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Sweet Potato Value Chain: Uganda
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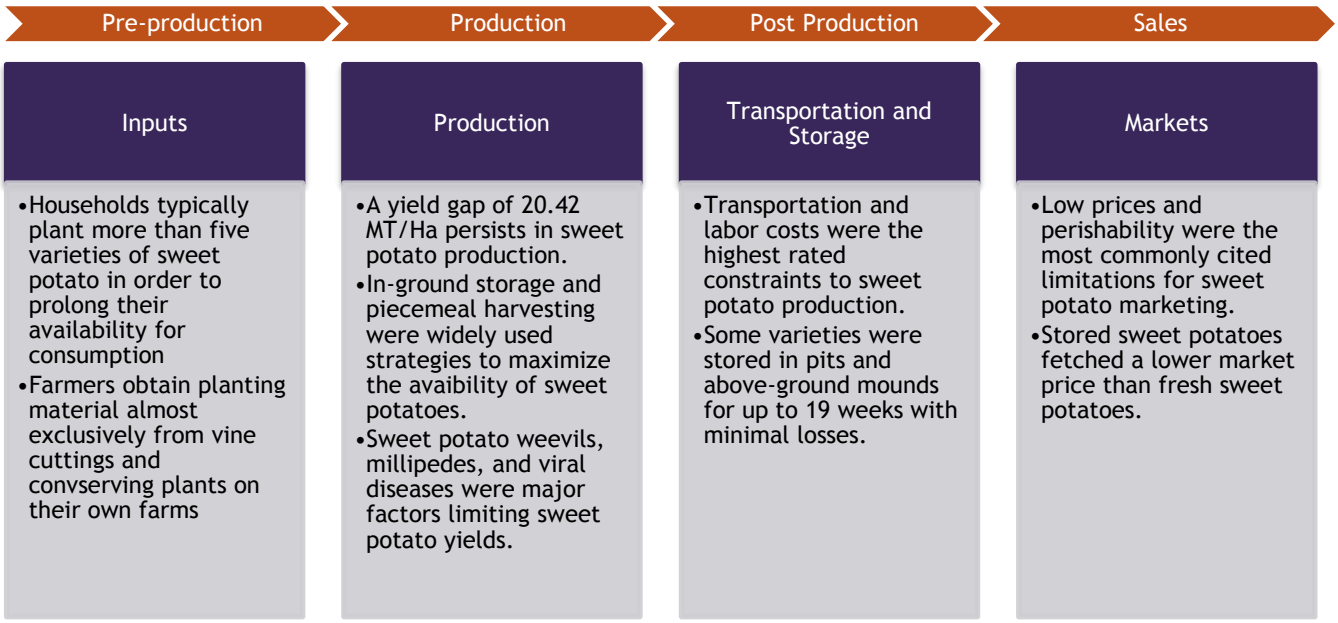
This report provides a general overview of the sweet potato value chain in Uganda. The first section describes trends in sweet potato production and consumption since 1996. The second section describes the varieties grown and their uses. The final section summarizes current practices and constraints in production, processing, and marketing.

Uganda Sweet Potato Value Chain Highlights

The figure below summarizes key findings along the different stages of the sweet potato value chain in Uganda.



Key Statistics about Sweet Potatoes in Uganda

Uganda is the biggest sweet potato producer in Africa in terms of area harvested and production (see *Table 1*), although Burundi, Rwanda and Madagascar have significantly higher yields. Sweet potato is a major crop in Uganda, ranking third in cultivated area following plantains and cassava (Aritua et al., 2007). Sweet potato ranks fourth in gross agricultural production value (see *Table 2*). The Government of Uganda has recognized sweet potatoes as an important crop for the

country and a research priority, especially through establishing the National Agricultural Research Organization potato center.[1]

Table 1: Area Harvested, Yield, and Production of Top Sweet Potato Producers in Africa, 2007

	Area Harvested (Ha)	Average Yield (MT/Ha)	Production (1000 MT)
Uganda	578,000	4.5	2,591
Tanzania	505,000	1.9	960
Rwanda	158,000	5.9	872
Angola	145,000	4.8	689
Burundi	125,000	6.7	838
Madagascar	125,000	7.0	874

