MAFAP
SPAAA

Monitoring African Food and Agricultural Policies

Suivi des politiques agricoles et alimentaires en Afrique

ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR PALM OIL IN GHANA

Draft Version

JUNE 2013

This technical note is a product of the Monitoring African Food and Agricultural Policies project (MAFAP). It is a technical document intended primarily for internal use as background for the eventual MAFAP Country Report. This technical note may be updated as new data becomes available.

MAFAP is implemented by the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Organisation for Economic Co-operation and Development (OECD) and national partners in participating countries. It is financially supported by the Bill and Melinda Gates Foundation, the United States Agency for International Development (USAID), and FAO.

The analysis presented in this document is the result of the partnerships established in the context of the MAFAP project with governments of participating countries and a variety of national institutions.

For more information: **http://www.fao.org/mafap**

Suggested citation:

Angelucci F., 2013. Analysis of incentives and disincentives for palm oil in Ghana. Technical notes series, MAFAP, FAO, Rome.

© FAO 2013

FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO as the source and copyright holder is given and that FAO's endorsement of users' views, products or services is not implied in any way.

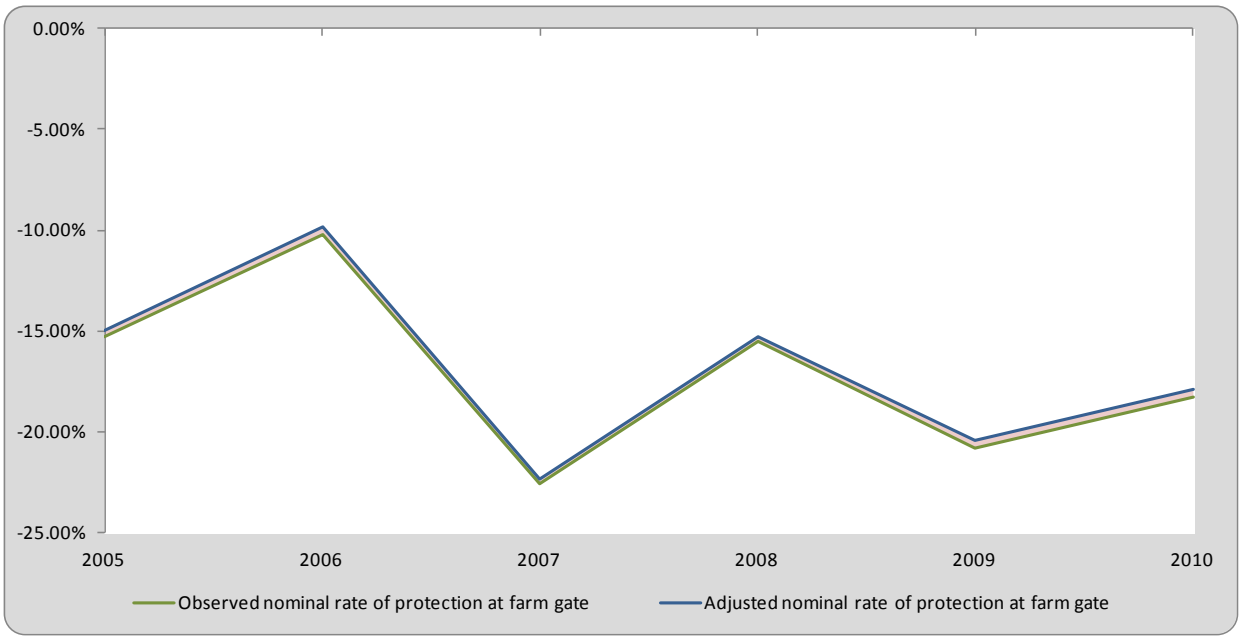
All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via www.fao.org/contact-us/licence-request or addressed to copyright@fao.org.

FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org.

