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Yam Value Chain: Ghana
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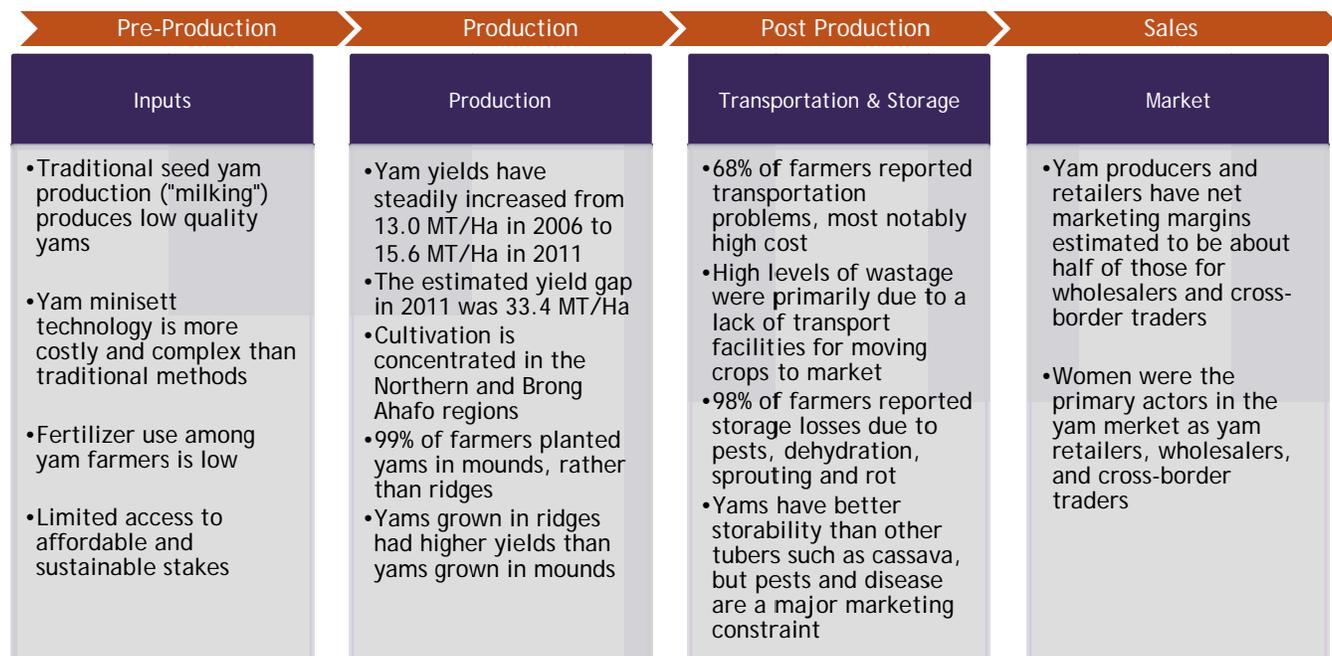
Ghana Yam Value Chain Highlights

This brief provides a general overview of the market for yams in Ghana. We begin by describing historical trends in yam production and consumption since 1996, recent international trade, and prices. The second section summarizes the varieties grown in Ghana and their uses. The next several sections review available information about the production and marketing systems, followed by a discussion of the importance of yams as a source of nutrition and household income. The limited information available on sweet potato production in Ghana is presented in the appendix.

Key Takeaways

- Yam production in Ghana has increased steadily over the last 15 years.
- Yam yields have increased from 12.8 MT/Ha in 1996 to 15.6 MT/Ha in 2011; however, an estimated yield gap of 33.4 MT/Ha persists.
- Yam export levels have varied over the past 15 years, but show a generally positive trend.
- Most yam farmers are male smallholders with low levels of education, while most retailers, wholesalers and cross-border traders are women.

The below figure summarizes key findings along the different stages of the yam value chain in Ghana.



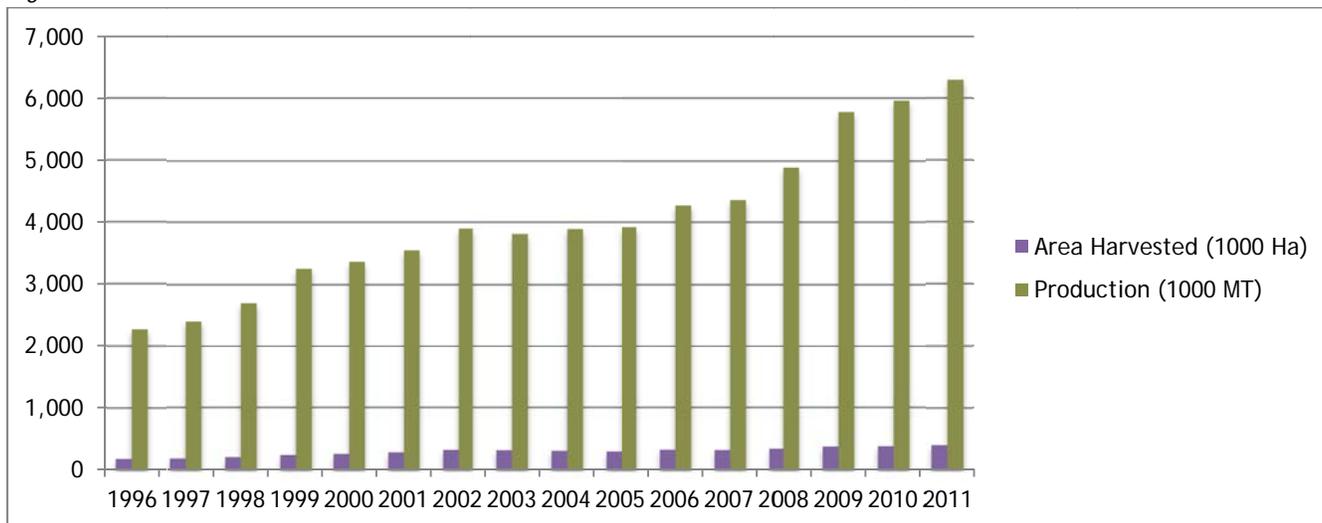
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Key Statistics about Yams in Ghana

Yam Production and Yields in Ghana are Large and Growing

Yams had the second highest production level of any food crop in Ghana over the past fifty years, and yam production increased from 1980-2002 by an average of 13.2% per year.^{1,a} Production has increased in all but one year since 1996, with a high of 6,295,500 MT in 2011 (see *Figure 1*). In 2010, Ghana became the second largest producer of yams in the world in terms of quantity, and has been the second largest producer in terms of value since 2001; in 2010, the gross agricultural production value for yams was USD\$1,654,000 and accounted for the largest proportion of any crop (see *Table 1*).^{2,b}

Figure 1: Estimates of Total Area Harvested and Total Production of Yams in Ghana, 1996-2011



Sources: FAOSTAT and CountrySTAT Ghana (Statistical, Research, and Information Directorate, SRID-MoFA)

Note: FAO estimates are reported for 1996-1999, while estimates from SRID-MoFA are reported for 2000-2011. In most years, both sources have the same estimate.