Source: FAOStat

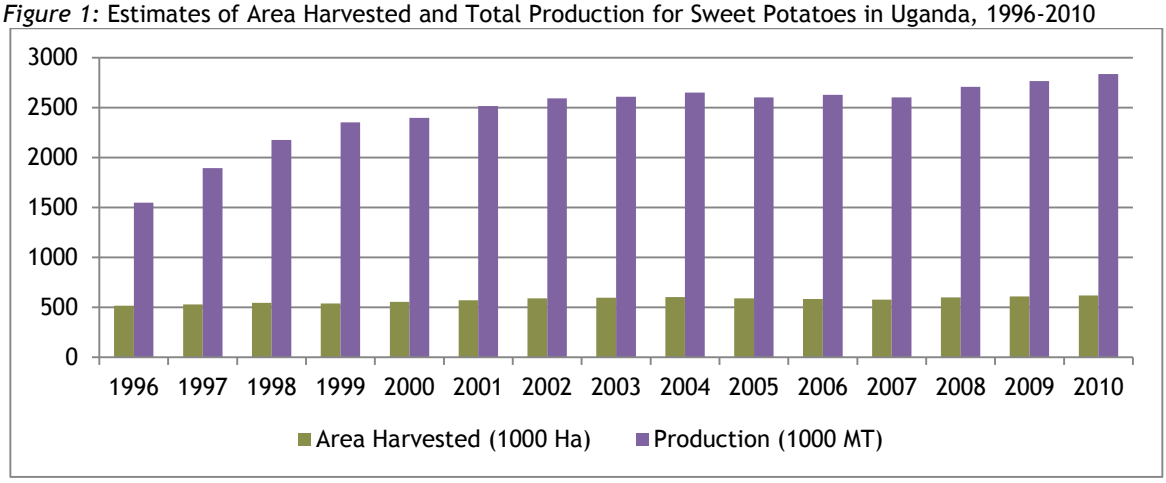
Table 2: Top Five Single Food Crop Contributors to Gross Agricultural Production Value in Uganda in 2010

Crop	Gross Production Value (constant 2004-2006 USD$)	Proportion of Total Production Value
Plantains	$1,971,674	40.4%
Cassava	$551,774	11.3%
Beans, dry	$273,635	5.6%
Sweet Potatoes	$214,349	4.4%
Maize	$194,506	4.0%

Source: FAOStat

The area harvested and production levels of sweet potatoes in Uganda have changed very little over the past ten years (see *Figure 1*). Production rose from 1,548,000 MT in 1996 to 2,838,000 MT in 2010, but shows only small fluctuations since 2000. As cassava production declined, especially as a result of cassava mosaic virus, the importance of sweet potatoes as a starch staple crop has increased (A. Hall et al., 1998; Scott et al., 1999). This is reflected in the rising production seen in the 1990s in *Figure 1*.

Figure 1: Estimates of Area Harvested and Total Production for Sweet Potatoes in Uganda, 1996-2010

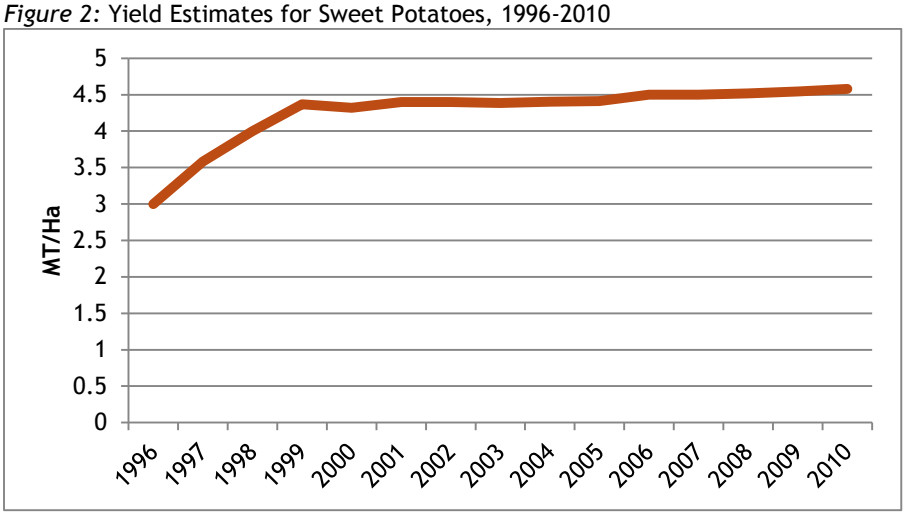


Source: FAOStat

[1] At the time of writing the NARO potato center research was not available online.