SUMMARY OF THE NOTE

Product: Palm oil
Period analyzed: 2005 – 2010
Trade status: Import in all years

- The total volume of palm oil imported in 2010 was 134,600 tonnes
- Total production from 108,000 tonnes in 2000 to 120,000 tons in 2010. 80% from smallholders
- Malaysia and Indonesia are the main palm oil suppliers with a total average share of almost 90% over the last six years.
- Import duties are levied at 20 percent for palm oil for human consumption and at 10 percent for palm oil for soap and production of other non-edible products.



The observed Nominal Rate of Protection (NRP, green line) indicates palm oil producers are facing price disincentives under the prevailing cost structure in the value chain. Our results show that disincentives, arise from: 1) high access cost; 2) illicit taxation; 3) costly and inefficient processing techniques.

- Notwithstanding the disincentives, production has increased in most years due high demand
- Actions to be taken to reduce disincentives could include: 1)Modernizing and upscaling of processing techniques and facilities; 2) Monitoring farm gate prices paid to producers.

CONTENTS

1. PURPOSE OF THE NOTE

This technical note aims to describe the market incentives and disincentives for Palm Oil 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. 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 outcomes of this analysis can be used by those 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.

All information is preliminary and still subject to review and validation.

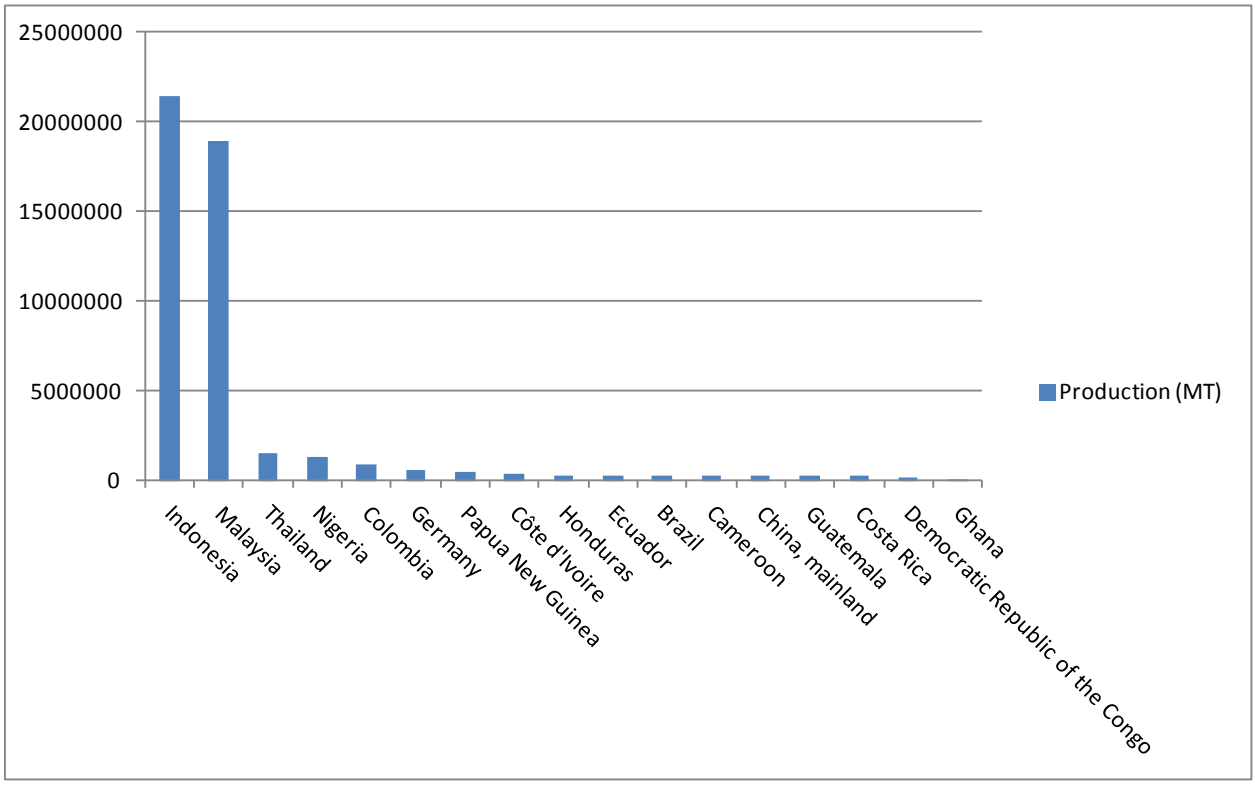
2. POLICY CONTEXT

Palm oil is the most important edible oil crop in Ghana and in the whole West Africa region. Palm oil and palm kernel represent 2% of total agricultural production value of Ghana in 2010.

