be mutually beneficial to agriculture and the rest of the economy, particularly the manufacturing sector (starting with agro-processing). Such linkage is also likely to raise the profile of agriculture and engage the interest and participation of a wider segment of government and the general population, thereby increasing overall support for improvements in agriculture. This is the rationale for a grant given to ACET by the Bill and Melinda Gates Foundation (BMGF). ACET seeks, through the study of a number of national crop/livestock value chains, to help create this linkage. The poverty reduction objective of BMGF and the economic transformation objective of ACET led us to select the following value chain studies.

<table>
<thead>
<tr>
<th>Crop</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 overall objective of the study is to identify, through the analyses, the policy measures, institutional reforms, and potential public investments that could: (a) help increase the productivity of traditional smallholders and improve post-production value (storage, processing, and market access—domestic or foreign) in order to increase their 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 an overall economic transformation through linkages with industry, starting with agro-processing.
The Uganda country report is a synthesis of the four value chain studies (i.e. on Sorghum, millet, cassava and cow) and will be the basis for convening policy forums that will bring together the finance, agriculture, and trade and industries ministries as well as with other stakeholders from the private sector and research and non-governmental sector representatives to discuss and advocate for policy positions that can unlock the potential opportunities identified in this study. The study was sponsored by the Bill and Melinda Gates Foundation. The individual value chain studies can be downloaded from the ACET website: www.acetforafrica.org/agricultural trasformation.
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</table>
i. Background

Uganda is a landlocked country in East Africa with a total land area of 241,551 km$^2$, 17% of which is lakes and wetlands. Uganda has fertile soils and regular rainfall, making land its most important natural resource. Indeed, agriculture is the most important sector of the economy, employing over 66% of the workforce. It contributed 25.9% of GDP and agricultural exports accounted for 48.5% of total exports that year. The agricultural sector is also the basis for most industrial activity in the country.

About 85% of Ugandans live in rural areas and rely mainly on agriculture. Uganda’s population numbers about 35 million and is relatively young, with the lowest median age in the world. Further, it has one of the fastest rates of population growth in the world, about 3.3% per annum. Thus, agriculture will continue to play a key role in the future, as the population explodes and brings a huge demand for food and jobs.

However, agriculture remains largely underdeveloped. The agricultural value chains of Uganda remain weak and fragmented, with much of their potential yet to be unlocked. This can be attributed primarily to policy, as the agriculture sector remains a low priority in the national budget. It has not received more than 5% of the national budget since 2009/10, and the total budget allocation for the financial year 2012/13 was 3.5% of the total national budget, while the projection for 2013/14 is 3.2%. Even if we count total direct and indirect allocation to this sector, the amount does not exceed 5% of the national budget. Either way, agriculture’s allocation is far below the recommendation of the Maputo Declaration (2003) to dedicate at least 10% of the national budget to agricultural development.

The advantage Uganda has in agricultural production compared to other countries in the region and in Africa means that potential for further development of the agro-processing sector is significant. It has been projected that if an investment strategy in agriculture is established, delivering annual growth of 6%, it will reduce the number of absolute poor from 10.15 million to 7.25 million.

A. Ugandan Agricultural Policy

A review of Ugandan agricultural policy can help identify where insights from our value chain studies can be most effective and how to start building platforms for engagement. The many policy documents addressing various aspects of agriculture are listed in Box 1.1.

Box 1.1: National strategies related to agricultural development

1. National Development Plan (NDP) 2010/11–2014/15
2. Prosperity for All (PFA) program
3. Plan for Modernization of Agriculture (PMA)
4. Rural Development Strategy (RDS)
5. Peace and Recovery Development Program (PRDP)
6. Agricultural Sector Development Strategy and Investment Plan (DSIP) for FY 2010/11–2014/15
7. National Food and Nutrition Strategy
8. National Agricultural Advisory Services (NAADS) Strategy
9. Meat Quality and Safety Improvement Strategy
10. Livestock Development Strategy
11. Animal Disease Control Strategy

For this reason, Uganda was christened the “Pearl of Africa” by a young Winston Churchill when he visited in 1907 as the parliamentary undersecretary of state for the colonies.


The Maputo Declaration by the Comprehensive Africa Agriculture Development Program (CAADP) aims to reduce food insecurity and poverty in line with the Millennium Development Goal (MDG) of halving poverty and hunger by 2015.
However, the key policy framework is the National Agriculture Policy (NAP, 2011). NAP is anchored in the National Development Plan (NDP) 2010/11–2014/15, which identifies agriculture as a primary source of growth in the economy.

1. National Agriculture Policy (NAP)

NAP’s mission is “transforming subsistence farming to sustainable commercial agriculture.” More specifically, the NAP objective is to increase the incomes of farming households through promoting specialization in strategic, profitable, and viable enterprises and value addition through agro-ecological zoning, and promoting domestic, regional, and international trade in agricultural products. The policy addresses three sub-sectors: crops, livestock, and fisheries. Under NAP, activities are prioritized and implemented in accordance with the 2004 policy that divided the country into 10 agricultural production zones.

2. Development Strategy and Investment Plan (DSIP)

The Development Strategy and Investment Plan (DSIP) is a foundational document for the Comprehensive Africa Agriculture Development Program (CAADP) and has been packaged into four main programs: (1) enhancing production and productivity, (2) improving access to markets and value addition, (3) creating an enabling environment, and (4) institutional strengthening in the sector.

The DSIP is implemented through the ongoing Agriculture Technology and Agribusiness Advisory Services (ATAAS) project, which aims for technology generation, provision of agribusiness advisory services, and creation of the needed interface between agriculture research via Uganda’s National Agricultural Research Organization (NARO) and National Agricultural Advisory Services (NAADS). Programs are implemented based on the 2004 agriculture zoning policy, and all investments are tied to strategic commodities identified in the DSIP.

3. Agriculture Zoning Policy

<table>
<thead>
<tr>
<th>Zone</th>
<th>2010/11</th>
<th>2011/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone i</td>
<td>Cassava</td>
<td>Beef cattle</td>
</tr>
<tr>
<td>Zone ii</td>
<td>Poultry</td>
<td>Cassava</td>
</tr>
<tr>
<td>Zone iii</td>
<td>Coffee</td>
<td>Beans</td>
</tr>
<tr>
<td>Zone iv</td>
<td>Coffee</td>
<td>Cassava</td>
</tr>
<tr>
<td>Zone v</td>
<td>Maize, fish</td>
<td>Poultry</td>
</tr>
<tr>
<td>Zone vi</td>
<td>Coffee, fish</td>
<td>Dairy cattle</td>
</tr>
<tr>
<td>Zone vii</td>
<td>Coffee, maize</td>
<td>Tea, beef cattle</td>
</tr>
<tr>
<td>Zone viii</td>
<td>Dairy cattle, beef cattle</td>
<td>Dairy cattle, beef cattle</td>
</tr>
<tr>
<td>Zone ix</td>
<td>Coffee</td>
<td>Tea, bananas</td>
</tr>
<tr>
<td>Zone x</td>
<td>Coffee, maize</td>
<td>Tea, dairy cattle</td>
</tr>
</tbody>
</table>

This policy was launched to promote development of agricultural enterprises in agro-ecological zones that are most suitable and where they have a comparative advantage. The policy divides Uganda into 10 agricultural development zones, each with its priority commodities (see Table 1.1). Priority commodities in each zone receive extra public investment support to develop the value chain.

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5 These are sub-structures of MAAIF.
6 An “agro-ecological zone” is a broad area in which ecological conditions, farming systems, and farming practices are fairly homogeneous. The same agricultural enterprises, more or less, can be carried out across a particular zone.
B. Ugandan Industrial Policy

Industrial development is an integral part of the government’s overall development strategy. The path to industrial development is seen as adding value by processing to reduce post-harvest losses and by increasing exports of higher-value products, especially from agricultural and mineral resources.

The National Industrial Policy7 sets out the strategic direction for industrial development in Uganda for the next 10 years. The policy’s vision is to build a modern, competitive, and dynamic industrial sector fully integrated into the domestic, regional, and global economies. Target indicators for achieving its objectives will include:

- 25% contribution of manufactured products to total GDP
- 30% contribution of manufactured exports to total exports
- 30% value added in industry (as a percentage of GDP)
- 4.2 score on the World Economic Forum’s Global Competitiveness Index8

The policy focuses on:

- Exploiting and developing natural domestic resource–based industries, such as the petroleum, cement, and fertilizer industries, and other competitive industries that use local raw materials
- Agro-processing, including food processing, leather and leather products, textiles and garments, sugar, dairy products, and value addition in niche exports
- Knowledge-based industries, such as ICT, call centers, and pharmaceuticals
- Engineering for capital goods, agricultural implements, construction materials, and fabrication

The National Industrial Policy plans to develop these activities through private-sector-led industrialization, though there is also some potential for public–private partnerships. Creating a business-friendly environment and improved infrastructure are key prerequisites to ensuring private-sector participation in the economy.

C. Uganda Value Chain Studies

In studying how the agricultural value chains in Uganda work, so as to identify bottlenecks and potential levers for unblocking them, the journey towards agricultural transformation, and eventually economic transformation, can begin. Our four value chain studies were carried out in this spirit. Their key aim was to provide insights into how both the agricultural and the industrial policies can be improved, as aligning the two is crucial to agriculture-led economic transformation.

The choice of crops was informed both by the importance of the crop now and in the future and by its potential as a basis for the establishment of agro-industrial clusters. A summary of the rationale is given in Table 1.2 below.

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The overall objective of the studies is to identify policy options needed to increase smallholder productivity and to improve post-production value (storage, processing, and domestic or foreign market access) in order to improve the incomes and food security of smallholders, and to increase agriculture’s contribution to an overall economic transformation that reduces poverty in the whole country. The studies also seek a better understanding of linkages between smallholder poverty reduction and the broader economic transformation agenda. Findings and recommendations on each product will be used to produce a country report, which will act as the basis for policy forums bringing the finance, agriculture, and trade and industries ministries together with private-sector stakeholders and the research and non-governmental sectors. These forum participants will advocate for policy positions to unlock the potential opportunities identified in the studies.

Sections II through V of this paper will describe the four value chain studies, highlighting key issues (including challenges) along the value chain, value capture opportunities, and what it will take to capitalize on those opportunities. Section VI discusses the results of a simulation exercise to better understand how market structure of these commodities can be improved to increase welfare, while Section VII is a synthesis of issues emerging and policy options for rural transformation. Section VIII concludes and discusses potential directions for agricultural and industrial policy.

Table 1.2: Rationale for crop selection

<table>
<thead>
<tr>
<th>Crop</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum</td>
<td>Key staple</td>
</tr>
<tr>
<td></td>
<td>• Sorghum is used as feedstock for brewing, guaranteeing income for smallholders (9,000 smallholders are already supplying sorghum to SABMiller)</td>
</tr>
<tr>
<td></td>
<td>• Promoted as an alternative feed for dairy industry in the north, where it is also an important staple</td>
</tr>
<tr>
<td></td>
<td>• Being evaluated as feedstock for the ethanol industry</td>
</tr>
<tr>
<td>Millet</td>
<td>Key staple</td>
</tr>
<tr>
<td></td>
<td>• Nutritious, drought-resistant, and can store for long periods</td>
</tr>
<tr>
<td></td>
<td>• Very good malting qualities, thus high potential for use in the developing food and beverage industry</td>
</tr>
<tr>
<td>Cassava*</td>
<td>An important staple, with 23% share of agricultural output</td>
</tr>
<tr>
<td></td>
<td>• Seen as potential substitute for wheat, reducing dependency on food imports</td>
</tr>
<tr>
<td></td>
<td>• Cassava processing is fueling growth of the processing equipment industry</td>
</tr>
<tr>
<td></td>
<td>• Plans to use cassava as feedstock for beer industry</td>
</tr>
<tr>
<td>Beef (Meat)*</td>
<td>Third most important agricultural product in terms of value</td>
</tr>
<tr>
<td></td>
<td>• An emerging regional market for processed meat products</td>
</tr>
<tr>
<td></td>
<td>• Potential to support an animal feed industry that can utilize cassava, sorghum, and millet, thus increasing markets for these crops</td>
</tr>
</tbody>
</table>

* Note that beef and cassava are priority products in three of the 10 agricultural zones, while sorghum and millet are not a priority in any of the zones.
Livestock is an important sector of the Ugandan economy, contributing about 17% of total agricultural output and 9% of total GDP (Ugandan Ministry of Finance, Planning, and Economic Development [MoFPED], 2012). The livestock sector has also been growing at 3% per annum, compared to 1% for agriculture overall, implying that it has been a key driver of agricultural growth and overall GDP growth. In most communities in Uganda where agro-pastoralism is practiced, livestock dung is also the main source of soil nutrient replenishment (Okoboi and Barungi, 2012). Beef is the primary source of meat in Uganda, with a 61% share of supply. Production has been growing steadily at 5% per annum. In eastern and northern Uganda, bulls are also used for traction. Thus cattle are regarded as a valuable asset, and indeed it has been shown that households whose livelihood is mainly dependent on livestock are less likely to be poor (MoFPED, 2004). Uganda's cattle population is close to 13 million at present, and the potential for further growth of this herd is significant given Uganda’s abundance of grazing resources—44% of the total land area, or 107,000 km².

A. Uganda’s Beef Production System

As shown in Figure 2.1, production has grown steadily, rising from about 100,000 metric tons (MT) in 2000 to about 190,000 MT in 2012. The key producing regions, with about two-thirds of Uganda's beef herd, are the Western and Northern regions, particularly the Karamoja sub-region in the north. Indigenous cows make up 94% of the herd; the dominant indigenous breed is zebu/Nganda (70%), followed by Ankole (30%) (MAAIF and UBOS, 2009).

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In 2008, Uganda’s cattle population was 11.4 million head, and it has been growing at 3% per year (MAAIF and Uganda Bureau of Statistics [UBOS], 2009).

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Footnote 9: In 2008, Uganda’s cattle population was 11.4 million head, and it has been growing at 3% per year (MAAIF and Uganda Bureau of Statistics [UBOS], 2009).
Production is mainly through a pastoralist system, though agro-pastoralist systems combining agriculture and cattle raising also play an important role. Pastoralists’ herds range from about 10–200 head, while agro-pastoralists have herds ranging from about 2–20 cows. Cultural symbolism, rather than commercial considerations, is the key driver of herd sizes.

A commercially oriented ranching production system has a long history in the country, though the sector is small. The ranching system, comprising about 165 ranches, accounts for about 2% of the total national cattle herd. These herds range from 2,000 to 8,000 cattle, including local, exotic, and cross-breeds, and are raised using modern animal husbandry methods. The majority of animals sold from commercial ranches are steers, while cows and heifers are left for breeding. Calves are also sometimes sold. Young animals (2–4 years) are preferred for selling because they fetch a better price. A commercially oriented feedlot production system to buy and fatten cows for market is also emerging.

1. **Beef Production Cost Structure**

Production cost structures for pastoralists and agro-pastoralists are hard to determine. Very few inputs are used in production, apart from labor for herding cows, and very few of these farmers keep records. Commercial ranching, on the other hand, is characterized by high set-up costs and running costs. Typical set-up costs for a 600-acre ranch are shown in Table 2.1. Building up a ranch also requires either a high level of buying or slow stocking with animals born on the ranch, and at least 10 years of initial low returns that must be bridged.

<table>
<thead>
<tr>
<th>Item</th>
<th>Ugandan Shillings (UGX)</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bush clearing and pasture establishment</td>
<td>200,000,000</td>
<td>80,000</td>
</tr>
<tr>
<td>Dip tank</td>
<td>150,000,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Overhead pump</td>
<td>70,000,000</td>
<td>28,000</td>
</tr>
<tr>
<td>Water tanks</td>
<td>35,000,000</td>
<td>14,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>UGX 455,000,000</strong></td>
<td><strong>$182,000</strong></td>
</tr>
</tbody>
</table>

*Source: Field survey, 2014*

2. **Challenges of Beef Production**

Farm-level productivity is very low, as evidenced by the low weaning rate and low number of salable cattle per year compared to potential levels. Outcomes are also far below global benchmarks, as figure 2.2 shows. This low productivity can be attributed to many factors; key among them is the general lack of commercial orientation among key pastoralist producers. They keep cattle mainly for prestige and for milk, and so tend to have more cows than bulls, while in commercially oriented beef production, bulls or steers are preferred because of their bigger weight. Pastoralists tend to be attached to their cows, preferring not to sell except in case of emergency, and usually sell culled (sickly and old) animals first. They also sell during the dry season, when grass and water for the animals are scarce (Agriterra, 2012). These cows thus tend to be older and lower in weight and can fetch only low returns.
In addition, the sector for veterinary services, drugs, and other inputs in Uganda is weak, due in part to government inability to provide extension services, including artificial insemination (AI) and cattle dips.\(^\text{10}\) The prevalence of poor farmers also means that real demand has not been adequate to stimulate a vibrant private-sector inputs market. Indeed, the small private sector has experienced significant challenges getting payment for inputs advanced to farmers.

One result of low input availability is a significant shortage of breeding services to improve local breeds. The cost of improved bulls is too high for many farmers, and government-subsidized AI services are not available. Disease prevalence is also high, as public health services to control endemic diseases like East Coast Fever (ECF) are weak. The prevalence of disease leads to a preference for indigenous species such as zebu, which are more resistant to disease but are also smaller in size.

Pastures are of low quality due to poor management, overgrazing, encroachment by bush or weeds, and drought, and communal land ownership has hindered pasture improvement.\(^\text{11}\) Frequent drought conditions have increased competition for water and pasture, leading pastoralists to move their cattle frequently, which results in disease propagation, reduced weight gain, and poor meat quality.

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\(^{10}\) A study by Landell Mills (2012) for MAAIF calculated the cost of spraying, a private-sector service, at US$60 per year per cow, compared to US$45 for cattle dips, a government-provided service.

\(^{11}\) Pasture can be improved by seeding after burning, especially with plants like Desmodium, Stylosanthes, and Stratro.

---
B. Cattle Trade

Cattle are usually sold in huge open-air markets on specific market days. Stakeholders interviewed complained of poor location and poor coordination and scheduling of livestock markets; however, the key challenge identified was in market management. Markets are established by local authorities, but managed by private individuals, who compete in a yearly tender to run the market. These lessees pay a fee and collect market levies, and in return they collect commissions from sales and maintain security, cleanliness, and market infrastructure. However, the temporary nature of the tenders means that winners put very little into infrastructure development. All the markets visited lacked basic recommended facilities for livestock marketing, such as perimeter fencing, pens, weigh bridges, loading ramps, and water sources. Of critical importance is the lack of crushes for veterinary inspection of the livestock brought for sale, tick control, and other veterinary treatment. Thus the market raises the threat of disease transfer, since the animals originate from different locations and from farmers using different farming methods. This is especially serious given that some buyers will use the animals for breeding.

1. Cattle Market Efficiency

These markets are essentially buyers’ markets. Sellers at the market may not be getting the true price for their cattle, as they do not necessarily sell according to the optimal selling time. Indeed, prices can rise by almost two-thirds depending on the season. At the same time, traders do not make huge profits, contrary to conventional wisdom. Figure 2.3 below shows that margins are in the range of 13%, which is fairly modest.

![Figure 2.3: Cattle traders’ margins](image)

Traders must also contend with significant risks, as farmers tend to be unscrupulous. Cattle owners tend to sell pregnant cows, as they fetch more money because they are heavier, or sell sick animals first. This information is kept from traders, who bear the loss when the animal is slaughtered.  

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12 For example, if 800 animals are sold in a market in one day for a fee of UGX 15,000 each, then UGX 12,000,000 (US$4,800) will be collected.

13 Realized weight will be smaller than expected for pregnant cows, while sick cows may be rejected at the slaughterhouse or die on the rough journey there.
2. Transport

Traders usually hire open trucks to transport cattle, mostly in one-off transport arrangements. In some cases, the trader and the transporter operate jointly. Other livestock traders have their own trucks to transport their and others’ livestock.