Sweet potato yields have stagnated over the last ten years, as seen in *Figure 2*. The current sweet potato yield is 4.58 MT/Ha (2010), which shows minimal improvement from 4.37 MT/Ha in 1999. The Uganda Census of Agriculture 2008/09, implemented by the Uganda Bureau of Statistics, reports the sweet potato yield to be 4.1 MT/Ha (Uganda Bureau of Statistics, 2011).

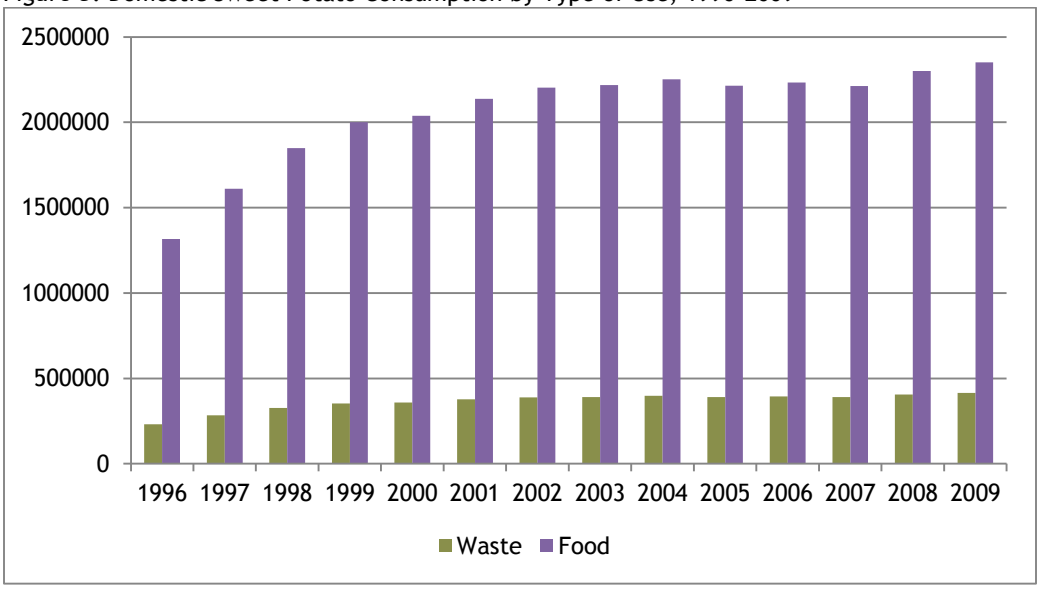
Figure 2: Yield Estimates for Sweet Potatoes, 1996-2010



Source: FAOStat

As seen in *Figure 3* sweet potato consumption rose from 1,315,800 MT in 1996 to 2,351,098 MT in 2009. Figures reported for sweet potato usage were limited to food and waste; usage as seed, feed, processed, or other utilization was not reported. Because sweet potatoes are grown most frequently for home consumption, consumption of sweet potatoes closely tracks production.

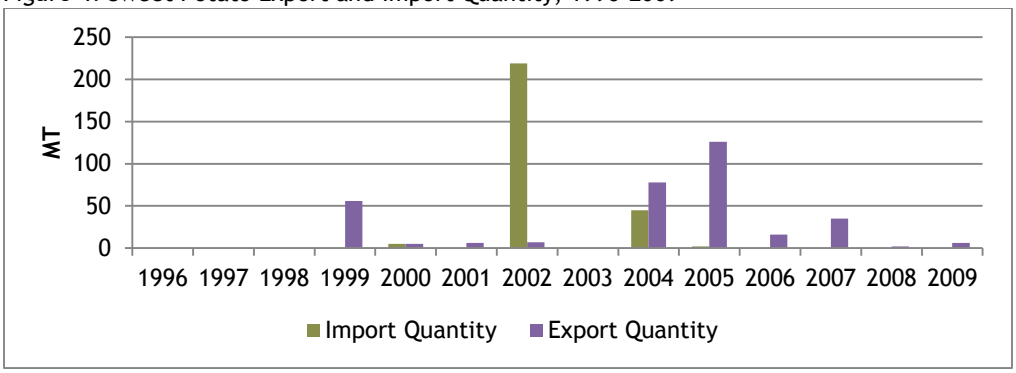
Figure 3: Domestic Sweet Potato Consumption by Type of Use, 1996-2009