Ghana was the first country were the British established oil palm plantations in the 19th century. The same seeds and production techniques were then used to establish palm oil estates in another British colony, Malaysia. Despite the common root, the palm oil value chain in Malaysia and Ghana took two divergent development pathways.

Malaysia is now the world second largest palm oil producer and exporter after Indonesia, while Ghana ranks 15th in terms of production quantity (Figure 1). Palm oil is getting increasing attention on commodity world markets thanks to several factors including the high yields of palm oil as compared to any other edible oil crop and the level of world production which is going to exceed that of any other vegetable oil. The increase in supply as well as demand is primarily attributed to the increase in demand for palm oil for bio-fuel production

Figure 1. Top ten world producers of palm oil in 2011



Source: FAOSTAT, 2012

Palm oil in Ghana became a commercial crop at the beginning of the 19th century. Originally, the sector was based on wild palm harvesting and later in 1850 oil palm plantations were established and oil palm evolved to an agricultural crop. This lead to palm oil becoming the principal export in the 19th century accounting for 75% of Ghana's export revenues. At present, Ghana with its 305,758 hectares of area planted and a production of 243,852 tons of palm oil has an internal unmet demand of 35,000 tons. The whole ECOWAS region has an unmet demand of 850,000 tons (MOFA, 2012).

Several Government interventions with the support of international agencies were undertaken to re-launch the palm oil sector and boost production and productivity:

- 3,000ha outgrower project currently ongoing in the Upper & Lower Denkyira Districts with the support of Agence Francaise de Developpement (AFD).
- Expansion of the seed nuts production capacity of OPRI from 2 million to 5 million seed nuts per year under the World Bank sponsored Agriculture Services Sub-Sector Investment Programme (AgSSIP).
- Cultivation of over 10,000ha small-scale farms under the President's Special Initiative (PSI) on oil palm.

Amongst the upcoming Government interventions is the development of a master plan for the oil palm sector with the support of AFD. However, as of today, the palm oil industry has not expanded due to the lack of diversification into value added products which constitute one the main success factors in exporting countries like Indonesia and Malaysia (Fold and Whitfield, 2012).

It appears that the policy shift, which occurred after independence, on increasing production of palm oil for the domestic market as opposed to the export market is penalizing the oil palm industry as a whole.

