



# MAFAP SPAAA

Monitoring African Food and Agricultural Policies  
Suivi des politiques agricoles et alimentaires en Afrique

## **ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR YAM IN GHANA**

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Draft Version

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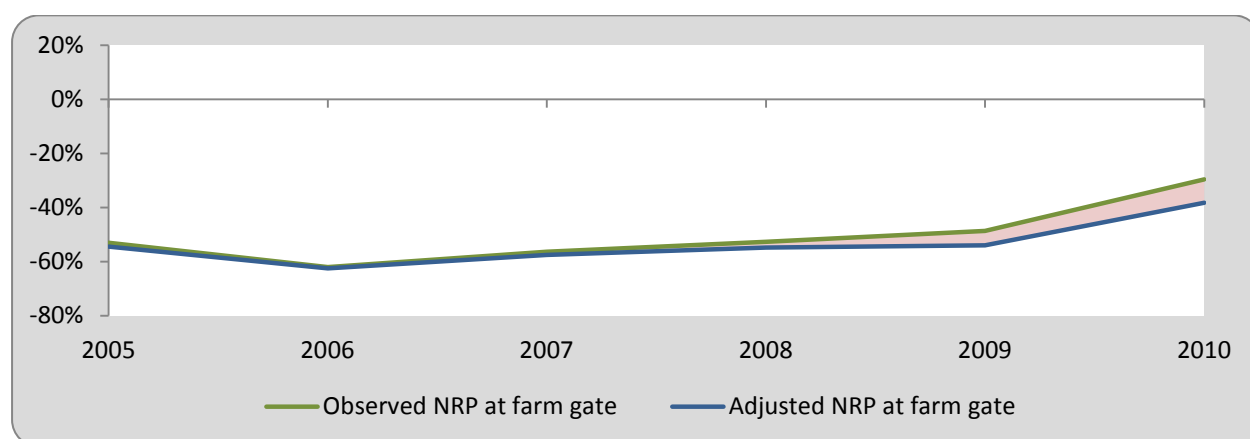
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## SUMMARY OF THE NOTE

Product: Yam  
 Period analyzed: 2005 – 2010  
 Trade status: Export in all years

- The commodity contributes to 16 percent to the country's Agricultural Gross Domestic Product (GDP).
- Total production increased from 877,000 in 1990 to 5,960,490 tonnes in 2010 mainly by smallholder farmers.
- Yam is an important staple food for many Ghanaians, accounting for 11 percent of total consumption in 2007.
- Ghana is the leading exporter of yam, accounting for over 94 percent of total yam exports in West Africa.
- As one of the staple crops, yam is targeted by most of the country's general policy frameworks to boost production. Initiatives were launched to prevent yam spoilage and bureaucracy such as the National Yam Export Pack-House.



The observed Nominal Rate of Protection (NRP, green line) indicates that Yam farmers have received disincentives under the prevailing cost structure in the value chain. The adjusted NRP (blue line) captures the effects of market inefficiencies on farmers. The area in red shows the cost that these inefficiencies represent for producers.

Our results show that disincentives, arise from: 1) the export duty of 20 percent, in place in 2007, 2008 and 2009; 2) lower quality of Ghanaian yams on the international market; 3) high access costs including transportation and spoilage of the product.

- Notwithstanding the disincentives, production has increased in most years due to the adoption of high yield varieties in recent years and various input subsidy programmes
- Additional value chain information is needed to define better policies and interventions for the development of the yam value chain and promote exports

## CONTENTS

SUMMARY OF THE NOTE .....	3
CONTENTS .....	4
1. PURPOSE OF THE NOTE.....	5
2. COMMODITY CONTEXT .....	6
PRODUCTION .....	6
CONSUMPTION/UTILIZATION .....	10
MARKETING AND TRADE .....	12
DESCRIPTION OF THE VALUE CHAIN AND PROCESSING .....	16
POLICY DECISIONS AND MEASURES.....	20
3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS.....	22
TRADE STATUS OF THE PRODUCTS .....	22
BENCHMARK PRICES .....	22
DOMESTIC PRICES .....	23
EXCHANGE RATES .....	24
MARKET ACCESS COSTS .....	25
4. INTERPRETATION OF THE INDICATORS .....	32
5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS .....	34
MAIN MESSAGE .....	34
PRELIMINARY RECOMMENDATIONS .....	34
LIMITATIONS .....	34
BIBLIOGRAPHY .....	36
ANNEX I: Methodology Used .....	37
ANNEX II: Data and calculations used in the analysis .....	38

## 1. PURPOSE OF THE NOTE

This technical note aims to describe the market incentives and disincentives for yam in Ghana. For this purpose, yearly averages of farm gate and wholesale prices are compared with reference prices calculated on the basis of the price of the commodity in the international market. The price gaps between the reference prices and the prices along the value chain indicate to which extent incentives (positive gaps) or disincentives (negative gaps) are present at farm gate and wholesale level. In relative terms, the price gaps are expressed as Nominal Rates of Protection (NRPs). These key indicators are used by MAFAP to highlight the effects of policy and market development gaps on prices.

The note starts with a brief review of the production, consumption, trade and policies affecting the commodity and then provides a detailed description of how the key components of the price analysis have been obtained. The MAFAP indicators are then calculated with these data and interpreted in the light of existing policies and market characteristics. The analysis that has been carried out is commodity and country specific and covers the period 2005-2010. The indicators have been calculated using available data from different sources for this period and are described in Chapter 3.

The results of this analysis can be used by stakeholders involved in policy-making for the Food and Agricultural Sector. They can also serve as input for evidence-based policy dialogue at country or regional level.

This technical note is not to be interpreted as an analysis of the value chain or detailed description of production, consumption or trade patterns. All information related to these areas is presented merely to provide background on the commodity under review, help understand major trends and facilitate the interpretation of the indicators. Additionally, all information is preliminary and still subject to review and validation.

## 2. COMMODITY CONTEXT

Yam is an important staple food crop in Ghana and is produced throughout the country. Ghana is the leading exporter of yam, despite the fact that it is the third largest producer in the world, after Nigeria and Cote d'Ivoire. Per capita consumption of yam increased by 12 percent between 1997 and 2007. Average daily consumption of yam is about 300 kcal per capita (FAO STAT, 2012), and it is the third most important source of energy in the Ghanaian diet, accounting for 20 percent of total caloric intake (FAO STAT, 2012).

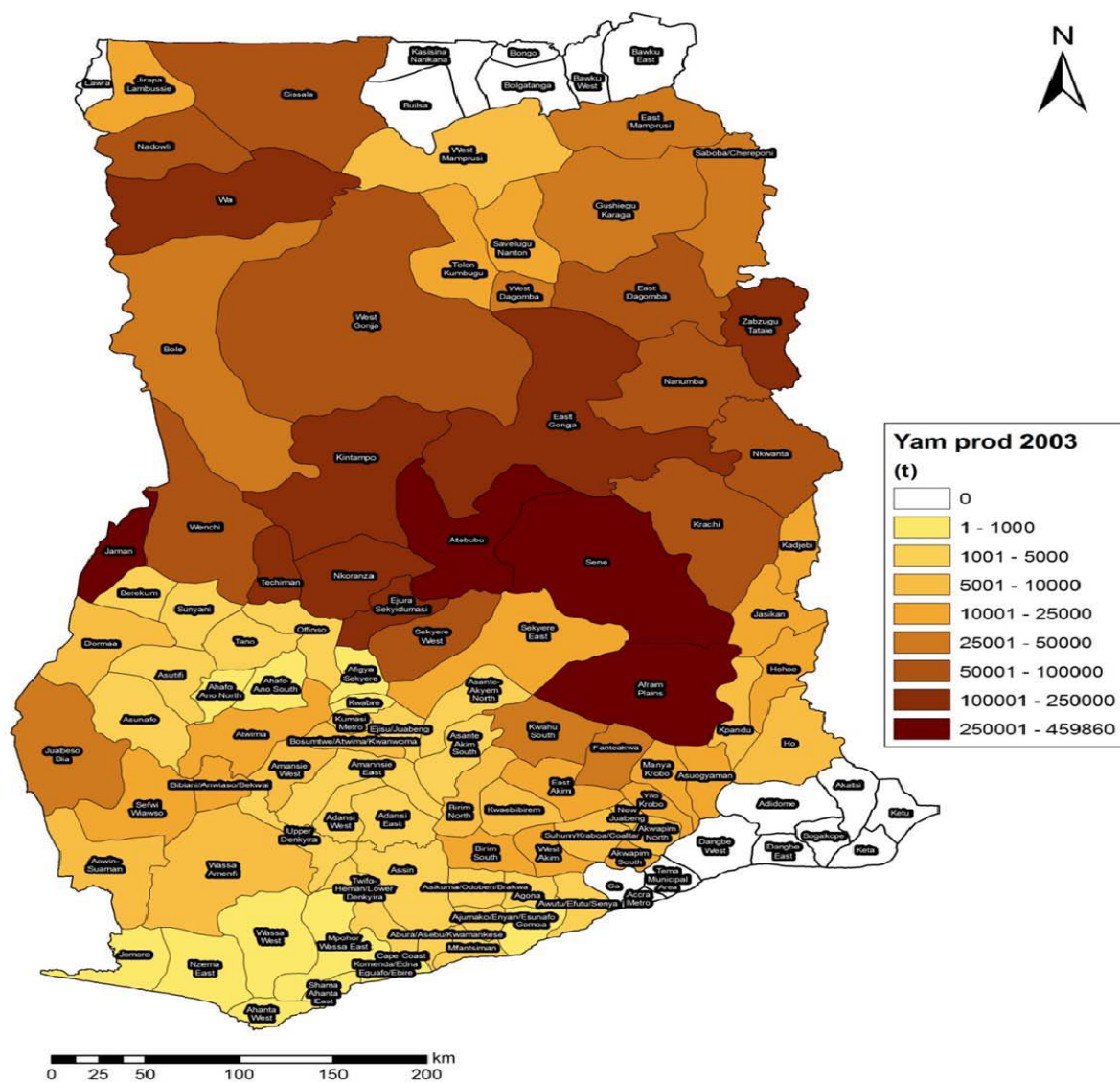
Yam contributes about 16 percent of the country's Agricultural Gross Domestic Product (GDP). In addition, 6.3 percent of Ghana's arable land is used for yam cultivation (Otto, 2005).

### PRODUCTION

During 2005-2010 period, yam production accounted for about 24 percent of total roots and tubers production in the country (MoFA, 2010). The distribution of yam production throughout the country is largely dependent on rainfall patterns. Yams require rainfall five months out of the eight months of growth in the field (Orkwo & Asadu, 1997), as well as highly fertile soils (Sagoe, 2006). Yams generally grow better in areas where annual rainfall ranges from 1 000 to 1 500 mm and is well distributed over six to seven months of the growing season.