While transport cost per cow is a small share of total cost, the transporters make very good margins. Our survey found that gross margins (accounting for only direct costs) can be as high as 68%, though only when the truck is overloaded with 20 cows per truck. When loaded as stipulated by law—15 cows per truck—the gross margin drops to 58%. These are healthy margins, but come at the expense of the cows’ welfare. Tight packing means that cows have to be forced onto trucks with heavy whipping and piercing, combined with twisting of tails and sometimes gouging out eyes. When they are loaded, some transporters tie their heads, tails, or legs in fixed positions during the journey, which not only causes bruises that lower the value of hides but also great distress to the cows, resulting in weight loss, especially when combined with travel long distances over poor roads. Cows have been known to die en route from markets to urban slaughterhouses. Transportation is probably one of the more value-destroying activities in the beef value chain.

C. Processing

Key processing operations are handled by fee-for-service slaughterhouses. Slaughterhouse-based traders buy cows and organize slaughter and sale to butcheries. Though cattle can be bought on a spot basis at the slaughterhouse, to maintain a steady supply most slaughterhouse brokers develop informal contractual arrangements with large-scale traders.
The slaughterhouse brokers/traders make most of their margins from selling offal as opposed to meat. As shown above, of the 20% margins realized by traders, 19% is from offal.

1. Modern Meat Processing

A small and fairly dynamic modern meat processing sector is emerging, spearheaded by modern butchery chains that process and retail meats. Fresh Cuts Uganda (also known as Quality Cuts) is the largest company involved in beef processing.

Figure 2.5 shows the cost structure of modern butcheries/processors. Though their operating costs are higher, they also enjoy much higher margins. Since modern processors buy large quantities of beef, they are able to negotiate lower prices and can sometimes avoid dealing with slaughterhouse brokers by buying directly from traders and larger farmers. Further, since they also sell high-quality products, their average retail price per kilogram is UGX 10,000, compared to regular butcheries’ retail price of UGX 7,000–8,000.

Much progress remains to be made before the meat processing industry approaches global best practices. Fresh Cuts has started the process and may be able to show the way forward. However, concerted efforts by the government, its development partners, and other stakeholders will be needed.

2. Challenges of Beef Processing

The capacity of slaughterhouses in Uganda has largely been exceeded by their throughput (see Figure 2.6). The majority of slaughter slabs and slaughterhouses are in poor condition and lack necessary facilities. The small fees charged to slaughterhouse-based traders are inadequate to maintain the slaughterhouses appropriately. In addition, quality control for slaughterhouses is poor, which means that dead and sick animals can be slaughtered and sold before meat inspectors arrive.

A large traditional butchery buys an average of 80 kg per day, while big processors buy 2.5 MT per day.
D. Retailing

The estimated 5,000 roadside and market stall butchers in Uganda are the country’s main purveyors of meat, distributing about 85% of the meat sold to consumers. The carcasses are bought early in the morning and brought to the shops by small motorbikes (boda-bodas) or pick-up trucks, then butchered into various cuts to be displayed for sale. Some innovative small-scale retailers in urban areas have mincing machines that allow them to sell mincemeat as well.

All the same, butchery margins are very small and thus highly sensitive to price. The typical cost structure of a small butchery and its margins under different retail prices and buying prices is shown below. Note that when the cost of the carcass is at the higher end, the margin shrinks and big butcheries with high overheads can register losses.

**Figure 2.7: Cost structure of a butchery**

**Butchery cost structure and margins**

<table>
<thead>
<tr>
<th>Butchery Cost Structure</th>
<th>Butchery Margins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat 85.7%</td>
<td>Small Butcher (40kg/May)</td>
</tr>
<tr>
<td>Trasport 1.1%</td>
<td>Selling Price Low (UGX 7,000/kg) 2.6%</td>
</tr>
<tr>
<td>Labor 1.3%</td>
<td>Selling Price High (UGX 8,000/kg) 14.8%</td>
</tr>
<tr>
<td>Rent 0.7%</td>
<td>Buying price at slaughter house = High (UGX 6,500/kg)</td>
</tr>
<tr>
<td>Packaging 0.7%</td>
<td>Selling Price Low (UGX 7,000/kg) 9.8%</td>
</tr>
<tr>
<td>Utilities 0.2%</td>
<td>Selling Price High (UGX 8,000/kg) 21.1%</td>
</tr>
<tr>
<td>Butchery Margins 9.8%</td>
<td>Big Butcher (500 kg/May)</td>
</tr>
<tr>
<td>Total 100.0%</td>
<td></td>
</tr>
</tbody>
</table>

Source: ACET field study, 2014
Essentially, if butcheries sell meat only, they will struggle once the buying price goes up, which probably explains the wide range of other products they also sell. Figure 2.8 shows the range sold by a typical butchery.

**Figure 2.8: Range of products sold by a typical butchery**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price UGX/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs</td>
<td>3,000</td>
</tr>
<tr>
<td>Bones</td>
<td>3,000</td>
</tr>
<tr>
<td>Kidneys</td>
<td>4,000</td>
</tr>
<tr>
<td>Head</td>
<td>5,000</td>
</tr>
<tr>
<td>Hooves</td>
<td>6,000</td>
</tr>
<tr>
<td>Bone Meal</td>
<td>7,000</td>
</tr>
<tr>
<td>Liver</td>
<td>12,000</td>
</tr>
<tr>
<td>Fillet</td>
<td>15,000</td>
</tr>
</tbody>
</table>

*Source: ACET field study, 2014*

Our survey identified the following as primary constraints faced by butchers:

- Lack of cold storage facilities to keep leftover meat at the butchery
- Lack of capital to invest in storage facilities and expand business
- High cost of electricity, combined with frequent power cuts, leading to losses
- Low purchasing power of customers, especially around rural butcheries
- Poor sanitation around market areas, combined with lack of safe water supply, which tends to discourage customers
- Stiff competition due to too many butcheries

1. **Supermarket-Based Modern Butcheries**

Modern butcheries offer a wide variety of meat in hygienic condition and displayed in an attractive way. This improved shopping experience allows them to charge a high premium over roadside butcheries for customers who can afford their prices.

**Figure 2.9: Meat products sold by supermarkets and prices (UGX) per kg**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price UGX/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Beef</td>
<td>14,000</td>
</tr>
<tr>
<td>Beef stew</td>
<td>17,100</td>
</tr>
<tr>
<td>Beef drops</td>
<td>17,400</td>
</tr>
<tr>
<td>Beef steak</td>
<td>17,400</td>
</tr>
<tr>
<td>Beef liver</td>
<td>17,500</td>
</tr>
<tr>
<td>Beef steak</td>
<td>18,200</td>
</tr>
<tr>
<td>Veal steak</td>
<td>19,800</td>
</tr>
<tr>
<td>Veal veal</td>
<td>20,500</td>
</tr>
<tr>
<td>Veal skull</td>
<td>22,400</td>
</tr>
<tr>
<td>Beef liver</td>
<td>26,500</td>
</tr>
<tr>
<td>Beef liver</td>
<td>39,300</td>
</tr>
<tr>
<td>Beef liver</td>
<td>68,000</td>
</tr>
</tbody>
</table>

*Source: ACET field study, 2014*
Supermarkets are also adding value by offering a range of cooked or prepared meats. Marinating, for instance, can add a premium of between 35% and 67%, depending on the meat and the cut. The range of cooked meats sold by the large retailer ShopRite is shown in the figure below. Note that prices per kilogram are lower for fresh meat compared to cooked meat.

![Figure 2.10: Value addition from ShopRite supermarket cooked meat products (in UGX per kg)](chart)

Supermarkets also carry imported beef products, such as tinned corned beef, salami, and polony, indicating the potential for local processors to increase their product ranges.

2. Exports

Beef exports are limited due to disease prevalence and the lack of an export-standard abattoir. The absence of reliable animal identification, movement control, and traceability systems is also a hindrance. However, limited beef exports are sent to the Democratic Republic of Congo (DRC), South Sudan, and, more recently, Somalia, mainly as supplies for UN peacekeeping soldiers. These can be categorized as niche markets, as they are mainly driven by the fact that many of these soldiers are from Uganda. Some neighboring countries also receive informal exports of meat products and live animals from Uganda, likely because producers in border areas with markets nearby find it cheaper to export to neighboring countries rather than travel to Kampala, due to high transport costs.

E. Value Capture Opportunities and What It Will Take

Per capita beef consumption in Uganda remains low at 6 kg, which is half that of neighboring Kenya, although the two have very similar traditions and diets. Key demand drivers for beef include urbanization, a growing middle class, and general population growth. All available data on these drivers point to a rising demand for meat in the near and longer-term future.
To meet this demand, supply needs to be ramped up, which will require increased productivity and, more importantly, an upgrade to the entire beef value chain. Some levers that can address the value capture opportunity for beef are discussed below.

1. Improving Farm-Level Productivity
   
   i. Improving Veterinary Services

   Table 2.2 below demonstrates the extent to which veterinary services can improve the productivity of cattle farmers. Though improving veterinary services can improve productivity, the improvement is generally small, indicating the challenge is deeper and will require addressing more fundamental challenges.

   Table 2.2: Effects of veterinary services on productivity

<table>
<thead>
<tr>
<th>Metric</th>
<th>No veterinary services</th>
<th>Veterinary services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving rate per year</td>
<td>0.58</td>
<td>0.60</td>
</tr>
<tr>
<td>Young stock losses up to selling age (%)</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>Selling age of young cattle</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Adult losses (%)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Young males for sale (%)</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>Young females for sale (%)</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Annual income per cow (including value for home consumption) (US$)</td>
<td>96</td>
<td>113</td>
</tr>
</tbody>
</table>

   Source: Landell Mills, 2012

   ii. Improving Breeds

   The use of improved breeding bulls can substantially increase beef production. No studies have been undertaken at the smallholder level to assess the extent of possible benefits, but it is known that the initial gain would improve the weaning rate from approximately 47% to almost 80% per year.

   Breeding can also help move the herd structure towards a higher proportion of bulls. Only a few high-quality cows are needed, and a bull-centric herd will reduce the wasteful practice of selling pregnant cows to get a higher price. Currently 30% of cows slaughtered are pregnant, which has significant implications for growth of the herd.

   There are efforts by private farms and non-governmental agencies, such as Send a Cow and Heifer International, to increase supply, but new models are needed to improve access. One such model could help develop new farms that combine a feedlot business with breeding or AI services. Feedlot operators acquire cows to fatten, and because they interact closely with farmers (some farmers’ organizations have feedlots of their own), they are well positioned to gain trust and educate farmers on improved breeds while dispelling some of the myths associated with them. Feedlots can also develop the needed infrastructure to keep high-quality bulls for breeding.
iii. Improving Feed

Studies show that Ugandan cattle can be very responsive to feed management. Figure 2.11 shows weight gain per day under three feeding regimes. Just adding concentrate to a grazing feed regime can almost double productivity, while feedlot finishing can triple the meat output. Beyond increasing the weight of sold animals, supplementary feeding can also improve the calving rate and thus the herd size.

Figure 2.11: Weight gain per day in grams under three feeding regimes*

Agro-industrial byproducts are not sufficiently used in Uganda. Calculations by Landell Mills (2012) indicate that the available national quantity of these products would be enough to fatten over 10% of all slaughtered cattle per year (5 kg x 90 days per cow). Further, agro-industrial byproducts could cover up to 20% of annual feed needs if properly collected and stored. Resources should be mobilized to develop the agricultural feed sector, which will require creating incentives for existing food processors to diversify their investment into animal feeds production, or for new entrepreneurs to enter feed manufacturing.

2. Reorganizing the Traditional Production Model

Current levels of productivity are very low due to the non-commercial orientation of the traditional system. Table 2.3 shows the impact of moving toward a more commercialized system.

Table 2.3: Impact of a shift toward a more professionalized beef production system

<table>
<thead>
<tr>
<th>Metric</th>
<th>Traditional</th>
<th>Emerging (improved)</th>
<th>Ranch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at first calving in years</td>
<td>4</td>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>Calving rate per year</td>
<td>0.58</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>Young stock losses up to selling age (%)</td>
<td>30</td>
<td>24</td>
<td>13</td>
</tr>
<tr>
<td>Selling age of young cattle</td>
<td>4</td>
<td>3.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Adult losses (%)</td>
<td>6</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Culled cows per year (%)</td>
<td>11</td>
<td>11</td>
<td>12.5</td>
</tr>
<tr>
<td>Culled sires per year (%)</td>
<td>14</td>
<td>33</td>
<td>50</td>
</tr>
<tr>
<td>Cows per sire</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Young males for sale (%)</td>
<td>20</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td>Young females for sale (%)</td>
<td>3</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>Annual gross margin/cow (US$)</td>
<td>96</td>
<td>128</td>
<td>211</td>
</tr>
</tbody>
</table>

*T1: grazing only; T2: grazing + concentrate; T3: feedlot finishing (maize stover + concentrate)

Source: Nantongo et al, 2014
The key is to reorganize the herd structure toward a higher proportion of bulls, which is standard practice for beef production, and improve breeding to reduce the prevalence of low-weight local breeds, moving the weight of slaughtered animals toward global benchmarks. Two actions are necessary:

i. Developing a Dairy Sector Alongside the Pastoral System

The current tendency to prefer cows for milk production is a very inefficient way to produce milk. Ugandan cows produce on average only 8.5 liters of milk per cow per week (UBOS, 2008), well below the 40 liters per day that a single dairy cow can produce. Cattle keepers should be encouraged to keep one or two dairy cows to meet their milk needs, which will entail the development of a new set of managerial skills, as a dairy cow is very different from a beef cow. Since the rearing of cattle is traditionally a man’s role, a dairy cow targeted toward women could not only increase household food security but also provide women with a new stream of income.

ii. Fattening on Feedlots

As indicated above, feedlots can be a very effective way to increase productivity. The success of feedlots largely depends on the availability of high-quality feeds. Our survey indicates that most of the available supply of agro-industrial byproducts is stover of low quality. Higher-quality byproducts, such as molasses, cake, and brewer’s mash, also exist, but better transport and storage options are needed.

The main advantage of feedlots is that they can focus on growing pasture during the wet season, while cattle feed on grazing land, as is traditional. At the onset of the dry season, when many are prone to sell (even if it is not the optimal time) for fear of losing animals, cattle can be moved to feedlots for fattening and slow release to markets, thus stabilizing prices. Another benefit of feedlot systems is reduced pressure on land and reduced environmental degradation during the dry season, which allows natural pastures to regenerate and thus improves the productivity of the grazing system. Discussed below are three potential approaches to developing feedlots.

a) Farmer-Based Organizations (FBOs)

Farmers can pool their resources as a cooperative to develop their own feedlot, supply cows for fattening, and share in the profits of the resulting improved cows. This is the model being tested by Balunzi Cooperative Society (see Box 2.1).

Box 2.1: Balunzi Cooperative Society, Zirobwe Feedlot

The members of the Balunzi Cooperative Society provide cows and calves according to their ability (contributions ranging from 1–4 animals per farmer). At the time of the field study, the feedlot had a stock of 70 cows aged 3–6 year, and 30 bull calves aged 6–8 months. The major costs of the feedlot include fencing, growing maize, pumping water from the river, additional feeds, drugs, veterinary services (extension service consultations), and labor. The cows are kept in a kraal and graze on 5 hectares of improved pasture daily, but briefly. Calves are initially housed in a special structure until they are ready for grazing on an improved pasture of Guinea grass and stargrass. Supplementary feeds consist of maize silage, molasses, and vitamins. The silage is planted twice a year on 2 ha of land, and water is pumped from the Lwajjali River, 700 meters away from the feedlot. Feeding depends on each animal’s weight; mature cows (300–400 kg) consume 20 kg per day, while bull calves may consume 5 kg per day. On average, the farmers invest approximately UGX 500,000 (US$200) in buying and keeping a single calf, including feeding. Bulls are kept for about one year before being sold for approximately UGX 600,000 (US$240) each, yielding a margin of about 20%. Ten to fifteen percent of the proceeds are retained by the cooperative, and the rest is shared among the members.
b) Rancher + Smallholder Model

In another model that exploits the strengths of both traditional and commercial systems, ranchers buy cattle from smallholders and then fatten them for further sale. Smallholders, with their extensive grazing systems, can produce a large herd of cows (albeit low-quality ones) quickly and at little cost, while ranchers have the capital and knowhow to intensively rear high-quality cows. However, our survey obtained little information from ranches on the potential for feedlot fattening, although many ranchers indicated that this scenario would present opportunities for investment in both feedlot fattening and feed production.

One of the few ranches practicing fattening on improved natural pastures is Banuti Ranchers Ltd. The ranch 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 all after four months, at the end of the rains. However, estimates of their profit margins from fattening were not available due to lack of records.

c) PPP Local Government/Traders Model

Another potential model would encourage traders to integrate backwards and establish feedlots. Extending existing public–private partnership (PPP) arrangements, in which traders lease markets from town councils and run them, the whole market can be made into a stockyard that incorporates both fattening and the buying and selling of cattle. If the economics are right, the combination markets/feedlots could also incorporate an abattoir so that the end product is meat rather than cattle. This can go a long way toward promoting rural transformation by establishing some form of industrial activity in those rural areas. This model will require stronger traders who can mobilize the resources needed to upgrade the poor conditions of rural markets.

Combination markets/feedlots can also greatly improve the revenues of town councils due to the resultant expansion of economic activities. The PPP model can also be extended to include traders, beef producers’ associations/cooperatives, and local authorities as a way of bringing key stakeholders together.

Whatever approach is used to develop a feedlot, the key decision is locating them so as to cut the cost of transport (of animals to feedlot, feeds to feedlot, and fattened animals to slaughter). This is a critical factor, as transport costs can be very high, especially if feeds are imported from far away. Imported molasses, for example, can cost up to UGX 500 per kg, making its use unprofitable; however, if the feedlot is located close to a sugar plant, the cost falls to UGX 160 per kg.

One advantage of the combination market/feedlot model is that trucks that come to transport cows can also be used to deliver feed from various locations, especially agro-industrial byproducts. This can lower transport costs drastically, essentially making them zero if the traders also own the feedlot and can decide how to allocate the cost of transport.

A detailed study modeling the various feedlot ownership options and potential locations is needed to establish the best way forward.

3. Upgrading Transport

As mentioned, our analysis shows that cattle transporters generally earn very high margins, but often do so through cruel practices that also lower the value of the animals. Forward integration by traders, giving them ownership of the transport system, may lead to better handling of cattle, as traders will try to maximize the profits from cows, as opposed to transporters, whose objective is to pack as many cows as they can onto a truck and who bear no cost of loss of quality.
Upgrading to trucks with refrigeration facilities, which can transport meat from long distances rather than transporting cows, can also increase value. At present, cattle are transported to slaughter locations hundreds of kilometers from the areas of cattle production. Slaughtering in production areas creates jobs and increases the value captured by beef producers, as transport costs for high-value meat products are lower than for live animals. Note that though the cost of transport may fall, refrigerated trucks are more expensive, so the cost of financing the investment will go up. While no analysis has been done to ascertain whether lower transport costs can compensate for higher capital investment, Fresh Cuts, processors have a few refrigerated trucks that transport meat from slaughterhouses to shops and indicated that this model works well for them. However, a more careful analysis is needed to understand the economics of establishing slaughterhouses and other related infrastructure in production areas.

4. Upgrading Processing: From Slaughterhouses to Meat Processors

The current model, in which slaughterhouses operate on fees for service, is a relic of the past. It does not encourage investment, which largely explains the poor state of slaughterhouse facilities today. This not only limits the market for meat, especially export markets, but is also a public health hazard.