Table 1: Top Five Crop Contributors to Gross Agricultural Production Value in Ghana in 2010

Crop	Gross Production Value (constant 2004-2006 USD\$)	Proportion of Total Production Value
Yams	\$1,654,000	17.3%
Cassava	\$1,541,000	16.1%
Plantains	\$1,025,000	10.7%
Cocoa beans	\$630,000	6.6%
Maize	\$534,000	5.6%

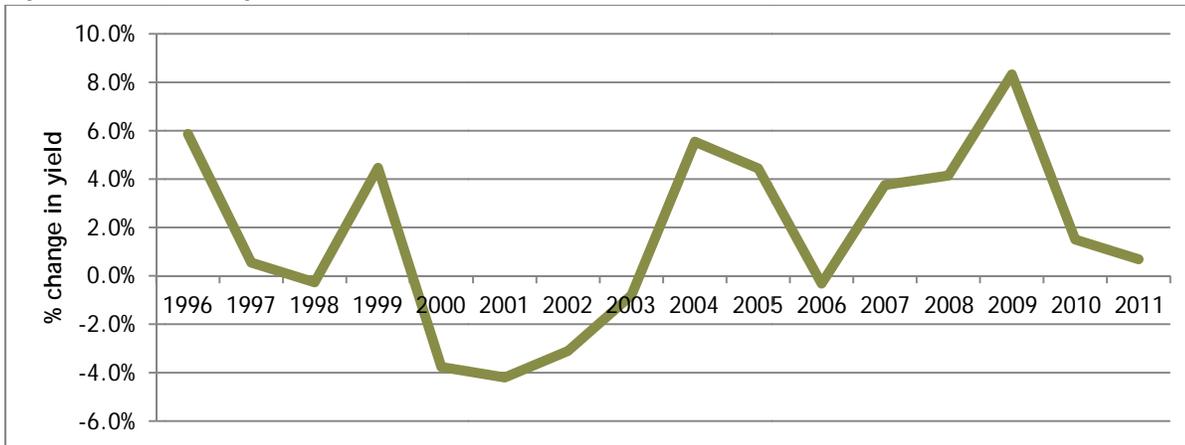
Source: FAOSTAT and author's calculation

While the area harvested of yams increased from 178,000 hectares in 1996 to 403,800 in 2011, improved yields also contributed to the production boost. The yield for yams was 15.6 MT/Ha in 2011, up from 12.8 MT/Ha in 1996.³ However, growth in yields has varied significantly over the past 15 years. Recent increases in yields from 2006 to 2009 may be related to the implementation of the Root and Tuber Improvement and Marketing Program by the Ministry of Food and Agriculture (MoFA) in 2007. Yields have shown a notable decline in the growth rate over the past two years (see *Figure 2*).

^a Cassava is the only food crop with a higher production level.

^b Nigeria is the largest yam producer in regard to both quantity and value. The value estimate is in constant 2004-2006 USD\$.

Figure 2: Annual Change in Yield Estimates for Yams, 1996-2011



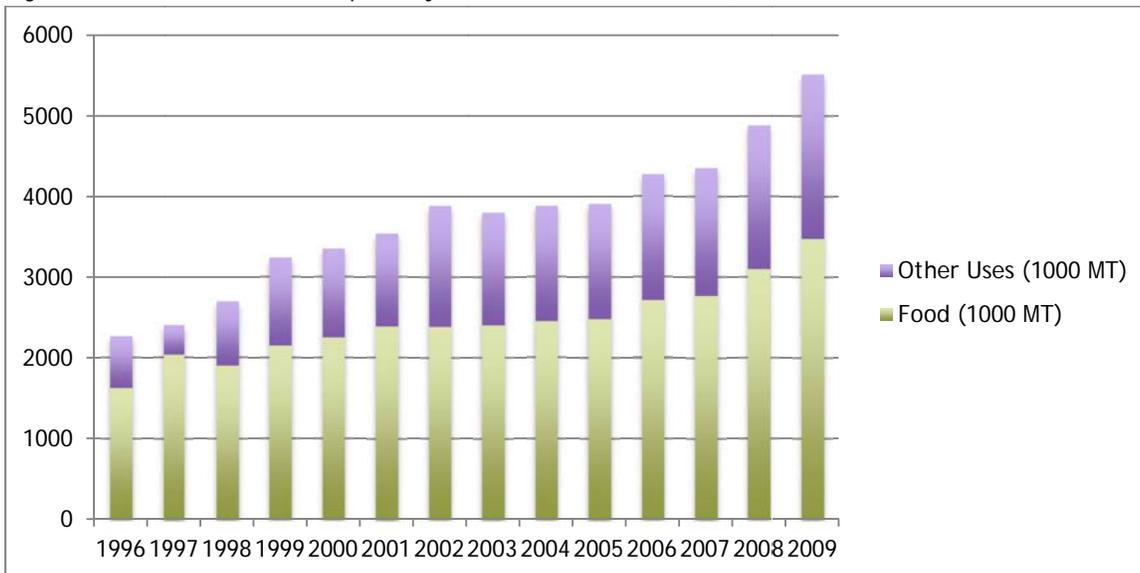
Sources: FAOSTAT and CountrySTAT Ghana (Statistical, Research, and Information Directorate, SRID-MoFA)

Note: FAO estimates are reported for 1996-1999, while estimates from SRID-MoFA are reported for 2000-2011. In most years, both sources have the same estimate.

Most Yam Consumption is for Food, with Significant Losses due to Wastage

Domestic consumption has increased significantly since 1996; according to FAO estimates, consumption grew from 2,267,000 MT in 1996 to 5,517,000 MT in 2009 (see Figure 3). Non-food consumption has risen at a faster rate than food consumption and now accounts for 37% of total consumption, compared to 28% in 1996. It is not clear from FAO documentation where wastage is factored into these estimates, but the MoFA estimated that 80% of yam production in 2006 was available for human consumption, while 20% of production was lost to wastage or other unspecified uses.⁴ FAOSTAT does not report any yam use for animal feed or seed.⁵

