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Sweet Potato Value Chain: Tanzania
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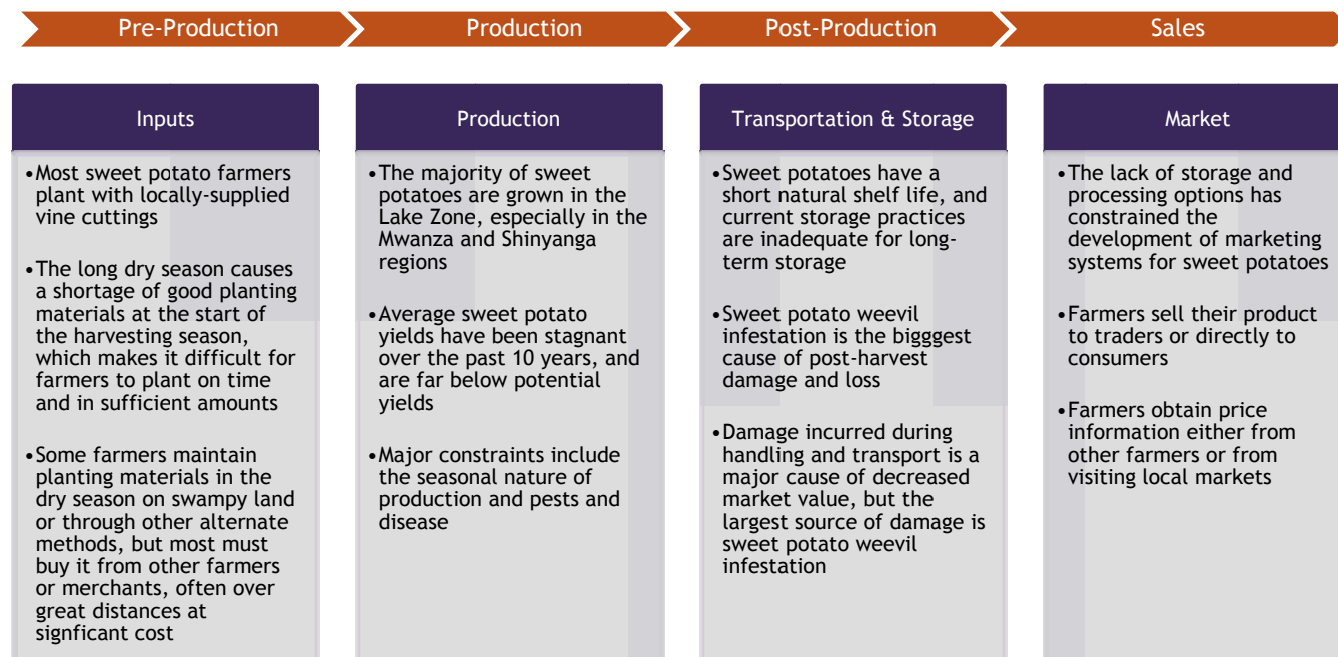
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Tanzania ranks fifth in the world in quantity of sweet potatoes produced. Production and consumption of sweet potatoes have been relatively constant over the past 10 years, although both production and consumption in this period have been high in comparison to earlier decades. Sweet potato yields increased in the early 2000s, but have stagnated since, and are far short of potential yields. Sweet potato consumption is almost entirely domestic and plays an important role in nutrition and food security for smallholder farmers. Sweet potato production faces a variety of constraints, including pests and disease, short shelf life, lack of planting materials, damage during handling, and lack of market access.

This brief provides a general overview of the sweet potato value chain in Tanzania. The first section describes trends in sweet potato production and consumption since 1990. The second section describes the uses and importance of sweet potatoes in Tanzania. The final section outlines current practices and constraints in production, post-production, and marketing.^a

Tanzania Sweet Potato Value Chain Highlights

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



^a Due to lack of data, this brief does not contain information on Tanzanian yam production. Available information about yams is given in the appendix.

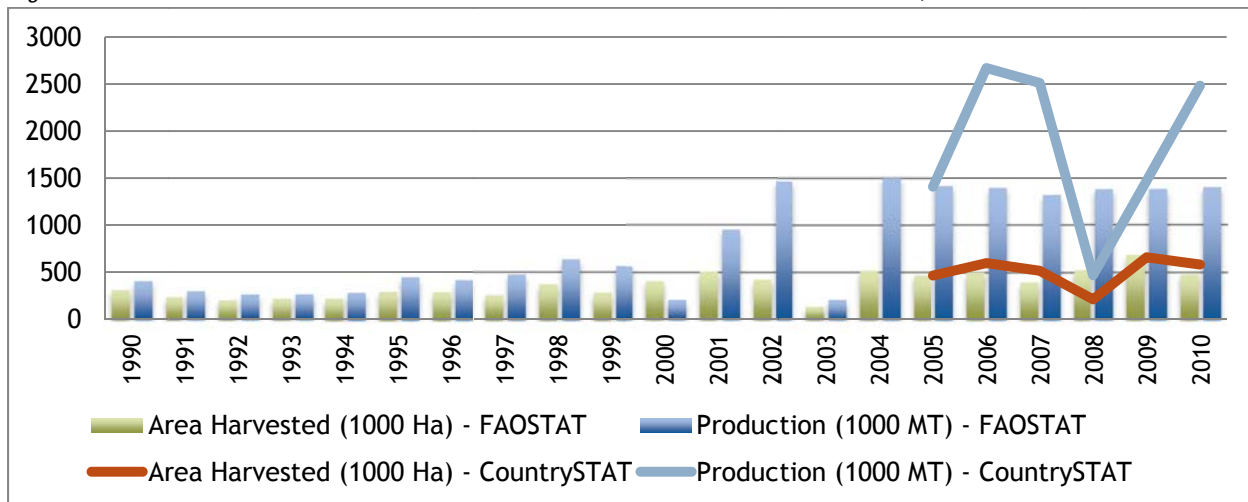
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Key Statistics about Sweet Potatoes in Tanzania

Production

Tanzania ranks fifth in the world in terms of sweet potato production.¹ Among African countries, only Uganda and Nigeria produce more. Production has generally been high in the past decade compared to previous years; average annual sweet potato production from 2001-2010 was 223% higher than it was from 1991-2000 (see *Figure 1*). Sweet potatoes ranked 13th of all crops cultivated in Tanzania in terms of gross production value in 2010; the top five crops included bananas, maize, beans (dry), cassava, and rice.

Figure 1: Estimates of Area Harvested and Production of Sweet Potatoes in Tanzania, 1990-2010^b



Sources: FAOSTAT and CountrySTAT Tanzania

Production increased dramatically from 207,830 MT in 2000 to 1,466,120 MT in 2002, due mainly to an increase in yields (see *Figure 2*). However, yields have failed to reach that level since and fell four times between 2000 and 2010. According to FAOSTAT, yields have also been consistently lower in Tanzania than in some neighboring sweet potato producing countries (*Figure 2*). *Table 1* gives yield estimates in 2008 from the Living Standards Measurement Study: Integrated Surveys on Agriculture (LSMS-ISA).