It has been estimated that if slaughterhouses bought the animals and slaughtered them for sale, their margins could rise to 11.7% per animal. It may thus be necessary to shift from slaughter as a service model and institute better-capitalized slaughterhouses that integrate backwards and forwards. This will help improve quality, better coordinate the chain, and stabilize supply. Three options are available:

- Slaughterhouse owners (the local authorities) go into the meat processing business.
- Slaughterhouse operators (or other investors) buy slaughterhouses outright.
- A PPP arrangement is established between traders (and investors) with the city authorities that own slaughterhouses.

This will require investment in facilities and employment of skilled labor. Many of the brokers/traders now operating are unlikely to raise the needed resources for upgrades. Government and development partners can provide one-time subsidies to upgrade facilities and help identify partners to run them. Potential candidates for support include existing meat processors like Fresh Cuts.

![Figure 2.12: Price differential for quality of beef (UGX per kg)](source: ACET field study, 2014)
Box 2.2: Hides’ Hidden potential

Hides provide a good export opportunity, but due to the way animals are reared, handled, transported, and slaughtered, the quality of the hides is generally poor. At farm level, poor nutrition, damage from branding marks, tick bites, and old-age culling have a significant impact on the final product. Poor nutrition and husbandry also result in smaller animals with smaller hides; the weight of a green, unsalted hide can range from 15 to 30 kg, a variation of 100%.

Slaughterhouses often employ unskilled casual laborers who use inappropriate tools for flaying and handling, resulting in further damage. The cutting pattern and shape is not always correct, and the use of improper tools and techniques causes undesirable perforations. Slaughterhouses also lack facilities to process hides, so many are improperly dried. Ground drying, the most common practice, results in defects such as cracks, abrasions, infestation with insects and rodents, and putrefaction due to intermittent periods of high and low temperatures. The result is huge variation in the quality and price of hides.

Figure 2.13: Price differential for hides (UGX per kg)

However, traders seem to be able to exploit this great disparity in quality to their advantage. As shown in Figure 2.13, while the buying price may vary by 11% (UGX 2,700/kg versus UGX 3,000/kg), the selling price varies by 100%. Thus, traders are given a more or less fixed price for skins regardless of condition, but incorporate hefty premiums depending on condition when they sell.
i) Quality Control

The market pays a significant premium for quality. For instance, the wholesale price at the main abattoir in Kampala can vary by 100% depending on meat quality. This clearly indicates that enforcement of quality control standards holds significant potential for creating value.

ii) Development of Water Points

Water is one of the biggest challenges of rearing beef cattle. Herds are moved vast distances in search of water, reducing the productivity of the animals and greatly damaging the environment, especially in locations near water holes. Setting up watering points—small reservoirs that can be built using communal manual labor—can significantly increase productivity. These reservoirs can hold 2,000–5,000 m$^3$ and be constructed at an estimated cost of US$10,000 per sub-county.

iii) Animal Identification and Movement Control

An identification system is important for controlling animal movements and thus disease outbreaks. This is critical to raising national productivity. Traceability is also increasingly required for access to high-value markets and especially lucrative export markets.

There is no official national animal identification system in operation. A national cattle brand, incorporating the country identifier (U), followed by two figures for the district and one letter for the county/sub-county, was introduced by MAAIF in 2004, but uptake from the districts has been slow and limited. Today, several unrelated systems are used in different regions of the country by different actors. NGOs use ear tags for vaccinated animals; the Office of the Prime Minister launched a sophisticated identification system in Karamoja, using rumen bolus and ear tagging; and farmers’ associations and cooperatives use their own systems, mostly based on ear tagging.

The beef value chain has many challenges, and significant inputs in ideas and investments will be required before that significant potential is unlocked. The table below lists some quick wins that can be realized.
### Table 2.4: Quick wins for the beef industry

<table>
<thead>
<tr>
<th>Node of the Value Chain</th>
<th>Main Challenges Faced</th>
<th>Some Quick Wins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input supply</td>
<td>• Lack of inputs</td>
<td>• Incentivize big ranchers and farmers cooperatives to become input suppliers and also service providers</td>
</tr>
<tr>
<td></td>
<td>• Lack of quality feeds</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>• Low productivity</td>
<td>• Establish feedlots to fatten cows by supporting beef producers, cooperatives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Develop dairy farming so that beef production can be more specialized</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Encourage tight integration between ranchers and pastoralists through contracting</td>
</tr>
<tr>
<td>Logistics</td>
<td>• Poor market infrastructure</td>
<td>• Privatization of the markets or a very strong PPP arrangement with local authorities that can spur investments to improve the market</td>
</tr>
<tr>
<td></td>
<td>• Bad roads</td>
<td>• Support traders to acquire transportation fleets and also consolidation of the trading sector so that the trader buys the animal from the rural market, transports it to slaughter, and sells both hide and meat</td>
</tr>
<tr>
<td></td>
<td>• Poor handling of animals</td>
<td></td>
</tr>
<tr>
<td>Processing</td>
<td>• Poor infrastructure including inadequate facilities</td>
<td>• Privatize slaughter house or create strong PPPs that will spur further investment.</td>
</tr>
<tr>
<td>Marketing &amp; Distribution</td>
<td>• Low level of product development</td>
<td>• Encourage beef marketers to integrate backwards to processing to increase investment in the sector and also raise quality standards</td>
</tr>
<tr>
<td></td>
<td>• Under developed distribution channels</td>
<td>• Encourage the emergence of modern butchery chains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Branding of the Ankole beef as a healthy choice for emerging class of health conscious middle class consumers</td>
</tr>
</tbody>
</table>

In the longer run, the beef value chain will need significant upgrades. This will require mobilization of investments to upgrade processing facilities, logistics, etc., and will require the emergence of strong players able to organize the effort.

At the moment, the only strong player seems to be Fresh Cuts, which can be incentivized to integrate backwards all the way to production, where they can start working with cooperatives like Uganda Beef Producers to create a strong supply chain.

Establishing the needed business environment to attract investment in the sector by existing and new investors will be the key input by the policy actors. However, investment in roads and market infrastructure and strengthening the regulatory capacity will be vital to upgrading the beef value chain.
Cassava plays a very important role in Uganda, at both the household level and a national food security level. It is the second most important staple crop after bananas, and Uganda is the sixth largest producer of the crop in Africa, generating 5.5 million MT in 2014 (Director of Crop Resources, personal communication 2015).

Cassava’s ability to grow well in marginal environments and its flexibility in the cropping and food systems make it an attractive crop for most Ugandan farmers. It is estimated that in some parts of Uganda, nearly 90% of the people consume cassava in different forms at least daily (Eastern Africa Agricultural Productivity Program [EAAPP], 2011). It provides opportunity for both sexes, particularly in terms of employment on the farm and in processing units and local industries, making it an important source of income in Ugandan households, as shown in Figure 3.1.

As a result, cassava is one of the 10 agricultural commodities prioritized by the government of Uganda in the DSIP. The crop is recognized as a major agricultural commodity for poverty eradication and food security, and as a potential raw material for industry. In addition, cassava is seen as playing a strategic role in addressing the adverse effects of climate change.
A. Production Trends and Structure

Cassava production peaked at 5.6 million MT in 2005–2006, after which it collapsed to 4.9 million MT following an outbreak of cassava brown streak virus disease (CBSD). A similar collapse occurred from 1990 to 1995 after an outbreak of cassava mosaic disease (CMD). While production has since shown rapid recovery, it has yet to reach pre-CMD levels. Figure 3.2 shows that the harvested area has grown faster than production, indicating that yields have not been rising.

**Figure 3.2: Trends in production and harvested areas of cassava**

- Cassava production is recovering from the devastating cassava mosaic disease (CMD), though production is being driven by area expansion.
- Cassava production trends and area harvested trends.
- Cassava plat size (ha) and % pure stand.
- Production was badly affected by an outbreak of cassava mosaic disease (CMD) in 2006. Though production is recovering, this is largely driven by expansion in the area.
- Cassava is largely grown by smallholders, though there is significant variation in this group, ranging from subsistence to commercial smallholder farmers.
- Cassava tends to be intercropped, though pure stand has become more prevalent as plot size increases.

FAOSTAT, Uganda agricultural census (UCA 2009/10)

Cassava production remains largely a smallholder domain. The 2009 Uganda Census of Agriculture gives the average plot size for cassava as 0.27 ha. Sixty-one percent of plots are pure stand, and 39% are intercropped, mostly with maize, beans, millet, sorghum, and bananas, depending on the region. Our survey identified three systems of production:

- Production by subsistence farmers who own very small plots (around 0.25 ha) and use few inputs and mostly manual labor. They grow cassava mainly for household consumption, with average yields of 8–11 MT/ha.
- Production by smallholder farmers who grow cassava both for home consumption and for market. They use improved varieties, weed control, and animal traction for labor, and obtain average yields of 12–19 MT/ha.
- Production by commercial cassava farmers who maintain high crop management standards, including improved varieties and use of pesticides and mechanization. Their yields range from 20 to 30 MT/ha.
1. Cost Structure

Figure 3.3 shows the cost structure of the two smallholder farming systems. For subsistence farmers, margins are hard to calculate unless one imputes the labor cost, which is the main cost and is largely provided by the family. For smallholder commercial farmers, who tend to use hired labor, the return on cassava investment is in the area of 15.2%.

Our survey did observe an increasing tendency toward commercialization, as cassava farmers are beginning to join farmer-based organizations (FBOs) and commercial farming associations in greater numbers.

2. Yields

Cassava yields are lower than potential yields indicated by field trials and benchmark countries, and yields vary significantly between farmers and farming systems.
Factors contributing to low and varied yields are discussed below.

- Many farmers grow cassava primarily for food and food markets, so the varieties they sow are determined largely by consumer taste preferences and not by high yield. Increasing yields will thus be an uphill battle, as it will require more extensive breeding work to get a high-yield variety that also suits the palates of Ugandan consumers.

Figure 3.5: Market demand vs. yield for smallholder cassava producers

- Input use is low. Our survey found that few farmers use fertilizers on cassava, although it has been shown to respond well to fertilizer. Weed control is also a necessity, as uncontrolled weed growth may reduce cassava yields by 50–65% (Melifonwu, 1994). However, for many farmers, adopting best practices is a challenge, as cassava is very labor-intensive and many resource-poor farmers cannot hire labor or access needed inputs or mechanization services. Even improved varieties require a high level of inputs to be profitable.

- Disease is another serious challenge. While the devastating CMD threat has been countered by the introduction of CMD-resistant varieties, it has been reported that up to 13% of farmers abandon these varieties every year, largely because they consider their taste to be inferior (MAAIF, 2011). Some CMD-resistant varieties are also now susceptible to CBSD.

3. Gender Dimension in Cassava Production

A 2005 International Fund for Agricultural Development (IFAD) study in six African countries, including Uganda, found that men owned 70% of cassava plots. The study also found that both men and women made significant contributions of their labor to the cassava industry. However, men and women were found to specialize in different tasks. Men worked predominantly on land clearing, plowing, and planting, while women specialized in weeding, harvesting, transporting, and processing, as shown in Figure 3.6. These findings are largely similar to what our focus group discussions have indicated.

15 The proportion of cassava fields owned by men ranged from 15% in Côte d’Ivoire to 81% in Nigeria (IFAD, 2005).
Women are mainly responsible for harvesting, transport and processing, and these are highly labor-intensive activities. It has been noted that men’s involvement increases as processing becomes more mechanized and commercialized (Martin, Forsythe and Butterworth 2008).

![Figure 3.6: Male vs. female labor in cassava production](image)

Source: IFAD, 2005

However, research has shown that as processing becomes more mechanized and labor-intensive, as is common in the commercial sector, men tend to take over women’s activities. Therefore, careful consideration must be given to women’s roles as the cassava value chain becomes more commercialized and value addition becomes more common.

**B. Farm to Market**

The nature of cassava requires that roots are either sold immediately or processed into a more durable form once harvested. Our survey found that cassava farmers both sell roots and process them to cassava chips for sale. Fresh cassava roots, dry chips, and flour are transported either manually, mainly by women; by ox-carts, especially for fresh roots, from garden to home; or by bicycle or motorcycle from farm to markets. For small-scale/subsistence farmers, the quantity harvested is dictated by their ability to transport, as both operations take place on the same day. Long-term storage is unfeasible, as most farmers lack appropriate storage structures to prevent the roots from perishing or protect cassava products from infestation by rats, mold, and weevils.

Harvesting makes up almost 30% of the total production cost, and transportation is almost in the same league. Harvesting and post-harvest handling, therefore, call for mobilization of significant resources and is a serious challenge for many resource-poor farmers in Uganda. As a result, post-harvest losses of cassava in Uganda tend to be fairly high, similar to the costs of harvesting and transportation (see Figure 3.7). Because of this, many farmers choose to sell their cassava fields and let a buyer/trader organize the harvesting and transportation.
High post-harvest losses are caused mainly by poor storage. At farm level, cassava is stored as fresh roots, which are kept in soil to reduce perishability; dry chips, stored in sacks treated with brine; or milled flour, stored in plastic buckets or polythene bags for approximately six months. The storage period for chips is highly influenced by the moisture content after drying and demands at the household and market levels.

## C. Cassava Trade

### 1. Cassava Roots Trade

The percentage of cassava released to the market ranges from 18% to 30%, as Figure 3.8 shows. Interestingly, the Eastern and Northern regions, the country's major producers, tend to sell less and store more than the Central and Western regions. Thus, for the latter two regions, cassava is more of a cash crop than a food crop.

- Nationally about 60% of cassava is consumed, about 22% is traded, 10% is stored, and 7% is used for other purposes.
- There is a huge national variation in cassava sold and cassava stored, with regions that produce less selling more.
As mentioned, transportation is a key cost for cassava farmers. A snapshot of the average transport costs for cassava farmers we interviewed is shown in Figure 3.9, and demonstrates that transport costs tend to rise as one moves from a big town to transportation within a district. Since farmers are responsible for transport from farm to local markets, they tend to pay higher prices. Indeed, traders traveling between towns incur about one-fifth of the costs that farmers do. This is partly due to the lack of economies of scale and lack of competitiveness in village transport markets.

![Figure 3.9: Transport costs for cassava farmers (in UGX)](Image)

The key intermediaries at village level are the village assemblers (VAs) and traveling traders (TTs). Village assemblers are individuals with greater access to capital than their village neighbors, who use these financial resources and knowledge of the local environment to bulk cassava at village level. Traveling traders buy from VAs or buy a field from farmers, then transport the produce for wholesale at urban markets. The TTs indicate that it is difficult to rely on village labor for uprooting cassava (whole roots being the main product sold), particularly when they buy a whole field. Thus TTs often bring hired labor from Kampala to assist in the exercise. Because the TTs are usually not sure of the yield, the farmers are paid based on the size of the truck to be filled. At the markets, TTs sell to market-based urban brokers/commission agents, who act as intermediaries between suppliers and urban retailers. The wholesale trade is dominated by men, due to the financial and physical requirements of the job (e.g., lifting heavy bags). Women, on the other hand, dominate retailing; in Jinja market alone, there are about 70 retailers of fresh cassava and sweet potato, and of these 40 are women and another 10 are youths. Urban cassava roots traders are well organized and some belong to formidable associations. Many traders in Jinja belong to the Bogere Soka and Sanyu (BOSOSA) savings and credit cooperative society (SACCO), whose 737 members save and borrow for business needs without interest. Some of the challenges traders face include limited working capital and losses due to the roots’ perishability, and they expressed a need for interventions to increase the roots’ shelf life.

2. Cassava Chips Trade

Cassava chips are the second most important cassava product. Chips are purchased from farmers, transported, and kept in produce stores in local trading centers. As with cassava roots, the key intermediary is the VA, who performs quality checks and bulks the cassava chips for onward sale to TTs. The TTs pay to mill the chips and sell flour to wholesalers in urban markets.

16 When filled, a truck with a capacity of 4 MT would be worth at least UGX 400,000.
17 In the new Jinja market now under construction, there are plans for a cold room, but it is not clear whether the cassava traders will have access to it.
18 VAs usually grade the cassava as high-quality (white and dried) or low-quality (discolored).
Cassava chip markets differ in the way chips are handled and sold. For instance, in Kisenyi, the price of chips varies from UGX 350 per kg for darker-colored chips to UGX 480 per kg for whiter ones, while the flour price ranges from UGX 600 per kg to UGX 650 per kg. The milling charge is UGX 70 per kg. The cost structure and margins for cassava chips from Soroti and flour sold in Kampala are shown in Figure 3.10.

Washed chips are also sold, for a premium. Some traders or millers purchase ordinary gray chips, wash them, and sun-dry them again to remove sand and other contaminants. They are then milled into sand-free flour, which is sold to local bakeries. Cassava flour from washed chips is sold at UGX 1,300 per kg, compared to UGX 650 per kg of flour from ordinary chips.

**Figure 3.10: Cassava chips traders’ value addition**

<table>
<thead>
<tr>
<th>Source</th>
<th>Buying price of chips per kg (UGX)</th>
<th>Selling price of chips per kg (UGX)</th>
<th>Selling price of flour per kg (UGX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lira</td>
<td>480</td>
<td>500</td>
<td>620</td>
</tr>
<tr>
<td>Kibale</td>
<td>480</td>
<td>500</td>
<td>620</td>
</tr>
<tr>
<td>Soroti</td>
<td>380</td>
<td>400</td>
<td>550</td>
</tr>
<tr>
<td>Masindi</td>
<td>350</td>
<td>450</td>
<td>600</td>
</tr>
<tr>
<td>Busoga</td>
<td>350</td>
<td>450</td>
<td>600</td>
</tr>
</tbody>
</table>

Village Assemblers (VAs) incur significant cost in bulking, while traveling traders (TTs) bear the cost of transport to urban markets. Margins are thin all round and it is hard to say that traders are exploiting farmers.

The key challenge of trade in cassava chips is that they are mainly sold along informal value chains and in informal markets, which are characterized by inadequate storage facilities, distorted weighing scales, and the absence of quality standards.

### 3. Exports

Data on exports is rather sketchy because most of it is informal, but cassava exports have been quite low since 2004, peaking in 2007–2008. Most of these went to South Sudan and parts of eastern DRC. In 2007, Uganda exported 20,506 MT of cassava (worth US$1.9 million), which fell to 9,143 MT (worth US$573,591) in 2008 (Uganda Revenue Authority [URA], 2009). However, there is a growing level of informal export to Kenya, Rwanda, and Burundi.
D. Processing

Box 3.1: Household processing

Cassava processing starts at the household level, and according to the EAAPP, 56% of farmers process their cassava by turning it into chips (91%) or cassava flour (33%). The key challenge of processing cassava is the low level of adoption of modern machines. Knives and mortar are still used by many to chip and grind cassava, though adoption of modern chippers is also fairly high (41%). However, very low use of modern drying methods and continued reliance on sun is a major challenge due to weather inconsistency. Other problems include mold growth and domestic animals.

The basic processing of cassava involves peeling, chipping, then drying the chips; the chips are then sold as they are or further milled into flour. Flour can then be sold as is or further mixed with other flours (e.g., millet, sorghum, soya, etc.) to produce composite flour.

Although data on the range of processors and their shares is not readily available nationally, the processing landscape consists mainly of Soroti, Jinja, and Kampala. Of these, Soroti is the main processing and supply hub for both traditionally processed cassava flour and sun-dried chips. Overall, traditional cassava flour is the primary product made from cassava, followed by composite flour and high-quality cassava flour (HQCF).

1. Traditional Flour

Traders usually mill chips into flour using service millers. Traders may also incur costs for loading (in the range of UGX 2,000 each for loading and off-loading) and the polythene bags (costing about UGX 800–1,000) that are generally used to transport cassava. The cost structure for producing cassava flour is shown in Figure 3.11.

Figure 3.11: Cassava flour cost structure
As shown above, margins are highly volatile and range from 1% to 21%, as the price of inputs can vary from UGX 270 to UGX 300 per kg. This clearly indicates that cassava traders are not really making a windfall, despite controlling the trade.