Figure 3: Domestic Yam Consumption by Food versus Non-food Uses, 1996-2009



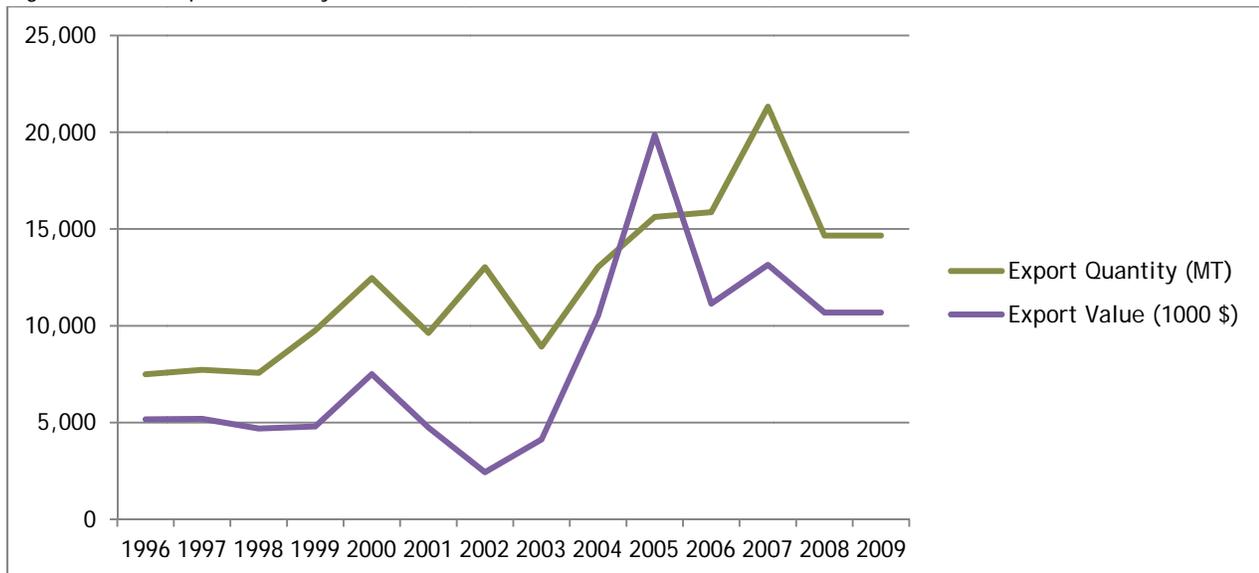
Source: FAOSTAT

Ghana is a Major Yam Exporter, Primarily to European Countries

Although yam export levels in Ghana have shown significant variation since 1996, export levels have trended upward overall (see Figure 4). After a peak of 21,323 MT in 2007, Ghana exported 14,666 MT in the subsequent two years; despite that decline, Ghana was still the third largest yam exporter in the world by quantity in 2008 and the second largest (after Costa

Rica) in 2009. Despite these large export share, however, yam exports account for an average of only 0.3% of domestic production from 1996-2009.

Figure 4: Yam Export Quantity and Value from Ghana, 1996-2009

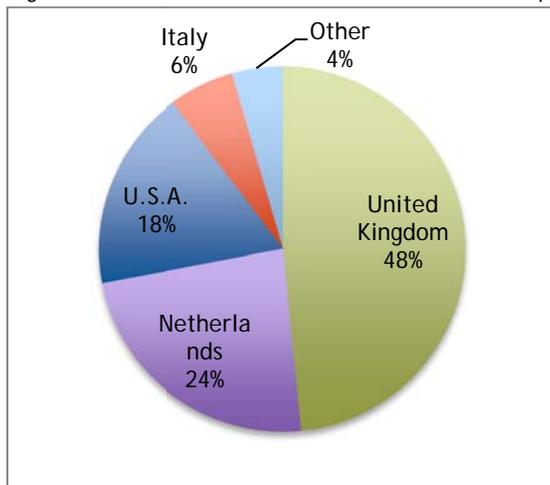


Source: FAOSTAT

Note: The Ghana Ministry of Food and Agriculture (MoFA) also presents export estimates for 1998-2006, which differ from FAO estimates in the majority of those years. There is no evidence of systematic bias in either data series, since one series is not consistently higher or lower than the other. The reason for this inconsistency across sources is unknown.

Nearly all of Ghana's yam exports go to European countries or the United States; in 2008, nearly half went to the United Kingdom (see Figure 5).

Figure 5: Destination Countries for Ghana Yam Exports in 2008 (By Proportion of Quantity Exported)



Source: FAOSTAT

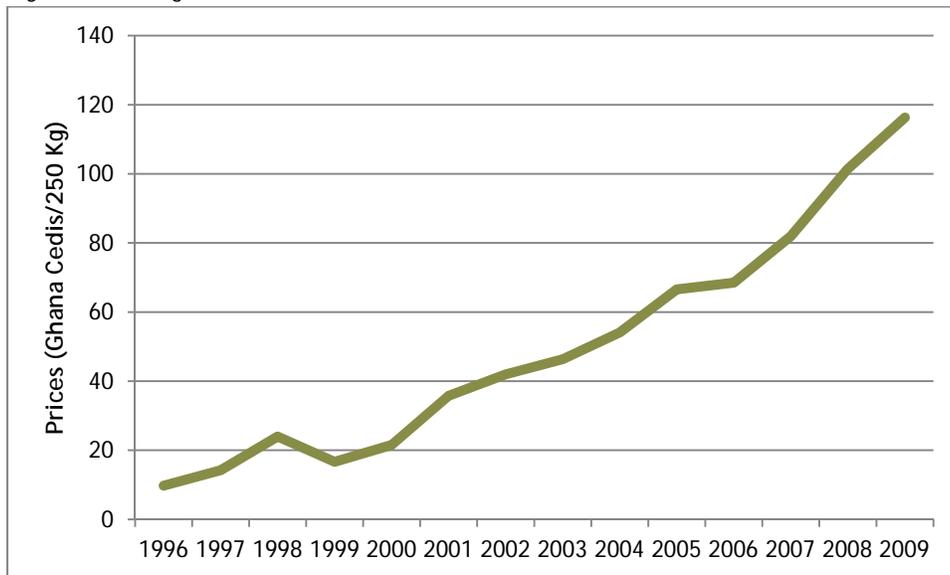
The Government of Ghana has Adopted Policies to Liberalize Trade

The government in Ghana has adopted trade liberalization policies in an effort to position Ghana as the gateway to the broader West African market for international traders.⁶ In December 2007, the government signed a bilateral Economic Partnership Agreement with the European Commission that eliminated most tariffs on virtually all of Ghana's exports to Europe and on 80% of imports from the European Union by 2022.

Yam Prices have Increased Sharply since 2000 and Exhibit Strong Seasonal Variation

Local food prices in Ghana have been rising rapidly since 2000, and yam prices were no exception (see *Figure 6*).⁷ Prices have increased every year since 2000, when the average wholesale price was 21.53 Ghana cedis (\$15.20) for 100 tubers (about 250 kilograms); in 2009, the average wholesale price increased to 116.30 Ghana cedis (\$83.07) for 100 tubers. The margin between farm gate and wholesale prices has also increased. In 2006 the farm gate and wholesale prices were both approximately 68 Ghana Cedis/100 tubers, but by 2008 the average farm gate price was 83 Ghana cedis/100 tubers and the wholesale price had risen to 101.43 Ghana cedis/100 tubers.⁸

Figure 6: Average Wholesale Yam Prices in Ghana, 1996-2008



Sources: CountrySTAT Ghana and Millennium Development Authority (both reporting data from MoFA-SRID)

Note: All prices are in Ghana Cedis, which were implemented in 2007 at an exchange rate of 10,000 Cedis = 1 Ghana Cedi.