Table 1: LSMS-ISA Yield Estimate for Sweet Potatoes in Tanzania, 2008

	Yield (MT/ha)	Number of Observations (Plots)
Long Rainy Season	1.4	209
Short Rainy Season	.9	82

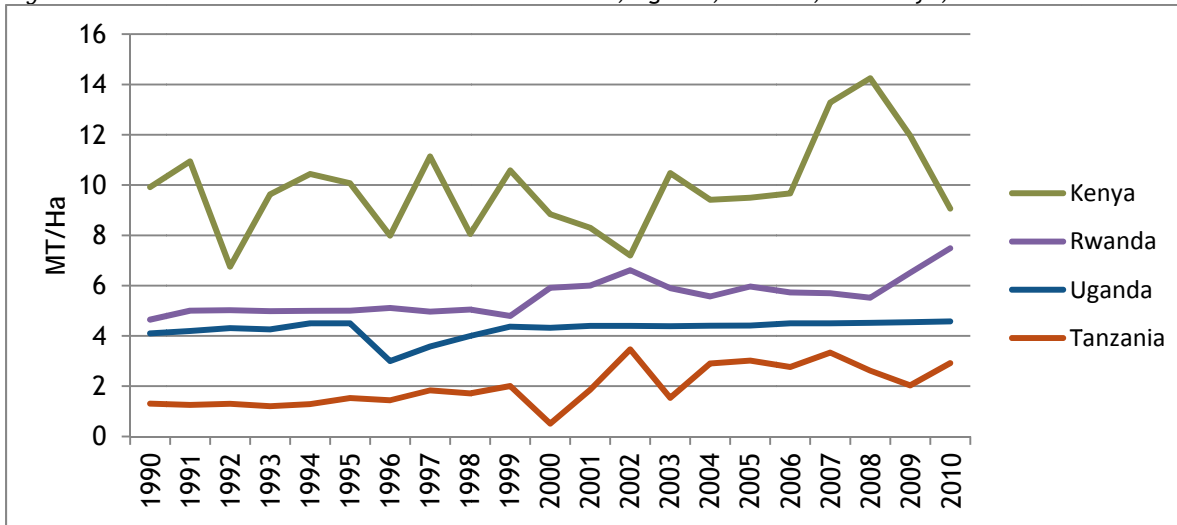
Source: LSMS-ISA Tanzania 2008 Data

Note: Sixty-one percent of the plots growing sweet potato were intercropped. Yield estimates are not representative of plots that only grew sweet potatoes.

One study from 1995 (Kapinga, Ewell, Jeremiah et al.) suggested that sweet potato yields in Tanzania are significantly underestimated, in part because of the piecemeal harvesting that is practiced throughout the country. The authors of this study surveyed 879 farmers in Tanzania and found that sweet potato yields ranged from 3.5 to 9.5 MT/ha, with yields of 6.5 reported in the Lake Zone.² Outside of the LSMS-ISA data, we did not find any more recent surveys reporting sweet potato yields.

^b The cause of the drop in production and area harvested in 2003 was unclear from the data available. FAOSTAT data does include increases in sweet potato stock in 2001 and 2002 totaling 600,000 MT, followed by a decrease in stock of 600,000 MT in 2003, suggesting that in 2003 Tanzanians may have relied on stores from previous years.

Figure 2: Yield Estimates for Sweet Potatoes in Tanzania, Uganda, Rwanda, and Kenya, 1990-2010

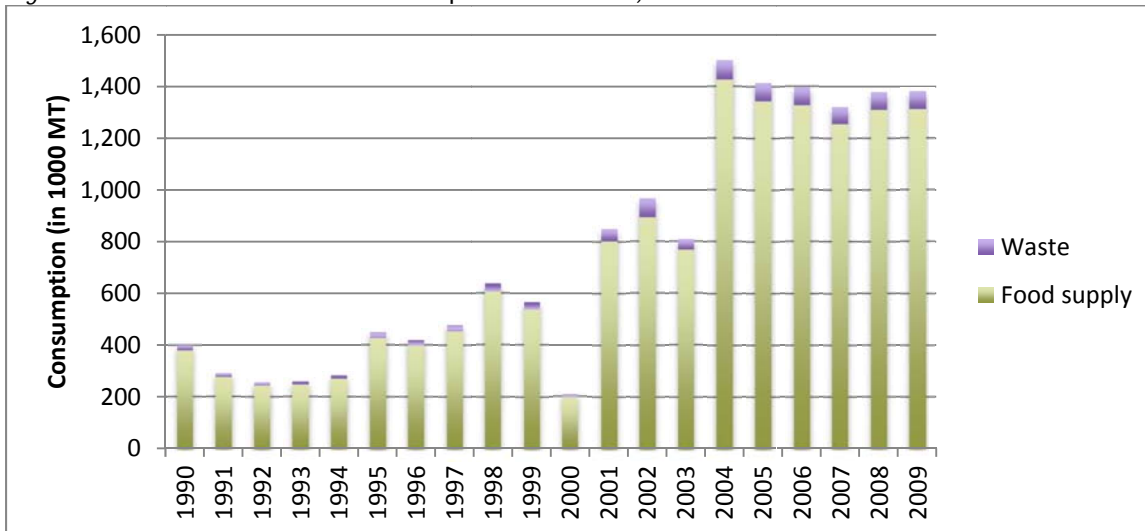


Source: FAOSTAT

Consumption

Domestic sweet potato consumption has increased significantly since 1990, from 400,000 MT in 1990 to 1,381,120 MT in 2009 (see Figure 3). However, consumption has fallen somewhat since a high point in 2004. Roughly 95% of annual consumption is domestic food supply, while roughly 5% is waste. According to FAOSTAT, sweet potatoes are not used for animal feed or other purposes in Tanzania.

Figure 3: Domestic Sweet Potato Consumption in Tanzania, 1990-2009



Source: FAOSTAT

Trade

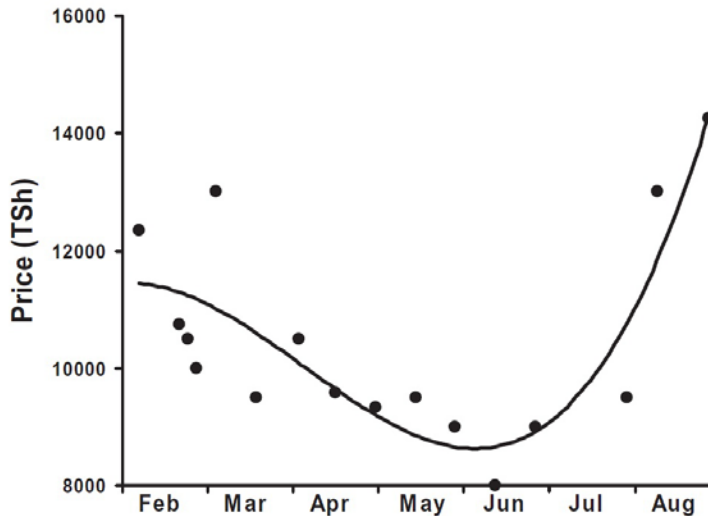
According to FAOSTAT, Tanzania effectively does not import or export sweet potatoes.^c

^c FAOSTAT does list extremely minor amounts of sweet potato imports or exports in some years, typically either 1 or 2 MT. The largest amount was in 2003, which lists an export quantity of 21 MT.