Box 3.2: Service millers

Service millers, who use hammer mills (also used for milling maize) powered by electricity, diesel, or gas engines, are common in the main trading centers. The most basic requirement for operating a mill is capital, about UGX 10–30 million. Competition is very high. In general, the cost of milling cassava chips is around UGX 70–100 per kg, and most millers also offer bulk milling services at a rate of UGX 5,000–6,000 per bag (approximately 100 kg). The high cost of electricity is one constraint faced by milling operations; some millers in Pallisa, for example, have reportedly reverted to using diesel engines because electricity is unaffordable. The overall productivity of these mills is low, with losses at around 30% of the chips.

2. High-Quality Cassava Flour (HQCF)

High-quality cassava flour is still a very small sector, with only about 1% of the cassava flour market. However, the growth potential is huge, as HQCF can partially substitute for wheat in baking. The cost structure of producing HQCF is shown in Figure 3.12. Note that roots constitute the biggest cost of processing, giving yields an important impact on cost and therefore on returns.

Figure 3.12: Cost structure for producing HQCF

Source: ACET field survey, 2014

19 Note that in 2012, cassava chips sold for UGX 700 per kg.
E. Challenges of Cassava Processing

1. Production Model/Technology

The part of the process most sensitive to cost and quality is drying. Sun drying can lead to quality issues, such as contamination, mold, fermentation, and discoloration, and, of course, it cannot be done on rainy days. The alternative is to use mechanical dryers, which are reliable and yield consistent results, but are expensive to acquire and run, mainly due to high energy costs. The choice of drying technologies is therefore a key determinant of cassava processors’ profits.

Three production systems are used in Uganda: community processing groups (CPGs), artisanal processors’ associations using low-tech methods, mainly sun drying; more formal small or medium (SME) processors using sun drying; and better-capitalized SME processors who can invest in flash dryers. The relative profitability of these three systems for various cassava products is shown below.

As shown above, profits from products using any of the three methods of processing are higher than those from the sale of fresh roots (US$5–7) by farmers. Depending on the product, the profitability of CPGs using sun drying can vary, from US$35 for animal feed sold as wet cake to US$251 for HQCF for paperboard manufacturing. SMEs using sun drying obtain US$36–271 profit for their products, while those using flash drying get US$20–265.

Note that SMEs using sun drying are much more profitable per unit than SMEs using a flash dryer due to increased operating costs. The advantage of flash dryers comes from increased throughput, which translates to higher income compared to the other processing systems. Figure 3.14 shows income profiles for production of HQCF for baking under these three systems. The income of an SME with a flash dryer is nearly 10 times the income of an SME relying on the sun.
To lower the cost of flash dryers, which can be 20 to 50 times the cost of other processing equipment, efforts are being made to upgrade the capacity of local fabricators so that they can produce high-quality processing machines.

2. Certification

The lack of certification for cassava-processing sites and the products themselves is a major barrier to market access. Cassava products are currently limited to end-user markets that do not require certified flour, such as paperboard and composite flours. This is changing, however, as the Uganda National Bureau of Standards (UNBS) has implemented a project to build awareness of HQCF standards as well as other food and drink manufacturing standards, starting with Cassava: Adding Value for Africa (CAVA) processing sites. At each site, “champions” are selected and trained to carry out quality control and inspection, and act as a link with regulatory bodies. District production staffs in host districts are also being trained to assist in quality control. UNBS is now working with the sites to have them certified.

Box 3.3: Product development

Efforts are being made to increase the range of cassava products, especially for growing urban markets. Gari processing technology has been introduced to Uganda via a number of farmers’ processor groups in Kibuku (PATA), Bukedea (P’KWI), Masindi, and Ambako. These initiatives have been spearheaded by the International Institute of Tropical Agriculture (IITA) and the Sasakawa Global 2000 Network. The technology has been well received by farmers’ processor groups and the market; PATA, for instance, has begun selling to niche markets in Kampala and Nairobi. However, processors still face many constraints, including the seasonal availability of cassava, low-quality cassava chips, high operating costs, poor-quality processing equipment, poor quality control, and impurities in chips such as metal pieces, stones, hard peels, and fibers.

3. From Processing to Markets

Cassava products are sold in both traditional markets and modern retail outlets. Traditional cassava flours are sold exclusively by local wholesalers and retailers because they do not meet the UNBS quality requirements to be on supermarket shelves. These channels handle about 95% of processed cassava products. However, well-packaged composite flours, which fetch a premium price, are sold almost exclusively by supermarkets. Several brands mix cassava and millet or cassava and sorghum in addition to the pure cassava flours they offer.
F. Value Capture Opportunities and What It Will Take

1. Increasing Productivity

Increasing cassava yields will entail the adoption of high-yielding and disease-resistant varieties. However, more research must be done to develop varieties that not only meet these requirements but also satisfy user taste preferences.

i. Increasing Access to Farm-Level Processing Equipment

Mbwika (2001) has observed that Ugandan farmers in remote areas who had no easy access to markets, but did have access to processing, planted more cassava for sale than farmers who had easy access to markets but no processing equipment. This underscores the role that farm-level processing equipment plays in increasing production and market participation. Greater efforts should be directed toward mechanization, in tandem with increasing the adoption of higher-yield varieties. Thus, more energetic efforts are needed to develop local capacity to fabricate simple machines for farms, as well as new business models to increase access for resource-constrained farmers who are unable to purchase machines.

Here lessons can be drawn from the milling sector, which uses a fee-for-service model to turn cassava chips into flour, rather than requiring chip traders to invest in their own milling equipment. This has allowed the emergence of a vibrant cassava flour sector. The fee-for-service model could be particularly useful for the provision of drying technology; as a flash dryer allows for a very high throughput, but is too expensive for farmers’ processor groups and many SMEs, a fee-for-service model for drying could make this critical technology available to smaller processors and allow them to scale up.

ii. Increasing Quality

Unlike in West Africa, the use of graters and presses in cassava processing at the farm level in Uganda is not widespread; where these machines are available, they are not made from stainless steel, which is required for food-grade products (C:AVA, 2010).

Figure 3.15: Impact of quality improvements

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting</td>
<td></td>
</tr>
<tr>
<td>• Motorized chipper</td>
<td>Aflotoxin reduced to safe levels</td>
</tr>
<tr>
<td></td>
<td>Drying time more than halved</td>
</tr>
<tr>
<td>Drying</td>
<td></td>
</tr>
<tr>
<td>• Raised racks</td>
<td>Before (Low price) 7</td>
</tr>
<tr>
<td>• Biomass dryers</td>
<td>Before (High price) 2</td>
</tr>
<tr>
<td>• Polythene sheets</td>
<td>After</td>
</tr>
<tr>
<td>• Improved local oven</td>
<td>Price goes up by between 40% and 120%</td>
</tr>
<tr>
<td></td>
<td>Price of cassava chips per kg. UGX</td>
</tr>
<tr>
<td></td>
<td>Before 180</td>
</tr>
<tr>
<td></td>
<td>After (Low price) 250</td>
</tr>
<tr>
<td></td>
<td>After (High price) 400</td>
</tr>
</tbody>
</table>

Source: Nabawanuka-Oputa, Jane and J.A Agona (undated)
Commercialization requires greater attention to quality, and simple technology interventions can significantly improve the quality and thus the value of cassava. For example, an intervention by the Uganda National Post-Harvest program to reduce aflatoxin contamination through better drying and handling was able to halve drying time and increase the selling price by 40–120% (Nabawanuka-Oputa and Agona, undated).

Box 3.4: Transgenic cassava

Uganda is currently looking at the potential of genetic engineering to address some of the challenges facing cassava. To date, the cassava research team at the National Crops Resources Research Institute (NaCRRI), Namulonge, working alongside a team of scientists at the Donald Danforth Plant Science Center (DDPSC) in St. Louis, Missouri, has developed transgenic cassava with genes that confer resistance to CMD. These varieties are now undergoing field trials in Uganda, and their potential to control CBSD is also under investigation. Other transgenic research aims to improve cassava’s nutritional value; research efforts will specifically target elevated protein and beta carotene content, starch modification, and reduced cyanogenic content, as well as post-harvest physiological deterioration. The National Agricultural Resource Organization (NARO) has also embarked on building capacity for transgenic cassava research in Uganda.

2. Product Development

Processing cassava roots adds significant value and can be very profitable. A study by the CAVA project found profit margins for various cassava products, as shown in Figure 3.16. HQCF production yields especially high returns and thus presents a significant opportunity.

Figure 3.16: Profit margins for various cassava products

Studies by CAVA point to potential demand for cassava flour at 31,150 MT by 2019, mainly driven by demand from rural bakeries (for HQCF) and the animal feed industry (for cassava chips). Other key drivers include biscuit manufacturers and breweries.
i. Animal Feeds

The C:AVA investment study found potential for significant improvements in sales margins (1.5–20%) when cassava was included in animal feed rations at 10–20%. At this rate of inclusion, the demand for cassava in the feed sector would be approximately 40,000 MT per year. The fact that Uganda has considerable vegetable and animal protein (fishmeal) resources to complement a cassava-based feed makes this a particularly addressable opportunity. There are, however, certain challenges that need to be resolved if this is to be realized. Principally, these include creating awareness among feed millers and farmers of the nutritional value of cassava in livestock feeds, and equipping processors and millers with appropriate techniques so as to preserve the feed’s quality and integrity.

ii. Beer Production

Beer brewing companies have expressed interest in using dry cassava as an adjunct for beer brewing. They have already undertaken trials and found HQCF to be a feasible option. However, cassava production costs must be lowered to make it profitable to supply at the price point brewers want (UGX 850 per kg), as cassava must be able to compete with other alternative starch sources like maize and sorghum. Another key challenge is the ability of farmers’ groups to supply the required quantities, about 30 MT per week, on a continuous basis. Strategies must be developed to reduce processing costs and guarantee a stable supply in order to take advantage of this opportunity.

iii. Standards

Cassava can also benefit from the development of standards, especially for HQCF, so that its potential as a wheat substitute can be unlocked. Efforts are under way to set and harmonize standards for cassava and cassava-based products, including hygiene and food handling guidelines, across the East African Community (EAC), and some of these standards are already being implemented at lower levels. Some farmers’ associations, like SOSPPPA, PATA, AFAMCOS, and P’KWI, have received copies of these standards from the Africa Innovations Institute (AfrII). Further diffusion and adoption of these standards will expand market access for cassava and also increase quality.

iv. Way Forward

Table 3. 1: Quick wins for the Cassava Industry

<table>
<thead>
<tr>
<th>Node of the Value Chain</th>
<th>Main Challenges Faced</th>
<th>Some Quick Wins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>• Low productivity</td>
<td>• Strengthen the emergence of commercial smallholder farmers by helping them form processing groups.</td>
</tr>
<tr>
<td></td>
<td>• Lack of drying and processing facilities for chips</td>
<td></td>
</tr>
<tr>
<td>Logistics</td>
<td>• Cost transport from village to rural market</td>
<td>• Help village assemblers acquire transport like Motorking tricycles, to lower cost. This can be form of a special loan facility.</td>
</tr>
<tr>
<td>Processing</td>
<td>• Costly to commercially dry cassava produce HQCF</td>
<td>• Provide flash drying as business service so that farmers can hire drying service</td>
</tr>
<tr>
<td>Marketing &amp; Distribution</td>
<td>• Under developed HQCF markets</td>
<td>• Cassava beer is a major opportunity that will require government intervention</td>
</tr>
</tbody>
</table>

While there are many value capture opportunities, the degree to which they can be addressed varies, and therefore there is a need to take short, medium term and long term perspectives in developing a strategy to address the opportunities. Some quick wins are addressed in Table 3.1. Identifying the specific medium and longer term actions will require developing a more detailed road map will need to be developed.
iii. Ugandan Sorghum Value Chain

Sorghum is Uganda’s fifth most important staple, after banana, cassava, maize, and millet (UBOS, 2010). It is critical to the livelihoods of the country’s most vulnerable communities, especially in the arid and semi-arid regions and in the densely populated highlands of southwestern Uganda, where it is considered a woman’s crop. The southwestern region grows the red-seeded highland local landraces, primarily for local brew, while in the eastern highlands, farmers grow mainly the white-seeded *Epuripur* or its relatives for industrial brewing of lager beer. The rest of the country grows mixed varieties of sorghum (i.e., the red, multicolored, or white-seeded improved varieties and local landraces), mainly for food and local brewing.

A. Production Trends

Annual production in 2012 was estimated at 315,000 MT from about 350,000 ha (UBOS, 2010). Trends over the last 10 years show that production has not grown and may even be declining slightly. Average yields remain very low, at 0.9 MT/ha, mainly driven by the very low yields of the key producing region, the Northern Region, which, at 0.7 MT/ha, are half those of the Western Region.

![Sorghum production trends](image)

The average size of sorghum plots is 0.33 ha, with the largest plot sizes (0.43 ha) in the Northern Region. In the 2008/9 season, 68% of sorghum plots were pure stand and 32% were mixed stand. Intercropping with beans is common in northern, southwestern, central, and western Uganda.
i. Sorghum Production System

Sorghum is mainly grown by smallholder farmers, who fall into two basic categories. Traditional farmers grow sorghum mainly for household consumption and sell the surplus to market, while commercial farmers grow with an eye to selling a significant part of their output. Table 4.1 shows the characteristics of the two types of traditional sorghum farmers.

Table 4.1: Characteristics of small-scale traditional sorghum farmers in Uganda

<table>
<thead>
<tr>
<th>Small-scale market-oriented</th>
<th>Small-scale subsistence</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Grow red-seeded sorghum for sale to agents</td>
<td>• Found in the southwest highlands and medium-altitude areas</td>
</tr>
<tr>
<td>• Grow specific plots for home consumption and surplus is sold to the market</td>
<td>• Grow red-seeded sorghum</td>
</tr>
<tr>
<td>• Most sorghum is used for traditional brews, especially in southwest Uganda and Rwanda.</td>
<td>• Grow landraces in the southwest and a mix of landraces and improved varieties in the mid-altitudes</td>
</tr>
<tr>
<td>• Plot size = 2–5 acres</td>
<td>• Plot size = 0.25–2 acres</td>
</tr>
<tr>
<td>• Yields are about 0.8 MT/ha.</td>
<td>• Use seed from previous crop</td>
</tr>
<tr>
<td></td>
<td>• Rarely use soil improvements</td>
</tr>
<tr>
<td></td>
<td>• Use traditional methods of planting</td>
</tr>
<tr>
<td></td>
<td>• Yields are about 0.8 MT/ha</td>
</tr>
</tbody>
</table>

Source: Focus group discussions by authors, Kabale

Figure 4.2 shows the cost structure for a small-scale sorghum farmer. Their key inputs are land and family labor, and their margin is modest at 11%. However, since many smallholders own their land and do not impute family labor as a cost, the perception of margins from farming sorghum is very high.

Figure 4.2: Cost structure for smallholder sorghum producers

Source: ACET field study, 2014

21 The cost of hiring a combine harvester is UGX 60,000/acre (same as the cost of tractor plowing), while using a mechanical thresher costs UGX 3,000/100 kg bag of threshed sorghum grain. The mechanical thresher also requires extra labor for cutting the sorghum and feeding the thresher (UGX 20,000/acre).
2. Commercial Farming

Because of sorghum’s use as a substitute for barley in the brewing industry, a vibrant commercial sorghum farming sector has emerged alongside subsistence farming. Our survey identified three categories of commercial sorghum farmers: large-scale, medium-scale, and small-scale. Their characteristics are shown in Table 4.2 below.

Table 4.2: Characteristics of commercial sorghum farmers in Uganda

<table>
<thead>
<tr>
<th>Large-scale commercial</th>
<th>Medium-scale commercial</th>
<th>Small-scale commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few and just emerging, mainly found in eastern highlands</td>
<td>Found in eastern highlands and in the fertile lowland plains</td>
<td>Majority in eastern highlands, with some in mid-altitudes</td>
</tr>
<tr>
<td>Mainly grow Epuripur</td>
<td>Grow mainly Epuripur</td>
<td>Buy seeds from brewery</td>
</tr>
<tr>
<td>Highly mechanized operations, including tractors and combine harvesters</td>
<td>Use mechanized equipment and combine harvesters</td>
<td>Grow 1–5 acres</td>
</tr>
<tr>
<td>Use improved inputs</td>
<td>Use improved inputs</td>
<td>Grow Epuripur for sale</td>
</tr>
<tr>
<td>Grow over 50 acres</td>
<td>Grow 6–50 acres</td>
<td>Receive extension from brewery</td>
</tr>
<tr>
<td>Yields are 1–2 MT/ha</td>
<td>Yields are 1–2 MT/ha</td>
<td>Use improved inputs</td>
</tr>
<tr>
<td>Large storage capacity</td>
<td>Large storage capacity</td>
<td>Sell to agents and cooperatives</td>
</tr>
<tr>
<td>Sell directly to breweries</td>
<td>Sell to breweries via cooperatives</td>
<td>Yields are 1–1.2 MT/ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use ox plows and hand-hoes</td>
</tr>
</tbody>
</table>

Source: Focus group discussions by authors, Kapchorwa district

While traditional sorghum farmers have not been organized, the emergence of a commercial farming sector has been accompanied by the emergence of strong FBOs in the sorghum sector. The most active FBOs are found in eastern Uganda, where sorghum is gaining importance as a commercial crop. These organizations provide sorghum seed, extension, advisory services, and other inputs, as well as bulking and storage services and market grains (see Box 4.1). Kapchorwa Commercial Farmers Association (KACOFA), Mt. Elgon Farmers Organization, Bubare Innovation Platform, and Soroti Sorghum Producers and Processing Association (SOSPPA) are some of the stronger FBOs.

Box 4.1: Kapchorwa Commercial Farmers Association (KACOFA)

Kapchorwa Commercial Farmers Association (KACOFA) brings together sorghum farmers in Kapchorwa district and helps them source inputs and markets. KACOFA sources its seed from East African Breweries Ltd. (EABL) and sells it to members. It also buys sorghum from farmers, carries out quality control, and stores, packages, and sells sorghum at a profit to EABL. Members are paid dividends earned from profits.

KACOFA also facilitates members’ access to mechanization, storage, and financial services:

- It owns tractors, combine harvesters, and threshers, which it hires to members.21
- With support from USAID and the World Food Program (WFP), KACOFA has established a state-of-the-art, 2,000-MT cereal storage and cleaning facility for processing and storing the sorghum. In Ngege sub-county, the leading sorghum-growing area in the eastern highlands, KACOFA has a store with a capacity of about 10 MT where sorghum is stored (1–2 days) before being taken to different destinations. KACOFA plans to construct additional 50-MT capacity cereal stores for maize and sorghum in each of the seven cereal-producing sub-counties.
- KACOFA also recommends members to credit institutions so they can access loans.
3. Potential for Synergies Between Farm Types

There is a huge opportunity for synergies between smallholders and medium- and large-scale commercial farmers. In the eastern highlands, farmers at different levels are already collaborating and sharing resources through a common organization, KACOFA. During land opening, small-scale farmers can access tractors from commercial farmers through KACOFA for a small fee. They may also be mentored by the stronger commercial farmers, and in some cases, better-off farmers hire their implements and other facilities out to smallholders.

B. Challenges to Productivity

- Fake seeds: The percentage of fake seed in the Ugandan seed market is very high, around 40%. This reduces farmers’ confidence in the seed supply chain and discourages adoption of improved varieties of seed (Alliance for a Green Revolution in Africa-Program for Africa’s Seed Systems [AGRA-PASS], 2011).
- Bird menace: Birds are a serious threat to sorghum growing, especially to the white-seeded sorghum grown by commercial farms. In 2013, birds caused massive damage to sorghum fields, leading to losses of up to 60% of the 1,090-acre crop (KACOFA 2013, personal communication).
- High cost of inputs: Farmers using improved sorghum varieties use more of other factors of production and therefore incur higher costs, which do not always translate to higher returns.