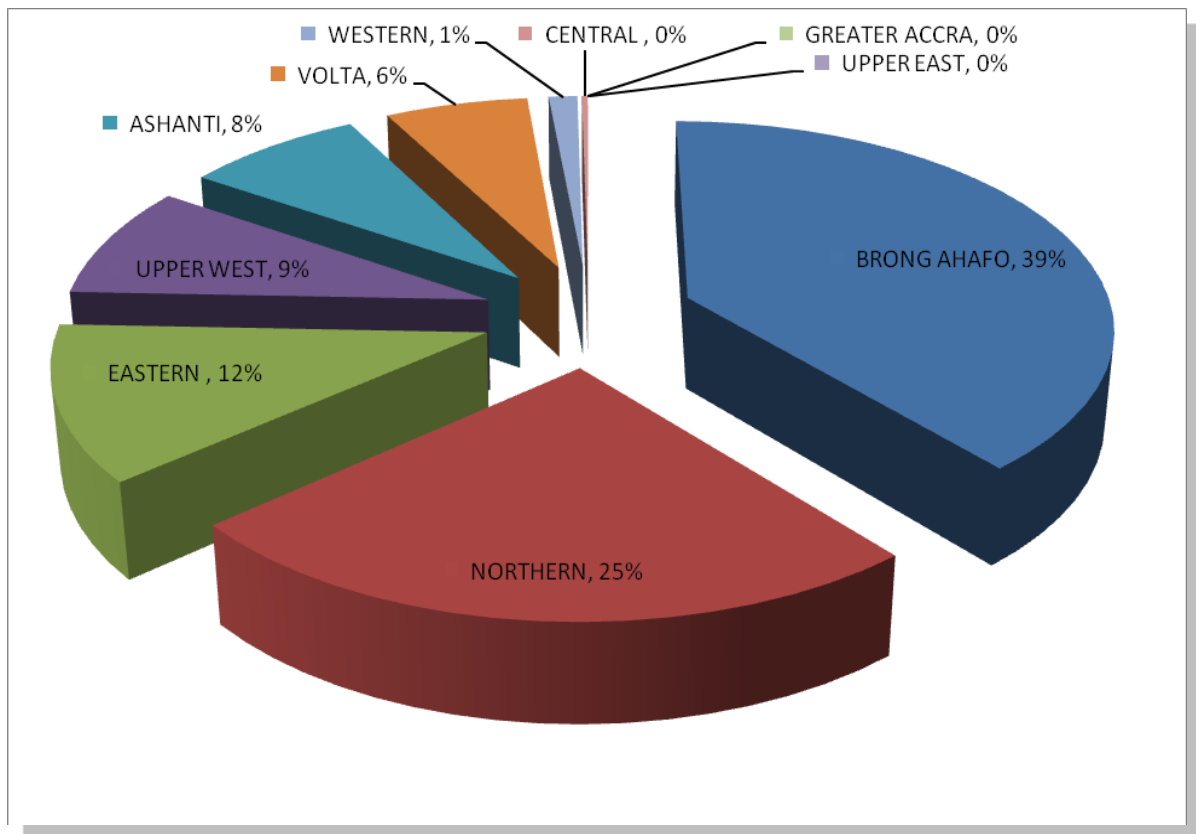
As illustrated in Figure 1, districts with the highest levels of production are concentrated in the central and northern portions of Ghana. Figure 2 indicates that yam production occurs in all regions, except for the Central, Greater Accra and Upper East. About 76 percent of yam production takes place in the Brong Ahafo, Northern and Eastern Regions, which account for 39, 25 and 12 percent of total production, respectively, while the remaining 24 percent of production is distributed throughout the Upper West, Ashanti, Volta and Western Regions.

Figure 1: Distribution of Yam Production in Ghana by District, 2003



Source: Crops Research Institute, 2003

**Figure 2: Distribution of Yam Production in Ghana by Region, 2010**



Source: MOFA, SRID (2011)

Several varieties of yam are produced throughout Ghana. These include Pona (white yam), Dente, Asana and Serwa. In recent years, Ghana's Crop Research Institute (CRI) introduced new high yield varieties, such as the Mankrong and Kukrupa. However, white yam/Pona remains the most preferred variety in both the domestic and export markets (Millennium Development Authority [MDA], 2005).

In Ghana, yam cultivation is primarily carried out by smallholder farmers using rudimentary hand tools. For this reason, yam cultivation tends to be labor intensive, especially with respect to land preparation, as indicated in Figure 3. Furthermore, most yams in Ghana are produced under a shifting cultivation system, in which farmers cultivate a plot of land until it is no longer fertile and then move to another plot, leaving the previous plot fallow. Yam production is also seasonal, with the main harvest season occurring from August to December and a lean crop season occurring from May to July. Harvest season in the Volta Region occurs much earlier than in the Northern Region. In many cases, yam producers are persuaded by traders to harvest their crop early in the season, when prices are very high. However, immature yams are more perishable, which may partly explain why many producers experience high post-harvest losses.



**Figure 3: Yam Production Partial Budget Analyses in three agro-ecological zones**

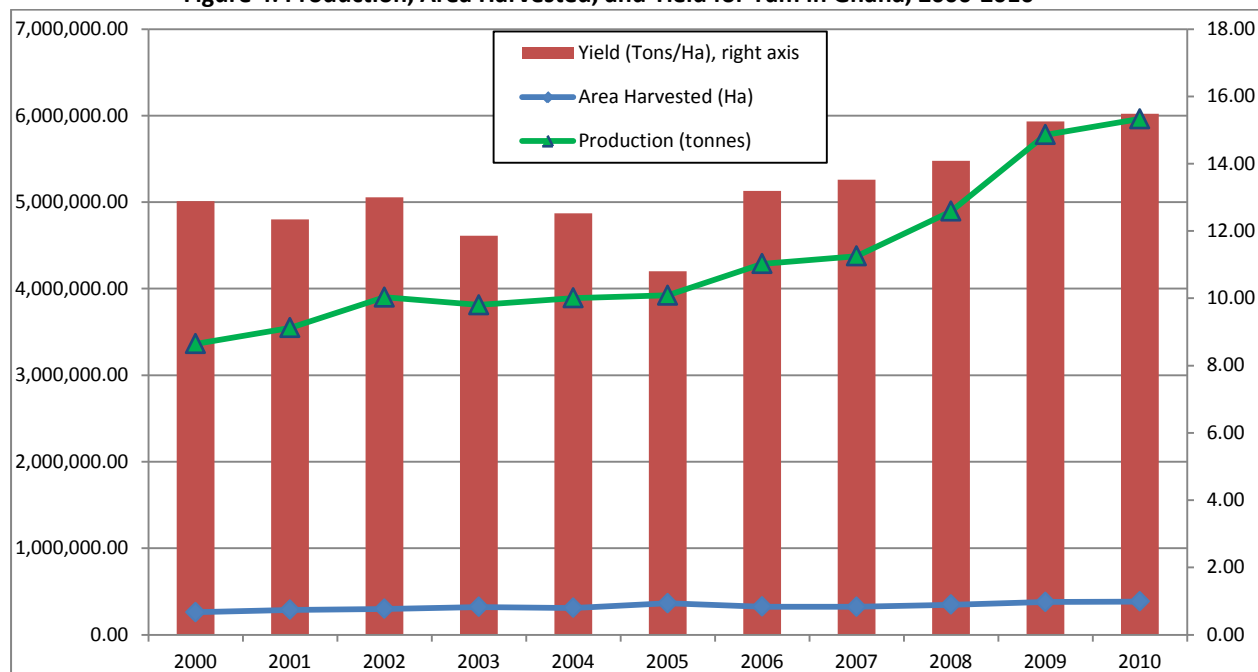
	On hectare basis		
	Forest	FST <sup>■</sup>	DCS <sup>■■■</sup>
Average yield (t ha <sup>-1</sup> ) <sup>■■■</sup>	19.8	26.8	32.2
Adjusted yield (t ha <sup>-1</sup> )	17.82	24.12	28.98
Price per 110 tubers of 5kg size at harvest	400,000.00	400,000.00	600,000.00
Price per 110 tubers of 5kg size at lean period	700,000.00	700,000.00	1,200,000.00
Gross field benefits (cedis ha <sup>-1</sup> )			
At harvest	18,423,529.41	18,917,647.06	34,094,117.65
Lean period	18,344,117.65	24,829,411.76	51,141,176.47
Adjusted yield for 25% storage loss in 2-3months (t ha <sup>-1</sup> ) lean period	13.37	18.09	21.74
<b>Costs that vary (cedis ha<sup>-1</sup>)</b>			
Renting of land <sup>■</sup>	250,000.00	75,000.00	625,000.00
Land preparation			
Clearing	375,000.00	450,000.00	625,000.00
Ploughing	375,000.00	450,000.00	625,000.00
Mounding	1,818,181.82	2,727,272.73	4,545,454.55
Under-digging	0.00	0.00	4,545,454.55
Sub total	2,568,181.82	3,627,272.73	10,340,909.09
Planting including cutting and treatment of yam setts(15 man-days)	225,000.00	300,000.00	375,000.00
Staking			
Material cost including cost of transporting	10,000,000.00	8,000,000.00	12,000,000.00
Labour (contract)	625,000.00	625,000.00	1,250,000.00
Field maintenance 4x	1,125,000.00	1,800,000.00	2,500,000.00
Harvesting (15 man-days)	300,000.00	300,000.00	375,000.00
<b>Total Costs that vary</b>	<b>14,843,181.82</b>	<b>14,652,272.73</b>	<b>26,840,909.09</b>
Total Costs that vary US\$ @1US\$=8500*	1,746.26	1,723.80	3,157.75
Net benefit (in cedis)			
At harvest	3,580,347.59	4,265,374.33	7,253,208.56
Lean period	3,500,935.83	10,177,139.04	24,300,267.38
<b>Net benefit (US\$)</b>	<b>421.22</b>	<b>501.81</b>	<b>853.32</b>
	<b>411.87</b>	<b>1,197.31</b>	<b>2,858.85</b>

■ Forest-Savanna Transition, ■■ Derived Coastal Savanna. ■■■ Based on 2003 on-farm farmer-managed trials production figures. \*2003 exchange rate.  
Cost of renting land is 150,000, 180,000 and 250,000 cedis/ acre for Forest, Forest-Savanna

Source: Otoo et Al.

Figure 4 shows the evolution of production, area harvested and yield for yam in Ghana from 2000 to 2010. Between 2000 and 2005, total production increased by about 16 percent. As illustrated, this increase was mainly driven by growth in total hectares planted to yam, rather than growth in yam yields. However, from 2005 to 2010, both yields and total area harvested increased, resulting in an even larger increase in total yam production by about 52 percent.

**Figure 4: Production, Area Harvested, and Yield for Yam in Ghana, 2000-2010**



Source: FAOSTAT, 2012

Increases in total hectares planted to yam from 2000 to 2010 may be partly due to the shifting cultivation system under which the crop is produced. Additionally, increases in yam productivity over this time period may be attributed to the adoption of high yield varieties introduced by the CRI in recent years, as well as the IFAD Roots and Tubers Programme (RTIP), which ended in 2004. The RTIP provided farmers in the Ashanti and Brong Ahafo Regions with short term credit and inputs to boost yam production.

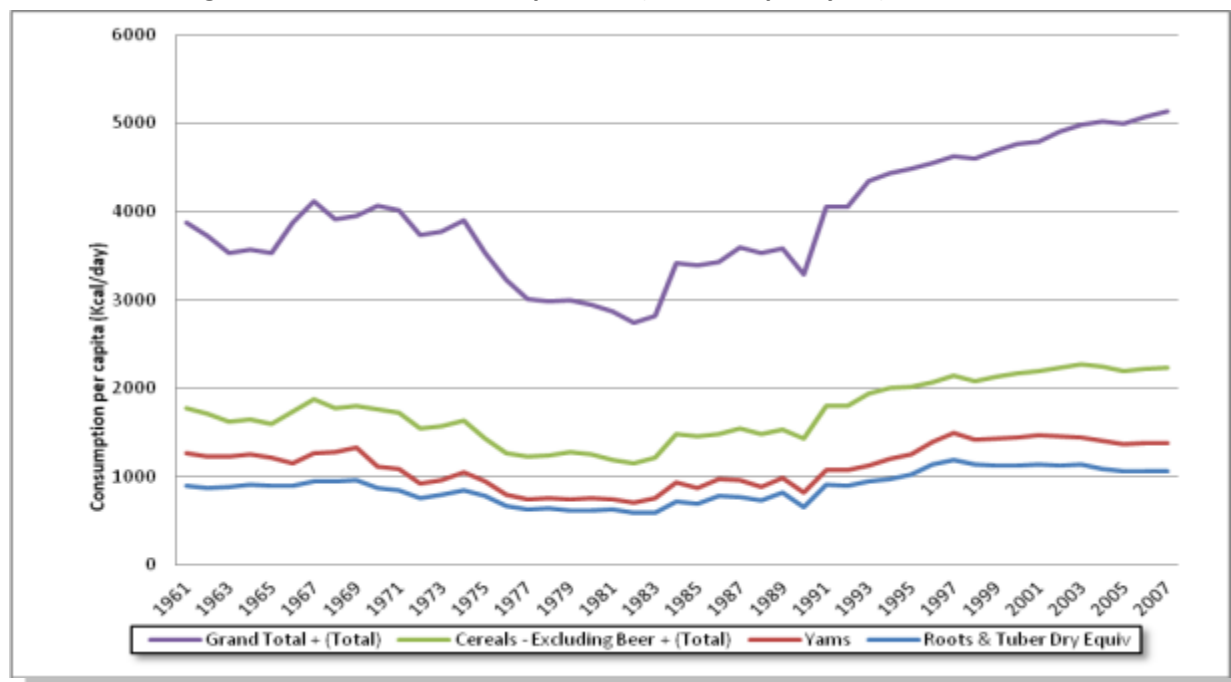
Ghana faces several challenges and opportunities for increasing yam production. On the one hand, increasing yam production through expansion of area harvested is limited due to decreasing land availability in the Brong Ahafo Region, where most of the production takes place. On the other hand, it is believed that yam productivity can be increased, both through improved yields and through reduced post-harvest losses. However, a major challenge to increased productivity is the unavailability of improved yam seeds. Furthermore, post-harvest losses for yam in Ghana amount to 24.4 percent of production, despite the Ministry of Agriculture's goal to reduce these losses to only 12 percent by 2012 (MoFA, 2007). The major causes of post-harvest losses are weight loss due to evapotranspiration intensified by sprouting, rotting due to fungal and bacterial pathogens and insect infestation (Bancroft, 2000)