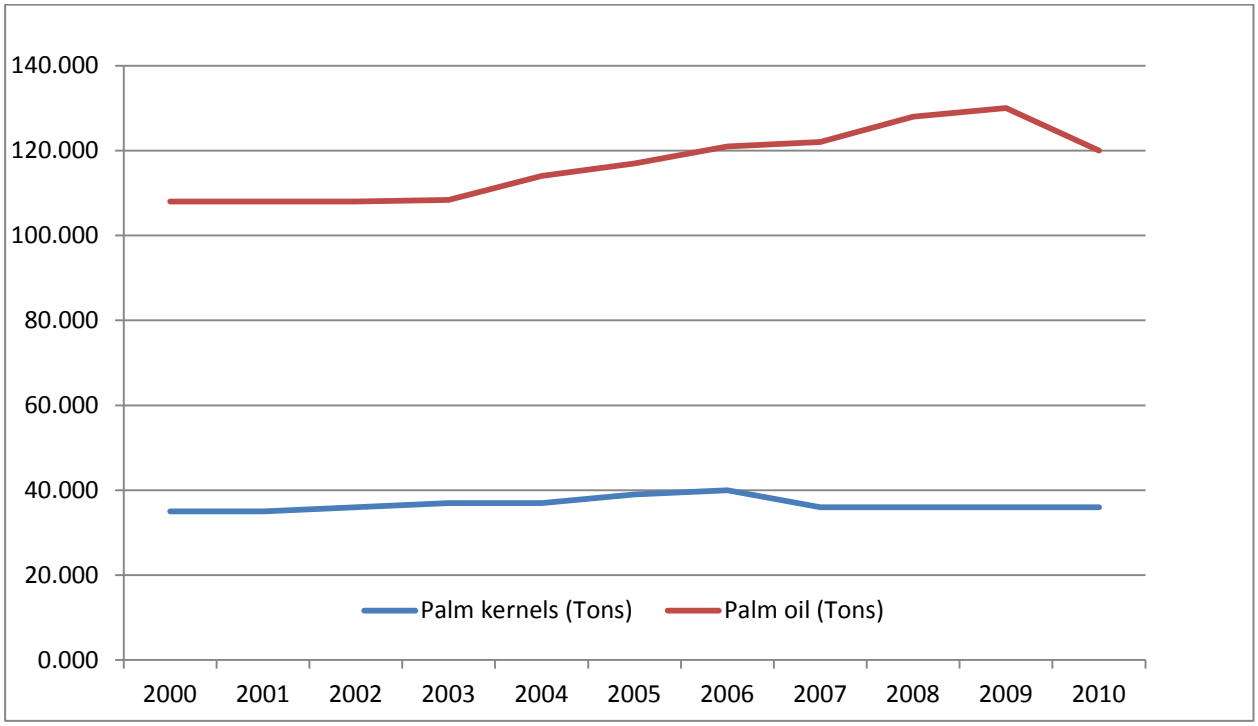
PRODUCTION

80% of palm oil plantations are owned by small scale farmers who supply both the large estates and small scale processors (MOFA, 2012). Small scale processors producing crude palm oil account for 80% of total Ghana palm oil production. The vast majority of processors (80%) are women who are employed in this activity as wage workers.

There are significant differences in palm oil production and processing at the small and large plantation levels. One of the most striking aspects is the wide variation in the productivity of oil palm in Ghana. The highest productivity of 20 tons/ha have been recorded by plantations in valley bottoms. The large estates achieve productivity levels of between 10 – 15 tons/ha. Smallholders and out-growers produce between 7 – 10 tons/ha while private small-scale farms produce about 3 tons/ha.

Production of Palm Oil in Ghana is experiencing a positive trend which started in the early 2000s when the industry was re-launched following several initiatives including seed research and improvements, upscaling of outgrowers schemes. However, the increase in the production of fresh fruits has only had a partial rebound in terms of palm oil production. This is largely explained by the still high incidence of manual processing techniques which are characterized by low extraction rates as opposed to large industries. If we exclude the picks reached in 2008 and 2009 palm oil production has increased by 10,7% since year 2000.

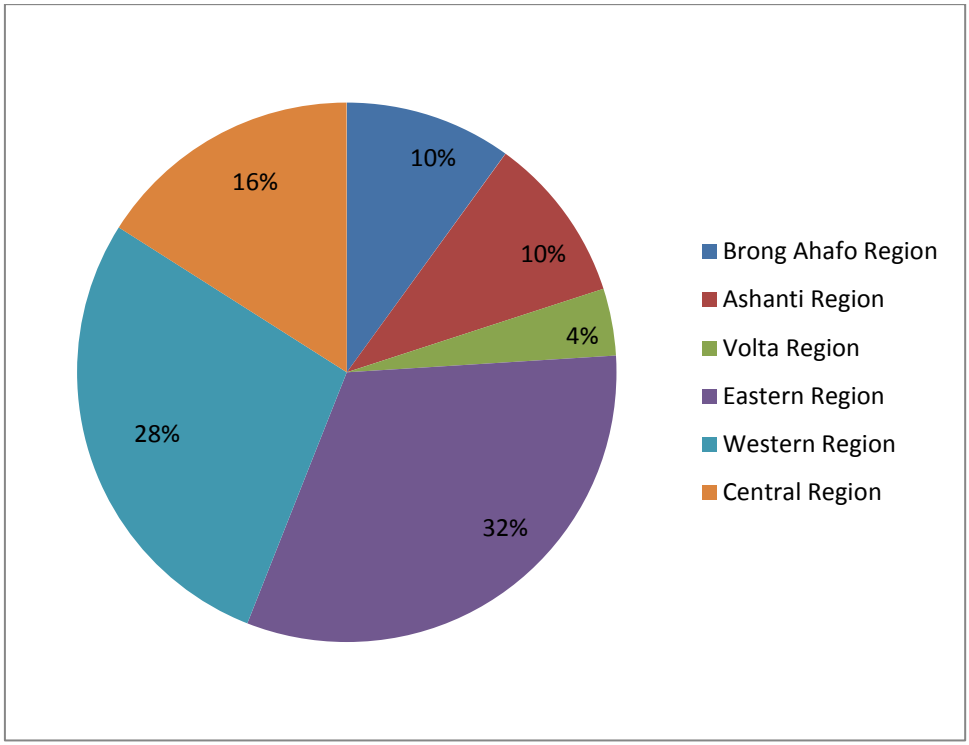
Figure 2: Palm oil and palm kernels' production trends in Ghana (2000-2010, Tonnes)