Figure 4.3: Cost structure using local versus improved seeds

![Figure 4.3: Cost structure using local versus improved seeds](image)


- Farming practices: Focus group discussions with farmers indicate that farmers appreciate the impact of good husbandry. For instance, 40% of farmers know that simple actions like planting in rows, which demands only more care and time, can increase yield by 30%. Yet they fail to implement these practices, and traditional methods like broadcasting seeds and using local varieties and low inputs persist.
4. Gender Dimension in Sorghum Production

Sorghum uses largely human labor, and women provide most of this labor, as a study by INTSORMIL (2006) found. Our survey largely confirms this in the areas where sorghum is grown mainly as a subsistence crop, e.g., in the southwestern highlands. In the mid-altitudes, where sorghum is grown for both food and income, 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.

Figure 4.4: Farm power inputs and sorghum production

![Diagram showing farm power inputs and sorghum production](image1)

Production is largely labor intensive using family labor

In the eastern highlands, where sorghum is farmed commercially and highly mechanized and most labor is hired, men provide the bulk of the labor. This largely confirms the observation that as the value chain is upgraded, the participation of men increases, and men capture a disproportionate part of the value created.

Figure 4.5: Gender involvement in sorghum production systems

![Diagram showing gender involvement in sorghum production systems](image2)

Since sorghum farming is an important source of cash income for women, it is imperative that mechanization technologies are gender-sensitive, in order to ensure that women are not displaced but rather benefit from the efficiencies that come with mechanization.
C. Farm to Market

1. Harvesting and Storage

Manual harvesting and threshing are the most common practices, though a few commercial farmers in the eastern highlands employ mechanized harvesting. Harvesting losses are mainly experienced due to delays, especially resulting from manual harvesting and threshing operations. Delays in harvesting mean that sorghum is very dry when harvested, leading to losses of up to 5%. These losses can be exacerbated by prolonged exposure to pests and diseases.

Traditionally, sorghum has been stored by individual farmers in granaries constructed from locally available materials. It is now common for threshed and cleaned sorghum grains to be packed in sacks and stored in a secure corner in the main house or a designated store. Providers of storage facilities for sorghum are also emerging:

- In Kabale district, there are parish-level stores owned by the district farmers’ association and input dealers. These are hired out by farmers and traders to store grain, including sorghum.

- In Kapchorwa district, brewery agents own parish-level stores that farmers can use to store grain for 2–3 days for a small fee, before the grain is finally transferred to larger stores in urban centers.

2. Sorghum Distribution

Because sorghum is largely a subsistence crop mainly grown for household consumption, with some commercial use, the amount sold varies from 11% to 64% of production. Big producing regions tend to sell less and store more. Of the total sorghum marketed, about 20% is sold at the farm-gate level and 80% is sold at rural markets. In Soroti, key informants interviewed said that they sold a high percentage of their sorghum in case of financial emergencies, as for school fees, household needs, or medical care.

Prices for sorghum vary in all markets. In November 2013, the wholesale price ranged from UGX 350/kg in Mbale to UGX 800/kg in main urban markets of Kabale and Kampala (Owino market). The retail price at the main urban markets ranged from UGX 700–1,100/kg. The disparity in price is due mainly to demand factors; for example, in Kabale, demand from importers in Rwanda pushes the price up.

As shown in figure 4.6, gross margins on sales for sorghum traders can range from 38% (high season) to 100% (low season). Though these margins may seem high, traders have to contend with serious quality issues, and many have to employ people to clean the product. Bigger, more organized, and more formal traders or logistics companies contracted by breweries to source and bulk sorghum from contracted farmers have much lower margins (see Figure 4.6), but operate on huge volumes, which means that their actual returns can be significant. Beyond bulking, they also engage in other business lines, such as supplying inputs and transport, allowing them to operate on slimmer margins.
Informal traders have very high gross margins, though they incur significant risk in quality of product

Informal traders, gross margin

- Informal sorghum traders, margins can be very high compared to formal logistics companies buying for breweries from commercial farmers
- However, the informal traders can have much higher costs. Subsistence and smallholder farmer supply low quality grain, and traders can spend significant resources cleaning the sorghum.

D. Challenges to Sorghum Trade

Below are some of the key challenges facing sorghum traders:

- Unpredictable supply, markets, and prices: For instance, in November 2013, when prices were low, farmers decided to store their grains in anticipation of an increase, reducing supply.

- Poor quality of grains: Sorghum is prone to weevil infestation, and in order to avoid or reduce losses, traders sometimes mix infested grain with good-quality product.

- Importers from neighboring countries who buy directly from farmers: In the Teso sub-region, for instance, interviews with key informants indicated that some of the farmers had sold their produce even before the harvest period. Some of the more enterprising importers are also hiring fields and growing the sorghum themselves. This was pointed out as a major challenge by the urban traders in St. Balikuddembe Market in Kampala and the Soroti and Mbale markets in eastern Uganda.

These challenges underscore the need for interventions in marketing and grain quality control to ensure that small-scale traders can engage in a profitable and sustainable sorghum grain business.

Source: ACET field study, October 2013

http://www.irinnews.org
E. Processing

Sorghum grains have traditionally been processed into flours and local beers, although traditional processing of flour by stone mill has largely been replaced by the use of modern mills, which can be found all over the country. The technologies for making traditional sorghum beverages largely remain as they were.

1. Traditional Processing

Local brewers account for a significant amount of the sorghum sold and provide the main market outlet for the red-seeded sorghum variety in Uganda. The main products are omuramba (alcoholic), obushera (non-alcoholic), and enturire (alcoholic). In Kabale in the southwest highlands, a key sorghum-producing area, our survey found that sales to local brewers for the making of obushera or omuramba constituted 40% of total sorghum sales (see Figure 4.7).

Local brews are also an important household enterprise, with processing and sales dominated by women; the industry, therefore, has significant implications for rural household incomes. The enterprise budget for preparation of omuramba shown in Figure 4.7 illustrates that processing local sorghum drinks can be a very profitable engagement, although sales volume is not very high.\(^{23}\)

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\(^{23}\) The figure shows that omuramba processors get a net profit of UGX 116,000 per batch. Considering that they can run four batches a month, their monthly net profit can be as high as UGX 464,000 per month (about US$ 180), a significant income for a rural household.
2. Modern Processing

i. Milling

Milling is the key processing activity for sorghum, as the grain is mostly consumed as flour at the household level. Characteristics of the three types of millers—service millers, trade-based millers, and factory-based millers—are outlined in Table 4.3 below.

Table 4.3: Categories of sorghum processors

<table>
<thead>
<tr>
<th>Type of processor</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service millers</td>
<td>• Process for others for a fee</td>
</tr>
<tr>
<td></td>
<td>• Constitute 85% of millers in the country</td>
</tr>
<tr>
<td></td>
<td>• Handle 50% of total national produce</td>
</tr>
<tr>
<td>Trade-based millers</td>
<td>• Process for others for a fee</td>
</tr>
<tr>
<td></td>
<td>• Also purchase milled flour/grain as input for making composite flours</td>
</tr>
<tr>
<td>Factory millers</td>
<td>• SME food manufacturers and breweries</td>
</tr>
<tr>
<td></td>
<td>• Main products are composite flours and beverages (e.g., Bessa and NUMA brands)</td>
</tr>
<tr>
<td></td>
<td>• Target high-income urban and peri-urban markets</td>
</tr>
</tbody>
</table>

Source: ACET field study, 2014

Some farmers’ groups are now engaging in processing, thus combining farming and processing. One such group is SOSPPA, the sorghum-growing farmers’ association based in Soroti district, which is producing composite flours and supplying to local bakeries. Their current challenge is to obtain certification from UNBS, without which they cannot sell freely within or outside the country.

Modern Brewing

Sorghum processing to produce modern beer is undertaken by the two leading beer companies in Uganda: Nile Breweries Ltd. (NBL), a subsidiary of SABMiller, and EABL, who together produce about one-third of sorghum milled. The beers are made from a locally developed *Epuripur* sorghum variety. This project started in 2002, with the government playing a key role in incentivizing breweries and keeping sorghum beer competitive through a waiver of excise duty on beer (while other brands received a 60% duty).²⁴ Sorghum beer has been extremely successful and now accounts for over 50% of NBL’s sales. It typically targets low-income consumers, some of whom are currently consuming illicit, untaxed, and unregulated alcohol.²⁵

NBL identified seed purity as one of the key challenges it faces in sorghum beer production. A survey of farmers’ plots conducted by NBL has found incidence of mixed varieties on a single farm. NBL is working with the National Semi-Arid Resources Research Institute (NaSARRI) on the issue and believes it will be resolved soon.

²⁴ The duty is subject to change from year to year depending on government policy.
F. From Processing to Markets

As indicated, many sorghum traders mill and package flour for sales directly to consumers. They operate from rudimentary premises; some places we visited did not meet food standards (e.g., were lacking proper ventilation, rodent proofing, and storage pallets). Further, traders also transport sorghum in open hired trucks, at times with no tarpaulins, which gradually affects moisture content and overall quality.

A modern SME food manufacturing sector, producing mostly composite flour and able to meet the standards demanded by modern retailers, is also emerging. Nakumatt, Uchumi, and Tusks supermarkets command the biggest share of sorghum products (mainly composite flours) in the modern retail sector with about 25%, followed by wholesale and retail shops.

G. Value Capture Opportunities

There is a clear opportunity for increased commercialization of sorghum through upgrading marketing channels and product development; however, this will require output and quality improvements in farm-level productivity.

i. Integrating Sorghum and Livestock

Attempting to improve sorghum productivity through fertilizer is problematic. Kaizzi et al (2007) have demonstrated that although increasing the application of nitrogen results in yield gains, it does not produce net benefits unless accompanied by manure. They conclude that a combination of nitrogen and manure would therefore offer better returns (UBOS, 2010; Okobo and Barungi, 2012). Consequently, integrating sorghum and livestock production would both enhance the benefits of fertilizers to sorghum and provide a source of feed for cattle, a win-win proposition. This is especially crucial for the Northern Region, where cattle owners rely on the unsustainable practice of grazing indigenous cows on open grasslands for milk (see Section II, “Ugandan Beef Value Chain”).

Figure 4.8: Sorghum yield improvement versus benefits

- While increasing N fertilizer can boost yields, this comes with falling benefits cost ratio.
- Using manure and fertilizer can greatly increase the net return to the farmer.
- Combining sorghum farming with livestock keeping can thus have huge benefits as sorghum stover is in excellent animal feed.

There are efforts to promote sorghum as an alternative feed in the Northern Region, and some farmers are already seeing good results; one farmer testified that by using standby sorghum as alternative feed for her cow, she recorded a stable increase in milk production from 12 liters to 18 liters per day. Sorghum grains have the high level of proteins required by the feed industry (Ebiau et al, 2005), and sorghum-based feeds are already being produced and sold in western Uganda by NUMA feeds. By products from *Epuripur* processing are also being used in chicken feed and other animal feed industries in Uganda. Further development of this product could expand the industry and greatly benefit the country.

2. Reorganizing the Value Chain

With the exception of the modern breweries, the sorghum value chain is characterized by many small, largely uncoordinated actors. A stronger value chain will require the emergence of stronger actors to govern it. We have seen that some farmers’ groups are moving into processing, some traders are moving into farming, and some processors are contracting farmers directly or through agents (e.g., breweries). These trends should be encouraged, as they create stronger actors.

There are also good lessons to be learned from the brewery value chain, which has created very strong intermediaries able to coordinate the chain and, in particular, provide inputs and advisory services to farmers. This has been very successful in increasing productivity and stabilizing supply. Cross-contamination of varieties remains a challenge and underscores the importance of developing both traditional varieties for home consumption and local brews and modern varieties for commercial processors.

H. Product Development

1. High-Value Health Foods

Sorghum’s biggest advantages are its high level of drought tolerance, high starch content, and exceptional nutritional and health attributes. Compared to other cereals, sorghum has a higher mineral content and higher levels of isoleucine, leucine, tryptophan, and valine (INTSORMIL, 2011). It is also gluten-free and therefore very good for diabetic patients (Hamaker and Bugusu, 2002). These qualities can be leveraged to position sorghum as a high-value food for the health-conscious.

However, this will be an uphill battle, as sorghum is largely seen as a food for the poor, and few are willing to pay a premium for sorghum-based products. Product development will thus require a significant marketing campaign to change sorghum’s image.

More critically, sorghum’s starch and protein can be difficult to digest due to the presence of phytates, so product development to address protein digestibility will also be needed. Fortunately, there is now adequate evidence that these drawbacks can be mitigated through appropriate processing, as is done in traditional and modern malting and fermentation processes (Chavana et al, 1989; Mella, 2011; Muyanja, 2010).

27 http://intsormil.org/
28 Note that some have started to use the indigestibility as a selling point to market sorghum as a weight-loss product.
2. Upgrading Traditional Sorghum Products

Traditional sorghum beverages (obushera, omuramba, malwa, etc.) are very popular, but confined to rural markets due to poor packaging and lack of shelf stability. However, a commercialized beverage market is emerging, producing traditional sorghum beverages in modern packaging; a canned version of obushera has been made available, targeted at high-end elite markets and sold at a higher price point than local varieties. The potential exists for more research into producing shelf-stable versions of such products. The Makerere University food science and nutrition department is already conducting investigations in this area and has created some products that could be commercialized.

Ingredient in Food Manufacturing Industry

i. Malt Ingredient

Sorghum’s good malting quality has allowed breweries to use it as a substitute for barley in modern beers. This can be extended to other food products, as Nestlé has demonstrated in Nigeria, where some of its very popular products (e.g., Milo) use malt derived from sorghum.

ii. Wheat Substitute

Research indicates that sorghum can substitute for wheat by up to 30% with no noticeable difference in taste. This is a clear value capture opportunity given Uganda’s huge and growing wheat imports.

Box 4.2: Toward 100% sorghum bread

Sorghum is a potential candidate to fill the significant demand for gluten-free bread. Abdelghafar et al (2011) found that a flour ratio of 70/20/10 (decorticated sorghum/pre-gelatinized cassava starch/raw cassava starch) can produce acceptable bread. Preliminary experiments in their laboratory with sorghum and ≤30% cornstarch have shown that it is possible to produce good sorghum bread. However, 100% sorghum bread is currently restricted to home baking, partly because sorghum bread stales more than twice as quickly as wheat bread (Hugo et al, 1997). Work is ongoing to investigate how enzymatic treatments of sorghum flour can improve baking quality, adding a softer crumb structure and resistance to staling, in order to commercialize production.

4. Ready-To-Eat Products

As urbanization gathers steam, the demand for ready-to-eat (RTE) foods will grow. Sorghum can address this demand through extrusion, a process increasingly used in the manufacture of snack foods. Youssef et al (1990) used two varieties of sorghum (one brown, one white) to make 16 different extrusion products, with the proportion of sorghum in each formulation ranging from 45% to 97%. This study showed that sorghum can be used with other cereals to make acceptable extruded products.

30 http://krex.k-state.edu/dspace/bitstream/2097/1821/EmilyFrederick2009.pdf?sequence=5
31 The urban poor have limited resources and prefer not to cook at home due to high energy costs, while the middle class have limited time due to work pressures.
32 In extrusion processes, cereals are cooked at a high temperature for a short time, gelatinizing the starch and denaturing the protein, which improves their digestibility. Anti-nutritional factors may be inactivated. Microorganisms are largely destroyed, extending the product’s shelf life. These products are easily fortified with additives.
33 http://www.fao.org/docrep/T0818E/T0818E00.htm#Contents
5. Fast Foods

Uganda is seeing the rapid growth of many modern fast foods, including flatbreads and wraps with fillings, especially as urbanization takes place and the middle class grows. The technology of gelatinizing part of the flour to make viscous batter, the so-called "custard" process common in the fast-food industry, has also successfully been applied to make conventional leavened pan bread using sorghum.

i. What It Will Take: Policy Recommendations

The value capture opportunities that can be quickly realized are summarized in Table 4.4 below.

Table 4.4: Quick wins for the sorghum industry

<table>
<thead>
<tr>
<th>Node of the Value Chain</th>
<th>Main Challenges Faced</th>
<th>Some Quick Wins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input supply</td>
<td>• Poor quality</td>
<td>• Strengthen FBOs to become suppliers of inputs and work with the FBOs to distribute</td>
</tr>
<tr>
<td></td>
<td>• Low productivity</td>
<td>• Incentivize the consolidation of the sector and brand development by input supplier that will give better reassurance of quality</td>
</tr>
<tr>
<td></td>
<td>• Low level of commercialization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Low level of mechanization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unreliable supply</td>
<td>• Catalyze the very successful FBO models that are transforming the sorghum sector, e.g., KACOFA, which are allowing farmers to easily access inputs and mechanization</td>
</tr>
<tr>
<td></td>
<td>• Poor quality</td>
<td>• Further strengthen the strong symbiotic relationship between the bigger commercial farmers and smallholders, where commercial farmers are providing mechanization services and mentorship. One way is to develop subsidy vouchers for the poor subsistence farmers to buy the services. A more effective way is to allow commercial farmers to write off the cost as expenses when paying tax due.</td>
</tr>
<tr>
<td>Production</td>
<td>• Low productivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Low level of commercialization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Low level of mechanization</td>
<td></td>
</tr>
<tr>
<td>Logistics</td>
<td>• Unreliable supply</td>
<td>• Encourage local traders to emulate the examples of traders/importers who are integrating backwards to leasing land and farming sorghum. This will help improve the supply and also bring more players with market knowledge to the sector and thus help further commercialize it. The presence of traders/farmers can have an important demonstration effect on smallholder farmers.</td>
</tr>
<tr>
<td></td>
<td>• Poor quality</td>
<td>• Further stimulate the emergence of storage providers. This can be done by subsidizing credit for development of storage, providing land, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Legislate to incentivize the development of a grading system and the pricing of sorghum by grade so that farmers can invest in improving quality. Empower traders and farmers with simple tools and technologies for measuring quality.</td>
</tr>
<tr>
<td>Node of the Value Chain</td>
<td>Main Challenges Faced</td>
<td>Some Quick Wins</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Processing</td>
<td></td>
<td>• Link rural-based artisanal processors (the farmer processing groups, e.g., SOSPPA) to urban based SMEs in food manufacturing with the aim of making rural processors into contract manufacturers for SME food manufacturers. In this way rural processors focus on solving the supply issue, while urban SMEs focus on product development and navigating food regulations. This is a win-win as each processor focuses on its strength.</td>
</tr>
<tr>
<td>Marketing &amp; Distribution</td>
<td>• Low level of product development</td>
<td>• Link Makerere University food science and nutrition departments which is already incubating the development of modern products with potential investors who can start commercializing the products. • This can be via the creation of a sorghum development fund that puts a small levy on imported products, like malt and wheat, that can be replaced with sorghum.</td>
</tr>
</tbody>
</table>
In the longer run, the experience of breweries in commercializing sorghum points to what is needed to strengthen and upgrade the sorghum value chain. Contracted farmers are supported by appointed agents—KACOFA and Afro Kai Ltd. for EABL and Nile Breweries, respectively—which provide improved technologies and extension support to farmers, buy or assemble and clean farmers’ grains, and deliver to the breweries. Essentially, the agents have taken on the role of value chain governance that ensures steady supply and high quality, acting as formalized versions of middlemen. Though much maligned, the middleman is the person best placed to play this crucial role; however, most middlemen are very small traders who lack the resources needed to effectively organize the value chain. Thus, upgrading the sorghum value chain will require consolidation of the middlemen, either by organizing them into formal groups or companies or supporting the stronger ones to buy out the smaller ones. At the same time, farmers’ groups that are venturing into processing, such as SOSPPA, can be strengthened to encourage the emergence of vibrant rural processing sectors.