## CONSUMPTION/UTILIZATION

Though yam consumption has decreased by about 12 percent since the 1960s, it is still an important staple food for many Ghanaians, accounting for 11 percent of total consumption in 2007. While it is consumed by the majority of Ghanaians in both rural and urban areas, yam consumption tends to be higher in urban areas (Aidoo, 2009). Boiled yam (ampesi) was found to be the most preferred yam product in Ghanaian urban centres, followed by pounded yam (fufu) (Aidoo, 2009). Most Ghanaians prefer the taste of the white yam, as opposed to the yellow yam.

As shown in Figure 5, yam consumption per capita has increased since the 1980s, but at a much slower rate than total consumption per capita for all food products. Since the late 1997, growth in yam consumption has become somewhat static, leveling off at an average of about 312 kcal/capita/day. This growth trend is relatively parallel to the one for all roots and tubers; however, cereal consumption has continued to increase since the late 1990s and is now much higher than root and tubers.

**Figure 5 : Trends in Diet Composition (in kcal/capita/year), 1961-2007**

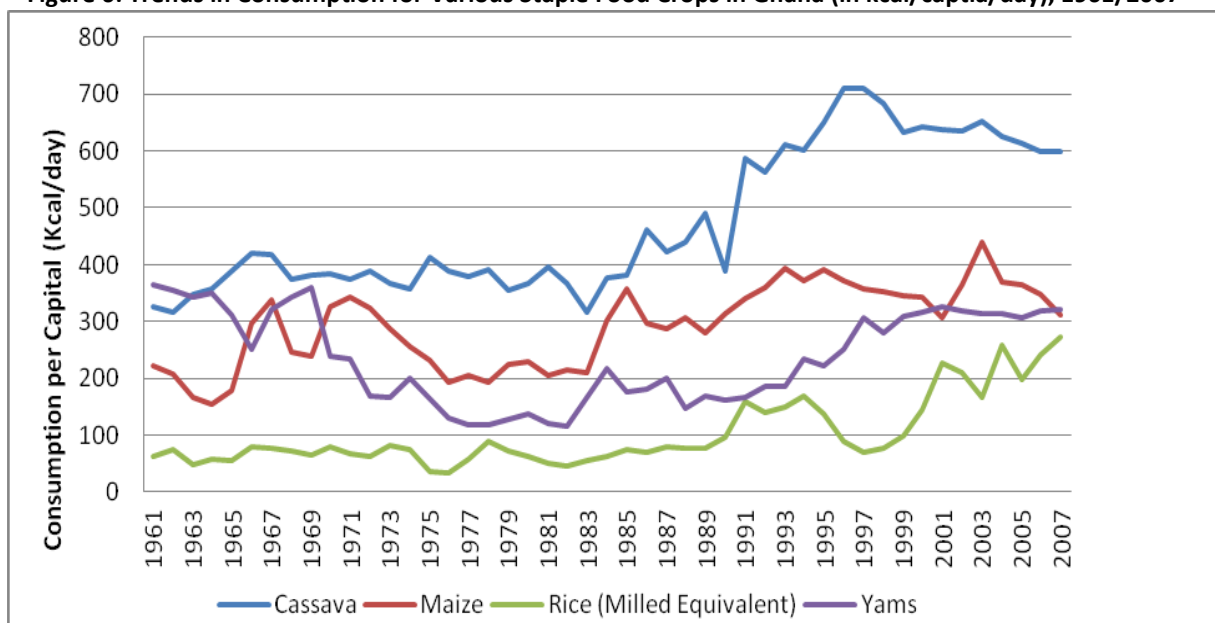


Source: FAOSTAT, 2012

As illustrated above the trend observed for yam is similar to the one observed for cassava, which is preferred by most consumers in Ghana (Figure 6). It has been noted that the price for yam in Ghana is very high compared to other staple food crops, notably cassava (see Figure 7), due to higher production costs and post-harvest losses (shown in Figure 3). Consequently, cassava often serves as a more affordable substitute for yam (Tetteh & SaaKwa, 1991). Consumers also substitute rice and maize for yam, especially during the food price crisis in 2008.

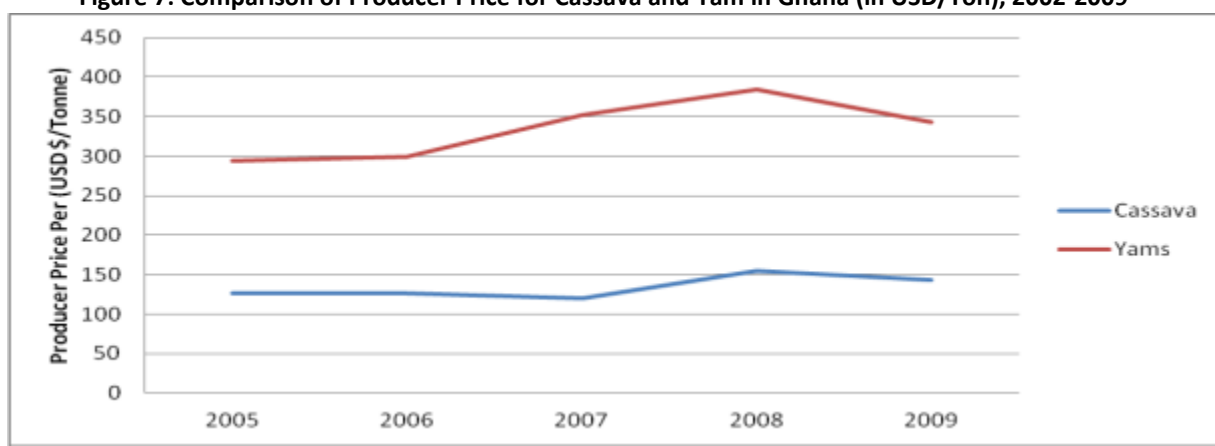
However, since 2000, only rice consumption has increased, while maize consumption decreased and both yam and cassava consumption became somewhat static (Figure 6).

**Figure 6: Trends in Consumption for Various Staple Food Crops in Ghana (in kcal/captia/day), 1961/2007**



Source: FAOSTAT, 2012

**Figure 7: Comparison of Producer Price for Cassava and Yam in Ghana (in USD/Ton), 2002-2009**

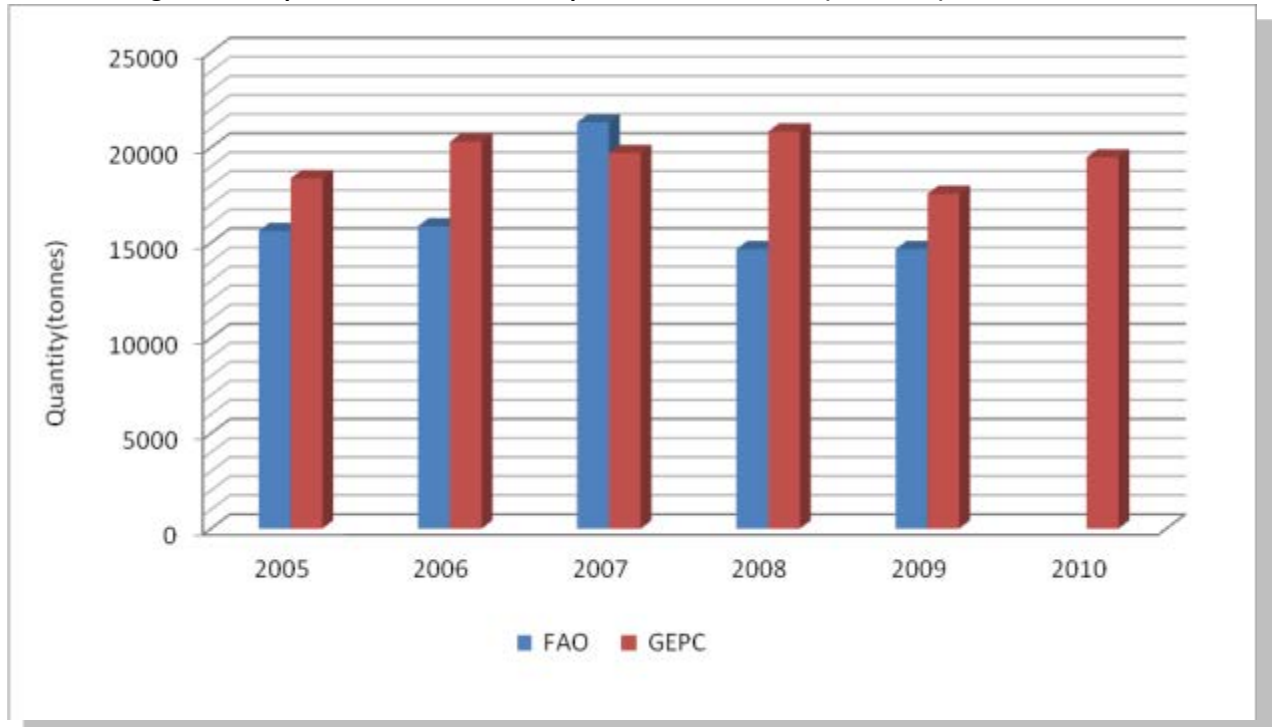


Source: FAOSTAT, 2012

## MARKETING AND TRADE

The only trade data available for yam in Ghana is that of FAOSTAT and Ghana's Export Promotion Council (GEPC), but figures from these two sources are fairly inconsistent. Figures from FAOSTAT ranged from 2 percent higher to 40 percent lower than those from GEPC, as shown in Figure 8. Despite this inconsistency, both data sets clearly indicate that Ghana was a net exporter of yam for the entire 2005-2010 period. Figure 8 also indicates that exports fluctuated throughout the period under review, with an apparent increase from 2005 to 2008, followed by a slight decrease from 2008 to 2010. This trend is much more pronounced with FAOSTAT data than with GEPC data. The increase in yam exports in 2008 could be associated to the soaring food prices during this period, which led to a decrease in domestic consumption of yam and an increase in the volumes exported to Europe.