Source: FAOSTAT (2012)

Palm oil has a wide geographical coverage as it is cultivated in six out of the ten administrative regions of Ghana (Adjei-Nsiah et al, 2012). However, despite the total land suitable for cultivation in Ghana is estimated at around 3 Million Ha the actual area planted is of around 300,000 ha (PSI, 2004).

Figure 3: Palm oil distribution of area under cultivation in Ghana by region, 2010



Source: MOFA, Palm Oil Master Plan study, 2011

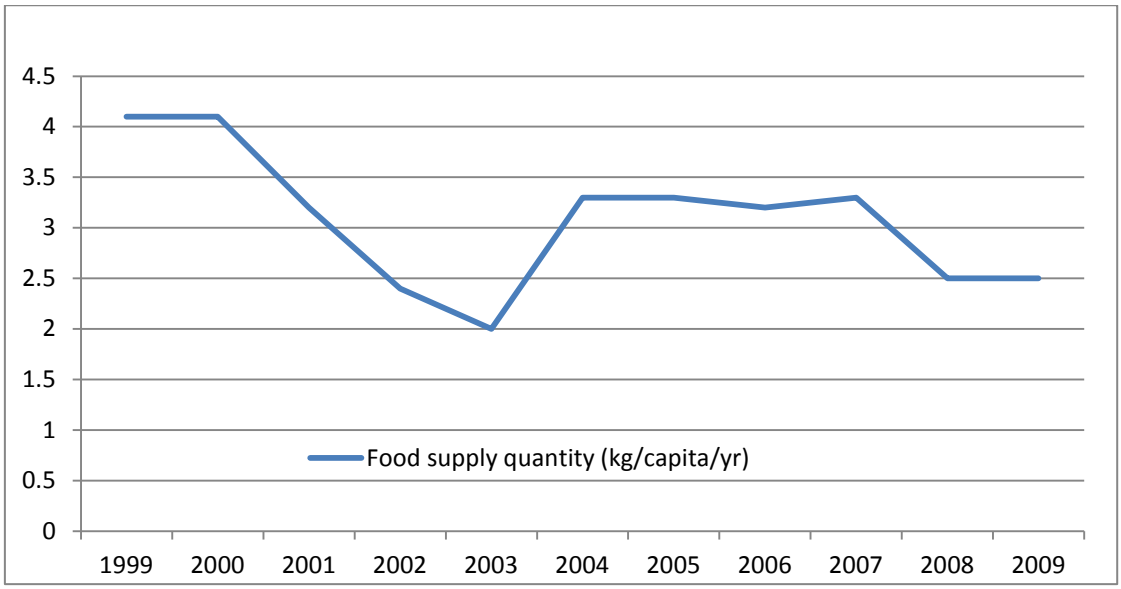
CONSUMPTION/UTILIZATION

Before analyzing consumption patterns some basic information will be provided on the two main products that can be obtained from palm oil trees and their main uses. The palm oil trees bear fruits in bunches, the fresh fruit bunches (FFB). Individual fruits contain an external skin, the pulp which is used to produce palm oil and a central nut consisting of a shell and the kernel. The kernel is used to produce palm kernel oil. Crude palm oil is employed in the production of both food and non-food products such as soap. Crude palm oil has to be refined before it is used in the food industry. The main food products obtained from refined palm oil are cooking oil and margarine as well as biscuits and ice cream. Palm kernel oil can be used as an edible fat and in the oleo-chemical industry for the production of cosmetics.