**Mandates vs. Incentives**

Strong supply chains are needed to support the emergence of a sorghum-driven food processing sector. However, policy is equally important. In Nigeria, the emergence of a strong sorghum-based food processing sector has largely been driven by mandates, which has seen the government ban imports of barley (the main base for malt extract used in the food industry), forcing food manufacturers to develop sorghum supply chains to meet demand. While the current policy in Uganda is use of incentives, like the current duty waiver on sorghum beer in Uganda, the option of mandates for sorghum inclusion needs to be further explored. Mandates can be justified if the market is huge so that in the longer run manufacturers can recover their investments in developing the supply chains and developing the needed plants. And given the huge East African market that is open for Uganda, a more aggressive policy of inclusion of sorghum malt as an ingredient in food and beverage production can be justified.

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34 Today there are big sorghum malting plants in Nigeria. For instance, Nestlé has plans to produce the malt that it uses in many of its food products, including Milo drink.
v. Ugandan Millet Value Chain

Millet has a long history in Uganda, having probably been first domesticated by humans in northern Uganda (Harlen, 1992). It is the staple food for over 50% of the country’s population and contributes about 6% of the national caloric intake. It is also increasingly a major source of income, contributing 2.4% of the value of GDP.

Finger millet plays an important role in the dietary needs and incomes of many rural households. Finger millet is high in starch, and its protein digestibility is superior to that of wheat. It also has the third highest iron content of any grain, after amaranth and quinoa, and contains important minerals such as calcium and phosphorus, as well as the amino acids methionine and cysteine. These are crucial to human health and growth, but are not found in most cereals. More critically, they are lacking in the diets of the millions of very poor who live on starchy foods such as cassava (Oryokot, 2001, cited in Wanyera, 2007). As a result, children from finger millet-eating parts of the country suffer less frequently from nutritional deficiencies than those from banana-eating areas. Finger millet, therefore, is an important preventive food against malnutrition, especially kwashiorkor (Wanyera, 2005). Further, due to the small size of the seeds, millet grain stores well for long periods without risk of insect damage, making it an ideal food security crop.

A. Production Trends

Millet production in Uganda is currently estimated at 936,000 MT. Production has been rising steadily over the last decade, mostly through expansion of the farmed area.

![Figure 5.1: Millet production trends](source: FAOSTAT)

Although the crop grows in all ecological areas of the country, the Northern Region is the leading growing area, accounting for 40% of total production, followed by the Eastern Region, with 20% of output. The southwest is another significant growing region.
1. Production Structure

The bulk of millet is produced by smallholder farmers, though there is significant variation within this group. Descriptions of the three types of finger millet farmers identified in our survey and the key issues facing them are given in Table 5.1.

Table 5.1: Characteristics of three finger millet farmer types

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics/production technology used</th>
<th>Key issues/needs</th>
</tr>
</thead>
</table>
| Smallholder subsistence (85% of millet farmers) | • Grow 0.25–1 acre of millet  
• Rely on family labor  
• Mainly use grain for home brews and/or food  
• Store grain in containers in their houses | • Access to higher-yielding, well-adapted varieties demanded by the market  
• Alternative labor-, time-, and drudgery-saving techniques  
• Access to land and other productive assets  
• Knowledge and skills in millet production  
• Enterprise selection for food and cash  
• Detailed review and passing of seed bill  
• Enforcement of agro-input laws |
| Smallholder commercial (10% of millet farmers)  | • Grow 1–2 acres of millet  
• Rely on both family and hired labor  
• Use oxen (hired or own) for opening up land  
• Sell about 90% of the crop  
• Some engaged in “commercial” farming under agreed conditions | • Access to seeds of higher-yielding varieties for specific market segments  
• Access to appropriate labor-saving technologies, such as planters and weeners  
• Alternative marketing arrangements and channels  
• Support to informal farmer-based system  
• Production of quality declared seed  
• Extension advice for millet production, harvesting, and primary processing  
• Storage facilities to take advantage of fluctuating prices |
| Medium-scale commercial (5% of millet farmers)  | • Grow 2–5 acres of millet  
• Rely on hired labor  
• Own oxen or hire tractor  
• Have storage facilities  
• Sell to contractor or keep until prices improve | • Access to seed of higher-yielding varieties for specific market segments  
• Access to appropriate labor-saving technologies  
• Alternative marketing arrangements and channels  
• Access to production assets and finance  
• Support for production, processing, and value addition  
• Information on quality specifications and standards  
• Supportive industrial policy and agricultural policy regarding access to appropriate equipment and finance |

Source: ACET field study, 2014
2. Millet Contract Farming

The emerging class of medium-scale commercial millet farmers described in Table 5.1 is assisted by the entry of several food manufacturers eager to secure supply and increase quality. These include Maganjo Millers, Family Diet, and NUMA Feeds. The companies ensure that their contracted farmers have access to seed, extension advice, and tarpaulins for proper harvesting, drying, threshing, and winnowing, and pay a premium price of UGX 2,000/kg, compared to an average price of UGX 1,300/kg. However, these arrangements are still experiencing teething problems. Discussions with the three above-named processors revealed that compliance by farmers with contract terms has proven significant challenge.

3. Cost Structure

Cost structure for the two types of smallholder farmers is shown below. The key cost is labor, mainly for plowing, weeding, and harvesting. Weeding constitutes the biggest cost for the smallholder subsistence farmers (SHS), at about 37% of total cost. For smallholder commercial farmers (SHC), harvesting is the biggest cost, making up about one-third of the total.

![Figure 5.2: Cost structure for the two types of smallholder farmers](image)

Source: ACET field study, 2014

For subsistence farmers, most labor is provided by the household, while commercial farmers tend to use hired labor and some mechanization, mostly oxen. For this reason, smallholder commercial farmers’ costs are about twice those of the subsistence farmers. However, the smallholder commercial farmer gets about three times the yield of the subsistence farmer, which translates to about five times the profit.
Figure 5.3: Margins for small-scale subsistence vs. small-scale commercial producers

<table>
<thead>
<tr>
<th>Costs, UGX/ha</th>
<th>Yields kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,020,500</td>
<td>1300</td>
</tr>
<tr>
<td>$2,102,500</td>
<td>3500</td>
</tr>
</tbody>
</table>

Small-scale subsistence Small-scale commercial Small-scale subsistence Small-scale commercial

Gross Profit Margin

<table>
<thead>
<tr>
<th>Gross Profit Margin</th>
<th>Absolute Profits, UGX/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>22%</td>
<td>40%</td>
</tr>
<tr>
<td>279,500</td>
<td>1,397,500</td>
</tr>
</tbody>
</table>

Source: ACET field study, 2014

B. Challenges of Millet Production

Millet yields are generally below potential, especially for subsistence farmers. Low yields not only mean lower income from sales but can also increase harvesting costs by about 30%. It is more difficult and time-consuming, and thus more expensive, to harvest a finger millet crop that has performed poorly, since such crops tend to be shorter, requiring the person to bend while harvesting. Below is a list of some of the challenges of millet production identified in our survey:

- Declining soil fertility is a key challenge in finger millet production, yet few farmers use fertilizers.
- Finger millet is not among the crops directly supported by the NAADS strategy, since it has not been identified as a priority enterprise. Linkages with input providers and output markets are entirely private sector–driven.
- Weed management and harvesting are also problematic. These two activities are very labor-intensive, and many resource-poor farmers do not have access to mechanization. Reliance on human labor has important implications:
  - Significant labor needs to be employed during the harvest period, increasing wage costs.
  - Farmers can suffer losses due to delays in harvesting, especially subsistence farmers who cannot afford hired labor and rely instead on family labor for harvesting. Family labor is often demanded by many activities, leading to delays in harvesting and exposing the crop to destruction by logging, rodents, rain, and hailstones.
Box 5.1: Gender issues in millet production

As pointed out, millet is a very labor-intensive crop, and this labor is provided mostly by women. Table 5.2 shows the division of labor identified by our field survey. Women are involved in all millet production activities, while men are involved in only half of them.

Table 5.2: Role of women vs. men in millet production systems

<table>
<thead>
<tr>
<th>Task</th>
<th>Women alone</th>
<th>Men alone</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land selection</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Seed selection</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land preparation</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Planting/sowing</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st weeding</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd weeding</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drying</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshing</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winnowing</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: ACET field study, 2014

As with sorghum, greater mechanization of millet production activities will probably increase the supply of men’s labor and also increase productivity. What is not clear, however, is whether the increase in men’s labor will also mean that men capture a disproportionate percentage of the value created by increased mechanization.

C. Farm to Market

For small-scale subsistence farmers, the quantity harvested per day is dictated by their ability to transport, as both operations take place on the same day. Finger millet is transported either manually on heads, mainly by women, or using animal-drawn sledges and ox-carts. Hiring oxen is a cheaper option, at about 60% of the cost of manual transport, but their use is limited by lack of availability. Ox-carts are usually owned and managed by men. Some farmers also use bicycles or motorcycles.

As Figure 5.4 shows, about 19% of millet harvested is sold to market. Though this is a small proportion, finger millet is a major source of cash, with 76.5% of finger millet farmers indicating that they sold at least some of it. Among commercial farmers, 90% of finger millet produced is sold. Most farmers (70%) out of those surveyed sell their millet at traditional open-air markets, while about one-fifth sell at the farm gate. Sixty-one percent of farmers sell to middlemen, and about one-third sell directly to consumers.
Millet prices show significant variation depending on supply and demand. Prices are low during the post-harvest glut, usually just after the period when children return to school and many farmers need cash for school fees and related expenses. When the crop is scarce, prices go up significantly, and those farmers who are able to store it get a windfall.

Local agents usually purchase finger millet grain from farmers at the farm gate or through rural markets. As Figure 5.5 shows, village traders’ margins are in the range of 30–37%, which are reasonable given that the traders also handle bulking and storage. Urban traders’ margins are even thinner, ranging from 8% to 20%, because they incur transport costs and extra selling costs in urban markets. However, urban traders are also more organized, usually through produce dealers’ associations based at a market. Through association membership, they are able to coordinate pricing among dealers to avoid cutthroat competition, determine who should enter the market, and influence policy issues such as market dues. Essentially, they act as cartels.
D. Processing

1. Traditional Processing

Traditional processing is a significant economic activity in rural areas; indeed, as our studies indicated, most of the millet in local markets is sold to traditional processors. The main product of traditional processing is millet-based beverages (both alcoholic and non-alcoholic).

With the exception of milling, which is sometimes mechanized, most processing activities are labor-intensive and done almost exclusively by women. Traditional millet processing is an important source of income for many urban and rural women. In northern and eastern Uganda, brewing the local millet-based beer ajon is a leading source of income for many women. It is estimated that gross income from the sale of ajon is more than twice the income from the sale of raw finger millet (Okwadi, 2007).

2. Modern Processing

Modern processing uses mills to turn millet grain into flour, which SME food manufacturers then use to produce a range of millet flour–based products.

Millers are generally small or micro-enterprises, typically using hammer mill technology to convert millet grain into flours. They handle small volumes, less than 1 MT per day. These small millers constitute 85% of millet processors and handle over 50% of the total grain produced (Byaruhanga and Auko, undated).

In addition, there are two classes of millers: service millers, who offer milling services only to other actors in the value chain (including consumers, traders, and retailers) for a fee, and trader-millers, who, in addition to providing milling services, also purchase finger millet grain from traders and farmers, which they then mill and sell. Trader-millers essentially represent forward integration by traders to increase value capture by selling flour rather than grain.

3. SME Food Manufacturers

Modern processors are mainly SME food manufacturers, processing millet into composite flours and packaging them for middle- and high-income earners in urban and peri-urban areas; some of them also export. Although most of the products are millet-based composite flours, some of the new millers have ventured into millet-based alcoholic and non-alcoholic beverages. Table 5.3 shows the key finger millet processors.
Table 5.3: Selected milling companies, annual volumes, prices, and market outlets

<table>
<thead>
<tr>
<th>Company</th>
<th>Grain price (UGX/kg)</th>
<th>Product selling price (UGX/kg)</th>
<th>Market outlets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maganjo Grain Millers Ltd.</td>
<td>850</td>
<td>3,000</td>
<td>Multiline in Masaka</td>
</tr>
<tr>
<td></td>
<td>1,600</td>
<td>5,000</td>
<td>Supermarkets, schools, South Sudan, UK</td>
</tr>
<tr>
<td>Katumba</td>
<td>1,400</td>
<td>1,900</td>
<td>Obushera</td>
</tr>
<tr>
<td></td>
<td>1,400</td>
<td>1,500</td>
<td>Ajon</td>
</tr>
<tr>
<td>NUMA Feeds</td>
<td>2,000</td>
<td>4,200</td>
<td>Supermarkets</td>
</tr>
<tr>
<td>Family Diet Ltd.</td>
<td>1,600</td>
<td>4,200</td>
<td>Supermarkets</td>
</tr>
<tr>
<td>EDRAC</td>
<td></td>
<td>4,200</td>
<td>Supermarkets</td>
</tr>
<tr>
<td>MACO Ltd.</td>
<td></td>
<td>4,200</td>
<td>Supermarkets</td>
</tr>
<tr>
<td>East African Basic Foods Ltd.</td>
<td>4,600</td>
<td></td>
<td>Supermarkets</td>
</tr>
</tbody>
</table>

Source: www.rfbn.in; www.eagc.org; www.ratin.net; personal communication with selected processors

SME processors can create significant value, up to three times the value of raw millet grain, as the above table shows. Three interesting observations emerge:

- One major player, Maganjo Grain Millers, has been very successful in market segmentation. It targets two distinct markets: small urban centers and the high-income segment of major markets. This is a clear indication of the potential for product development to target different segments.

- Katumba’s value creation is very small compared to those of the other processors. This is probably explained by the fact that they sell traditional millet beverage products and so face competition from the many artisanal processors engaged in the same business. Katumba could probably benefit from Maganjo’s strategy of market segmentation, creating traditional products targeted at high-end markets.

- NUMA Feeds offers a very high price to farmers for their grain, yet is still competitive in the retail market. Its supermarket products are actually priced lower than those of its competitors. The reason for this is twofold. The fact that NUMA has a well-developed contracting system and provides farmers with good support means that they get very good grains, so that the quality more than offsets the extra costs. Millet is usually contaminated with stones and organic matter, and processors can spend significant resources to clean it before processing; starting from better-quality grain saves both time and money. Indeed, higher quality is probably the greatest value addition furnished by modern processors. NUMA is also located in a rural town rather than an urban area, which means that its salary costs and raw material transportation costs are lower (in fact, NUMA collects its millet directly from farmers). Further, its rural location has allowed NUMA to diversify into animal feed, meaning that waste from food processing can be used to produce animal feeds.
E. Challenges for Modern Processors

1. Millet Supply

One key concern for modern processors is security of supply. Finger millet production and productivity are low, and as a result, all of the processors interviewed reported operating at less than half their installed capacity. Family Diet said that it is not actively engaged in any promotional activities because demand for the product outstrips supply, and promotion may trigger an increase in demand with which it cannot cope.

Processors employ several strategies to guarantee supply. Our survey observed the following:

• Some processors, such as Maganjo, contract a network of agents (traders) in regional towns to buy finger millet for them. The traders store and transport the product to the processing unit.

• In another model, employed by NUMA Feeds, the processor buys directly from farmers and transports finger millet grain from the farmers to the factory. These processors usually have a moisture meter to track moisture content.

• Processors may also own warehouses for bulking their millet. For example, Maganjo has a 400-MT warehouse, with plans to further expand capacity.

2. Quality

Quality is a major concern for processors because millet grain often contains sand and other impurities, as noted above. Poor post-harvest handling practices, such as threshing and drying on the ground, contribute to this contamination. Processors also believe that contaminants are sometimes deliberately added in order to increase the weight of the traded millet. These impurities are estimated to account for 20% of the millet supplied. Indeed, consumers have come to expect impurities as part of the product, which is why some of the better-off population shy away from millet. Processors have expressed concern about establishing linkages with farmers, then being unable to absorb the excess grain produced due to poor mechanisms for cleaning finger millet (Okwadi, 2007). Another quality challenge is the difference in taste between the millets supplied as a result of different soils and varieties, which leads to inconsistency in products.

Processors thus make great efforts to improve quality, including the following:

• Processors employ women as specialized cleaning teams. Women who clean finger millet in the peri-urban areas of Kampala can earn the equivalent of US$5 a day.

• Some, such as NUMA Feeds, offer premium prices to farmers for clean grain (see the description of NUMA under “SME Food Manufacturers”).

• Contracting farmers and sourcing exclusively from them, or working with a network of agents, can guarantee that all millet is sourced from the same region and thus consistent in taste.

3. Equipment

The lack of appropriate machinery and equipment and high cost of capital (i.e., loans) to acquire them limit the range of possible products as well as their quality. Many processors have no programs for research or technology upgrading and rely instead on trial-and-error methods of processing, further limiting product development (Wamala, 2007).
4. Poor Business Environment/High Cost of Doing Business

Below are some of the structural issues faced by modern processors:

• Electricity for the mills is expensive and unreliable.
• Weak links between the private sector and government and lack of government support for millet processing.
• High taxes on imported inputs, particularly packing materials, which are necessary for branding, marketing, and product protection but incur a 25% import duty. As a result, packing materials constitute 20% of processing costs.
• High cost of testing samples and calibrating scales at UNBS. This is centralized in Kampala and costs UGX 200,000–400,000 per sample.
• Excessive local off-loading taxes of UGX 5,000 per stop and withholding tax of 6% on all products sold.

To compound these challenges, Wamala (2007) further points out that many processing firms are also badly managed, with mostly untrained and poorly equipped staff.

E. Millet Product Marketing

The key market outlets for products made by modern processors are the supermarkets, institutional buyers, and other high-end retail outlets. The regional supermarket chains, namely Nakumatt, Uchumi, ShopRite, and Tuskys, account for about 30% of the market share, which presents a good opportunity for marketing these products outside Uganda, especially within East Africa.

Exports

There is potential to export composite flours, particularly to Europe, the US, and Asia, for purchase by Ugandans abroad and other African diaspora. Currently, these are air-freighted at great cost and largely confined to African stores because they lack certification and quality marks, limiting the quantities that can be exported. With appropriate certification and rebranding (e.g., with an emphasis on nutrition, health benefits, and the organic nature of production), larger quantities could be freighted through containers at cheaper rates.

F. Value Capture Opportunities

The foregoing discussion indicates that there are opportunities for increasing the value of millet. Key among them are increasing productivity, increasing quality, value chain reorganization, and product development.

1. Raising Productivity

We have seen that commercially oriented smallholders’ yields are three times those of subsistence-oriented smallholders, and that the key difference between the two is a higher level of inputs and mechanization. Providing support to subsistence farmers through credit facilities could raise their productivity to those of commercially oriented smallholders, and as we have seen, the increase in yields more than compensates for the higher costs.
i. Mechnization Services

Access to mechanization services is key to increasing productivity and reducing poor farmers’ reliance on family labor, which causes delays in planting and harvesting and increased losses. Work done in the Teso Farming System has demonstrated that using animal-drawn technologies for managing weeds in cereal crops has the potential to reduce required weeding labor from 157 hours/ha to 35 hours/ha (Obuo, 2005). In addition, animal traction attracts the participation of men in weeding. However, it also requires farmers to plant in rows, as opposed to broadcasting their millet crop.

One approach is to create mechanization centers where services can be hired on credit. Mechanization services can also be combined with labor services, especially during the critical harvesting period. Youth groups can be supported to deliver both labor and mechanization services.