Source: FAOStat

Because sweet potatoes are largely a subsistence crop for rural households, the international trade of sweet potatoes into and out of Uganda is limited. As shown in *Figure 4* the import and export quantities of sweet potato vary by year, but the highest quantity (219 MT imported in the year 2002) still only represents a minute fraction of total domestic production.

Figure 4: Sweet Potato Export and Import Quantity, 1996-2009



Source: FAOStat

As seen in *Table 3,* sweet potato ranks third in per capita consumption after plantains and cassava. Per capita consumption of sweet potatoes is estimated at 72.6 kg (FAOStat, 2009).

Table 3: Top Five Crops by Per Capita Consumption, 2009

Crop	Per capita consumption (kg/person/yr)	Daily caloric intake (kcal/person/day)	Share of caloric intake
Plantains	139.4	340	15.1%
Cassava	96.3	288	12.8%
Sweet Potatoes	72.6	191	8.5%
Maize	22.4	190	8.5%
Vegetables, Other	20.9	13	0.6%

Source: FAOStat, 2009

Sweet Potato Varieties and their Uses

A typical household cultivates more than five different varieties of sweet potato. This diversity extends the availability of sweet potato for the household as most varieties have different maturation periods (Bashaasha et al., 1995). A large number of varieties are cultivated within each district. Typically, multiple varieties are planted in distinct sections of a single plot. Many of the common varieties are low yielding and highly susceptible to diseases and pests (Abidin, 2004). Orange-flesh sweet potato varieties have been introduced in Uganda. Vitamin A intake levels in women and children increased in the communities in which the orange-flesh sweet potato was introduced (Hotz et al., 2012).

Sweet potatoes are commonly consumed as fresh tubers either boiled or steamed. They are also a critical food source during the dry season, when they are commonly consumed as sun-dried *amukeke* (sliced) or *inginyo* (chunk) (Abidin, 2004).

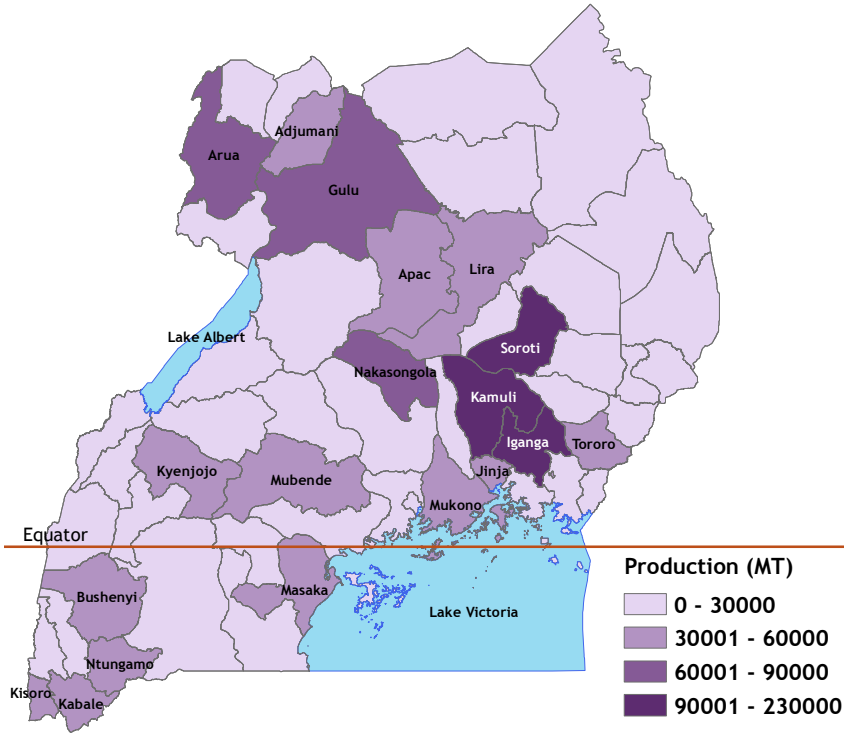
Overview of Sweet Potato Production in Uganda