Prices

The price of sweet potatoes in Tanzania varies greatly throughout the year, due to variations in the availability and quality of sweet potatoes in the market. Prices are low in the main harvesting season (May through July), when the supply of sweet potatoes is highest, and higher in the off-season.³ See *Figure 4* for an example of price variability during the year, from market information collected during 2002 in the Lake Zone.

Figure 4: Mean Market Prices of Sacks (150 kg) of Sweet Potato in the Lake Zone, 2002



Source: Tomlins, Ndunguru, Kimenya et al., 2007

Current price information was not available through FAOSTAT or the Ministry of Agriculture, and was not found in the most recent literature. However, price information was included in the LSMS-ISA 2008 survey (see *Table 2*).

Table 2: Average Price per Kilogram and Average Value of Sales of Sweet Potato

	Average Reported Price per Kilogram of Sales of Sweet Potato	Average Reported Value of Sales of Sweet Potato by Selling Household
Long Rainy Season (N=53)	\$0.18/kg	\$30.06
Short Rainy Season (N=14)	\$0.03/kg	\$21.23

Source: LSMS-ISA Tanzania 2008 data

Value Generated

The total value generated for sweet potato selling households was \$30.7 million in the long rainy season and \$21.8 million in the short rainy season. While the value generated in the short rainy season was less, it made up a greater proportion of the value generated by all crops; sweet potatoes represented 3% of the total value generated by crops in the long rainy season, and 8% in the short rainy season.⁴

Sweet Potato Varieties Grown and their Uses

Most of the sweet potato (*Ipomoea batatas*) varieties grown in Tanzania have white, cream, or yellow-colored flesh.⁵ Widely used varieties include Polista, Sinia, and SPN/O.⁶ Although less popular, orange-fleshed varieties are available that are high in beta-carotene. Orange-fleshed varieties are high in vitamin A and have the potential to decrease vitamin A deficiency, a problem that particularly affects children (see “Nutrition,” below).⁷ Farmers grow a diverse variety of land races, selected mainly on the basis of adaptation and taste.⁸ However, most varieties have a low yield and are vulnerable to pests and disease. A few improved varieties have been developed through breeding programs, but they have seldom been used by farmers due to lack of planting materials.⁹

Fresh sweet potatoes are often boiled or steamed, or else roasted or fried.¹⁰ Processed sweet potatoes are usually made into one of two products: *michembe*, where the roots are cut into slices and dried, or *matobolwa*, where the roots are boiled, sliced, and dried. Both products can last as long as 5 to 10 months.¹¹ Sweet potatoes in Tanzania are also sometimes processed into cake, chapattis, doughnuts, kalimati, meal flour, porridge, or chips.

Importance of Sweet Potatoes

Sweet potatoes are important for food security in Tanzania and elsewhere in East Africa. Sweet potatoes have consistent and reliable yields, can be grown on marginal land, and are suitable for areas with long dry seasons. They are also useful as a disaster recovery crop when other crops fail. Sweet potatoes are an important source of food in the homes of the rural and urban poor, as well as a source of income.¹² According to LSMS-ISA Tanzania 2008 data, 25.2% of households that grew sweet potatoes also sold sweet potatoes (25.6% in the long rainy season, and 18.7% in the short rainy season).

Table 3: Top Food Supply Items in Tanzania by Quantity, 2009

Food Item	Quantity Consumed (MT)	Percent of Total Food Consumed
Cassava	5,183,125.00	22.77%
Maize	2,527,789.00	11.10%
Bananas	2,253,204.00	9.90%
Roots & Tuber Dry Equivalent	2,004,875.00	8.81%
Sweet Potatoes	1,312,064.00	5.76%
Rice (Paddy Equivalent)	1,309,592.00	5.75%
Vegetables, Other	1,288,626.00	5.66%
Rice (Milled Equivalent)	873,498.00	3.84%
Wheat	727,519.00	3.20%
Beans	616,544.00	2.71%

Source: FAOSTAT, author's calculations

Note: excludes beverages

Household Consumption and Consumer Preference

Traditionally, sweet potatoes in Tanzania were eaten in rural areas and were thought of as a low-status food. As urban populations have grown, however, urban consumers' attitudes towards sweet potato have changed. Sweet potatoes are now also popular with urban consumers, particularly those with low to middle incomes. Some urban consumers grow their own sweet potatoes, but most purchase from local markets.¹³

When surveyed, consumers expressed a preference for sweet potatoes with a high dry matter content (i.e. more "starchy") and a good taste.¹⁴ The color of the flesh and skin and the time required to cook were also important considerations, followed by low fiber content, storability and root size.

Previous EPAR analysis of LSMS-ISA Tanzania data has shown that on average, households that grew their own sweet potatoes consumed a greater quantity than households that purchased sweet potatoes.¹⁵ In the previous seven days, LSMS-ISA survey households that produced sweet potatoes had consumed an average of 10.1 kg, whereas households that purchased sweet potatoes had consumed 4.0 kg.

Processing

One study (Mmasa, Msuya, and Mlambiti, 2012) focused on processed sweet potato in the Shinyanga and Mwana regions. This study suggested that the primary motives for processing sweet potatoes include household food security, emergency income security, and the desire to circumvent the limited fresh sweet potato market. The authors conducted a survey of 50

people and found that 70% of consumers buy processed sweet potato from local markets, 20% buy directly from processors, and 10% buy them from exhibitions or trade shows.¹⁶ The authors conducted another survey of 176 people that looked at reasons to purchase processed products (see *Table 4*).

Table 4: Reasons for Consumer Purchases of Processed Sweet Potato

	Percent of Respondents (N=176)
Nutritional value	34.7%
Unable to afford alternatives	31.3%
Unaware of imported products	17.0%
Saving for the off season	17.0%

Source: Mmasa, Msuya, and Mlambiti, 2012

Nutrition

Sweet potatoes are low in fat and protein and high in carbohydrates. They are a good source of antioxidants, fiber, zinc, potassium, sodium, manganese, calcium, magnesium, iron, and vitamin C.

Orange-fleshed sweet potatoes have received a great deal of attention for their potential to fight vitamin A deficiency. Vitamin A deficiency is a major cause of early childhood death in Sub-Saharan Africa, and a serious risk factor for pregnant women. It can also limit growth, weaken the immune system, and even lead to blindness.¹⁷ In 2005, an estimated 43 million children under age 5 in Sub-Saharan Africa were at risk of Vitamin A deficiency.¹⁸ Vitamin A deficiency is the most common vitamin deficiency in Tanzania.¹⁹

One study (Van Jaarsveld, Faber, Tanumihardjo et al., 2005) conducted with children in South Africa found that consuming 125 grams of orange-fleshed sweet potatoes significantly improved the vitamin A status of the subjects. The study concluded that orange-fleshed sweet potatoes could play a significant role in controlling vitamin A deficiency in children in developing countries. Another study conducted over two years in Mozambique (Low, Arimand, Osman et al., 2007) found that children who consumed orange-fleshed sweet potatoes three days or more during the week had significantly higher vitamin A intake.