Further mechanization of millet harvesting requires more research into seed systems to devise varieties that will ensure equal plant height and grains that don’t shatter easily from panicles. However, this will require additional innovations to develop threshing equipment that can efficiently loosen most of the grains.

ii. Supporting Livestock As a Complementary Activity

Manure can greatly increase millet yields, especially when accompanied by fertilizer. Maman and Mason (2013) found yield increases of 56% when manure is used, and, in Niger, millet yields increased by 117% with a combination of fertilizer. Animals, especially oxen, can also provide labor for plowing and transport, and millet stover is a very good animal feed. Thus, as with sorghum cultivation, livestock keeping is highly complementary to millet production. Poor farmers could be supported to acquire livestock through loans or a one-time subsidy that provides an ox and perhaps also a cow.

Quality Control

Already, an increasing number of middle-class consumers are willing to pay higher prices for uncontaminated, higher-quality millet products. Improving farm-level handling of the crop through tarpaulins, raised drying platforms, and simple graders can improve the quality of the finger millet grain sold. Processors have indicated a willingness to offer a 10% mark up in the buying price for clean millet, which could motivate farmers to maintain quality standards.

Beyond efforts at the farm level to supply clean millet, quality systems are needed across the whole chain. The establishment of regional labs by UNBS or a system to accredit other facilities for quality control (such as university labs) could help make testing and certification more widely available and reduce farmers’ travel costs.

At the trader level, the use of higher-capacity destoners can improve the quality of traded finger millet. Destoners are expensive, so financing options and business models will be required to make them available.

2. Upgrading the Value Chain

Much like the sorghum value chain, the millet value chain is fragmented, with many small actors, and the emergence of strong actors able to exercise governance over the chain is necessary to upgrade it. Processors seem best placed to take over this role. There are now a few processors operating contracting models with farmers and directly overseeing the production and quality of millet, and the results have been very positive. This model could be further strengthened by channeling through processors the support that farmers receive from donors and governments, as processors who already have contracting schemes may then be able to expand the model and increase farmer participation.
3. Product Development

The millet product range remains narrow, mostly consisting of traditional beverages and straight flours in rural areas and composite flours in urban areas. Traditional beverages tend to be prepared and presented under unhygienic conditions and are also not shelf-stable, which limits their market reach, especially in lucrative urban markets.

i. Upgrading Traditional Products for Sale in Modern Retail Channels

Studies indicate that people in cities, even the well-to-do, like traditional millet beverages but have no access, as they are all made and sold in rural areas. Thus there is a significant unmet demand. One canned millet drink has been a commercial success, demonstrating the potential for traditional beverages to create value. Makerere University’s food science and nutrition department has also developed shelf-stable varieties of various traditional products in its incubation labs, which have been well received. Linkages must now be created between the research sector and commercial processors to develop and commercialize traditional millet products.

ii. Ready-to-Eat (RTE) Products

As Uganda and the region urbanize, demand for RTE foods will grow. Already two RTE products, a canned traditional obushera beverage and instant flour for making obushera at home, are being sold in supermarkets, demonstrating the potential to expand the product range into breads, breakfast cereals, millet noodles, etc. The key constraint to product development will continue to be the need for equipment such as extruders. This will require partnerships between research institutions and equipment fabricators to facilitate technology transfer. The government should also consider creating special funds to support importation of food processing machinery or licensing to fabricate it.

iii. Bio-Fortified Foods

Bio-fortification to improve the nutrient content of millet products is a potential product development opportunity. Currently, bio-fortification sometimes occurs naturally via composite flours; however, a more explicit approach can increase the range of millet products boasting various properties and therefore add value.
iv. Way Forward

The value capture opportunities that can be quickly realized are summarized in the table below.

Table 5.4: Quick wins for the millet industry

<table>
<thead>
<tr>
<th>Node of the Value Chain</th>
<th>Main Challenges Faced</th>
<th>Some Quick Wins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input supply</td>
<td>• Poor quality</td>
<td>• Strengthen seed supply systems (informal and formal) and provide advice on preparation and application of organic and inorganic fertilizers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Strengthen emerging contract farming arrangements by helping millet farmers diversify livelihoods to livestock farming, as well as helping processors develop animal feed lines that can be inputs to the livestock</td>
</tr>
<tr>
<td>Logistics</td>
<td>• Lack of transport</td>
<td>• Increase supply of transport services in rural areas by helping the youth set up simple delivery technologies like Motorking tricycles or oxcart transport services, that women can hire. Youth development funds can be used to set up such enterprises.</td>
</tr>
<tr>
<td>Processing</td>
<td></td>
<td>• Set up fund lines of credit with banks to allow processors to import modern processing equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Link the leading processors to Makerere University, incubation center so that they can work jointly on product development and commercialization. Support that team to apply for innovation grants to support products and market development.</td>
</tr>
<tr>
<td>Marketing &amp; Distribution</td>
<td></td>
<td>• Encourage the rebranding of millet as a nutritious food for its health-conscious middle class to change the poor image. One proposal being looked at by ACET and other partners is to rebrand millet as a “superfood” through a cooking competition.</td>
</tr>
</tbody>
</table>

In the longer run, upgrading the millet value chain will require the already-strong processors who have developed contract farming to take a more active role in organizing the millet value chain. This will include helping the emergence of strong FBOs that can take over functions of logistics providers, as well as quality control and, more importantly, contract management. The FBOs should also work closely to help their members diversify their livelihoods into livestock keeping. The establishment of closer relationships between processors and farmers will be a key guarantor that contract farming works.
vi. The Role of Market Structure

The foregoing discussions indicate the highly underdeveloped and fragmented nature of Uganda’s agricultural value chains. In some of these chains, it can take up to four middlemen to move the product from farm to market, and some middlemen demonstrate cartel-like behavior. Poor infrastructure and institutional weakness on the part of government (e.g., meat inspectors who do not show up on time) may also impact value chain efficiencies, and farmers may be suffering from the non-competitive behavior of other agents along the chains, as we have seen in cassava transport from villages to rural markets.

To explore the role played in agricultural supply chains by the structure of domestic competition, a simulation was done using a model developed by Depetris and Guido (2012). The model combines theory, household surveys, and in-depth knowledge of the local context to isolate and quantify the effects on household income of changes in the level of competition in domestic markets. It also provides insight into the role played by household constraints and agricultural institutions that hinder productivity and market access.

Further, the simulation model analyzes potential impacts on poverty by combining the prediction of the model with information from the household surveys. In particular, it analyzes the changes in real income of different households caused by the hypothetical price changes of cash and food crops predicted by the models’ simulations.

A. Simulation Model Results

Table 6.1: Review of market share for four agricultural products

<table>
<thead>
<tr>
<th>Cassava Company</th>
<th>Cassava Shares</th>
<th>Beef Company</th>
<th>Beef Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local millers</td>
<td>96.6%</td>
<td>Fresh Cuts</td>
<td>86.0%</td>
</tr>
<tr>
<td>NUMA Feeds</td>
<td>0.8%</td>
<td>Sausage King</td>
<td>7.0%</td>
</tr>
<tr>
<td>Magano</td>
<td>0.6%</td>
<td>Your Choice</td>
<td>7.0%</td>
</tr>
<tr>
<td>Family Diet</td>
<td>0.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pallisa Agri-Business Training Association</td>
<td>0.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MACO Ltd.</td>
<td>0.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soroti Sweet Potato Producers and Processors Association</td>
<td>0.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popular Knowledge Women Initiative</td>
<td>0.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3R Agro Industries Ltd.</td>
<td>0.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HARREE Millers U Ltd.</td>
<td>0.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opit Investment Millers ltd</td>
<td>0.1%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Millet Company</th>
<th>Millet Shares</th>
<th>Sorghum Company</th>
<th>Sorghum Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local millers</td>
<td>48.3%</td>
<td>Local millers</td>
<td>49.4%</td>
</tr>
<tr>
<td>Other processing companies</td>
<td>27.6%</td>
<td>Uganda Breweries (EABL)</td>
<td>17.1%</td>
</tr>
<tr>
<td>Unga Kenya Ltd. Millers</td>
<td>14.5%</td>
<td>Other processing companies</td>
<td>14.4%</td>
</tr>
<tr>
<td>Magano</td>
<td>3.6%</td>
<td>Nile Breweries (SAB Miller)</td>
<td>14.2%</td>
</tr>
<tr>
<td>East African Basic Foods</td>
<td>1.2%</td>
<td>NUMA Feeds</td>
<td>1.7%</td>
</tr>
<tr>
<td>NUMA Feeds</td>
<td>1.2%</td>
<td>Katumba</td>
<td>1.0%</td>
</tr>
<tr>
<td>Katumba</td>
<td>0.6%</td>
<td>Ndungu</td>
<td>0.9%</td>
</tr>
<tr>
<td>Family Diet</td>
<td>0.5%</td>
<td>Mzungu</td>
<td>0.9%</td>
</tr>
<tr>
<td>MACO Ltd.</td>
<td>0.5%</td>
<td>3R Agro Industries Ltd.</td>
<td>0.1%</td>
</tr>
<tr>
<td>Majid</td>
<td>0.5%</td>
<td>HARREE Millers U Ltd.</td>
<td>0.1%</td>
</tr>
<tr>
<td>SESACO Ltd.</td>
<td>0.2%</td>
<td>Opit Investment Millers ltd</td>
<td>0.1%</td>
</tr>
<tr>
<td>EDRAC Ltd.</td>
<td>0.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ndungu</td>
<td>0.2%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: ACET field study, 2014
The household survey of Uganda shows that food consumption constitutes 61.2% of the total household budget (63.5% for rural households and 48.1% for urban). Of this, 32.6% is spent at the market, and 28.6% is auto-consumption. A significant amount of income, especially in rural areas, comes from selling food; for rural areas, income from food (markets and auto-consumption) makes up about 47% of household income. Therefore, the efficiency of food markets is important for people’s livelihoods.

At the same time, a review of market share for the four value chains studied shows that markets are not concentrated, with the exception of the processed beef market, where one player dominates (see Table 6.1). Our simulation exercise using the four studies reveals the following results.

1. Cassava

At the domestic level, cassava is a heavily traded commodity with many players. The impact of changing the market structure is therefore fairly small, as seen in the model results shown in Table 6.2. Moving the cassava market structure toward perfect competition increases farm-gate prices by only 1.2%. The impact of changing farm-level constraints is also low, so increasing household resources—which will increase the resources available for cassava and essentially increase supply, thus lowering farm-gate prices—also has a small impact. A 10% increase in household endowment results in a 0.41% increase in farm-gate prices.

<table>
<thead>
<tr>
<th>Competition Policy</th>
<th>Baseline</th>
<th>Leader Split</th>
<th>Leader Merge</th>
<th>Exit of Largest</th>
<th>Equal Market Shares</th>
<th>Perfect Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of 10% in:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Price</td>
<td>17.59</td>
<td>17.70</td>
<td>17.44</td>
<td>17.44</td>
<td>17.59</td>
<td>20.43</td>
</tr>
<tr>
<td>Marginal Cost of Producing Cash Crop</td>
<td>-0.11</td>
<td>-0.05</td>
<td>-0.17</td>
<td>-0.17</td>
<td>-0.11</td>
<td>1.20</td>
</tr>
<tr>
<td>Fixed Cost of Producing Cash Crop</td>
<td>-0.47</td>
<td>-0.40</td>
<td>-0.56</td>
<td>-0.56</td>
<td>-0.47</td>
<td>1.20</td>
</tr>
<tr>
<td>Household Resources (Endowment)</td>
<td>0.41</td>
<td>0.44</td>
<td>0.38</td>
<td>0.38</td>
<td>0.41</td>
<td>1.20</td>
</tr>
<tr>
<td>Risk and Food Security Parameter</td>
<td>0.42</td>
<td>0.46</td>
<td>0.39</td>
<td>0.39</td>
<td>0.42</td>
<td>1.20</td>
</tr>
<tr>
<td>Cash Crop Price</td>
<td>1.06</td>
<td>1.07</td>
<td>1.06</td>
<td>1.06</td>
<td>1.06</td>
<td>1.20</td>
</tr>
<tr>
<td>Marginal Cost of Producing Food Crop</td>
<td>0.33</td>
<td>0.37</td>
<td>0.29</td>
<td>0.29</td>
<td>0.33</td>
<td>1.20</td>
</tr>
<tr>
<td>Non-Farmer Demand</td>
<td>0.02</td>
<td>0.07</td>
<td>-0.03</td>
<td>-0.03</td>
<td>0.02</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Source: Simulation results from the model (see simulation report)

We also find that changes in production costs of the cash crop, the rival good, generate a reduction in the price of cassava. This is because increased costs of producing cash crops induce a shift of resources out of the cash crop and into the competing food crop, thus increasing cassava supply. Again, the magnitudes are very small: the impact of changes in marginal costs is -0.11% (Row 4), and the impact of changes in fixed costs is -0.47% (Row 5). A 10% increase in the price of the cash crop, in turn, raises cassava prices by 1.06% (Row 9) because it induces farms to produce more cash crop and supply less cassava.

The only parameter that seems to have a significant impact is an increase in international prices. A 10% rise leads to an increase in farm-gate prices of 17.59%; when combined with perfect competition, the farm-gate prices rise by 20.43%. This is an example of a complementarity, as the sum of the separate effects is lower (17.59 + 1.20 = 18.79%). We also observe small substitution effects. For instance, a move toward perfect competition combined with an increase in the price of the cash crop has a total impact of 1.20%, whereas the sum of the separate effects is 2.26%.
2. Millet

The millet market is not concentrated, with the largest firm having 15% of market share and the second largest 5%. As Row 1 in Table 6.3 indicates, changes in market structures have a modest impact. For instance, a perfectly competitive market would lead to a modest increase in farm-gate prices of 6.03%. However, the elasticity of farm-gate prices with respect to international prices is large, as implied by the results in Row 3. From the results in Rows 4–11, we stress only a rise in the price of the cash crop by 10%, which leads to a 3% increase in the price of millet, a sizable 0.3 cross-elasticity. Complementarities and substitution effects also arise: perfect competition and an increase in international prices have a combined effect of increasing farm-gate prices by 25.26%, but the sum of the effects is 23.82%. As for substitutability, the joint effect of the combination of perfect competition and an increase in the cash crop price is 6.03%, while the sum is 9.66%.

Table 6.3: Simulation results for millet

<table>
<thead>
<tr>
<th>Competition Policy</th>
<th>Baseline</th>
<th>Leader Split</th>
<th>Leader Merge</th>
<th>Exit of Largest</th>
<th>Equal</th>
<th>Perfect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Market</td>
<td>Competition</td>
</tr>
<tr>
<td>Increase of 10% in:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Shares</td>
<td></td>
</tr>
<tr>
<td><strong>International Price</strong></td>
<td>17.79</td>
<td>18.15</td>
<td>17.61</td>
<td>17.40</td>
<td>21.30</td>
<td>25.25</td>
</tr>
<tr>
<td><strong>Marginal Cost of Producing Cash Crop</strong></td>
<td>-2.10</td>
<td>-1.72</td>
<td>-2.32</td>
<td>-2.54</td>
<td>1.36</td>
<td>6.03</td>
</tr>
<tr>
<td><strong>Fixed Cost of Producing Cash Crop</strong></td>
<td>-1.06</td>
<td>-0.72</td>
<td>-1.23</td>
<td>-1.44</td>
<td>2.41</td>
<td>6.03</td>
</tr>
<tr>
<td><strong>Household Resources (Endowment)</strong></td>
<td>0.92</td>
<td>1.17</td>
<td>0.87</td>
<td>0.66</td>
<td>4.37</td>
<td>6.03</td>
</tr>
<tr>
<td><strong>Risk and Food Security Parameter</strong></td>
<td>0.82</td>
<td>1.07</td>
<td>0.77</td>
<td>0.55</td>
<td>4.25</td>
<td>6.03</td>
</tr>
<tr>
<td><strong>Cash Crop Price</strong></td>
<td>3.63</td>
<td>3.75</td>
<td>3.72</td>
<td>3.51</td>
<td>7.05</td>
<td>6.03</td>
</tr>
<tr>
<td><strong>Marginal Cost of Producing Food Crop</strong></td>
<td>0.24</td>
<td>0.52</td>
<td>0.14</td>
<td>-0.06</td>
<td>3.70</td>
<td>6.03</td>
</tr>
<tr>
<td><strong>Non-Farmer Demand</strong></td>
<td>0.02</td>
<td>0.31</td>
<td>-0.08</td>
<td>-0.29</td>
<td>3.48</td>
<td>6.03</td>
</tr>
</tbody>
</table>

Source: Simulation results from the model (see simulation report)

3. Sorghum

The simulation results for sorghum are shown in Table 6.4. Sorghum supply chains are mildly concentrated, with the two largest firms holding similar market shares, 16% and 14%. We see in Row 1 that when we assume market power vanishes and perfect competition is in place, prices decrease by a modest 4.41%. In Row 3, we see elasticities of approximately 0.8 in local prices with respect to international prices. In Rows 4–11, we see that an increase of 10% in the marginal cost of the cash crop leads to a 3.16% decline in local prices, and that an increase in the cash crop prices leads to an increase in sorghum farm-gate prices of 5.13%. The largest complementarity in absolute values arises from the combination of perfect competition and an increase in the cash crop price, the joint effect being -4.41% and the sum 0.72%. As for substitutability, the combination of perfect competition and an increase in the marginal cost of the cash crop yields a combined effect of -4.41%, with the sum effect being -7.58%.
4. Beef

The results of the beef simulation are shown in Table 6.5. Due to the concentrated nature of the processed beef sector, changes in structure have important welfare effects. For example, exit the of largest competitor produces a -7.09% variation in farm-gate prices, while equal market shares produce a 10.48% variation. The most extreme variation, perfect competition, leads to an impressive increase of 30.71% in farm-gate prices.

Row 3 shows an elasticity of local prices with respect to international prices of 9.25%. Since beef is almost a monopoly, the internal shocks presented in Rows 4–11 are much larger than for other products. A 10% increase in the price of the cash crop leads to a 5.24% increase in the farm-gate price of livestock, a 0.524 cross-elasticity. The combination of perfect competition with a 10% rise in international prices leads to an increase of 47.38% in local prices, a complementarity (the separate effects are 30.71 + 9.25 = 39.96, less than the combined effect). Substitution effects are also apparent; for instance, the combined impact of perfect competition and a rise in the cash crop price, with the joint effect being 30.71% and the sum 35.95%.