Yam prices are generally very low in August-October, when yams are abundant, but can be very expensive in November-July, when there are relatively long periods of scarcity. The “lean season” for yams is between March and June, and yam prices are highest in June and July when the preferred variety of yam is out of season and in low supply.^{9,10,11} *Figure 7* illustrates these trends using price data from 2008, when the average farmgate price reached its peak in July and then sharply dropped to half that level in August.

Figure 7: Monthly Average Farmgate Prices, 2008



Source: CountrySTAT Ghana

Note: All prices are in Ghana Cedis, which were implemented in 2007 at an exchange rate of 10,000 Cedis = 1 Ghana Cedi.

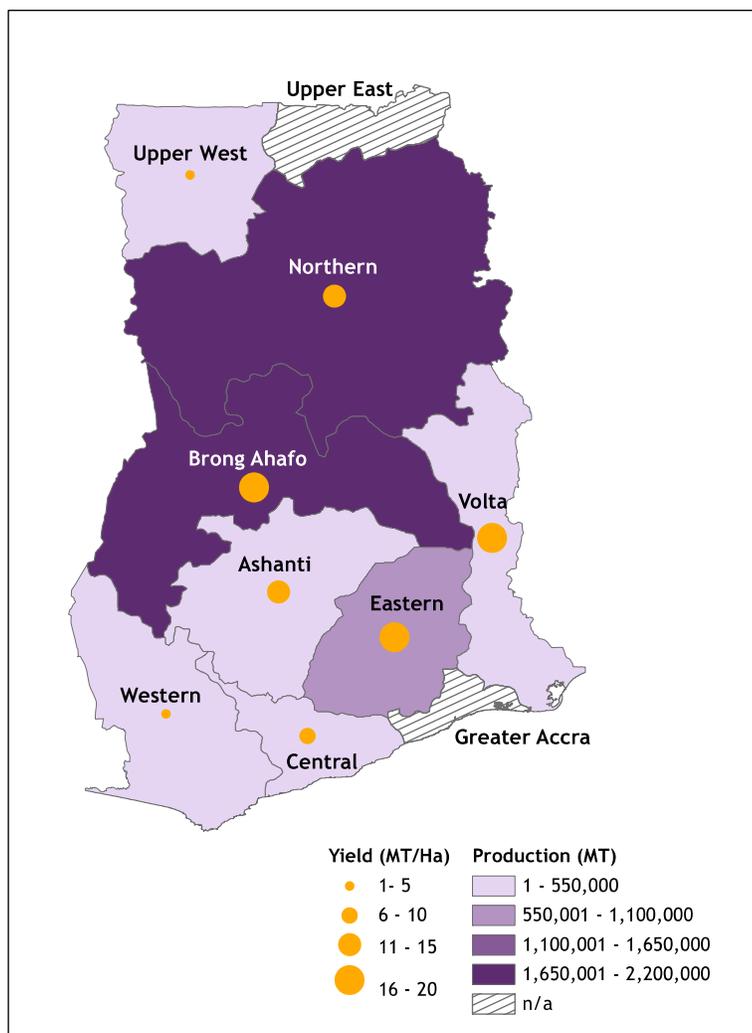
Yam Varieties Grown and their Uses

The majority of yams grown in Ghana are varieties of white yam (*Dioscorea rotundata*) or water yam (*D. alata*).¹² “Kpono” and “Labako” were the most popular varieties of white yam grown in one survey of Northern region farmers; although farmers claimed those varieties were among the lowest yielding and did not store well, they were still popular due to their good taste and early maturity. “Ziglangbo” was another popular variety because it could be stored for a longer period of time and therefore be available when other varieties were not in season. Farmers reported that the choice of variety cultivated depended on household eating habits, availability, and market value or demand. In this survey, nearly all of the yams cultivated were meant for both home consumption and sale, while only 4% was reserved solely for sale.¹³ Yams in Ghana are processed into various forms for consumption including fufu; boiled, roasted, or grilled yam; mashed yam; and chips.¹⁴

Overview of Yam Production in Ghana

While yam is grown all over the country, a large proportion is cultivated in the Northern and Brong Ahafo regions (see Figure 8).¹⁵

Figure 8: Yam Yields and Production by Region, 2006



Source: Map made by author using data from CountryStat Ghana (SRID-MoFA)

Land preparation, mounding, and planting usually begin in October and end in May of the following year. Farmers prefer this timing because the rainy season is between May and October.¹⁶ Most farmers (57%) in Sowley and Tiesaa, 2007 (Survey 2, Table 2) from the Northern region reported planting their yams between November and December and 36% between March and April.¹⁷ Yams take approximately a year to reach maturity. Yams are generally harvested from June to August, and usually abundant in Ghana from August to October and scarce from November to June. Because yam production is not feasible throughout the year, long-term storage is needed for tubers¹⁸

Most Yam Farmers are Male Smallholders

Several surveys of yam farmers have been conducted in Ghana that included questions about sociodemographic characteristics (see *Table 2*). Each of these studies has methodological limitations but together they provide a basic picture of yam cultivation in the key yam growing regions in Ghana. The data on cultivation presented below rely largely on these three studies. Yam farmers are predominantly male smallholders with little or no formal education, but findings about their average age are mixed. One survey reported an average age of 50 years with an average of 26 years of farming experience,

while the majority of respondents in another survey were 30-40 years old.^c Diverse ethnic groups are involved in yam production in the Northern region, including Dagomba, Gonja, Basare, Safaliba, Dagati, Mo, Bono, Kokomba, and Chokosi.¹⁹

Table 2: Comparison of Methods and Findings about Yam Farmer Sociodemographics from Three Surveys

	Survey 1: Asante, Mensah, and Wahaga 2007	Survey 2: Sowley and Tiesaa 2007	Survey 3: Braimah, Anchirinah, and Adu-Mensah 2008
Geographic Area	Northern Region	Northern Region	Brong Ahafo and Ashanti Regions
Survey Dates	July 2000-October 2001	October 2001-February 2002	June 2000
Sampling Methods	Non-random sampling: 10-20 farmers in 10 districts were selected with the help of extension agents for a total of 130 farmers.	Administered questionnaire in 10 randomly selected locations (7 villages and 3 market centers) to a total of 84 farmers and 36 yam sellers. Method for selecting respondents is not described in the article.	Administered questionnaire to 90 randomly selected farmers in three yam-growing districts. .
Gender	95% married males	84% male and 36% female (error in article since these add up to more than 100%)	92.3% male
Average Age	50.3 years ^d	Majority of respondents 30-40 years old (84%). 23% 40-50 yrs, 18% 20-30 yrs, and 5% 50-60 yrs. Another error-may be 54% for 30-40 yrs.	48 years. ^e
Education	88% illiterate ^f	n/a	67% illiterate ^g
Average Landholding Size	1.1 hectares ^{**h}	n/a	1.3 hectares ^{**}

**Values converted from acres to hectares by author.

Diverse Factors Constrain Yam Yields in Ghana

MoFA estimates the achievable yam yield in Ghana to be 49.0 MT/Ha, and therefore the estimated yield gap in 2011 was 33.4 MT/Ha (average yield was 15.6 MT/Ha).²⁰ Yam farmers in Ghana encounter many barriers including declining soil fertility, lack of access to credit, lack of transportation to markets, inaccessible roads, high crop perishability due to a lack of storage facilities, high production costs for labor and planting materials, pests, and diseases.²¹ This section reviews available literature about common yam farming practices in Ghana and the main constraints reported by yam farmers; the majority of the available evidence comes from the three surveys in Table 2 above.