Palm oil is the most important edible oil in Ghana and in the West Africa region in general. This is an important element as it partly explains the deficit which is affecting the region and Ghana in particular. Palm oil is an essential ingredient in Ghanaian food preparation especially in the coastal and forest zones and has been recommended by WHO as an ingredient for food fortification programmes where vitamin A is deficient (Master Plan Study for the Palm Oil industry in Ghana, 2012). Smallholders extract crude palm oil from fruits manually or by small mills to serve the local economy. On the contrary, in Asian countries like Malaysia or Indonesia coconut oil is the main vegetable oil used for cooking while palm oil which does not have any particular relevance in the dietary habits of Asian smallholders is mainly destined to the export market.

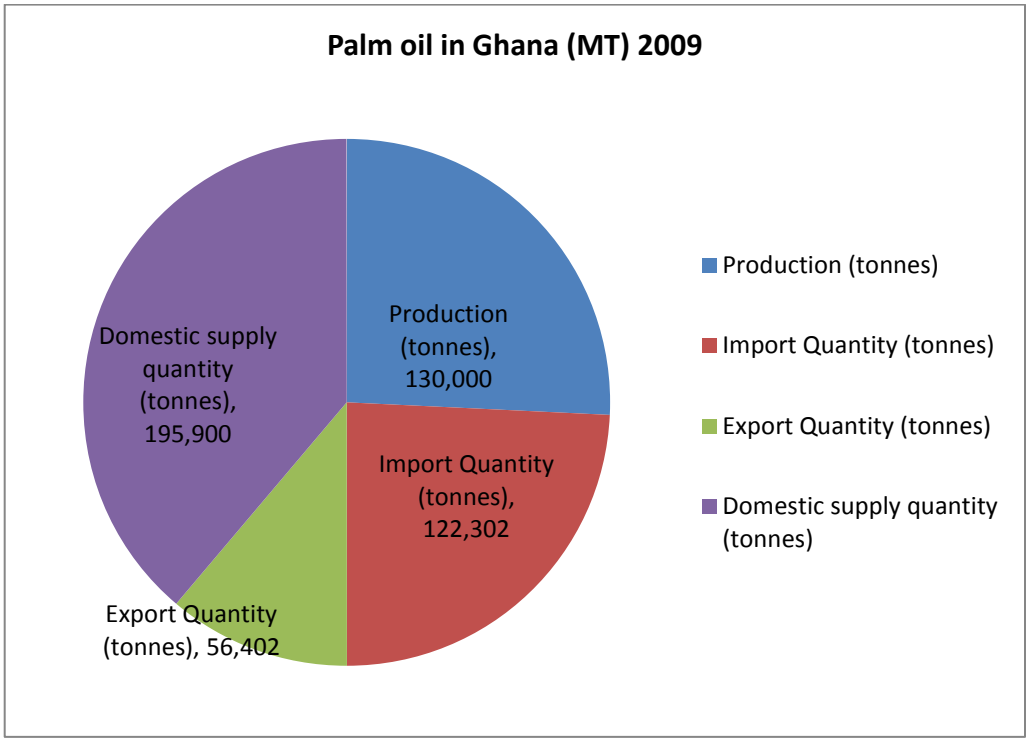
The social and cultural importance of oil palm in Ghanaian culture explains part of the unexploited potential of palm oil being considered as an industrial crop and the competition for fruits between the two segments, industrial processing for export or domestic consumption (palm oil trees are often felled before they reach maturity as they are used to produce palm wine, a drink of great cultural importance). Furthermore, smallholders refuse to adopt varieties more suitable to industrial processing as this would limit their penetration in the domestic palm oil segment (Fold and Whitfield, 2012).