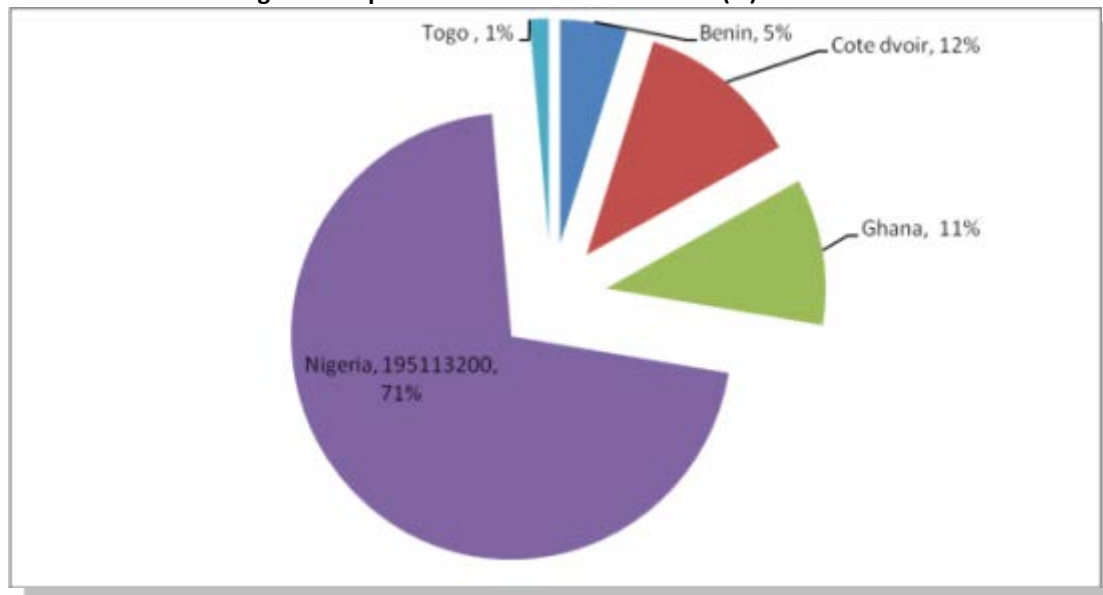
**Figure 8: Comparison of Data for Net Exports of Yam in Ghana (in Tonnes), 2005-2010**



Source: FAOSTAT & GEPC, 2012

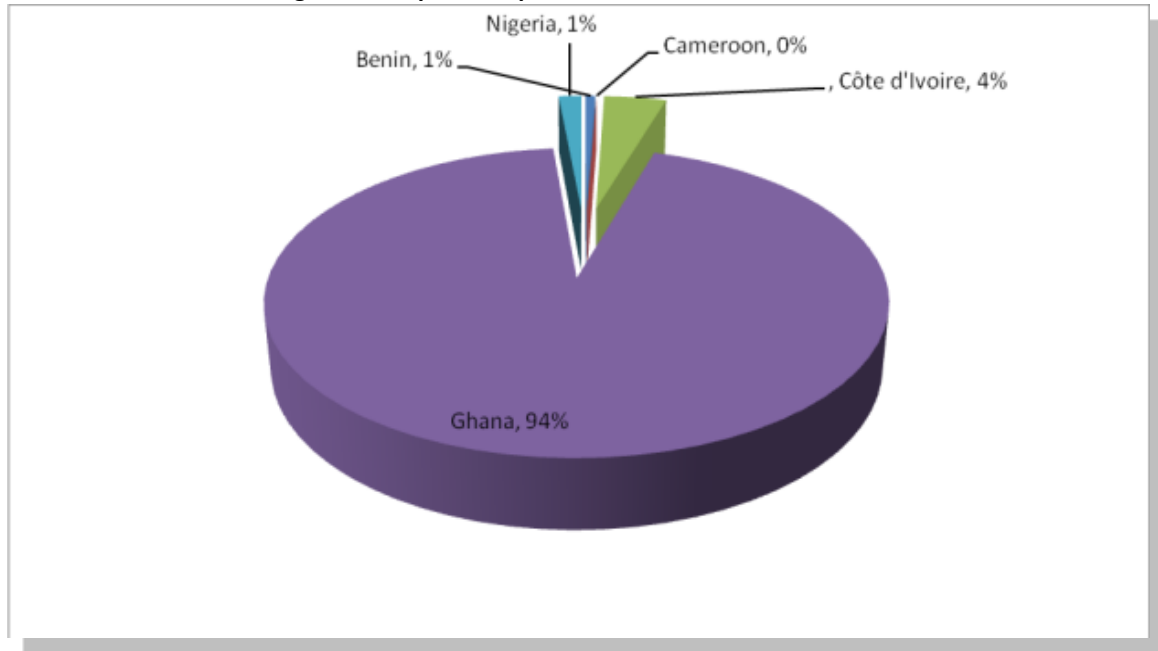
As shown in Figure 9 and Figure 10, Ghana is the third largest yam producer in West Africa, after Nigeria and Cote d'Ivoire, but is the leading exporter of yam, accounting for over 94 percent of total yam exports in West Africa.

**Figure 9: Top Yam Producers in West Africa (%) 2005-2010**



Source: FAOSTAT, 2012

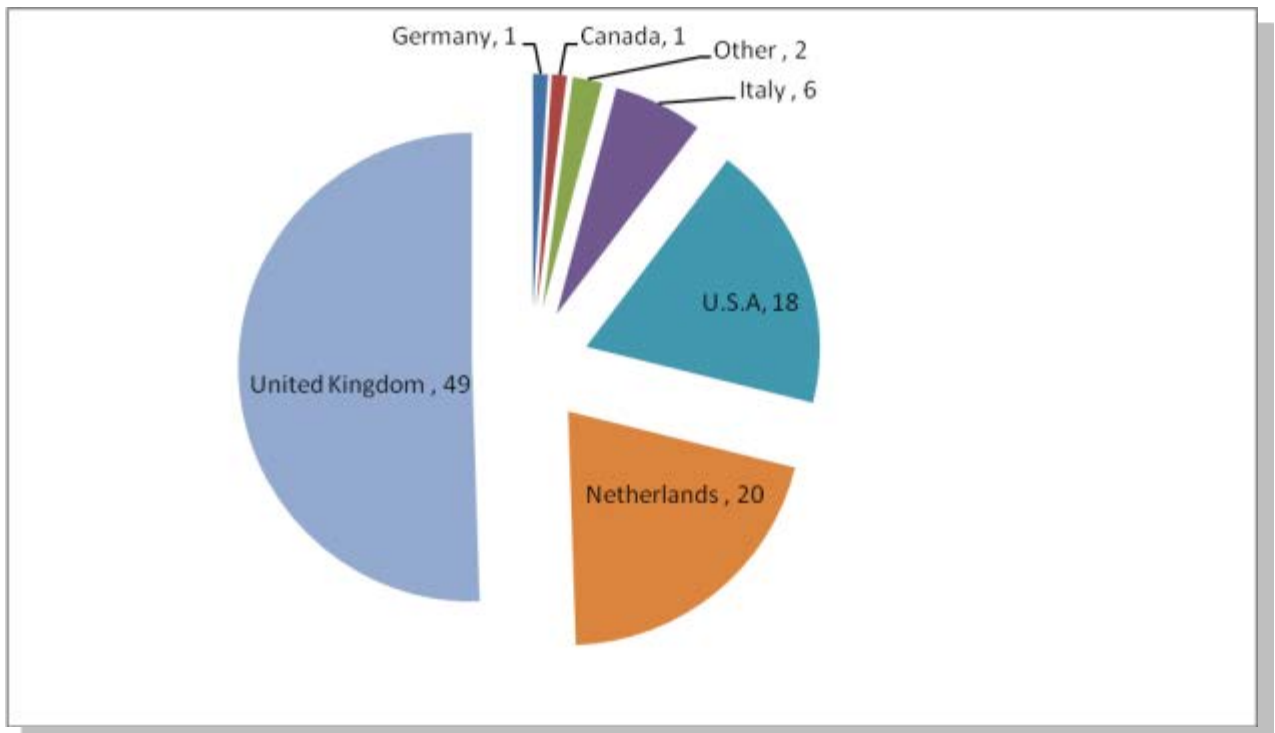
**Figure 10: Top Yam Exporters in West Africa, 2005-2009**



Source: FAOSTAT, 2012

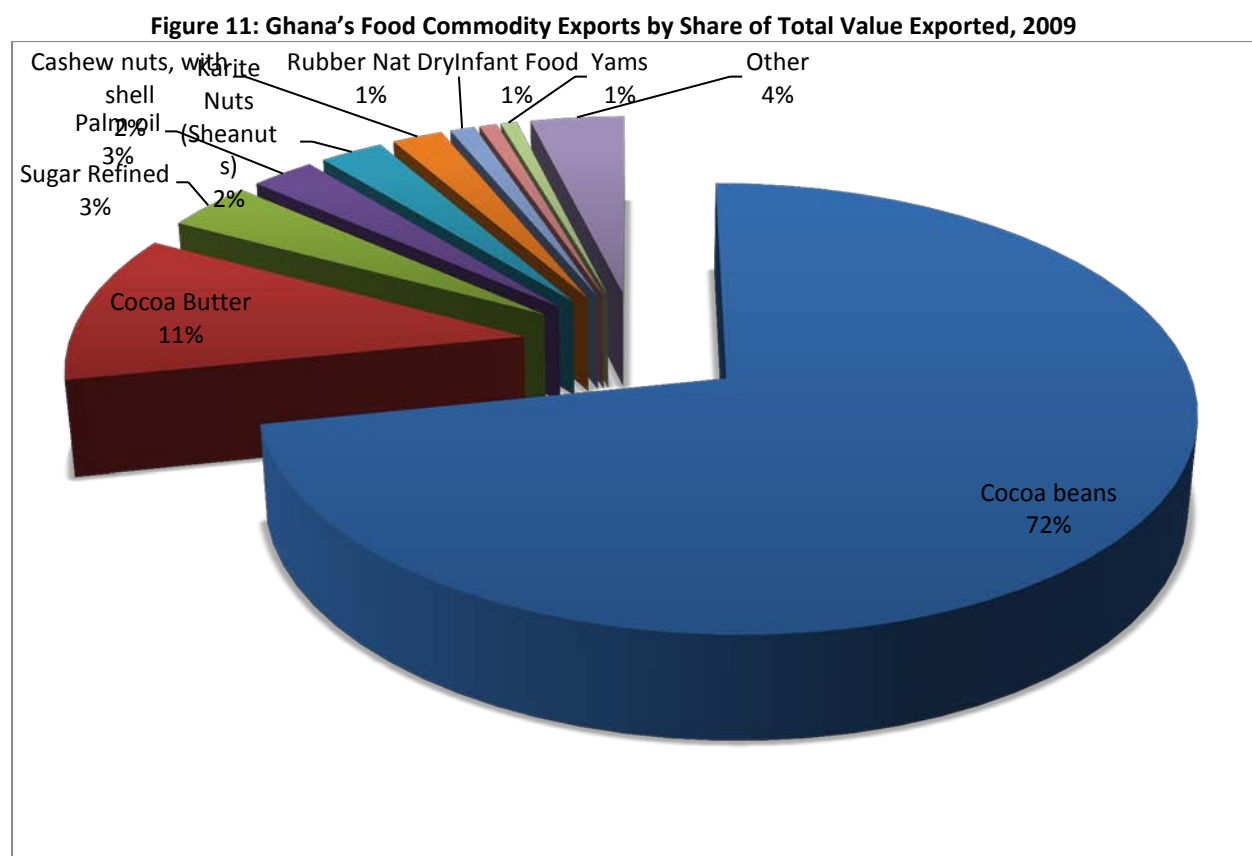
Almost 90 percent of Ghana's yam exports are imported by three countries – the United Kingdom, the United States and the Netherlands (see Figure 11). The large volumes of yam exported to these destinations are largely due to the high demand for yam by Ghanaians and other West Africans residing in these countries.

**Figure 11: Ghana Yam Exports by Importing Country (%), 2008**



Source: Millenium Development Authority

In 2009, yam was ranked 9<sup>th</sup> among Ghana's food commodity exports, representing less than 1 percent of the total value of food products exported (see Figure 12). Although Ghana is the leading exporter of yam in the region and in the world, yam exports represent less than 0.01 percent of national yam production.