^c This difference may be the result of different survey sampling methods; in the survey that reported a higher average age, respondents were recruited with the help of extension agents who may have had stronger relationships with older farmers whom they have worked with for a long time.

^d Range 20-80 years. 83% of respondents above the age of 40.

^e 34% of respondents above the age of 50.

^f 7% had received elementary education, and 5% had secondary education.

^g 11% had basic education

^h Range 0.2-4.9 hectares. 63% had between 0.8 and 1.6 acres of yam farm.

The Availability of Affordable High Quality Seeds is Limited

Asante, Mensah, and Wahaga (2007) report most yam farmers (88%) get planting materials from their own farm, 11% from the market, and 2% from friends. These planting materials are often of a low quality and infected with fungal or bacterial diseases, viruses, or nematodes.²²

The traditional method for obtaining seed yams involves “milking” or harvesting yam tubers after the first six months of planting. The yams are then left in the soil to propagate seed sets ready for the next planting season. This process may result in physiologically immature yams with a shorter shelf life.²³

The yam minisett technique is another method for cultivating yams. This technique involves cutting a yam tuber into approximately 40 pieces and cultivating these pieces into seed yams. The pieces can be dipped into fungicide or nematicide to prevent infections from developing. However, this method is more costly and complex than the traditional method.²⁴

Farmer’s choice in seed yam technique is largely dependent on the type of yam cultivated. In Braimah et al., 2008 (Survey 3, Table 2) farmers cultivating yam varieties that are more amenable to “milking” reported using this technique most often. Farmers cultivating water yams, which are only harvested once a year, were more likely to employ the yam minisett technique. Approximately 20% of farmers in this study could attribute pest problems on their farms to choice in seed material.²⁵

Yam Farmers Generally Use Traditional Cultivation Methods and Tools

Over 94% of yam farmers in Asante et. al., 2007 reported using traditional methods such as mulching, staking, and weeding.²⁶ Yam farmers generally prefer planting by direct seeding rather than transplantation of seedlings.²⁷ Yams may be cultivated either in mounds or on ridges. In Sowley and Tiesaa, 2007 about 99% of farmers reported planting yams in mounds rather than on ridges, and 38% cultivated more than 3,000 mounds every year.²⁸ Yams grown in ridges have shown higher yields than yams grown on mounds. Ridging maximizes the use of land and produces a slimmer yam, which is better suited for the export market than rounder yams grown in mounds. Ridging also provides the opportunity for mechanization, in contrast to mound-making, which is a labor-intensive task.²⁹

Reported strategies for meeting these labor needs varied across two surveys conducted in the Northern region. Respondents in Survey 1 reported that 66% of labor came from seasonal/hired labor, 25% from family, and 5% from friends.³⁰ In Survey 2 that used a different sampling strategy (as described in *Table 2*), 62% of farmers reported depending solely on family labor and 30% used both family and communal labor.³¹

About 36% of farmers in Sowley and Tiesaa, 2007 reported harvesting their yams with sharpened sticks and earth chisels, and 26% reported using sharpened sticks and cutlasses. The vast majority (95%) reported that their harvesting tools injured the tuber; about half reported preventing spoilage by consuming injured tubers as soon as possible, about a quarter either sold them immediately or consumed them, and the rest treated injured tubers with wood ash before storage.³²

None of the 84 farmers included in Sowley and Tiesaa, 2007 reported applying chemical fertilizers to their yams; the article summarizing these findings did not include any information about reasons for not using fertilizer.³³

About 90% of farmers in Braimah et al., 2008 reported weeding at least three times before harvest. Grass weeds were reported on 66.3% of farms and broadleaved weeds affected 30.3% of farms. Only 33.7% of farmers thought that weeds affected the incidence of pests on the farm.³⁴

Limited Access to Affordable, High Quality, and Sustainable Stakes poses a Significant Problem

Staking yam vines increases the sunlight exposure of leaves and enhances photosynthetic efficiency.³⁵ There is no evidence that staking needs vary between planting yams in mounds compared to ridges. A majority of farmers (95.6%) in Braimah et al., 2008 stake their yam plants.³⁶

Staking is a major concern of yam planters. Accessing staking materials and staking operations constitute a major component of yam production costs. Poles for staking have traditionally been cut and carted from outside the farm.

Demand for stakes has contributed to deforestation and biodiversity loss, which reduces soil fertility while increasing production costs and the length of time spent finding stakes.³⁷ Peprah and Boateng (2010) studied the use of trees (referred to as “live stakes”) as an option for avoiding this problem, and found that yams planted with live stakes in the forest-savannah transition zones of Ghana had higher yields than yams planted with conventional stakes.¹

Pests are a Major Cause of Crop Loss, but Farmers Lack Resources to Adopt Control Measures

Yam pests, particularly insects, are one of the major production constraints reported by farmers. Although over 90% of farmers in Asante et. al., 2007 reported pest problems, only 3% used traditional methods of pest control such as wood ash or cow dung; most farmers reported lacking access to appropriate pest control measures.³⁸

Efforts to Shorten the Growing Cycle of Yams have had Limited Success

The long growth cycle of yams also constrains production since it restricts production to a single season every year. The amount of time required to reach maturity depends on the variety. Otoo, Shiwachi, and Onjo (2009) reported that the average maturity period is one year, but farmers in Sowley and Tiesaa, 2007 reported maturity periods of 5-7 months.^{39,40}

During storage tubers are not dehydrated and active metabolism continues. Sprout growth begins after a period of dormancy. For yams harvested for sale and consumption, sprouting after dormancy results in damage to the stored crop. In seed yams, production is slowed by periods of tuber dormancy, which delay propagation in the absence of methods to induce sprouting. Research has been done to explore options for changing the duration of dormancy, which would allow the planting of more than one cropping cycle per year and increase flexibility for yam producers. Plant growth regulators have been used to change the rate of shoot development, but cannot break dormancy.⁴¹

Intercropping with Vegetable or Grain Crops does not Significantly Affect Yam Yields

While we did not find any literature about the frequency of yam intercropping in Ghana, several articles discussed yam intercropping practices and the effects of those practices on yam yields. In West Africa, yams and other late-maturing tuber crops are most often intercropped with vegetable crops. Since the vines of yam seedlings are staked, yam is commonly intercropped with other vegetables that also require staking, such as pumpkin or melon.⁴² Both crops are usually planted early in the season, when rains begin and water is available. However, the faster-growing, earlier-maturing vegetable crops had little to no negative effects on yam yields in field studies.⁴³ Yam may also be relay-planted into the second season of tomato, pepper, okra, or egusi melon, and then harvested in the next year as an early yam.⁴⁴ However, we did not find any literature about the frequency of yam intercropping in Ghana.