We found very few recent studies on sweet potato production in Uganda. The study conducted by Bashaasha, et al. in 1989-1992 provided much of the detail included in this brief and was widely cited throughout the literature on sweet potato production in Uganda. This study used non-randomized sampling in nine major sweet potato producing districts in Uganda, spanning four agroecological zones. Villages were selected using production data and guidance from local leaders; all sweet

potato farmers were sampled within the selected villages. Four hundred nineteen farmers responded to a production questionnaire and 216 individuals responded to a consumption and use questionnaire.

According to the 2005 Uganda National Household Survey about 44% of farmers cultivate sweet potatoes. The Eastern region has the highest proportion (57%) and the semi-arid Northern region has the lowest proportion (29%) (Haggblade & Dewina, 2010). *Map 1* shows the distribution of sweet potato production by district.

Map 1: Sweet Potato Production in Uganda, by District



Source: Uganda Census of Agriculture 2008/09

The country is divided into two rainfall regions. The area along the equator in southern and central Uganda is characterized by two evenly spaced rainy seasons. Further from the equator, the northern regions are characterized by a longer and less predictable dry season, and a single rainy season. This area is at higher risk for food shortages in the dry season than the bimodal equatorial region (Namanda et al., 2011).

Sweet potato is grown year-round in the equatorial region. Sweet potato is cultivated during the first rainy season from March to June. Planting during the first rainy season may be delayed due to lack of planting material or risk of millipede infestation. Sweet potato is also grown during the second rainy season, which occurs from August to November. Harvesting of tubers either planted late in the first rainy season or early in the second rainy season occurs in December and January. In the northern regions further from the equator, sweet potato is planted at the beginning of the rainy season and cultivated as far into the dry season as possible (Namanda, 2011). Because sweet potatoes have a short shelf life, farmers often store the tubers in-ground on plants to consume during the long dry season (December-March) (Ebregt et al., 2007).

Sweet potatoes are primarily planted in mounds, although ridges may also be used, especially to control soil erosion in highland areas (Bashaasha et al., 1995).

Women Play a Major Role in Cultivating Sweet Potatoes

Limited information is available on the characteristics of sweet potato farmers in Uganda. Bashaasha, et al. found that women represented a majority of respondents in most districts surveyed (Bashaasha et al., 1995). The average age of sweet

potato farmers was 42 years old and most farmers had little or no formal education. Respondents also reported low levels of off-farm income. According to Hall, Bockett, and Nahdy (1998), although sweet potatoes have been increasingly cultivated as a cash crop, when they are cultivated for subsistence they are considered a women's crop. While women often are responsible for cultivating sweet potatoes, men typically play a larger role in transport and marketing activities (Hall et al., 1998).

Many Farmers Employ In-Ground Storage and Piecemeal Harvesting Strategies

Hall, Bockett, and Nahdy (1998) identified a common pre-harvest storage strategy as "in-ground storage and piecemeal harvesting." This strategy involves staggered planting, planting an array of varieties, in-ground storage, and piecemeal harvesting. This strategy is intended to extend the availability of fresh sweet potatoes for the longest possible period. Staggered planting and using an array of varieties help to maintain a constant supply. Once roots are mature they can remain stored in the ground for up to six months. Farmers practicing in-ground storage begin harvesting large roots three months after planting and as the roots mature, leaving the plant intact to produce more roots. In piecemeal harvesting farmers harvest only the sweet potatoes needed for immediate consumption or sale. In the seven districts sampled by Hall, Bockett and Nahdy, over 80% of farmers were implementing a piecemeal harvesting strategy, with some districts sampled at a 100% implementation rate.[2] Subsequently, sweet potatoes were available for 7-12 months across these seven districts. However, agro-ecological factors, particularly rainfall, determine for how long this strategy can be used effectively (Hall et al., 1998).