Source: FAOSTAT, 2012

Yam, particularly white yam, is a high value commodity in Ghana, but its potential for income generation has not been fully realized due to problems and inefficiencies within the country's production, handling and trading systems. For example, in 2006, the yam export business suffered a major setback when a lack of coordination between traders caused Ghana exporters to flood the international market with yam, resulting in a major collapse in yam prices. However, things have improved since the establishment of a pack-house which is closer to the Tema port and coordinates all activities associated with exporting yam from Ghana. The pack-house introduced an effective quota system that has helped rationalize yam exports according to international demand.

Another major issue is that the quality of yam produced in Ghana is sometimes compromised due to poor road transport, infrastructure, harvesting practices and storage conditions (Bancroft, 2000). In some cases, this has caused yam exports to spoil before reaching EU and US markets. Consequently, yam exporters have often not been paid for their shipments, which have ultimately resulted in their refusal to pay local producers and traders (MC Modern Ghana Web, 2005).

The quality of yam exports from Ghana is also compromised by fumigation practices and days spent at sea. Currently, Ghana yam is fumigated upon arrival at USA ports, but this often reduces yam quality due to the high temperature at which fumigation takes place (USAID, 2005).

For reducing waste other methods, such as pre-shipment irradiation, could be an option to reduce sprouting and controlling microbiological infection. This alternative was submitted by USAID TRADE HUB as a project proposal.

## **DESCRIPTION OF THE VALUE CHAIN AND PROCESSING**

In Ghana, yam is generally traded in its original state (Bancroft, 2000) and is not processed into a secondary product. Traders and chop bar owners (small restaurants) often buy yam to sell or prepare for consumers directly. Yam for the export market also is not processed, but is treated, wrapped in newsprint and packed in 25 kg boxes before it is shipped.

The value chain for yam is less developed than the value chains for other commodities in the country, such as rice or maize. Although there has been considerable support for yam farmers, the value chain is still weak with respect to linking farmer organizations to market associations and ensuring that producers are not penalized.

### **Yam Marketing Chains**

Yam produced in the Northern Region is generally transported to Accra through the eastern corridor; either through Hohoe and Akosombo or through Kete Krachi in the Volta Lake Region (see Figure 14). Yam from the Northern Region is also transported to Kumasi, either through Yeji, Atebubu and Ejura or through Tamale. While the first route to Kumasi is only about 270 km, compared to 509 km from Tamale to Kumasi, it is unreliable due to the irregularities of the Volta Lake ferry crossing at Yeji. Brong Ahafo yams are generally transported to markets in Techiman, Kumasi or Accra. Table 1 lists the different categories of yam marketing outlets along these major trade routes and throughout much of Ghana.



Figure 12: Map of Yam Trade Routes in Ghana



Source: Author's own elaboration

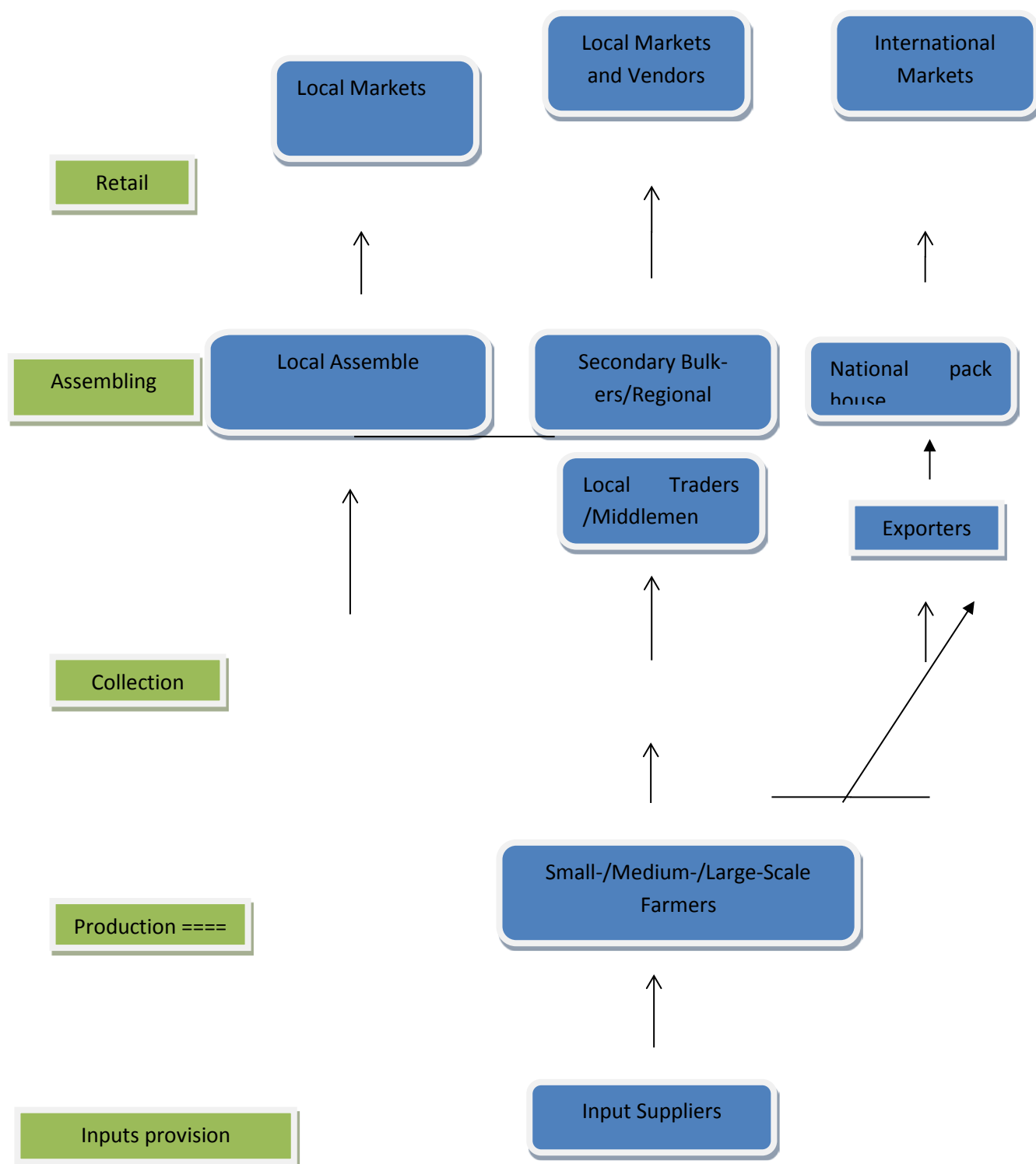
**Table 1: Categories of Yam Marketing Outlets in Ghana**

Market Type	Description
Farmgate	Trader comes to farm and buys direct from the farmer, e.g. in Bimbilla, Yendi and Salaga (Northern Region), Atebubu (Brong Ahafo).
Roadside markets	Small scale retail markets of traders who have assembled yam from the farmers for sale to passing traffic.
Village markets	Small markets offering few commodities to local consumers. These include weekly markets acting as a first-level assembly point for produce from the surrounding area. e.g. Kpalbe, Gindaturu (Northern Region). Most itinerant wholesalers interviewed stated that they always buy from the farm gate and never from the village market. The role of the village market as a first level assembly point may not, therefore be very strong in the case of yams.
Rural town market	Rural wholesale assembling markets where traders concentrate purchases made in the vicinity (e.g. Techiman in the Northern Region). These markets are under the jurisdiction of a particular District Assembly and have specific days on which marketing activities take place.
Large urban market	Markets where consignments are sold to consumers and retailers e.g. Kumasi Central Market in Ashanti region, Konkomba market in Accra. Also act as "transit markets" from which smaller lots of commodities are moved to other outlying markets.
Small urban market	Final markets where most produce is brought from the large urban market and sold to consumers e.g. Asafo and Bantama markets in Kumasi (Ashanti Region).

Source: Bancroft, 2000

Yam exporters operating in Accra typically buy yam directly from small- and large-scale farmers. They also purchase yam from sedentary wholesalers at the main markets in Accra-Konkomba, Agbogbloshi and Baasare Markets. However, with increasing competition in the yam export market, some exporters commission itinerant traders to purchase yam from major production areas (USAID, 2005).

Figure 13: the main distribution value chain for yam



Source: Millennium Development Authority, 2005

## POLICY DECISIONS AND MEASURES

Unlike cereals, which received a great deal of attention with respect to policy and input subsidies since the 1980s, roots and tubers only started to garner attention around 1988, with cassava being the main focus of policy efforts because of the essential role it plays in food security. Despite this trend, there have been several agricultural policies aimed at developing the yam industry in Ghana, most of which were established in the early 1990s.

### General Agricultural Policies to Boost Yam Production

The Ministry of Agriculture, in collaboration with the World Bank, prepared a **Medium Term Agricultural Development Programme (MTADP)** that outlined specific policies for the agricultural sector. The MTADP, which acknowledged the private sector as the engine for growth, served as a strategy for food and agricultural development from 1991 to 2000. This initiative aimed to further increase private sector participation in agriculture, liberalize trade, reduce marketing costs, raise producer prices and stimulate investment. Under this initiative, the agricultural sector annual gross domestic product was expected to grow by 4 percent each year.

Together, the MTADP and the **National Agriculture Research Strategy (NARS)**, established in 1994, focused on yam as a priority crop for research in order to boost production and decrease post-harvest losses (Bancroft, 2000).

In an effort to reduce bureaucracy with regards to yam export out of the country, the Ghanaian government introduced the followings measures to make yam exportation more effective:

- the establishment of a single **National Yam Export Pack-House**;
- rationalization of bureaucracy, placing all agencies under one roof, including the Plant Protection & Regulatory Services Directory (PPRSD) of the Ministry of Agriculture (MoFA), the Ghana Standards Boards (GSB) and the Customs, Excise and Preventive Services (CEPS);
- re-designation of yam as a traditional crop, thereby bringing in regulations on establishment of letters of credit by the importers, payment of export tax and the strict adherence to standards.

In 2002, the Ghanaian Government developed the **Food and Agriculture Sector Development Policy (FASDEP 1)** to guide development and interventions in the agricultural sector. This was a holistic policy that built on key elements of the **Accelerated Agricultural Growth and Development Strategy (AAGDS)** and focused primarily on strengthening the private sector as the engine for growth.

After a Poverty and Social Impact Analysis (PSIA) of the FASDEP I, it was concluded that the policies would not be able to achieve the desired impact on poverty for a number of reasons. As a result, the FASDEP II was developed in 2007. This new policy aims to improve the environment for all categories of farmers, but specifically targets the poor, risk prone and risk-averse producers. FASDEP II also builds upon key lessons from FASDEP I and other agriculture policies that were developed from 2002 onward.

Under FASDEP II, the Ministry of Agriculture intends to achieve food security via the promotion of five staple food crops (i.e. cassava, cowpea, maize, rice and yam). Since yam is one of these five staple food crops, it will receive government support to enhance productivity (MoFA, 2007). Although this is mentioned under the **Medium Term Agriculture Sector Investment Plan (METASIP)**, there has

been no further development of specific programs to assist yam producers or increase yam production in Ghana.

### **The Agricultural Mechanization Services Enterprise Centers (AMSECs) Programme**

In an effort to promote sustainable agricultural production and reduce entry barriers into the mechanized services sector, the Agricultural Mechanization Services Enterprise Centers (AMSECs) programme was implemented to establish credit facilities in key locations that help private sector players purchase agricultural machinery (IFPRI, 2011). The private sector is in turn expected to help farmers and agro-processors, who historically rely on labour intensive methods of production, gain widespread access to mechanization services at affordable prices. The goal of the program is to increase the effectiveness and efficiency in farming and processing operations (IFPRI, 2011).

The AMSEC programme initially set up twelve centers in eight regions throughout Ghana. The two key objectives of AMSEC are to increase the ratio of tractors to farmers and to gradually reduce the number of out-dated tractors (over 15 years old). Other objectives include timely access to mechanized services; better usage of agricultural machinery; reduction in drudgery and tedium linked with agriculture; increased yield and production; increased rural employment opportunities; and overall reduction in post-harvest losses (IFPRI, 2011).