One field experiment conducted in Ghana found that yam-based intercropping systems using leguminous grain crops generally led to reduced yam yields, although the difference was not significant. Maize and cowpeas were the two exceptions to this finding, and therefore the researchers concluded that yam farmers in that agroecological zone should use maize and cowpea as minor crops in intercropping to maximize productivity.⁴⁵

Some research suggests that intercropping yams with leguminous grain crops can increase soil fertility because the legume component can release nitrogen into the soil, which is particularly useful in Ghana since farmers rarely use fertilizer. However, the evidence on this question is mixed. In a field study comparing cropping strategies, the number of tubers did not vary significantly across monocropped and intercropped plants.⁴⁶

The cultivation of yams in mounds and ridges can affect the yields of intercropped crops. Vegetable crops, including tomato, pepper, and okra, planted in the ridge or mound base have demonstrated increased yields over those planted in untilled soil.⁴⁷

¹ Yams staked with *Sesbania grandiflora* had a mean yield of 17.7 t/ha in the first year, compared to 15 t/ha for the normal (control) stakes. In the second year, this difference increased to 11.7 t/ha for the live stakes and 7.6 t/ha for the control stakes. Two other tree species were also tested, and both had lower yields in the first year than the control stakes but higher yields than the control in the second year.

Post-Harvest Practices and Challenges for Yam Farmers

Yam Farmers have Diverse Storage and Transportation Practices

In addition to questions about cultivation, the survey conducted by Sowley and Tiesaa (2007) also included questions about post-harvest practices and challenges. All of the farmers stored their produce after harvest; 44% stored tubers on the farm, 27% stored them at home, and 13% stored tubers in the market. The most common storage methods were in sheds with roofs made from woven grass, in pits, in barns, or on platforms (see

Table 3).

Table 3: Methods Used by Yam Farmers in Northern Region for Storage

Storage method	% farmers using method
Zanamat shed (woven grass)	17.8
In pits	13.4
In barns	12.6
On platforms	12.6
Enclosed room and also on platforms	9.2
Heaped in airy place and covered	8.4
Enclosed room	5.9
Heaped in airy place and on platforms	5
In pits and on platforms	4.2
Heaped in airy place and in pits	3.4
Roofed and open-sided storage shed	2.5
Heaped in airy place and also in barns	2.5
Both pit and barns	2.5
Total	100

Source: Sowley and Tiesaa 2007

The majority (58%) packed tubers in jute sacks for transport while 27% loosely packed them in lorries. Seventy percent of farmers reported transporting tubers within a day of harvesting. Two-thirds of farmers reported using public transport options and slightly less than a third reported carrying harvested tubers on their heads from the farms to their houses and the market or from one market to another.

Sixty-eight percent of farmers reported transportation problems, including high cost (31%), inappropriate vehicles (24%), delays (3%), and poor road conditions (1%). Nearly all of the farmers (97%) reported that it usually takes 1-2 days to transport yams from the farm to the storehouse.⁴⁸

Post-Harvest Losses related to Storage and Pests affect Most Yam Farmers

In the same survey, half of farmers reported losing more than 5% of harvested tubers every year due to rot or pests. Nearly all of the farmers (98%) reported problems with storage that caused economic losses, including pests, dehydration, sprouting, and rot.^j About half of the farmers identified rats and mice as the major pests. All of the farmers and sellers reported experiencing rot, and 76% said it was severe in the warm season.

About half of farmers reported using traditional methods of control, such as wood ash treatment to prevent spoilage; however, 29% did not do anything other than store the tubers in an airy place for ventilation. Some farmers controlled sprouting by removing sprouts manually, but that was labor-intensive and sometimes ineffective. Other storage problems that were reported included theft, bush fires, destruction by cattle, poor storability of most varieties and lack of storage facilities.⁴⁹

Wastage, which accounted for an average of 583,300,000 MT in 2000-2002, was primarily due to a lack of transport facilities for moving crops to market.⁵⁰

The government was heavily involved in agricultural production, marketing, provision of services and subsidies during the 1970s, but those policies were dismantled in the 1980s and 1990s as part of structural adjustment programs.⁵¹

Marketing Systems

Net Returns are Distributed Unevenly Across Yam Value Chain Participants

Table 4 demonstrates the costs, returns, and efficiency obtained by key players in the yam value chain in Ghana. Cross-border traders have the highest efficiency (170%), meaning that their marketing costs represent the smallest fraction of their revenue. Marketing efficiency was calculated by dividing the marketing value added by the marketing costs. Marketing constraints identified in this study include poor road networks, limited financial resources, poor storage facilities, and high cost of transportation.⁵²

Table 4: Yam Marketing Margins and Efficiency among Players in the Yam Value Chain

Ghana Cedis/100 Tubers	Yam Producers	Yam Retailers	Yam Wholesalers	Cross-Border yam traders
Gross Margin	33.47	25.16	45	53.82
Marketing Costs	17.95	9.79	17.61	19.91
Net Marketing Margin	15.52	15.37	27.39	33.91
Marketing Efficiency (%)	86.46	157	155.54	170.32

Source: Aidoo et al, 2012

Yams have better storability than other tubers such as cassava, so can be stored and then gradually released onto the market. Still, as noted above, pests and rot can result in significant storage losses.⁵³

Yams are an important source of income throughout the crop's supply chain, especially for women active in the marketing of yam tubers and products.⁵⁴ Aidoo et al (2012) surveyed 320 yam value chain participants. Females comprised 100% of yam retailers, wholesalers, and cross-border traders, while only 20% of yam producers were female.⁵⁵

As of yet, no additional literature on the marketing system of yams in Ghana has been found.