Table 6.4: Simulation results for sorghum

<table>
<thead>
<tr>
<th>Competition Policy</th>
<th>Baseline</th>
<th>Leader Split</th>
<th>Leader Merge</th>
<th>Exit of Largest</th>
<th>Equal Market Shares</th>
<th>Perfect Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of 10% in:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Price</td>
<td>8.05</td>
<td>7.89</td>
<td>8.20</td>
<td>8.24</td>
<td>5.70</td>
<td>4.85</td>
</tr>
<tr>
<td>Marginal Cost of Producing Cash Crop</td>
<td>-3.16</td>
<td>-3.23</td>
<td>-3.12</td>
<td>-3.09</td>
<td>-5.45</td>
<td>-4.41</td>
</tr>
<tr>
<td>Fixed Cost of Producing Cash Crop</td>
<td>-0.86</td>
<td>-1.04</td>
<td>-0.70</td>
<td>-0.67</td>
<td>-3.19</td>
<td>-4.41</td>
</tr>
<tr>
<td>Household Resources (Endowment)</td>
<td>0.97</td>
<td>0.69</td>
<td>1.25</td>
<td>1.28</td>
<td>-1.31</td>
<td>-4.41</td>
</tr>
<tr>
<td>Risk and Food Security Parameter</td>
<td>1.44</td>
<td>1.15</td>
<td>1.74</td>
<td>1.77</td>
<td>-0.80</td>
<td>-4.41</td>
</tr>
<tr>
<td>Cash Crop Price</td>
<td>5.13</td>
<td>4.64</td>
<td>5.64</td>
<td>5.67</td>
<td>2.85</td>
<td>-4.41</td>
</tr>
<tr>
<td>Marginal Cost of Producing Food Crop</td>
<td>0.33</td>
<td>0.09</td>
<td>0.57</td>
<td>0.60</td>
<td>-1.92</td>
<td>-4.41</td>
</tr>
<tr>
<td>Non-Farmer Demand</td>
<td>0.05</td>
<td>-0.18</td>
<td>0.27</td>
<td>0.31</td>
<td>-2.28</td>
<td>-4.41</td>
</tr>
</tbody>
</table>

Source: Simulation results from the model (see simulation report)

Table 6.5: Simulation results for beef

<table>
<thead>
<tr>
<th>Competition Policy</th>
<th>Baseline</th>
<th>Leader Split</th>
<th>Leader Merge</th>
<th>Exit of Largest</th>
<th>Equal Market Shares</th>
<th>Perfect Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of 10% in:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Price</td>
<td>9.25</td>
<td>15.01</td>
<td>7.16</td>
<td>0.76</td>
<td>19.17</td>
<td>47.38</td>
</tr>
<tr>
<td>Marginal Cost of Producing Cash Crop</td>
<td>-0.45</td>
<td>4.41</td>
<td>-1.26</td>
<td>-7.72</td>
<td>9.90</td>
<td>30.71</td>
</tr>
<tr>
<td>Fixed Cost of Producing Cash Crop</td>
<td>-1.94</td>
<td>3.22</td>
<td>-3.07</td>
<td>-9.56</td>
<td>8.73</td>
<td>30.71</td>
</tr>
<tr>
<td>Household Resources (Endowment)</td>
<td>1.26</td>
<td>5.74</td>
<td>1.04</td>
<td>-5.22</td>
<td>11.26</td>
<td>30.71</td>
</tr>
<tr>
<td>Risk and Food Security Parameter</td>
<td>2.05</td>
<td>6.51</td>
<td>2.00</td>
<td>-4.22</td>
<td>12.26</td>
<td>30.71</td>
</tr>
<tr>
<td>Cash Crop Price</td>
<td>5.24</td>
<td>9.14</td>
<td>5.88</td>
<td>-0.86</td>
<td>15.91</td>
<td>30.71</td>
</tr>
<tr>
<td>Marginal Cost of Producing Food Crop</td>
<td>1.50</td>
<td>6.21</td>
<td>1.38</td>
<td>-5.34</td>
<td>12.39</td>
<td>30.71</td>
</tr>
<tr>
<td>Non-Farmer Demand</td>
<td>0.26</td>
<td>5.02</td>
<td>-0.28</td>
<td>-6.74</td>
<td>10.71</td>
<td>30.71</td>
</tr>
</tbody>
</table>

Source: Simulation results from the model (see simulation report)
5. Welfare Impacts

In general, the simulation results indicate that competition leads to positive welfare results, and increases in international prices lead to positive welfare results if the crop is exportable, but negative results if it is importable. For millet, the non-poor benefit less from competition policy than the poor; meanwhile, for sorghum, an importable food crop, simulation results indicate that the poor benefit more than the non-poor, and that the non-poor are actually hurt by a competition-induced decrease in prices. The results for cassava and beef are mixed. In general, the welfare impacts observed were very small.

B. Policy Imperatives Arising

The simulation results generally indicate that the most significant impact on farm-gate prices comes from a rise in international prices. This positive impact tends to be complemented by a competitive market structure. Uganda is already part of the East African Community (EAC) free-trade area, as well as the larger Common Market of Eastern and Southern Africa (COMESA), and is thus unlikely to benefit more from opening up further to regional trade. All the same, increasing ability to export to free-trade areas can have a significant impact on farm-gate prices. However, to effectively participate in regional markets, Uganda needs to put more emphasis on the development of regional standards, the lack of which has hampered the formalization of regional trade. (A significant informal trade in most agricultural commodities is on going in Uganda.) Supporting the further development of regional supermarket chains can also help to convert informal regional trade to formal.

The results for beef are particularly noteworthy. Farm-gate prices improve by almost one-third with perfect competition, and almost double when perfect competition is combined with an increase in international prices. Therefore, making the sector more competitive and upgrading it for participation in international markets pays off well.

In the short run, the beef sector may benefit from splitting the market leader to further spur competition. This should not be difficult, as the leader, Fresh Cuts, already trades under two names, Quality Cuts (which supplies the domestic market in Uganda) and Fresh Cuts (which delivers to UN troops in DRC, South Sudan, and Somalia, based on a contract). The real benefit of such a split, however, will be conferred as international prices are also rising. Therefore, such an intervention must come along with improved standards and other requirements so that Uganda can begin to export. Incentivizing Fresh Cuts to split without increasing capacity to participate in export markets will yield little benefit.
Policy Options for Rural Development

The value chain studies and the simulation exercise here have identified a number of opportunities that can be captured with the right policy and investments. These opportunities can be broadly summarized as (a) farm-level productivity (yield and quality), (b) improving logistics, (c) product development, and (d) stronger value chain governance.

A. Improving Farm-Level Productivity

1. Raising Yields

Our review of the four value chains makes clear that farm-level productivity is low. The right interventions in terms of inputs and a reorientation of the farming model toward commercial production can raise yields.

Increasing productivity involves more than just using improved seeds. Use of other inputs, including fertilizers, manure, hired labor, and mechanization yield the returns that make the use of improved seeds highly profitable. However, many resource-poor farmers are unable to participate in high-input farming and need significant support in order to reach higher levels of productivity. Current approaches using government subsidy and extension have had limited success due to inadequate government resources. Instead, subsistence smallholder farmers need to be converted into commercial smallholder farmers. Examples of new models to support smallholder farmers and reorient them toward commercialization include:

• Smallholder farmers’ organizations like SOSPPA that help member farmers become farmer-processors, essentially giving them a full commercial orientation

• Commercial farmers’ organizations like KACOFA that provide support to smallholder farmers through inputs, extension, and links with large-scale commercial farmers for access to mechanization and knowhow

• Processors like NUMA Feeds that extend support to farmers through a contracting model and quality control incentives

Such models have been proven to work very well, and support to farmers from government and development partners should thus be redirected away from government-led extension systems to these new models. Government extension officers can instead serve as consultants to these new vehicles for farmer development, rather than directly interfacing with farmers.
2. Improving Quality

Quality is a significant challenge across all four value chains. Fake seeds have hindered the rapid uptake of improved sorghum varieties. Issues of hygiene and lack of traceability prevent Uganda from tapping lucrative export markets for beef. Impurities in millet have imposed significant costs on processors and tarnished the image of millet products. The government has established quality and testing standards, and UNBS currently recommends product certification to promote increased entry into domestic and regional markets. However, UNBS’s approach to certification can itself be a hindrance. Certification costs close to UGX 400,000 per product, and the fee must be paid three times of each product before it can be certified, which means that SOSPPA, for instance, would be required to spend UGX 8,400,000 on the seven products it has developed this fee must be paid three times on each product before it can be certified NUMA Feeds, which is located in western Uganda, has also complained about the fact that UNBS’s centralized operations require taking samples to Kampala. Thus, to be effective and help develop the sector, standards authorities must also streamline their operations and lower the cost of testing and certification. For example, UNBS could contract private laboratories and universities to undertake testing.

Enforcement of standards is also weak. At the Kampala City Council Authority (KCCA) slaughterhouse, inspectors are often tardy, which allows unscrupulous traders to slaughter unfit animals before they arrive. At the regional level, the EAC states have agreed on recommended quality standards for cereals and cassava in the region; however, harmonization of these standards by member states has been continually delayed. Greater political will and engagement among top leadership are needed to fund and enforce regional standards.

More critically, improving quality will require a strong actor or actors in the chain who can support the development of a quality control system and police it by deciding who can participate or earn a premium. NUMA Feeds and Family Diet, as mentioned, play this role by training millet farmers, providing them with tarpaulins, and paying a premium for quality. A strong public–private partnership between standards authorities and processors, focused on quality of inputs and international market access, is also necessary and could help train farmers and others in the value chain on how to improve quality.

B. Improving Logistics

The value chains’ preponderance of middlemen increases inefficiencies and reduces the value captured by farmers. Trader middlemen play a key role in bulking, quality control, and providing storage, and their margins, sometimes shared by up to four intermediaries, are not as exploitative as the literature suggests. Even those traders who exhibit cartel-like behavior, e.g., urban millet traders, are making fairly modest margins.

Strong traders have the potential to upgrade value chains, as we have seen in the case of Afro Kai’s role as an agent between farmers and breweries. Afro Kai provides support for sorghum farmers through supplying seeds on credit, quality control, and bulking and storage services. In essence, they ensure that the breweries receive consistent, high-quality supply.

Efforts to strengthen and upgrade more established informal traders could thus benefit both farmers and processors. Traders’ associations can be converted to commercial groups that allow traders to pool resources and develop infrastructure, including transport and storage. Development partners and government can be pulled in to create PPP ventures with traders.

Note that many proposed warehouse receipt systems have focused on bringing in new players. The general trend has been to eliminate middlemen, who are seen as exploitative; yet middlemen are the most entrepreneurial actors in the agricultural value chains. Efforts to improve logistics should, as much as possible, be efforts to turn informal traders into stronger traders who can deliver more value-added services. Stronger traders can integrate backward into commercial farming or forward into processing—both positive moves, as traders’ deep understanding of the value chain makes them particularly effective as farmers or processors.
C. Product Development

Although we have seen occasional examples of product development and market segmentation—Maganjo Millers, for instance, which captures both high-income and low-income markets by selling essentially the same millet product for two very different prices—across the value chains examined, these activities are rare. Low-value products and low-value retail channels dominate the markets, and significant value capture opportunity is lost. Efforts should be made to increase product diversity and, in particular, to address two markets that will see significant growth: the urban poor food market (who require RTE foods that save on time and energy spent cooking) and the high-value food market among the growing middle class (who will require well-packaged, healthy foods).

Development of new products is hampered by lack of proper equipment and well-established processors with the resources for research and development (R&D). Better linkages between processors and research institutions, especially university food science departments, can go a long way toward hastening product development and commercializing some of the products already in development.

D. Stronger Value Chain Governance

All four value chains are dominated by small players, which negatively impacts productivity, quality, and product development. Significant opportunities to raising productivity and product diversity can be unlocked with stronger, streamlined, more organized value chains. Table 7.1 shows examples of actors who are playing multiple roles and are strong candidates for governing the value chain. Such actors should be identified and supported.

Consolidation will result in stronger middlemen who will be able to integrate forward to become processors in the long run. It has been observed in countries with emerging manufacturing sectors that it is often middlemen or traders, especially importers, who are responsible for the sector’s development.

Retailers, especially regional supermarket chains, have so far played a minimal role in the governance of Uganda’s agricultural value chains. However, there is good potential for their participation in the development and marketing of high-value health foods, as they have both access to the middle-class market and a regional reach, meaning the market size is fairly significant.

The potential for developing supermarket brands is also strong. For instance, Uchumi, which is well established in Uganda, has developed sorghum and millet flour brands in Kenya. Uchumi could be approached to work more closely with processors that already have strong contracting models (e.g., NUMA) and collaborate on the development of high-value sorghum and millet brands. Supermarket bakeries could also work more closely with well-established farmer groups, like SOSPPA, that farm cassava and produce HQCF for baking, to develop bakery products that use HQCF.

In the beef sector, Fresh Cuts should be encouraged to integrate backward and take over a slaughterhouse. Kampala needs an extra slaughterhouse, as existing capacity is woefully inadequate. Better, as Fresh Cuts already has a fleet of refrigerated trucks, it can be incentivized to establish itself closer to cattle ranching regions.
E. Greater Integration of Cassava, Millet, and Sorghum Farming with Livestock

The foregoing discussion has pointed to significant synergies between millet and sorghum farming and beef production. Farming using improved millet and sorghum is very profitable when the crops are treated with manure combined with fertilizer. At the same time, millet and sorghum stover are good animal feeds, and animals can also help in farm mechanization, easing the demand on human labor. An even better solution would be the integration of livestock raising with millet, sorghum, and cassava processing. Some processors, like NUMA Feeds, which already produce animal feeds from by-products of millet processing, can be incentivized to extend support to their contract farmers so they can expand into livestock production. The processor can then supply farmers with animal feed when it collects millet grain. Further, it can help its already-organized farmers to develop feedlots, encouraging them to buy cows, feed them intensively, and sell them at a profit. NUMA Feeds can also be incentivized to diversify into meat processing using its existing infrastructure.

F. Greater Integration Between FBO Artisanal Food Processors and SME Food Processors

Agricultural value chains can be a vehicle for rural transformation if some of the processing activities already taking place are energized further. This will require increasing support to those FBOs that are venturing into artisanal processing, e.g., SOSPPA's production of cassava flour. One way to do so is to link them with more established SMEs that are also producing flour products and marketing them. FBO artisanal processors would then supply bulk flour to SME food manufacturers, who would develop and package various products for the market.

In this way, FBO artisanal processors essentially play the role of contract manufacturers. These processors have the advantage of a secure supply of raw materials such as cassava roots, but have difficulty accessing markets (including developing products and packaging) and complying with food standards. SME food manufacturers, meanwhile, are good at product development and packaging, quality compliance, and marketing, but suffer from limited supply. A linkage between the two will help resolve issues on both sides.
G. Towards End-to-End Agricultural Value Chain Financing

Our field survey found finance to be a critical challenge across all the value chains that were studied especially to farmers who are already poor and thus have few reserves to invest in agriculture. This largely explains the subsistence nature of farming. The biggest challenge to agricultural sector financing is the perceived high risk by lenders. Risk mainly comes from the weather, events, and pests. The risk is compounded by poverty, which means that farmers lack assets that can be used as collateral and also lack insurance (which means that even minor family emergencies are devastating). Beyond the perception of risk, lending to many scattered smallholder farmers can be very expensive using the conventional banking model. Many smallholder farmers remain unbanked as a result.

Microfinance has been the big innovation to get banking to the poor, but even microfinance has not been very active in agriculture, as the models are designed so that loan repayment is made consistently, yet many farmers spend and receive in a lumpy way (during planting and after harvest, respectively) and thus require a more flexible repayment plan that accommodates farming cycles. All the same, 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.

Beyond flexible lending models, we are also seeing the deployment of mobile technologies 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.

IO’s objective is to provide farmers with services to move them from subsistence to commercial farming. The highlights of the OI model include:

- It pre-selects farmers to finance, using household profile and land mapping data to model the farmers’ ability to make the transition.
- In addition to loans and savings, it provides payment, money transfer, and remittance services, as well as insurance products (life insurance and crop insurance).
- It focuses on building low-cost delivery channels (fabricated from containers), mobile banking.
- 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 in its profiling is credited with creating the linkages, as it can tell exactly what the farmers need in-terms of inputs, extension etc.
- OI has also tapped into USAIDs Development Credit Authority (DCA), which guarantees 50% of credit risk for loans to farmers.

Although microfinance has been able to close some of the rural farmers, financing gap, one gap that has not been properly addressed is that of financing other value chain actors, especially rural-based suppliers, traders/brokers and processors. These tend to be too large for microfinances, and too small and too remote for formal banks. Yet, rural transformation cannot happen if these important actors cannot get financing. More importantly, these actors play a key role in financing the value chain—traders do advance farmers credit to plant, input suppliers may provide inputs on credit, etc. These are transactions based on trust developed over time. However, given that those traders, processors, and suppliers are all in businesses that also need financing, this approach has its limits (as it also depletes their working capital). Therefore, the entry of a financier/bank in the operations has the advantage of freeing working capital and also lets the value chain actors focus on their core businesses. Farmers may also obtain financing without having to produce collateral, as financing gets channeled through the stronger value chain actors.
The bank gets new business and is less exposed to lending risk, as the established relationships mitigate it. This is the rationale for the establishment of Root Capital, which is financing agricultural value chains in a number of countries across Africa. Root Capital provides financing to medium-sized enterprises working in the agricultural value chains to enable them to transact with farmers and also invest in equipment and infrastructure for operations. In Kenya, it is financing Freshco, a seed supplier, to increase its output, and in Tanzania, it is providing working capital for traders/processors to increase their capacity to buy millet from farmers. The long-term objective is to demonstrate good lending opportunities for local banks, which will then take over and start lending to this neglected sector.

Another approach being taken to catalyze lending to the sector is the establishment of a fund to lend to value chain actors. One such fund is the African Agricultural Capital fund. The aim is to channel finance to agricultural enterprises whose growth could catalyze the development of the value chains they operate in, delivering high social impact and strong financial returns, and, by demonstrating to the private sector that such investments can be profitable, encourage future investment. The fund usually invests between US$250,000 and US$2.5 million in SMEs in East Africa, typically using a combination of equity, quasi-equity, equity-related, and debt investments.

Box 7.2: 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). DCA guarantees lending to the Agricultural sector by providing a 50% credit risk for loans going to rural farming communities.

DCA loan or bond guarantees are often complemented by USAID-assisted training that develops banks ability to perform cash-flow analysis, due diligences 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 partial guarantees help demonstrate to local banks that loans to underserved sectors can be profitable. This fosters self-sustained financing because lenders become willing to finance projects on a continuous basis without the support 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.

35 The fund was established by Gatsby, Rockefeller, and Volksvermogen of Belgium.
viii. Conclusion and Way Forward

The four value chain discussions here indicate significant value capture opportunities, but the value chains themselves will require substantial upgrading if these opportunities are to be seized. The central challenge to upgrading value chains is mobilizing financial resources. Without this, resource-poor farmers cannot attain a higher level of production, middlemen cannot upgrade from micro-enterprises into integrated logistics operations, and artisanal processors cannot modernize to contend with the emerging global value chains dominated by supermarkets.

Policy should therefore focus on (a) motivating the reorganization of the production and processing sectors so that they can scale up, and (b) motivating financial resources to flow to the agricultural and agro-processing sectors in the form of budgetary allocations, grants, and lending. Specific recommendations are listed below.

A. Agricultural Policy

1. Develop a policy on new agricultural service delivery models based on public–private participation
   - Provide greater support to the development and strengthening of FBOs and use them to channel support
   - Recruit large- and medium-scale farmers as channels for directing support to smallholders. Create a fund or tax incentives for these farmers to provide knowledge, mechanization services, and inputs.

2. Move from providing single service/product subsidies toward providing a package of subsidies. For example, fertilizer subsidies for farmers should be accompanied by mechanization subsidies.

3. Integrate crop and livestock support in one package to exploit complementarities and better integrate livestock policy and crop policy. For example, some of the funding for fertilizer subsidies should be allocated to increase manure production.

B. Industrial Policy

1. Develop a funding mechanism to support collaboration between processors and food science research institutes to facilitate the co-creation and commercialization of products

2. Create a special fund to help middlemen become logistics and storage providers, which should incentivize traders to merge into larger corporate entities. Possible policy avenues include:
   - Converting existing trade groups based in urban markets into companies and having members become shareholders of the trading companies. These groups can be required to have a certain level of capitalization and infrastructure before operating in a given market. A lending facility can be provided to trade groups that meet the requirements.
   - Developing a PPP arrangement whereby the local authorities that usually own the market form a joint company with the trade associations and transfer the market assets to the joint company. The increased capitalization will allow the company to acquire vehicles for transport and storage facilities.

3. Provide subsidies and tax breaks to import equipment for food processing

4. Develop a special fund to support the development of FBO artisanal food processors to become contract manufacturers for SME food processors

5. Incentivize processors to play a stronger role in developing their supply chains, including the development of a contracting model and quality systems

6. Subsidize credit risk for the food processing sector to motivate lending by banks
C. Policy Platforms

The challenge lies in how to channel support to upgrade and strengthen the agricultural value chains. FBOs are the domain of the agriculture ministry, while processors, traders, and retailers fall under the trade and industry ministry. This calls for a platform that brings together both ministries, as well as the finance ministry and key stakeholders, in a coordinated approach to developing the identified actors. If such a platform takes rural transformation as its agenda, these players will be encouraged to adopt a more holistic view and allow the flexibility needed for the financial arm to find the necessary resources.
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