Table 5: Daily Macronutrient Intake from Sweet Potatoes, 1990 and 2009

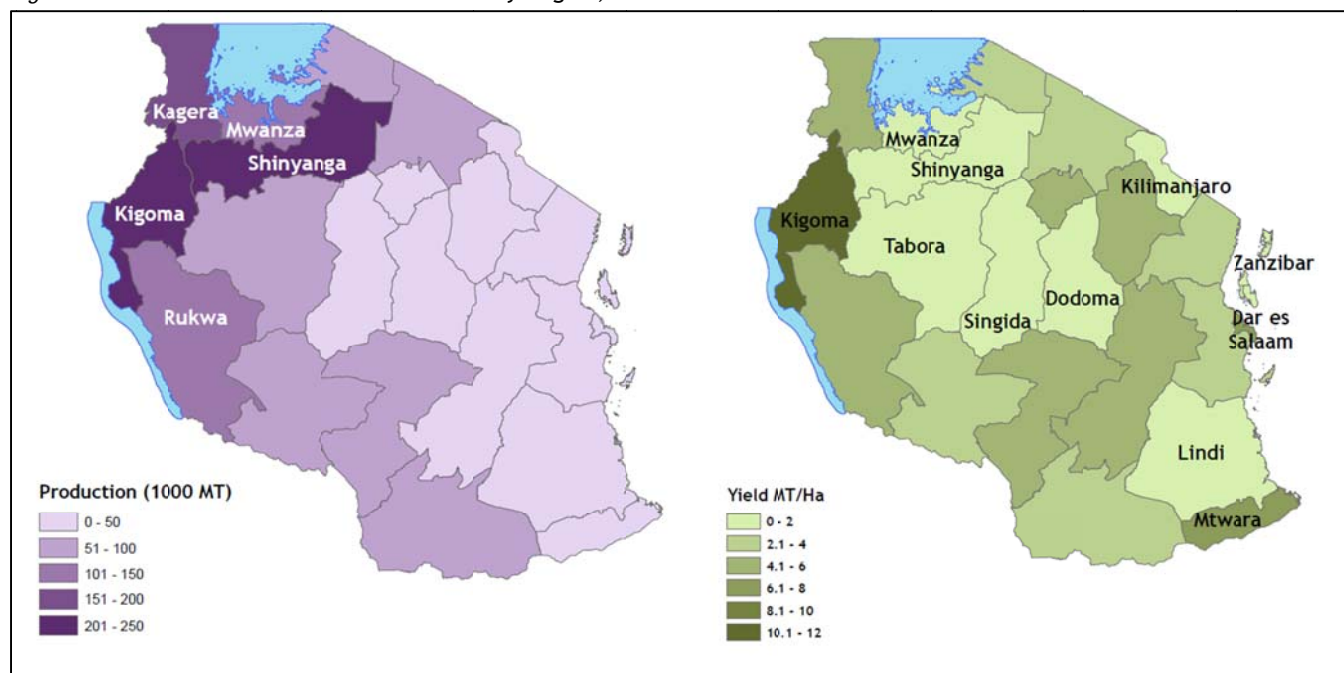
	Per capita caloric intake from sweet potatoes (% of total caloric intake)	Per capita protein intake from sweet potatoes (% of total protein intake)	Per capita fat intake from sweet potatoes (% of total fat intake)
1990	39 kcal/day (1.8%)	.5 g/day (.9%)	.1 g/day (.3%)
2009	79 kcal/day (3.7%)	1.1 g/day (2.0%)	.2 g/day (.5%)

Source: FAOSTAT

Overview of Sweet Potato Production in Tanzania

Sweet potatoes are produced throughout Tanzania, but the primary production areas are the Lake Zone, Southern Highlands, and Eastern Zone. In the Lake Zone, the Mwanza and Shinyanga regions are the leading producers.²⁰ According to the Tanzania Ministry of Agriculture, Shinyanga and Mwanza account for 31.7% and 23.3% of the area planted with sweet potato in Tanzania, respectively.²¹ However, Dar es Salaam leads the nation in terms of percentage of land planted with sweet potatoes, as well as sweet potatoes planted area per household, which may reflect the growing importance of sweet potatoes among urban consumers. See *Figure 5* for production and yield by region in the 2005 season.

Figure 5: Sweet Potato Production and Yield by Region, 2005



Source: Maps made by EPAR using data from the Tanzania Ministry of Agriculture

Sweet potatoes in Tanzania are propagated through vine cuttings, which are taken either from the farmer’s own supply or purchased from other farmers. Cuttings are occasionally distributed in the case of disaster relief or to promote a new variety. Specific vines are selected mainly on the basis of healthy appearance and freedom from disease or pests. The vines that provide cuttings must be weeded, watered, and inspected regularly, and diseased plants must be removed.²²

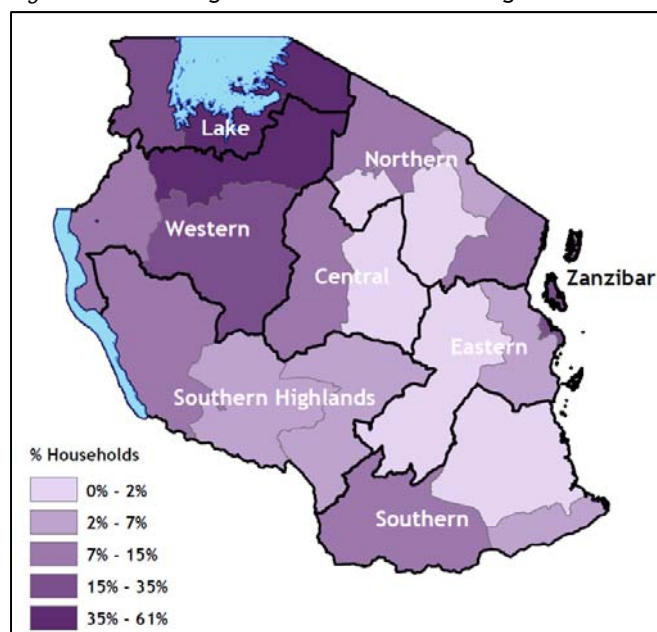
The main harvest period in the Lake Zone is from May to July, coinciding with the long rainy season.²³ In the 2007-08 agricultural year, the national sample census of agriculture estimated that 275,003 households grew sweet potatoes during the short rainy season and 467,089 households during the long rainy season on the mainland.²⁴ A further 12,241 households in the short rainy season and 16,924 households in the long rainy season grew sweet potatoes in Zanzibar.²⁵ Table 6 shows the percentage of households cultivating sweet potatoes in Tanzania. There was little overlap between the long rainy season and the short rainy season; both data sources indicated that most farmers cultivated in either one or the other. Also see Figure 6 for the percentage of households cultivating sweet potato by zone.