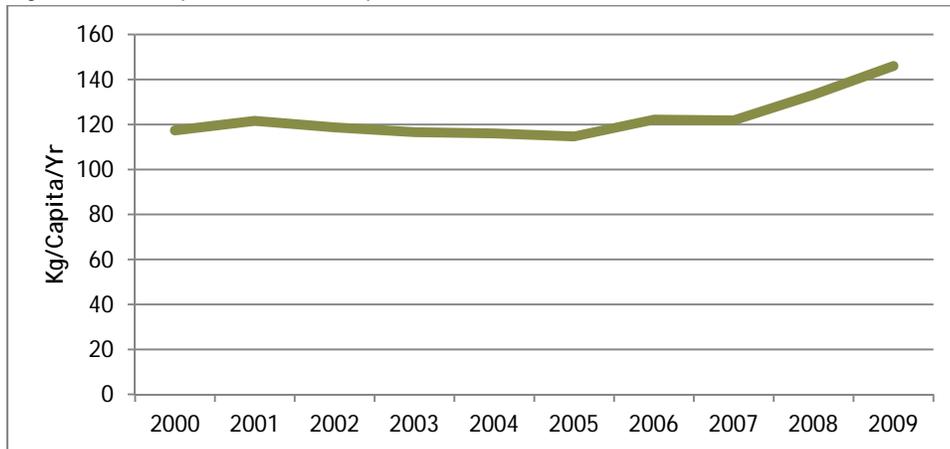
^j The rates of dehydration, sprouting, and rot vary across yam varieties.

Importance of Yams

Yams are an Important Source of Calories and Macronutrients in Ghana

Per capita yam consumption as reported by FAOSTAT has been fairly consistent in Ghana since 2000, with increases in 2008 and 2009 that bumped per capita consumption to 146 kg/year (see *Figure 9*). The Ministry of Agriculture reports substantially different figures for per capita consumption of yams. The Ministry reported 56 kg/capita/year in 2000 and 40 kg/capita/year in 2005. Both the FAOSTAT and MoFA estimates are derived from values of food available for consumption; an explanation for these vast differences could not be found.

Figure 9: Per Capita Yam Consumption as Food, 2000-2009



Source: FAOSTAT

As yam consumption has increased, its role in the nutritional status of the average Ghanaian has also increased. *Table 5* shows that yam intake accounted for a higher percentage of the total daily intake of calories, protein, and fat in 2010 than it did in 2000.

Table 5: Daily Macronutrient Intake from Yams, 2000 and 2010

	Per capita caloric intake from yams (% of total caloric intake)	Per capita protein intake from yams (% of total protein intake)	Per capita fat intake from yams (% of total fat intake)
2000	322 kcal/day (13.0%)	5.1 g/day (10.1%)	0.6 g/day (1.5%)
2010	400 kcal/day (13.6%)	6.4 g/day (10.6%)	0.8 g/day (1.7%)

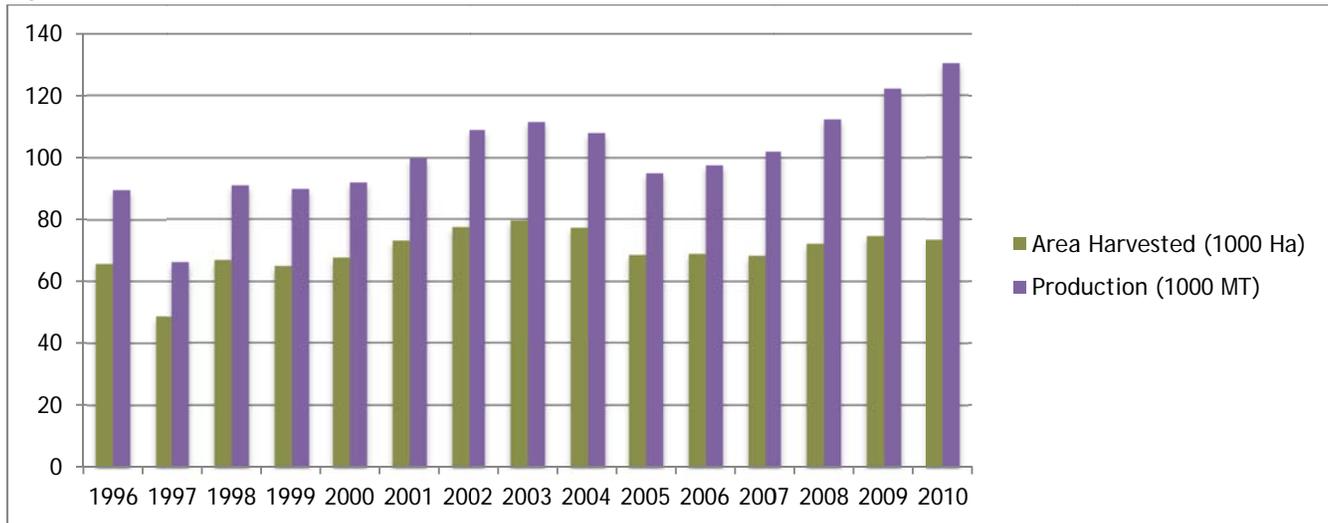
Source: FAOSTAT

Appendix: Sweet Potatoes in Ghana

Production Levels and Yields are Much Lower for Sweet Potatoes than Yams

Production of sweet potatoes reached a high of 130,300,000 MT in 2010, despite a slight decrease in the area harvested (see *Figure 10*). Since 1997, sweet potato production has ranged from 3-5% of yam production.^k According to FAO estimates and author's calculation, sweet potato accounted for only 0.2% of gross agricultural production value in 2010.

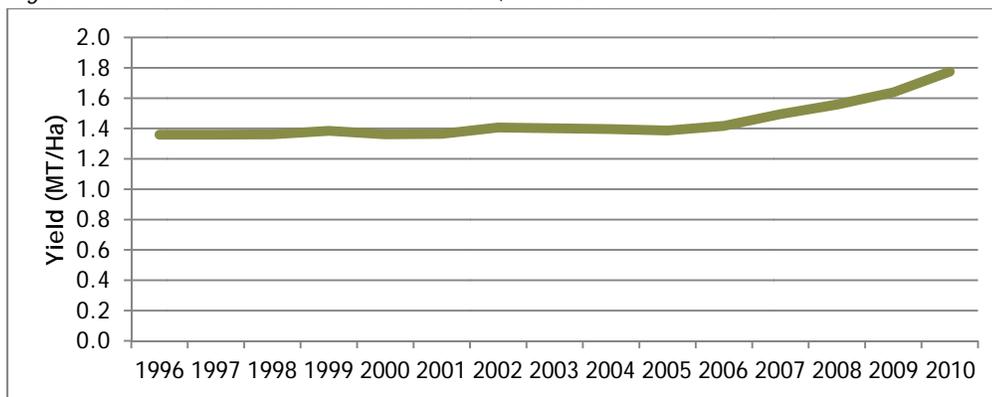
Figure 10: Estimates of Area Harvested and Production of Sweet Potatoes, 1996-2010



Source: FAOSTAT

Sweet potato yields remained fairly constant from 1996 until 2007, when yields began to increase from 1.4 MT/Ha to a high of 1.8 MT/Ha in 2010 (see *Figure 11*). The MoFA has a significantly higher yield estimate for 2009 (8.0 MT/Ha), but that is still only one-third of the estimated achievable yield (24.0 MT/Ha).⁵⁶