Currently under the AMSEC, the Agriculture Extension Services Division (AESD) has initiated a pilot programme for yam mechanization in the Kwahu North District of the Eastern Region, where they are improving farmer access to tractor drawn bund-formers to develop ridgers and bunds for planting yam as compared to manual bund-forming.

### **Trade Policy Measures**

In 2005, the Ghana Ministry of Trade and Industry (MOTI) granted waivers to the Federation of Associations of Ghanaian Exporters (FAGE), permitting the export of yam by sea to certain European destinations. However, the waiver was later removed after some groups started to abuse the waiver system. Information on export duties for Ghana yam available on the World Integrated Trade Solutions (WITS) database shows a 20 percent export tax in 2007, 2008 and 2009. There were no available figures for 2005, 2006 and 2010.

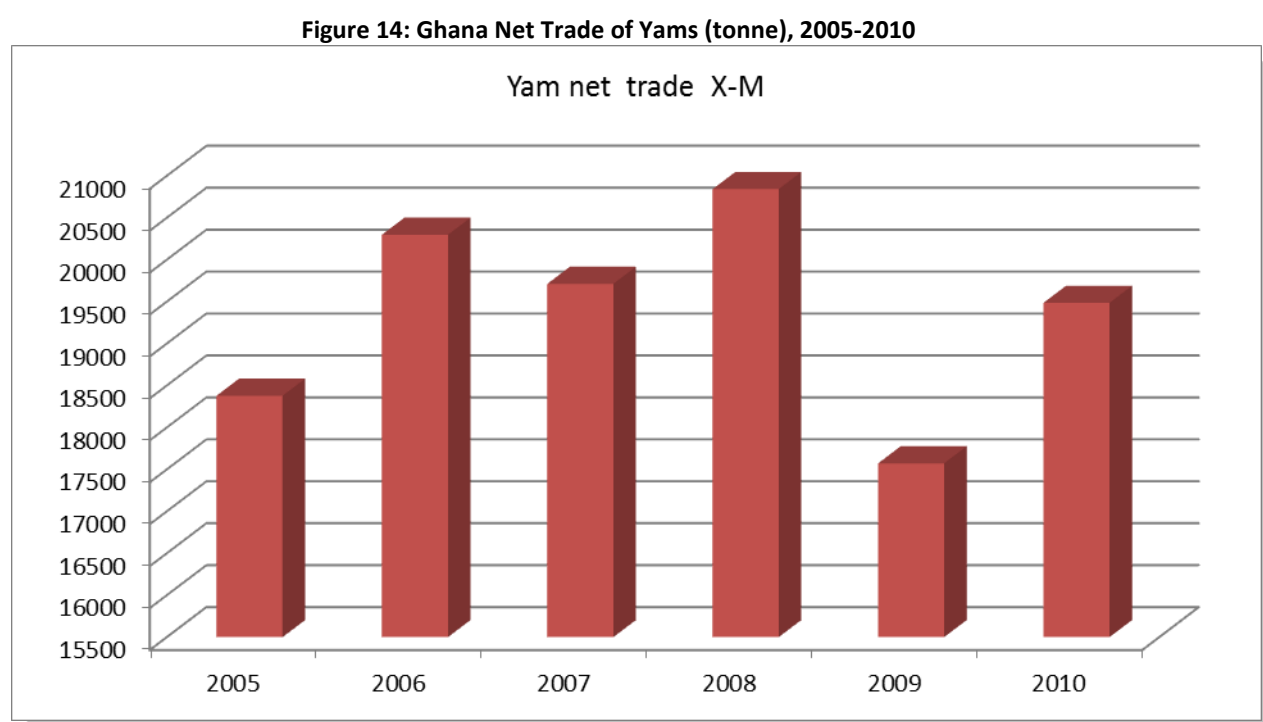
### 3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS

To calculate the indicators needed to estimate incentives or disincentives to production (NRP, NRA) as well as the Market Development Gaps (MDGs), several types of data are needed. They were collected and are presented and explained hereafter.

The analysis of price incentives/disincentives is carried out for the period of 2005-2010 and aims at estimating price gaps and rates of protection at wholesale and farm gate levels. This analysis requires the following variables.

#### TRADE STATUS OF THE PRODUCTS

Ghana is a net exporter of yam for the entire period under review (2005-2010), with a net surplus balance ranging between 17 800 tonnes (2009) and 21 000 tonnes (2008) over the period of analysis (Figure 15).



Source: Ghana Export Promotion Council, 2012

#### BENCHMARK PRICES

The benchmark price used in the analysis is the yam FOB export price, derived by dividing the trade value over the trade quantities. Data used was obtained from the Ghana Export Promotion Council (GEPC).

There was no data available on yam trade on UNcomtrade and the Global Trade Atlas. Moreover data from GEPC and FAOSTAT, show significant inconsistencies. Figures on yam exports from FAOSTAT were lower compared to GEPC, with the exception of 2007 where FAOSTAT data shows a higher value than the one recorded by the GEPC.

Furthermore, data from FAOSTAT is only available up to 2009; therefore the best option in this case was to use the data sets from the GEPC in obtaining the FOB prices. These prices could not be cross-referenced against quantities and values recorded by major importing countries as specific information on yam trade is either not available or inconsistent with domestic data sources.

**Table 2: FOB/Benchmark price for fresh roots of yam from Ghana (USD/tonne)**

	2005	2006	2007	2008	2009	2010
FOB USD/Ton	595.9	770.4	791.8	810.2	654.7	690.4
FOB GHC/Ton	542.3	708.7	744.3	858.8	923.1	987.3

Source: Own calculations based on data by GEPC

## Adjustment

No adjustments to the benchmark price have been made.

## DOMESTIC PRICES

### Observed

Two domestic prices are needed, the domestic price at the wholesale (point of competition) and the farm gate prices.

In determining the domestic price at the point of competition, it is important to identify the whole-sale market where most yam is in transit before exporting. Ghana has several wholesale market channels, which are subdivided into urban and rural wholesale markets. This type of market system applies to all the ten regions in the country. Most of the middle men purchase yam from the farm gate and sell part of it directly to exporters, the purchase of yam takes place in all the major production areas. However, yam purchased is packaged and stored in Accra for transport.

In this context and for the purpose of this study, urban Accra wholesale price was picked as the price at point of competition as Accra is also the area where most of the export companies are based. In addition, the city has a direct access to the Tema harbor, which is 25 km away from the city or from the markets mentioned earlier.

Furthermore, Accra has three major yam wholesale markets where yam from the Northern region of Ghana is marketed.

Wholesale prices refer to fresh yam roots and are collected on a monthly basis. Prices used for the analysis refer to yearly averages.

**Table 3: Wholesale prices of fresh yam roots in Accra, Greater Accra (GHC/tonne)**

	2005	2006	2007	2008	2009	2010
Yam fresh roots (GHC/Ton)	224.4	236.7	330.0	430.7	523.6	681.7

Source: Own calculation based on MOFA, SRID statistics

Farm gate prices for the analysis refer to the region where most production occurs. Yam production areas are spread throughout the country but most yam surplus comes from two regions, Northern Ghana and Brong Ahafo (USAID, 2005). Farm gate prices used for the analysis are those recorded in Tamale (Northern region) collected by the Ministry of Agriculture on a monthly basis and refer to a 250 kg bag; these were then converted into tonnes and yearly averages were calculated.

**Table 4: Farm gate prices for fresh yam roots in Tamale, Northern Region (yearly average GHC/tonne)**

	2005	2006	2007	2008	2009	2010
Yam Fresh Roots (GHC/Ton)	188.5	206.0	248.4	278.2	376.4	484.5

Source: Own calculation based on MOFA, SRID statistics

## EXCHANGE RATES

### *Observed*

Ghana has a floating exchange rate regime for its currency, the Ghana cedi. With the 2006 Foreign Exchange Act Ghana shifted away from exchange controls. In July 2007, the national currency was re-denominated by setting 10 000 cedis to 1 new Ghana cedi<sup>1</sup>.

The exchange rate between the Ghanaian Cedi and the United State Dollar is taken from the IMF database on exchange rates. The average of the exchange rate for each year has been calculated from the monthly data reported in the database.

**Table 5: Exchange rate GHC/USD**

Year	2005	2006	2007	2008	2009	2010
Nominal Exchange Rate	0.91	0.92	0.94	1.06	1.41	1.43

Source: IMF

Table 5 above shows a consistent stability of the Cedi. Over the period 2005-2008, the cedi was resolute against the dollar. In 2009 to 2010, the global financial crisis, among other factors, pushed the cedi marginally. According to the IMF country report (IMF Country Report No. 11/131) the aftermath of the global crises led to a decelerated GDP growth and the inflow from portfolio capital and remittance also declined. This eventually led to the depreciation in the exchange rate.

### **Adjusted**

No exchange rate adjustment was needed.

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<sup>1</sup> Prices used for the analysis have all been converted in the new currency. Specifically, prices in years 2005 and 2006 were divided by 10 000.



## MARKET ACCESS COSTS

Transport costs have been considered for two different segments of the yam value chain, from the farm gate (Northern parts of the country, mainly Tamale) to the point of competition (Accra) for a distance of 645 km and from the point of competition (wholesale) to the border (port of Tema) for exported yam for a distance of 25 km. Yam is transported to point of competition by road and from there to the port of Tema either by road or by ferry. In this context, we shall only consider transportation by road. In determining the access cost, transportation cost is one of the main components while other costs such as (processing, storage, handling and margins) are determined by wholesale and retail especially the middlemen. Data on transport costs per MT of yam were provided by the Ministry of Agriculture. However, the significant gaps and inconsistencies present in the data did not allow for sound estimates of transport costs for the selected commodity pathway over the period 2005-2010.

### *Observed*

#### *From farm gate to wholesale*

Although, some information on transport costs is available, obtaining the accurate access cost for yam from the farm gate to the wholesale market proved cumbersome. Information on other related costs such as handling, packaging, loading and off-loading is not available. Therefore, in view of gathering detailed information on the yam value chain and related costs, the best option was to adapt access costs of a commodity, maize, that follows a similar pathway to that of yam. It should be noted that maize produced in the Northern region transits through a feeder market, Techiman, and is then transported to Accra. This implies additional costs in terms of storage and wholesale market fees. Costs related to the Techiman market have not been considered for yam as there is no evidence about Techiman being a feeder market for yam especially in the case where yam is exported.

**Table 6: Estimated access costs for yam in Ghana (GHCs/tonne)**

	2005	2006	2007	2008	2009	2010
Handling, Marketing Fee, other	7.3	7.3	7.5	8.5	11.3	11.4
Transport	15.4	15.6	15.9	18	23.9	24.3
Storage, interest, losses	8.2	8.2	8.4	9.5	12.7	12.9
Wholesale Agent Fee	2.7	2.7	2.8	3.2	4.2	4.3
<b>Total access costs</b>	<b>33.6</b>	<b>33.8</b>	<b>34.6</b>	<b>39.2</b>	<b>52.1</b>	<b>52.9</b>

Source: authors calculations based on NRI (2006; as published by WB and IFPRI, 2007)

### **Adjusted**

No adjustment was made.

### **From wholesale to Border (Tema Port)**

Access costs are estimated using information about yam access costs reported in a sample survey undertaken in 2009 (Aidoo et al., 2009) among yam traders. Given that access costs were not elicited with reference to the specific pathway Accra-Tema Port, average access costs for traders have been considered as a proxy for the calculation of yam access costs from Tema to Accra (last column in Table 7). Furthermore, the survey did not clearly distinguish between exporters to neighboring countries and those who export to Europe or the USA.

Despite the significant heterogeneity in access costs for yam traders based in different regions in Ghana, the table below shows the high incidence of transport and losses on access costs.