Table 6: Percentage of Households Cultivating Sweet Potato by Growing Season

	LSMS-ISA (N=2,230)	United Republic of Tanzania (N=5,838,523)
Long Rainy Season	10.7%	8.3%
Short Rainy Season	6.4%	4.9%
Total Cultivating Sweet Potatoes (Either Season)	15.4%	13.5%

Source: LSMS-ISA Tanzania 2008 data, United Republic of Tanzania, 2012

Figure 6: Percentage of Households Cultivating Sweet Potato by Zone



Source: Map made by EPAR using LSMS-ISA Tanzania 2008 data

A 1997 study (Thomson, Ndunguru, and Waida) asked two key sweet potato traders in Mwanza to discuss the changes in sweet potato quantity, quality, and price through the year.²⁶ These traders described a peak in quantity between May and July, with a second (significantly lower) peak in December, when a crop of sweet potato grown on paddy fields became available. Smaller quantities are traded just before (March and April) and after (August and September) the main harvest season. The few sweet potatoes traded in other months were available only through in-ground storage and piece-meal harvesting. Quality was the highest in the main harvesting season, and lowest in September and October, when potatoes were past their ideal harvest time and had become watery.

Farmer Demographics

Women, who do the majority of the production and decision-making, largely oversee sweet potato production.²⁷ One large survey (Kapinga, Ewell, Jeremiah et al., 1995) looked at the share of production, processing, and marketing activities (planting, weeding, storage, etc.) performed by women within different regions in Tanzania (see *Table 7*). It found that the share of work done by women varied significantly by both region and activity, but men did at most 50% of the work, and sometimes none at all. Women were also responsible for finding suitable plots of land for sweet potatoes, and for obtaining planting materials. Another survey of 200 households (Mmasa, Msuya, and Mlambiti, 2012) found that most farmers interviewed perceived sweet potato as a female crop because the market value was not as high as maize or cotton.

Table 7: Gender Responsibility for Sweet Potato Production, Processing, and Marketing Activities in Tanzania by Zone

Activity	Central (N=109)	Lake (N=186)	Northern	Southern (N=200)	Eastern (N=146)	Overall mean
	F (M)	F (M)	F (M)	F (M)	F (M)	F (M)
Field preparation	60 (40)	52 (48)	50 (50)	50 (50)	50 (50)	52 (48)
Planting	100 (0)	100 (0)	100 (0)	100 (0)	80 (20)	96 (4)
Weeding	100 (0)	90 (10)	60 (40)	80 (20)	50 (50)	76 (24)
Harvesting	80 (20)	100 (0)	100 (0)	100 (0)	50 (50)	86 (14)
Processing	100 (0)	100 (0)	N/A	100 (0)	100 (0)	100 (0)
Storage of processed product	100 (0)	100 (0)	N/A	80 (20)	60 (40)	85 (15)
Rural area marketing	30 (70)	50 (50)	50 (50)	40 (60)	50 (50)	44 (56)

Source: Kapinga, Ewell, Jeremiah et al., 1995

Note: N not available for Northern Zone

Yield Gaps

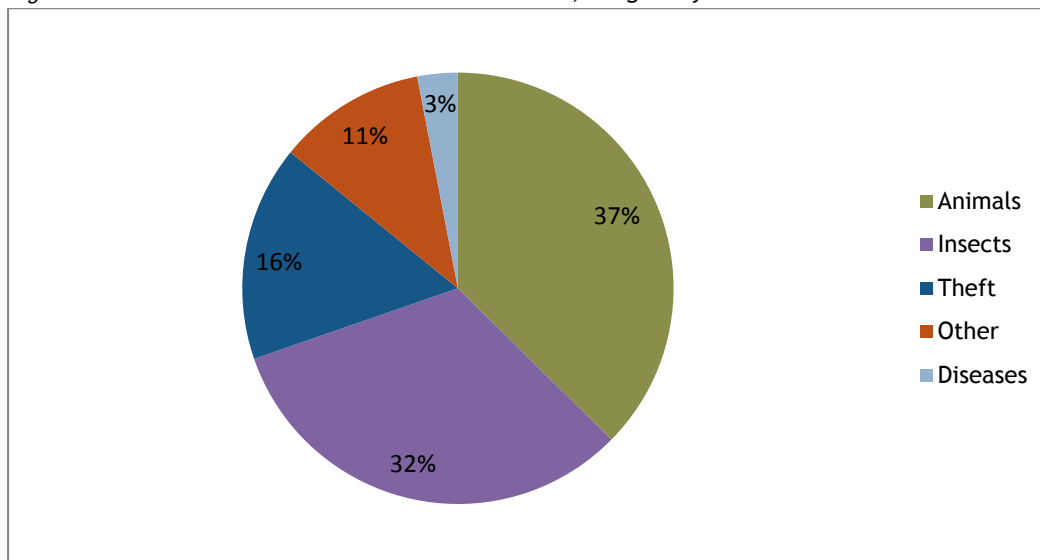
Estimates of potential sweet potato yields in Tanzania vary, but current yields are clearly far below their potential. In a 2009 report, the International Potato Center characterized sweet potato yields in Sub-Saharan Africa as being between 3 and 6 MT/ha in areas with a limited water supply, and 10-12 MT/ha in areas with adequate rainfall and soil fertility.²⁸ The report stated that potential yields for sweet potato can range up to 40 or 50 MT/ha, and that yields averaging 24 MT/ha have been achieved with improved materials in eastern and southern Africa. Given a potential yield of 24 MT/ha and the current yield of 2.9 MT/ha (*Figure 2*), Tanzania's yield gap in 2010 was 21.1 MT/ha. This suggests the potential for enormous gains if barriers to production and yield can be reduced. However, as mentioned earlier in the discussion around *Figure 2*, sweet potato yields may be underestimated due to piecemeal harvesting.

Factors Constraining Production and Yields

A wide variety of factors limit sweet potato production in Tanzania. The most widely discussed factors include the poor shelf-life of roots, losses in quality during handling, damage from weevils and disease, a lack of planting materials, poor accessibility to markets or market information, and the seasonal nature of production.^{29,30} Other factors include limited processing opportunities, low soil fertility, lack of access to credit among farmers and traders, and a lack of agricultural extension services.³¹ There is also a lack of high-yielding, early-maturing, drought-resistant, high dry matter and beta-carotene content varieties of sweet potato.³² Finally, it has been suggested that because sweet potatoes are grown for food security and marketing opportunities are often lacking, farmers do not manage them for maximum yield.³³ LSMS-ISA survey results showed that 41% of plots in the long rainy season and 50% of plots in the short rainy season experienced pre-harvest losses.³⁴ See *Figure 7* for the main causes of pre-harvest losses in the long rainy season.

The primary factors limiting sweet potato production are discussed in more detail below.