A Variety of Factors Limit Sweet Potato Production in Uganda

The most recent data available shows sweet potato yields to be approximately 4.58 MT/Ha (FAOStat, 2010). As of 1995, experimental yields of 25 MT/Ha were achieved with the use of fertilizers (Bashaasha et al., 1995). Therefore an estimated yield gap of up to 20.42 MT/Ha persists. The introduction of new pest and disease resistant varieties in recent years suggests that the yield gap may be even larger if compared to current potential yields, although we found no data on current potential yields with these varieties.

Planting Material is Sourced Almost Exclusively from the Farm

Sweet potato farmers obtain planting material almost exclusively from on-farm methods (Namanda et al., 2011). Along the equator, farmers obtain sweet potato planting material exclusively from vine cuttings. In areas with a longer dry season, farmers cultivated new plants from volunteer plants and through conserving plants in shady areas or in swamps and valleys, in addition to using vine cuttings.

Areas with a longer dry season often experience a "hunger gap" at the end of the dry season when the grain harvest is exhausted. During this period sweet potatoes can potentially serve as an early source of fresh food. However, vine cuttings may fail to provide sufficient planting material at the beginning of the rainy season, which may delay planting and limit the use of sweet potatoes as a famine relief crop (Namanda et al., 2011).

Namanda et al. (2011) found that farmers in northeastern Uganda (Soroti and Bukedea) reduced and delayed their planting due to lack of sufficient planting materials. Out of 271 farmers, 106 wanted to buy additional planting material, but only 40 were able purchase additional material. Thirty of those farmers who did buy had plot sizes between 0.04 and 0.4 hectares. Farmers reported that they would have planted twice as much and about a month earlier if more planting material had been available.

Pests and Diseases are Prevalent Among Sweet Potato Crops

Sweet potato weevils, millipedes and viral diseases are prominent biotic factors reducing overall sweet potato yields (Aritua et al., 2007). Sweet potato weevils are more abundant and damaging during the dry season than during the rainy season (Ebregt et al., 2007). Millipede infestation may facilitate weevil infestation. The Uganda National Sweet Potato Programme has released at least 15 new virus-resistant varieties since 1995 (Aritua et al., 2007).[3]

[2] The seven districts were Kabale, Gulu, Iganga, Mpigi, Luwero, Kabarole, and Arua.
[3] No further information about the National Sweet Potato Programme was available at the time of writing.

Bashaasha et al. (1995) found that farmers selected vines for planting based on the condition of the leaves. Farmers identified and rejected diseased vines for planting. In several districts surveyed, access to disease-free planting material was reported as a greater constraint to increased production than access to any planting material.

Bashaasha et al. (1995) surveyed farmers on the severity of constraints to sweet potato production. The highest rated constraints were labor costs and transportation costs. The second highest rated constraints were sweet potato weevils and butterflies.

Ebregt et al. (2007) found that the harvesting method has an impact on the scale of weevil infestation. The traditional harvesting method of in-ground storage and piecemeal harvesting contributed to the control of weevil infestation in vines and storage roots and thus improved the quality of the harvested roots when compared to one-time harvesting. Hall, Bockett, and Nahdy (1998) note that the control of weevil infestations occurs largely in the dry season. Contrary to Ebregt et al., farmers in their study indicated that roots stored in the ground for longer periods were more susceptible to damage from pests and rot. The in-ground storage and piecemeal harvesting strategy includes trade-offs between yield, pest risk, and long-term food sources.

Post Harvest Practices

Transportation and Storage

In the survey conducted by Bashaasha et al (1995) a majority of farmers in most surveyed districts reported storing harvested roots for less than a week. The two most popular short-term storage methods were on the floor in the house or in baskets. Many farmers also sliced and dried their harvested sweet potatoes in order to prevent pest infestation during storage.

Hall, Bockett, and Nahdy (1998) conducted field tests and pilot projects to determine the viability of long-term storage methods. Certain varieties were found to be storable either in pits or in clamps (covered above-ground mounds) for up to 19 weeks. Stored sweet potatoes could still be consumed piecemeal, and remaining roots could be processed into dried chunks or slices. However, they found that prices for stored sweet potatoes were lower and that the roots had a sweeter taste (A. Hall et al., 1998; A. J. Hall & Devereau, 2000).