**Table 7: Marketing costs for yam cross border traders in selected locations in Ghana (GHc/tonne)**

	Ejura	Techiman	Nkwanta	Atebubu	Total sample
Transportation	38.4	40.8	35.2	44.84	<b>39.8</b>
Loading & offloading	2.4	3.6	2.4	7.88	<b>3.24</b>
Value of yam losses	24.52	21.48	18.72	24.88	<b>17.44</b>
Costs at road barriers	5.32	6.36	4.84	6.28	<b>5.72</b>
Marketing margin	132.96	122.48	125.88	131.4	<b>135.64</b>
other costs	8.4	12.8	11.6	1.4	<b>8.12</b>
Total marketing costs	212	207.52	198.64	216.68	<b>209.96</b>

Source: own calculations based on survey data (Aidoo et al, 2009)

Survey data refers to year 2009 and was deflated/inflated using the Ghana GDP deflator from IMF to estimate access costs in the other years under analysis (Table 8).

**Table 8: Yam access costs from point of competition to the border (GHc/tonne)**

	2005*	2006*	2007*	2008*	2009	2010*
Transportation	20.3	23.5	26.6	31.8	39.8	46.7
Loading & offloading	1.7	1.9	2.2	2.6	3.2	3.8
Value of yam losses	8.9	10.3	11.7	13.9	17.4	20.5
Costs at road barriers	2.9	3.4	3.8	4.6	5.7	6.7
Marketing margin	69.1	80.0	90.6	108.2	135.6	159.1
Other costs	4.1	4.8	5.4	6.5	8.1	9.5
Total access costs	106.9	123.8	140.3	167.5	210.0	246.2

Source: author's calculations based on 2009 survey data

\*Estimate

### Adjusted access costs

Access costs were adjusted to account for excessive traders' margins which were reduced to 10 per cent of the yam Fob price and the costs at road barriers which are not associated with any specific service.

**Table 9: Total adjusted access costs from Point of competition to the border (GHc/tonne)**

Total adjusted access costs	94.5	117.5	125.0	135.8	134.1	149.5
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Source: author's calculations based on survey data (Aidoo et al, 2009)

## EXTERNALITIES

We are not aware of any positive or negative externalities associated with yam production in Ghana and have therefore not considered this in our analysis.

## BUDGET AND OTHER TRANSFERS

With regards to budgets and other transfers, specific government policies directly or indirectly related to budgets transfer to farmers - fertilizer subsidy programme; mechanization programme, block farms programme and procurement operations - are also targeting the yam sub-sector. However, estimates on the specific amount of budget transfers to the yam sector will have to be assessed in collaboration with the Ministry of Food and Agriculture.

Following the discussions above here is a summary of the main sources and methodological decisions taken for the analysis of price incentives and disincentives for Yam in Ghana.

**Table 10: Summary table for data description in MAFAP technical notes**

		<i>Description</i>	
<i>Concept</i>		<i>Observed</i>	<i>Adjusted</i>
Benchmark price		<i>Unit value divided by the quantity to obtain the FOB prices. Data was obtained from the Ghana Export Promotion Council</i>	<i>N.A.</i>
Domestic price at point of competition		<i>Whole sale price in Accra provided by MOFA</i>	<i>N.A.</i>
Domestic price at farm gate		<i>Farm gate prices in Tamale (Northern Region) provided by MOFA</i>	<i>N.A.</i>
Exchange rate		<i>Annual average of exchange rate as reported by IMF</i>	<i>N.A.</i>
Access costs from point of competition to the border		<i>Access costs were estimated on the basis of marketing costs and margins of a field survey undertaken in 2009 (Aidoo, 2009). Estimates of access costs for the other years under analysis were done using the IMF GDP deflator for Ghana</i>	<i>Access costs were adjusted to account for traders 'excessive margins and costs at road blocks</i>
Access costs to farm gate		<i>Cost items considered in the analysis include: local market fees, rural market traders margin, transport, warehousing costs, major market trader margin. These costs have been calculated using the maize value chain information (IFPRI, 2007)</i>	<i>N.A.</i>
QT adjustment	Wh-FG	<i>N.A.</i>	<i>N.A.</i>
	Wh-FG	<i>N.A.</i>	<i>N.A.</i>
QL adjustment	Wh -Bor	<i>N.A.</i>	<i>N.A.</i>
	Wh-FG	<i>N.A.</i>	<i>N.A.</i>

**Table 11: data used for the analysis**

		Year	2005	2006	2007	2008	2009	2010
		trade status						
<b>DATA</b>	<i>Unit</i>	<i>Symbol</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>	<i>x</i>
Benchmark Price								
Observed	USD/TON	$P_{b(int\$)}$	595.93	770.36	791.83	810.19	654.74	690.44
Adjusted	USD/TON	$P_{ba}$						
Exchange Rate								
Observed	GH/USD	$ER_o$	0.91	0.92	0.94	1.06	1.41	1.43
Adjusted	GH/USD	$ER_a$						
Access costs border - point of competition								
Observed	GH/USD	$AC_{owh}$	106.93	123.83	140.27	167.54	209.96	246.24
Adjusted	GH/USD	$AC_{awh}$	94.53	117.50	125.01	135.76	134.07	149.50
Domestic price at point of competition	GH/USD	$P_{dwh}$	224.4	236.7	330.0	430.7	523.6	681.7
Access costs point of competition - farm gate								
Observed	GH/USD	$AC_{ofg}$	33.60	33.80	34.60	39.20	52.10	52.90
Adjusted	GH/USD	$AC_{afg}$						
Farm gate price	GH/USD	$P_{dfg}$	188.5	206.0	248.4	278.2	376.4	484.5
Externalities associated with production	GH/USD	$E$						
Budget and other product related transfers	GH/USD	$BOT$						
Quantity conversion factor (border - point of competition)	Fraction	$QT_{wh}$						
Quality conversion factor (border - point of competition)	Fraction	$QL_{wh}$						
Quantity conversion factor (point of competition – farm gate)	Fraction	$QT_{fg}$						
Quality conversion factor (point of competition – farm gate)	Fraction	$QL_{fg}$						

## QUALITY AND QUANTITY ADJUSTMENTS

Further information should be gathered on the loss of weight that yam undergoes along the way from the farm gate to the point of competition. However, this quantity adjustment could not be factored in the analysis due to the unavailability of such information hence no quality or quantity adjustments were made for the time being.

## CALCULATION OF INDICATORS

The indicators and the calculation methodology used are described in Box 1. A detailed description of the calculations and data requirements is available on the MAFAP website or by clicking [here](#).

### Box 1: MAFAP POLICY INDICATORS

MAFAP analysis uses four measures of market price incentives or disincentives. First, are the two observed nominal rates of protection, one at the wholesale level and one at the farm level. These compare observed prices to reference prices free from domestic policy interventions.

Reference prices are calculated from a benchmark price, such as an import or export price, expressed in local currency and brought to the wholesale and farm levels with adjustments for quality, shrinkage and loss and market access costs.

The Nominal Rates of Protection - observed (NRPo) is the price gap between the domestic market price and the reference price divided by the reference price at both the farm and wholesale levels:

$$NRPo_{fg} = (P_{fg} - RPo_{fg}) / RPo_{fg}; \quad NRPo_{wh} = (P_{wh} - RPo_{wh}) / RPo_{wh};$$

The NRPO<sub>fg</sub> captures all trade and domestic policies, as well as other factors affecting market incentives and disincentives for the farmer. The NRPO<sub>wh</sub> helps identify where incentives and disincentives may be distributed in the commodity market chain.

Second, are the Nominal Rates of Protection - adjusted (NRPa) in which the reference prices are adjusted to eliminate distortions found in developing country market supply chains. The equations to estimate the adjusted rates of protection follow the same general pattern:

$$NRPa_{fg} = (P_{fg} - RPa_{fg}) / RPa_{fg}; \quad NRPa_{wh} = (P_{wh} - RPa_{wh}) / RPa_{wh};$$

MAFAP analyzes market development gaps caused by market power, exchange rate misalignments, and excessive domestic market costs, which contribute to the NRPo and NRPa indicators. Comparison of the different rates of protection identifies where market development gaps can be found and reduced.

With the data described above we obtain the price gaps summarized in Table 12, nominal rates of protection in Table 13 and Market Development Gaps in Table 14 for the period 2005-2010.

**Table 12: MAFAP price gaps for Yams in Ghana 2005-2010 (Gh Cedis per Mt)**

	2005	2006	2007	2008	2009	2010
	X	X	X	X	X	X
Observed Price gap at wholesale	(211.00)	(348.16)	(274.05)	(260.59)	(189.58)	(59.42)
Adjusted price gap at wholesale	(223.40)	(354.49)	(289.31)	(292.37)	(265.47)	(156.16)
Observed price gap at farm gate	(213.31)	(342.30)	(321.06)	(343.59)	(321.92)	(203.69)
Adjusted price gap at farm gate	(225.71)	(348.64)	(336.32)	(375.37)	(397.80)	(300.43)

Source: Own calculations using data as described above

**Table 13: MAFAP nominal rates of protection (NRP) for Yams in Ghana 2005-2010(%)**

	2005	2006	2007	2008	2009	2010
Trade status for the year	x	x	x	x	x	x
Observed NRP at wholesale	-48.46%	-59.52%	-45.37%	-37.70%	-26.58%	-8.02%
Adjusted NRP at wholesale	-49.89%	-59.96%	-46.71%	-40.44%	-33.64%	-18.64%
Observed NRP at farm gate	-53.09%	-62.11%	-56.38%	-52.69%	-48.69%	-29.60%
Adjusted NRP at farm gate	-54.50%	-62.54%	-57.52%	-54.89%	-53.98%	-38.27%

Source: Own calculations using data as described above

**Table 14: MAFAP Market Development Gaps for Yams in Ghana 2005-2010 (GhCedis/Mt)**

	2005	2006	2007	2008	2009	2010
International Market Gap						
Exchange Policy						
Access cost gap to point of competition	(12.40)	(6.34)	(15.26)	(31.78)	(75.89)	(96.74)
Access cost gap to farm gate						

Source: Own calculations using data as described above

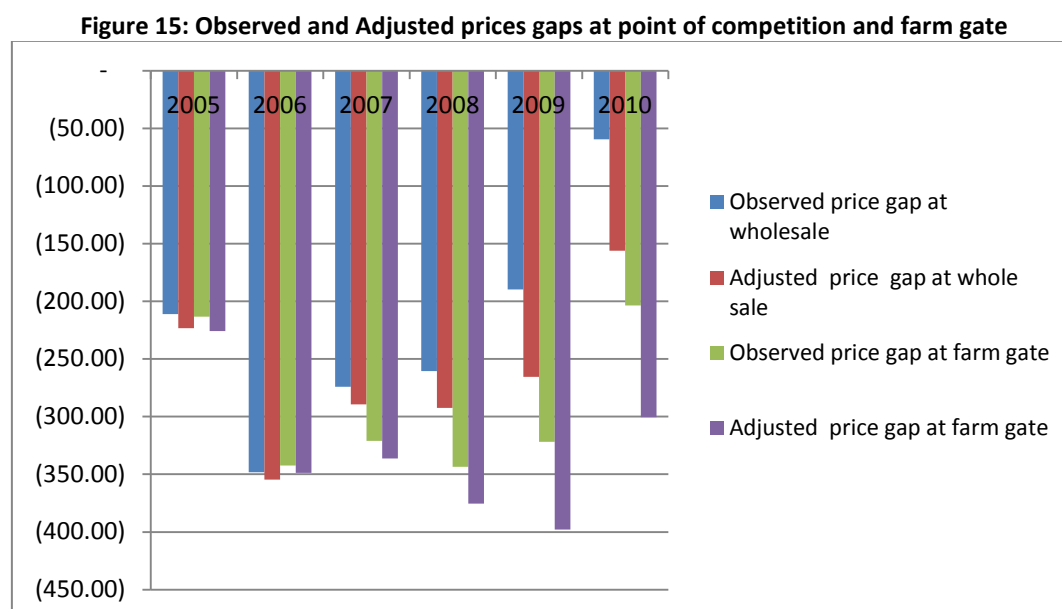
ND: No data available for calculation

## 4. INTERPRETATION OF THE INDICATORS

Our results show that the observed wholesale prices gaps, i.e. the difference between the domestic wholesale price and the reference price at point of competition are negative during the whole period. However, this has been decreasing starting from year 2007. The observed price gaps at farm gate, between observed farm gate prices and reference prices at the farm gate follow a similar trend but with higher price gaps for the whole period under analysis. Such gaps only started decreasing in 2008 and at a lower rate if compared to wholesale price gaps with the only exception of 2010.