Figure 7: Causes of Pre-Harvest Sweet Potato Losses, Long Rainy Season



Source: LSMS-ISA Tanzania 2008 data

Planting Materials and Methods

The lack of availability of good planting materials at the start of the harvesting season is a major challenge for farmers. A survey of sweet potato farmers in the Lake Zone identified the lack of planting materials as the main constraint to production, as it delayed the planting time and limited the area planted.³⁵ Most farmers were forced to buy planting material from other farmers, oftentimes traveling long distances at significant cost. Farmers in the Meatu district in Shinyanga reported paying the equivalent of \$6 US to travel 50 km and buy a 100 kg bag of cuttings, which could be used to plant 10-15 ridges of 10-20 meters in length.³⁶

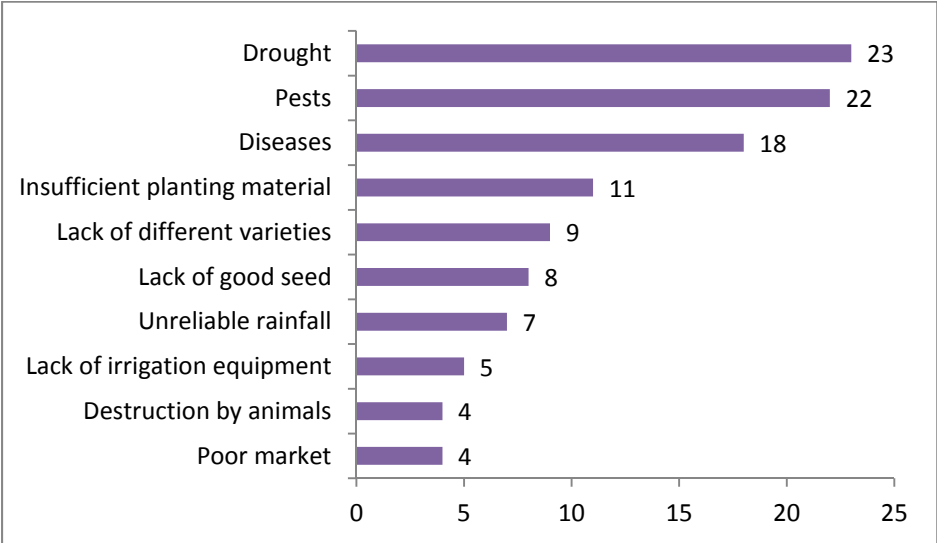
In regions of East Africa without a prolonged dry season, such as parts of Uganda, it is possible to maintain a supply of new vines through the plants that are already growing. However, in areas like Tanzania’s Lake Zone, the long dry season between sweet potato plantings can lead to a shortage of good planting materials, which often results in delayed planting. Delayed planting can mean that the sweet potato crop matures after the end of the rains. At this point the soil around the roots often becomes dry and cracked, creating a means of easy access to the roots for sweet potato weevils that can damage or completely destroy the root. When weevil infestations are particularly bad, farmers are obligated to harvest their remaining crop all at once, whereas they would typically prefer to harvest piecemeal as required for household consumption. This can increase the unevenness of the yearly supply, which is already problematic for farmers who produce an excess of sweet potatoes in the main harvesting season due to lack of good storage facilities.³⁷ The lack of cleaner, younger vines also leads to the use of vine parts that may be infested with pests and disease, furthering their spread.

A mix of alternate methods is used to maintain planting materials in Tanzania.³⁸ One method is growing a crop in the dry season on swampy land. This both provides food during a time of low supply, and also provides planting material in time for the start of the rains. Rice paddy fields are also used. It is necessary to fence these areas, to protect them from being eaten by animals at a time when vegetation is scarce. Another method is growing plants in the shade of other crops, such as bananas or coffee. However, this method cannot survive dry weather indefinitely, and is generally used in regions with only a moderately long dry season, such as Kagera.

A third commonly used source of planting material is “volunteer plants.”³⁹ These are plants found growing on roots left in the ground after the harvest season has passed, either because they were too small to notice or because they were rejected due to damage. Because this source of cuttings is free, it is popular among poor farmers. However, these plants always grow late, and the vast majority become infested by weevils. Finally, some farmers maintain planting material in the dry season through irrigation from a nearby river or other water source, often by hand with buckets. In Tanzania, this watering is done on average every other day for 2.5-3 hours from May to September, and nearly every day at its peak in July. This is generally done by women and young girls.

Some small-scale farmers employing the methods above, particularly watering with buckets or growing in swampy areas, grow enough planting material to sell to others. Farmers in the Shinyanga District reported earning \$90-140 US from the sale of vines.⁴⁰ NGOs play an important role in the secondary multiplication of vines in Tanzania, often using large-scale, mechanically-powered irrigation.

Figure 5: Number of Farmers Identifying Major Constraints to Sweet Potato Seed Production



Source: Namanda, Gibson, and Sindi, 2011, p. 880

Pests and Disease

As previously mentioned, sweet potato weevils (*Cylas* spp. (Coleoptera: Curculionidae)) present a major threat to sweet potato production in Tanzania, and worldwide.⁴¹ The females lay eggs in cavities in either the vines or in easily accessible roots of the sweet potato. Once the larvae develop, they tunnel into the vine or root and feed off of it. The feeding damages the sweet potato roots, and also causes the plant to produce bitter-tasting terpenoids (naturally occurring chemicals), both of which reduce the value of the sweet potato even in cases of minor infestation. Major infestation can render the roots completely unusable. One study (Ndunguru, Westby, Gidamis et al., n.d.) found that weevil infestation decreased the market value of sweet potatoes by 55% in Tanzania.⁴² Past studies have shown that in eastern Africa, the sweet potato weevil can cause yield losses of up to 73% (Smit, 1997) or 60-100% in times of drought (CIP, 2010).

Disease is also a major obstacle to production, particularly sweet potato virus disease (SPVD). This disease results from a simultaneous infection from the sweet potato feathery mottle virus (SPFMV), spread by aphids, and the sweet potato chlorotic stunt virus (SPCSV), which is spread by whiteflies. SPFMV has no symptoms by itself, but in combination with SPCSV the two viruses cause severe stunting, very low production of storage roots, and small, malformed leaves. Many sweet potato landraces are resistant to the disease, but they tend to be low-yielding and late-maturing.⁴³ Infection rates in Tanzania are high. One study found that infection rates in the Lake Zone varied from 54% to 94% (Barker, Andrade, Labarta et al., 2009). Another study looked at five locations each in the Mwanza and Kagera regions and found that SPVD infection rates ranged from 37-56% in Mwanza and 13-94% in Kagera (Ndunguru, Kapinga, Sseruwagi, et al., 2009). Both viruses are spread through cuttings. The International Potato Center has suggested that host plant resistance is the most effective long-term strategy for controlling SPVD. However, sweet potato varieties that have been bred for SPVD resistance and high yields have not been universally adopted by farmers if they lacked other desirable characteristics, such as storage root quality and compatibility with piecemeal harvesting.⁴⁴

Post-Harvest Practices and Challenges for Sweet Potato Farmers

Storage and Transportation Practices

Fresh sweet potatoes in Tanzania have a shelf-life of only 1-2 weeks after harvesting. Under the right storage conditions, it is possible to store sweet potatoes for much longer periods of time. In the United States, for instance, sweet potato roots stored at 13-15 degrees Celsius and 90% humidity can be stored for up to a year.⁴⁵

Research from the Natural Resources Institute (NRI) has shown that the use of pits and clamps with thatched roofs can extend the life of sweet potatoes for up to 4 months.⁴⁶ However, these methods are not universally used. Sweet potatoes stored in this way are acceptable for home consumption, but are more difficult to market, because they lack the natural garden look that consumers expect.