Engoru, Mugisha, and Bashaasha (2005) conducted a sweet potato utilization study in eastern Uganda with a sample of 191 farmers. Farmers were randomly selected from three sub-counties in both Kumi and Mbale districts. Farmers reported storing tubers in pits for an average of 38 days, although some mentioned storing tubers for up to 138 days. Farmers reported storage losses amounting to approximately 27% of total output. Most of the stored sweet potatoes were consumed by the household; only 3.7% of farmers reported selling a portion of their stored produce.

In districts with a market within 5km farmers reported carrying their harvest sweet potatoes on their heads (suggesting that women were the primary transporters). In districts with a market further than 5km the primary mode of transportation was by truck (Bashaasha et al., 1995).

Sweet Potato Processing

Sales of sweet potato in Uganda are confined largely to fresh tubers. The International Potato Center (CIP) explored the market options for sweet potato products. CIP tested the market for sweet potato chips, flour, and starch. However, the last available documentation of these market analyses suggests that the market is still very limited. Sweet potato chips are not commonly traded beyond household sales and there was no available information following up on the market test for new products like sweet potato flour (Foodnet, n.d.).

According to Engoru et al. (2005), farmers produced and consumed a total of six products from sweet potatoes including: fresh tubers, pit stored tubers, *amukeke* (dry white slices), *inginyo* (dry chips, chunks), *amukeke* flour, and *inginyo* flour. All sweet potato farmers reported consuming some portion of their harvest; farmers consumed approximately 6.4% of the total harvest as fresh tubers from their own farms (Engoru et al., 2005).

Approximately 29.8% of farmers processed some portion of their harvest in *amukeke* slices. About 35.1% of *amukeke* producers sold a portion of this produce. Few buyers and storage pests were the most commonly reported constraints to

amukeke marketing. Thirty three percent of farmers processed some portion of their harvest into *inginyo*. About 25.4% of *inginyo* producers sold a portion of their produce. Home consumption needs limited the portion of *inginyo* produce that could be sold. Low prices were the most common limiting factor to *inginyo* marketing (Engoru et al., 2005).

Sweet Potatoes as Animal Feed

Sweet potato roots and vines may be used as animal feed, especially by smallholder farmers raising pigs. Different varieties are better suited for animal feed versus human consumption. Farmers typically cultivate varieties they prefer for consumption and then use them additionally for animal feed. Farmers may also cultivate distinct varieties side by side for human consumption and for animal feed (Peters, 2008).

Marketing System for Sweet Potatoes

The majority of sweet potatoes are produced for home consumption, although many farmers market at least some of their crop. Engoru et al. (2005) found that 52.9% of farmers sold some portion of their sweet potato crop. Of these, 71.3% sold their sweet potatoes at the farm gate, 42.6% at roadside markets, 35.6% at rural markets, and 7.9% in urban markets.

On average farmers in this study sold 16.5% of the total harvest (864.3 kg) for an average price of 101.2 shillings per kg (about 0.05 USD). Low prices and perishability were the most commonly cited problems encountered in the marketing of fresh sweet potatoes (Engoru et al., 2005). In regions with a longer dry season sweet potato prices increase in December, at the beginning of the dry season, and persist through June when harvesting begins (Hall et al., 1998).

Hall, Bockett, and Nahdy (1998) found that the major constraint to sweet potato marketing was limited demand and the characterization of sweet potato as a crop for home consumption. Furthermore, sweet potatoes do not offer a comparative advantage when compared to cash crop alternatives. Finally, the ability to capture higher prices by storing roots is limited. Stored roots have a low demand because fresh roots are available a majority of the year in most areas and are more desirable than stored roots.

Literature Review Methodology

This literature review was conducted using a combination of the following search terms: Uganda, sweet potatoes, production, market, exchange, and value chain. The following websites were included in the search: UW library system, Ebsco, CGIAR, HarvestPlus, CIP's sweetpotatoknowledge.org, World Bank, FAO, IFPRI, IITA, Google Scholar, Foodnet, DFID, and 3IE.

At the time of writing, most of the national websites were under construction, including the Ministry of Agriculture's statistics site, the Uganda Bureau of Statistics, and the National Agricultural Research Organization's potato research center.

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Appendix: Yams in Uganda

At the time of writing, no data on yam production, consumption, or trade were available.