This overall negative gap can be attributed to high access costs for the yam value chain in Ghana. This high access costs are an evidence of the inefficiency in the transport industry but also in the way in which yam is handled as spoilage and weight loss are also an issue.

Adjusted price gaps contribute to highlight the negative impact that excessive traders' margins as well as other costs incurred along the value chain have on incentives especially at the producer level. A similar situation in terms of negative incentives at the farmer level was found in the cassava value chain.

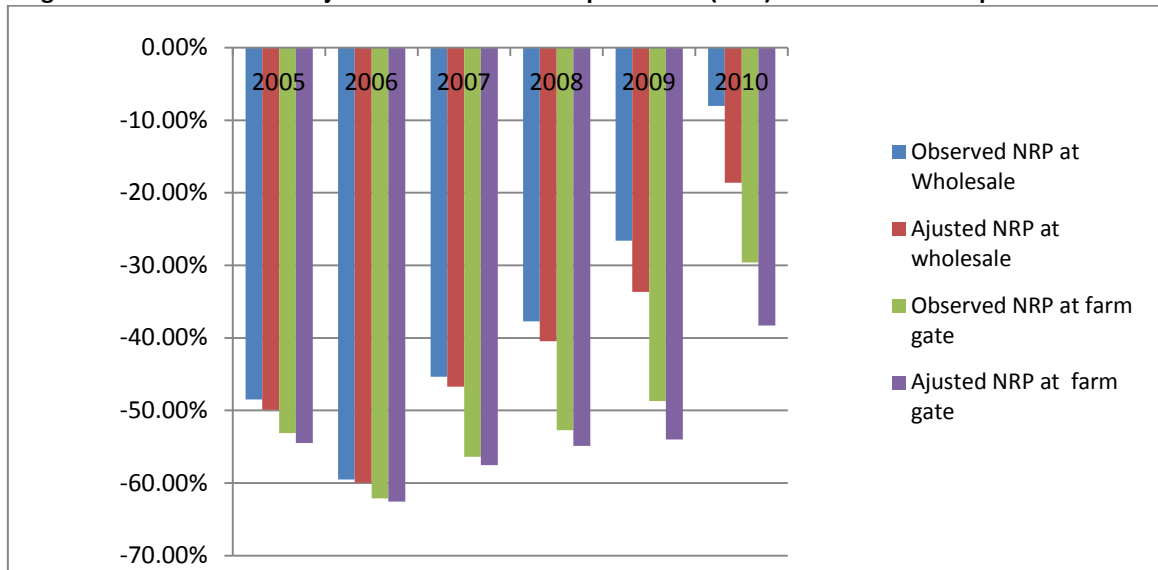


The observed NRPs follow the same trend as the observed price gaps. It is negative for all years under review. The wholesale NRP goes from more than 60percent down to 18percent in 2010, whereas the farm gate NRPs remains higher, between 60 percent till 45 percent (figure 16).

Our analysis shows disincentives for all the years, with low producer prices and high transportation cost. Farm gate prices below the export parity could be explained by different factors: the export duty of 20 percent which was in place in the years 2007, 2008 and 2009; secondly, the quality of Ghana yams on the international market is quite low compared to that of Brazil. Both elements could contribute to explain the lower prices offered by exporters to yam producers in Ghana. Finally, transportation cost to export yam is quite high, since yam was mainly transported by air to avoid sprouting and spoilage. However, since 2007, new treatment procedures have been adopted and yam is transported by sea again, which may trigger better prices for producers.



**Figure 16: Observed and adjusted Nominal Rate of protection (NRP) at whole sale and producer levels**



## 5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

### MAIN MESSAGE

As a draft preliminary version of the yam technical note, the main idea is to present the general key message in view of carrying out an in-depth analysis. In general the analysis indicates disincentives for both producers and wholesalers. This is mainly attributed to high transportation and other related access costs. These go on to further highlight the poor conditions of roads from the inter-lands to the main wholesale markets for yam, this could be the main reason why yam producers and traders earn low prices for their products.

A similar situation was found in the cassava value chain. In both cases, it seems that inefficient transport and other access costs have a higher incidence on root crops as compared to other commodities where at least wholesalers and traders more in general seem to have an incentive. For root crops the absence of development policies is thus more evident.

Under the Medium Term Investment Plan, the Ghanaian Government has indicated its willingness to invest and increase the value added for crops such as yam, cassava and plantain. In addition, the Ghana government envisaged a reform of institutional structures to reduce the bureaucracy of yam exports out of the country. In this context, MAFAP methodology could be used as a resourceful tool to enhance understanding with regards to the opportunities for yam producers.

### PRELIMINARY RECOMMENDATIONS

Despite yam is one of the most prominent export commodities for Ghana, information on the yam value chain is poor. Aspects such as a clear distinction between yam varieties for the export market and those consumed locally and the different pathways that characterize exported yam as opposed to domestically consumed yam do not emerge from available research. Another limiting factor is also represented by the quality of Ghanaian yam which seems to be lower if compared to other producing and exporting countries. This type of information is essential to the definition of policies and interventions for the development of the yam value chain.

### LIMITATIONS

The analysis has also highlighted some difficulties in understanding what types of yam is being exported to the international market. Although white yam is mentioned as the preferred variety, it will be good to identify if this is the main exported item as the FOB price as well as the domestic prices may differ depending on the quality of yam.

Main limitations were encountered in the calculation of access costs for both legs as no specific information is available on access costs for yam from the farm gate to the wholesale market. While data on access costs from the point of competition to the border do not specifically refer to the Accra-Tema corridor.

## **FURTHER INVESTIGATION AND RESEARCH**

- There is the need to undertake an in-depth analysis of the yam value chain and assess yam access costs as this will provide a better understanding of the market gaps;
- The second aspect that would need further investigation is yam losses which seem to affect the yam value chain up to the main destination markets in Europe (Aidoo et al. 2012).

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## **ANNEX I: Methodology Used**

A guide to the methodology used by MAFAP can be downloaded from the MAFAP website or by clicking [here](#).

## ANNEX II: Data and calculations used in the analysis

Name of product	Yam
International currency	US

Local currency	GHC
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				Year	2005	2006	2007	2008	2009	2010
DATA		Unit	Symbol	trade status	x	x	x	x	x	x
Benchmark Price										
1	Observed	US/TON	P <sub>b(int\$)</sub>		595.93	770.36	791.83	810.19	654.74	690.44
1b	Adjusted	US/TON	P <sub>ba</sub>							
Exchange Rate										
2	Observed	GHC/US	ER <sub>o</sub>		0.91	0.92	0.94	1.06	1.41	1.43
2b	Adjusted	GHC/US	ER <sub>a</sub>							
Access costs border - point of competition										
3	Observed	GHC/TON	ACo <sub>wh</sub>		106.93	123.83	140.27	167.54	209.96	246.24
3b	Adjusted	GHC/TON	ACa <sub>wh</sub>		94.53	117.50	125.01	135.76	134.07	149.50
4	Domestic price at point of competition		GHC/TON	P <sub>dwh</sub>	224.37	236.74	330.00	430.67	523.64	681.67
Access costs point of competition - farm gate										
5	Observed	GHC/TON	ACo <sub>fg</sub>		33.60	33.80	34.60	39.20	52.10	52.90
5b	Adjusted	GHC/TON	ACa <sub>fg</sub>							

6	<b>Farm gate price</b>	GHC/TON	P <sub>dfg</sub>	188.46	208.80	248.38	308.47	339.20	484.50
7	Externalities associated with production	GHC/TON	E						
8	Budget and other product related transfers	GHC/TON	BOT						
	Quantity conversion factor (border - point of competition)	Fraction	QT <sub>wh</sub>						
	Quality conversion factor (border - point of competition)	Fraction	QL <sub>wh</sub>						
	Quantity conversion factor (point of competition - farm gate)	Fraction	QT <sub>fg</sub>						
	Quality conversion factor (point of competition - farm gate)	Fraction	QL <sub>fg</sub>						

CALCULATED PRICES		Unit	Symbol	2005	2006	2007	2008	2009	2010
<b>Benchmark price in local currency</b>									
9	<i>Observed</i>	GHC/TON	P <sub>b(loc\$)</sub>	542.30	708.73	744.32	858.80	923.18	987.33
10	<i>Adjusted</i>	GHC/TON	P <sub>b(loc\$a)</sub>	542.30	708.73	744.32	858.80	923.18	987.33
<b>Reference Price at point of competition</b>									
11	<i>Observed</i>	GHC/TON	RP <sub>o<sub>wh</sub></sub>	435.37	584.90	604.05	691.26	713.22	741.09
12	<i>Adjusted</i>	GHC/TON	RP <sub>a<sub>wh</sub></sub>	447.77	591.24	619.31	723.04	789.10	837.83
<b>Reference Price at Farm Gate</b>									
13	<i>Observed</i>	GHC/TON	RP <sub>o<sub>rg</sub></sub>	401.77	551.10	569.45	652.06	661.12	688.19

14	<i>Adjusted</i>	GHC/TON	RP <sub>a<sub>fg</sub></sub>	414.17	557.44	584.71	683.84	737.00	784.93
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INDICATORS		Unit	Symbol	2005	2006	2007	2008	2009	2010
<b>Price gap at point of competition</b>									
15	<i>Observed</i>	GHC/TON	PG <sub>o<sub>wh</sub></sub>	(211.00)	(348.16)	(274.05)	(260.59)	(189.58)	(59.42)
16	<i>Adjusted</i>	GHC/TON	PG <sub>a<sub>wh</sub></sub>	(223.40)	(354.49)	(289.31)	(292.37)	(265.47)	(156.16)
<b>Price gap at farm gate</b>									
17	<i>Observed</i>	GHC/TON	PG <sub>o<sub>fg</sub></sub>	(213.31)	(342.30)	(321.06)	(343.59)	(321.92)	(203.69)
18	<i>Adjusted</i>	GHC/TON	PG <sub>a<sub>fg</sub></sub>	(225.71)	(348.64)	(336.32)	(375.37)	(397.80)	(300.43)
<b>Nominal rate of protection at point of competition</b>									
19	<i>Observed</i>	%	NRPO <sub>wh</sub>	-48.46%	-59.52%	-45.37%	-37.70%	-26.58%	-8.02%
20	<i>Adjusted</i>	%	NRPA <sub>wh</sub>	-49.89%	-59.96%	-46.71%	-40.44%	-33.64%	-18.64%
<b>Nominal rate of protection at farm gate</b>									
21	<i>Observed</i>	%	NRPO <sub>fg</sub>	-53.09%	-62.11%	-56.38%	-52.69%	-48.69%	-29.60%
22	<i>Adjusted</i>	%	NRPA <sub>fg</sub>	-54.50%	-62.54%	-57.52%	-54.89%	-53.98%	-38.27%
<b>Nominal rate of assistance</b>									
23	<i>Observed</i>	%	NRA <sub>o</sub>	-53%	0.62112323	0.56381984	0.52692982	0.48692965	0.29597647
24	<i>Adjusted</i>	%	NRA <sub>a</sub>	-54.50%	-62.54%	-57.52%	-54.89%	-53.98%	-38.27%



Decomposition of PWAfg		Unit	Symbol	2005	2006	2007	2008	2009	2010
25	International markets gap	GHC/TON	IRG	-	-	-	-	-	-
26	Exchange policy gap	GHC/TON	ERPG	-	-	-	-	-	-
27	Access costs gap to point of competition	GHC/TON	ACG <sub>wh</sub>	(12.40)	(6.34)	(15.26)	(31.78)	(75.89)	(96.74)
28	Access costs gap to farm gate	GHC/TON	ACG <sub>fg</sub>	-	-	-	-	-	-
29	Externality gap	GHC/TON	EG	-	-	-	-	-	-



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