A study by Van Oirschot, Ngendello, Rwiza et al. (2007) conducted in Tanzania compared sweet potato stores that differed by type (pit or heap), cultivar, and ventilation. They found that the main conditions that improved the storability of fresh sweet potatoes in tropical conditions were the use of high quality roots without damage or disease, avoiding grass linings (which led to higher levels of shriveling and weevil infestations), and avoiding high temperatures in the stores. The type of store, cultivar used, and level of ventilation had little effect. However, the authors emphasized the importance of positioning the store under a tree canopy (in addition to the store having a roof) and in a position where it would not be flooded by rainwater. The study found that roots stored in ideal conditions could be stored for up to 12 weeks.

Table 8: Sweet Potato Storage Methods, 2007-2008 Season

	Long Rainy Season (N=484,013)	Short Rainy Season (N=287,244)
Locally Made Traditional Structure	39.1%	28.4%
Sack/Open Drum	30.6%	29.7%
Not Stored	22.6%	32.0%
Unprotected Pile	2.7%	4.1%
Improved Locally Made Structure	1.7%	2.7%
Modern Store	.4%	.7%
Airtight Drum	.2%	.1%
Other	2.7%	2.4%

Source: United Republic of Tanzania, 2012

Post-Harvest Losses

Several types of damage reduce the market price of sweet potatoes once they have been harvested, especially related to water loss, transport and handling, and weevil infestation. Low humidity leads to water loss through the root periderm (the protective outer layer), and consequently weight loss and shriveling. Rough handling during loading and unloading and the high number of small impacts during transportation also lead to breaks and cuts in the sweet potatoes that reduce their value. Weevil infestations continue to be a problem post-harvest, and can have the most devastating effect on product value. In a 1997 survey (Thomson, Ndunguru, Waida et al.), four sweet potato traders were asked to give prices for heaps of sweet potatoes that were separated by types of damage. The authors of the study then calculated the average reduction in value resulting from each type of damage. *Table 9* compares the results of the 1997 survey and a similar survey of traders in Mwanza and Shinyanga conducted in 2001 (Ndunguru).

Table 9: Reductions in Sweet Potato Value from Various Types of Damage

Damage Type	Thomson, Ndunguru, Waida et al., 1997	Ndunguru, 2001
Shriveled	15%	n/a
Broken	26%	12.1%
Cut	28%	14.2%
Surface weevil	39%	36.3%
Deep burrowing weevil	55%	n/a

Source: Thomson, Ndunguru, Waida et al., 1997, p. 23, and Mmasa, Msuya, and Mlambiti, 2012

Marketing Systems

The marketing systems for sweet potatoes in Tanzania are limited, due partly to the lack of processing and storage options.

Table 10: Marketing Problems Reported by Households Cultivating Sweet Potatoes, 2007-2008 Season

	Long Rainy Season (N=230,468)	Short Rainy Season (N=137,492)
Open Market Price Too Low	58.9%	62.2%
Crop Market Too Far	6.9%	6.0%
Transport Cost Too High	5.6%	4.4%
No Transport	4.9%	4.1%
No Buyer	3.5%	2.4%
Lack of Market Information	1.9%	1.8%
Government Regulatory Problems	0.6%	0.5%
Farmer Association Problems	0.3%	0.2%
Cooperative Problems	0.2%	0.1%
Trade Union Problems	0.1%	0.2%
Other	1.0%	0.3%
No problems	15.9%	17.8%

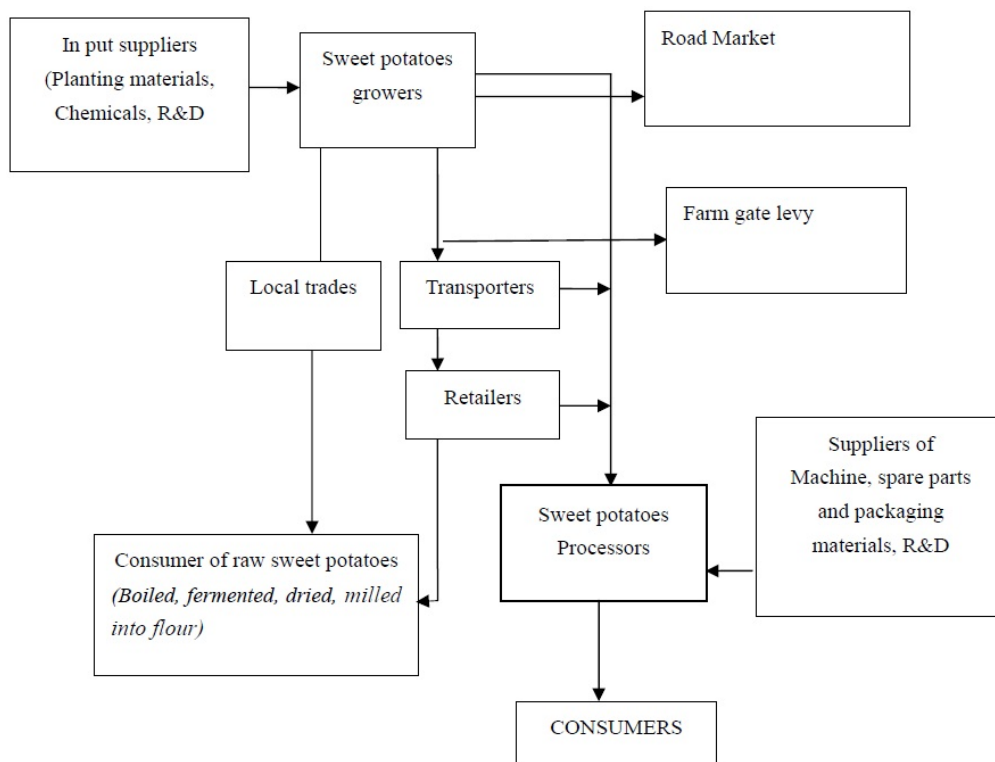
Source: United Republic of Tanzania, 2012

One recent study (Mmasa 2012) looked at the sweet potato value chain in the Shinyanga rural and Mwanza urban districts. It found that sweet potato farmers obtained market information on a relatively informal, local basis, and prices were decided by a small number of people in the value chain. Approximately half (50.7%) of the farmers surveyed set prices based on what other farmers said.⁴⁷ Another 44.7% reported setting prices after personally visiting the local market. The remainder learned of prices from friends, extension officers, or NGOs.