Figure 11: Yield Estimates for Sweet Potatoes, 1996-2010



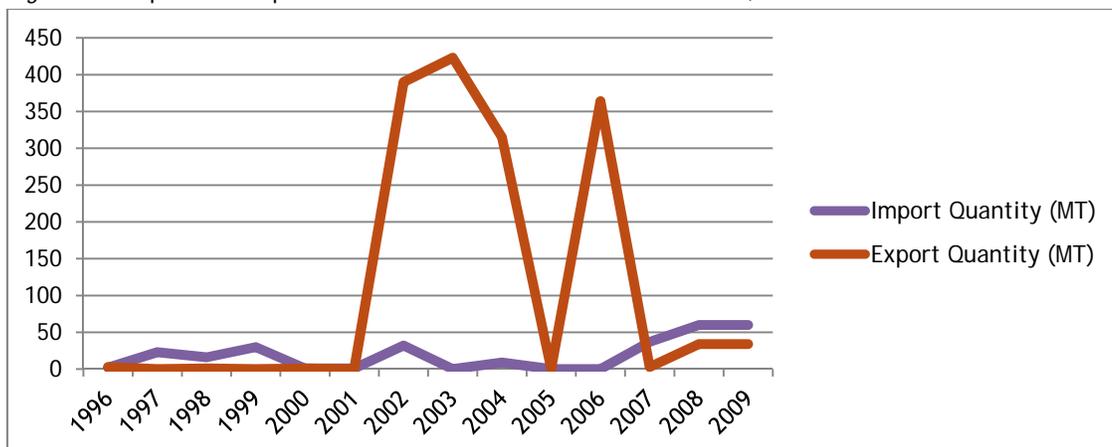
Source: FAOSTAT

Ghana both Imports and Exports Small Amounts of Sweet Potato, but has been a Net Importer in Recent Years

With the exception of some spikes in export levels in 2002-2004 and 2006, Ghana's involvement in international sweet potato markets has been very limited (see *Figure 12*). Ghana has been a net importer of sweet potatoes since 2007; in 2008, Ghana exported 34 MT (all to the United States) and imported 60 MT (59 to Belgium, and 1 to Togo).⁵⁷

^k In 1996, sweet potato production was 10% of yam production based on FAO estimates and author's calculation, but this was an outlier.

Figure 12: Import and Export Quantities for Sweet Potatoes in Ghana, 1996-2009



Source: FAOSTAT

Sweet Potatoes are not a Major Source of Nutrition

According to FAO estimates, per capita consumption of sweet potato in 2009 was only 5.1 kg/year, compared to 146 kg/year for yams. As a result of these low consumption levels, sweet potato accounted for only 0.4% of total caloric intake, 0.2% of total protein intake, and none of total fat intake.

Khor (2006) reported that sweet potato, along with cassava and cocoyam (taro), is a staple food for urban households in Ghana, particularly low-income households. Since the FAO estimates that roughly half of the Ghanaian population is urban, this claim does not seem to be reflected in the low consumption estimates; the reason for this inconsistency is not known.

Sweet Potato Value Chain

We found insufficient literature on the sweet potato value chain in Ghana to conduct a value chain analysis.

Literature Review Methodology This review was conducted using FAOSTAT, CountrySTAT Ghana (which draws primarily from the MoFA-SRID), CAB Abstracts, University of Washington Libraries, and Google search with combinations of the following search terms: yams, sweet potato, value chain, market, and Ghana.

Please direct comments or questions about this research to Leigh Anderson and Mary Kay Gugerty, at eparx@u.washington.edu.

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¹ Codjoe 2007

² FAOSTAT

³ FAOSTAT and CountrySTAT Ghana (Statistical, Research, and Information Directorate, SRID-MoFA)

⁴ CountrySTAT Ghana

⁵ Codjoe 2011

⁶ USDA Foreign Agricultural Service 2010

⁷ Wilhelmina et al. 2010, p. 361

⁸ CountrySTAT Ghana

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- ⁹ Otoo, Shiwachi, and Onjo 2009
- ¹⁰ Asante, Mensah, and Wahaga 2007, p. 186
- ¹¹ Millenium Development Authority, n.d.
- ¹² Asante, Mensah, and Wahaga 2007
- ¹³ Sowley and Tiesaa 2007
- ¹⁴ Asante, Mensah, and Wahaga 2007
- ¹⁵ Sowley and Tiesaa 2007
- ¹⁶ Asante, Mensah, and Wahaga 2007, p. 188
- ¹⁷ Sowley and Tiesaa 2007, p. 118
- ¹⁸ Otoo, Shiwachi, and Onjo 2009
- ¹⁹ Asante, Mensah, and Wahaga 2007
- ²⁰ Ghana Ministry of Food and Agriculture 2010, p. 16
- ²¹ Asante, Mensah, and Wahaga 2007
- ²² Asante, Mensah, and Wahaga 2007, p. 188
- ²³ Asante et al. 2011, p 710
- ²⁴ Asante et al. 2011, p. 711
- ²⁵ Braimah, Anchirinah, and Adu-Mensah 2008, p. 37
- ²⁶ Asante, Mensah, and Wahaga 2007, p. 188
- ²⁷ Olanitan 2011, p. 164
- ²⁸ Sowley and Tiesaa 2007, p. 118
- ²⁹ Ennin, Otoo, & Tetteh, 2009
- ³⁰ Asante, Mensah, and Wahaga 2007
- ³¹ Sowley and Tiesaa 2007, p. 118
- ³² Sowley and Tiesaa 2007, p. 119
- ³³ Sowley and Tiesaa 2007, p. 119
- ³⁴ Braimah, Anchirinah, and Adu-Mensah 2008, p. 37
- ³⁵ Otoo et al 2008 p.391
- ³⁶ Braimah, Anchirinah, and Adu-Mensah 2008 p. 38
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- ³⁸ Asante, Mensah, and Wahaga 2007
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- ⁴¹ Otoo, Shiwachi, and Onjo 2009
- ⁴² Olanitan 2011, p. 168
- ⁴³ Olanitan 2011, p. 160
- ⁴⁴ Olanitan 2011, p. 160
- ⁴⁵ Quainoo, Osei, and Adibokah 2009
- ⁴⁶ Quainoo, Osei, and Adibokah 2009
- ⁴⁷ Olanitan 2011, p. 164
- ⁴⁸ Sowley and Tiesaa 2007, p. 118-119
- ⁴⁹ Sowley and Tiesaa 2007, p. 119-120
- ⁵⁰ Codjoe 2007, p. 8
- ⁵¹ Khor 2006
- ⁵² Aidoo et al. 2012
- ⁵³ Asante, Mensah, and Wahaga 2007, p. 186
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- ⁵⁵ Aidoo et al. 2012
- ⁵⁶ Ghana Ministry of Food and Agriculture 2010, p. 16
- ⁵⁷ FAOSTAT