There are a variety of key players involved in the sweet potato trade in Shinyanga and Mwanza⁴⁸:

- *Producers* sell fresh or processed sweet potatoes to traders or other farmers experiencing food shortages. They also sell directly to consumers.
- *Vendors* buy sweet potatoes from producers and sell them to consumers. They are relatively few in number, and are not organized into any kind of professional organizations.
- *Processors* turn fresh sweet potato into processed product. They are generally also producers, and work on a small scale with limited equipment.
- *Retailers* sell sweet potato to consumers in both urban and rural areas. They generally work at town markets, village centers, and on road sides. They buy their sweet potatoes directly from farmers or from large-scale traders, and purchase roughly a week’s worth of fresh sweet potato at a time. They also sometimes engage in processing at the market to extend the product’s shelf life.
- *Consumers* generally purchase sweet potatoes from local markets, although they also purchase directly from producers.

Figure 8: Sweet Potato Value Chain in Tanzania



Source: Mmasa and Msuya, 2012

Conclusion

Tanzania is a major producer of sweet potatoes in Sub-Saharan Africa, but production has not increased during the past decade. Yields are far below what has been achieved under test conditions in Sub-Saharan Africa, but are reliable, and sweet potato is valued for its tolerance of marginal land and long dry seasons. However, production and yields are constrained by a number of limiting factors, including the lack of suitable planting materials, sweet potato weevils, sweet potato virus disease, and the seasonal nature of production. After harvest, sweet potato producers face limited storage options, damage from handling, further weevil attacks, and underdeveloped markets.

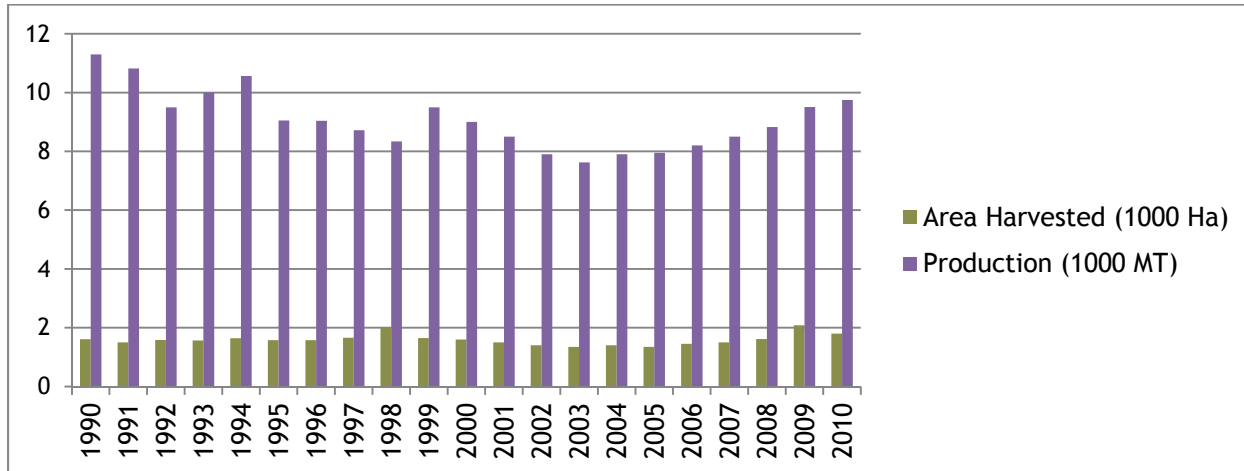
Despite these challenges, sweet potatoes play an important role in household food consumption, nutrition, food security, and income. They are also increasingly popular with Tanzania’s growing urban population, and are a source of responsibility

and decision-making for female farmers. Although not as popular as other varieties, orange-fleshed sweet potatoes hold the potential to decrease vitamin A deficiency in Tanzania, especially for children.

Appendix: Yams in Tanzania

Production of yams in Tanzania is extremely low in comparison to the production of sweet potatoes. According to FAOSTAT, in 2010 the amount of yams produced was only .7% as large as the amount of sweet potatoes produced (see *Figure 9*). Production of yams declined between the early 1990s and 2003, and although it has steadily increased since 2003, production has not yet returned to its 1990 level of 11,300 MT.

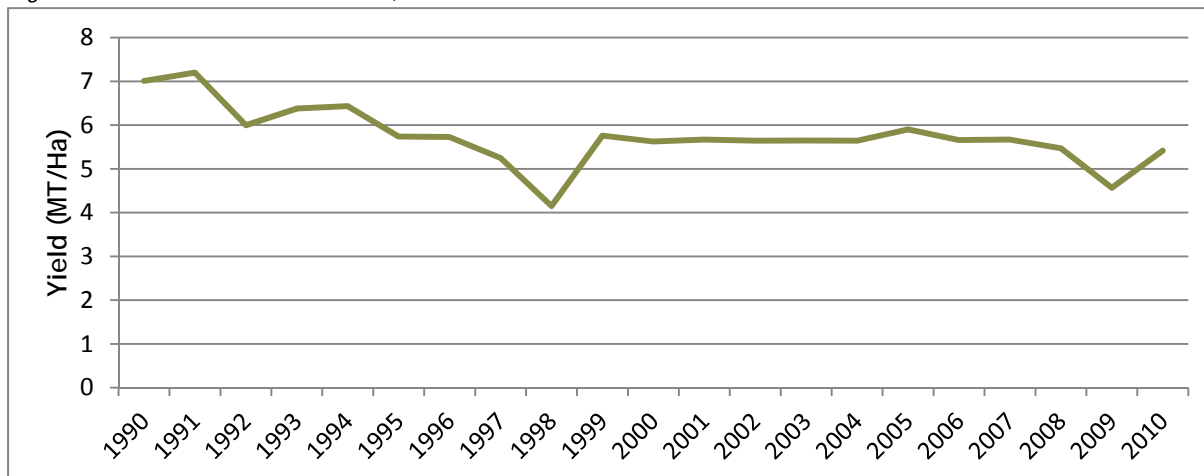
Figure 9: Estimates of Area Harvested and Production of Yams in Tanzania, 1990-2010



Source: FAOSTAT

As with production, yam yields have declined since 1990 (see *Figure 10*). Based on FAOSTAT data, yam yields are much higher than sweet potato yields. Yam yields in 2010 were 5.4 MT/Ha, compared to 2.9 MT/Ha for sweet potatoes in the same year.

Figure 10: Yield Estimates for Yams, 1990-2010



Source: FAOSTAT

According to FAOSTAT, no yams are imported or exported. No relevant literature was found on the production, storage, marketing, or consumption of yams in Tanzania.

Literature Review Methodology

Searches for literature were conducted through Google Scholar and the University of Washington library website, using combinations of the terms “Tanzania,” “sweet potato,” “yam,” “East Africa,” “price,” “yield,” “value chain,” “intercropping,” “production,” and “marketing.” Data was also gathered from FAOSTAT, CountrySTAT Tanzania, and Tanzania’s Bureau of Statistics and Ministry of Agriculture.

Please direct comments or questions about this research to Leigh Anderson and Mary Kay Gugerty, at eparx@u.washington.edu. Thanks to Angela Gaffney and Alice Golenko for providing maps and LSMS-ISA data.

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