Figure 4: Ghana palm oil consumption per capita, 1999 - 2009 (kg/year)



Source: FAOSTAT Food Balance Sheets

Figure 5: Commodity balance indicators (MT)



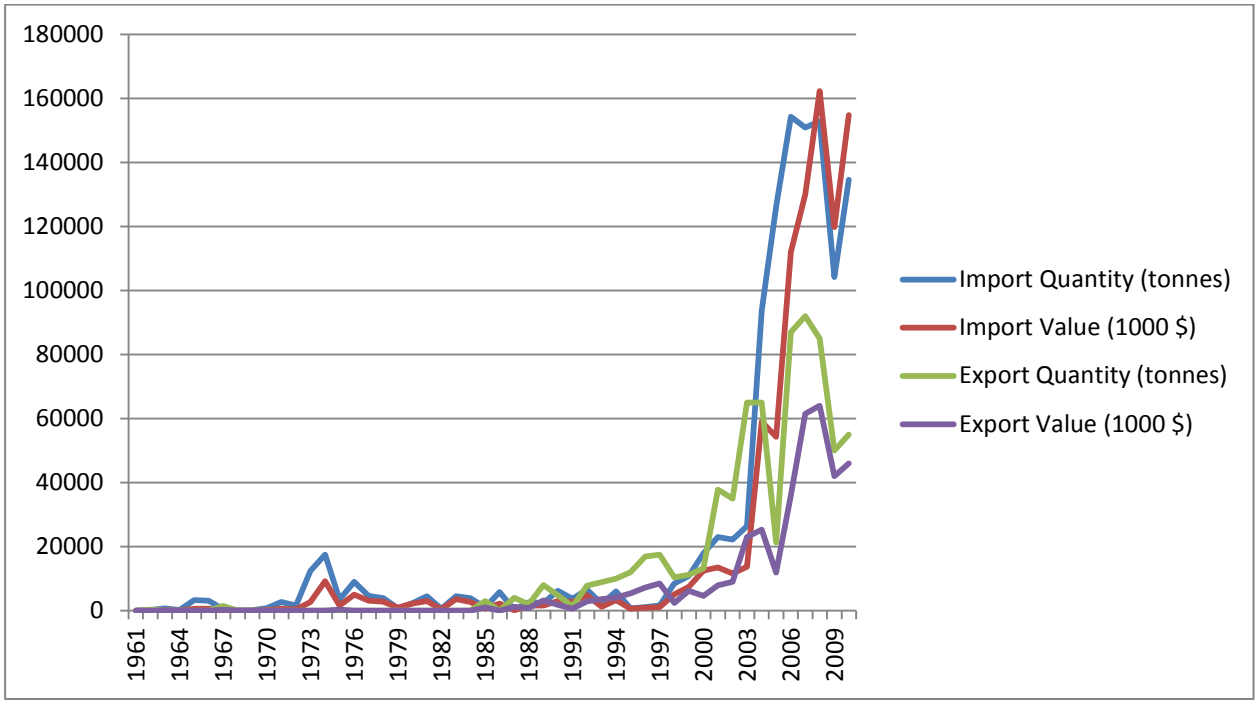
Source: FAOSTAT Commodity Balance Sheets 2012

MARKETING AND TRADE

The figure below shows export and import trends starting from the 60s as this was the period when Ghana stopped exporting palm oil. Palm oil exports regained some momentum in the 90s. In the last decade, there seems to be an increased volatility in both import and export flows as well as a net outpace of oil palm imports against exported volumes and values.

After independence, Ghanaian Governments made attempts to revive the industry. But these attempts were all aimed at meeting internal demand and not at developing export oriented by-products. Other factors that affected the decline in the palm oil industry in Ghana are the low quality of palm oil due to outdated processing techniques and the high transport costs (Fold and Whitfield, 2012).

Figure 6: Trends of import and export of palm oil in Ghana 1961-2010



Source: FAOSTAT, 2012

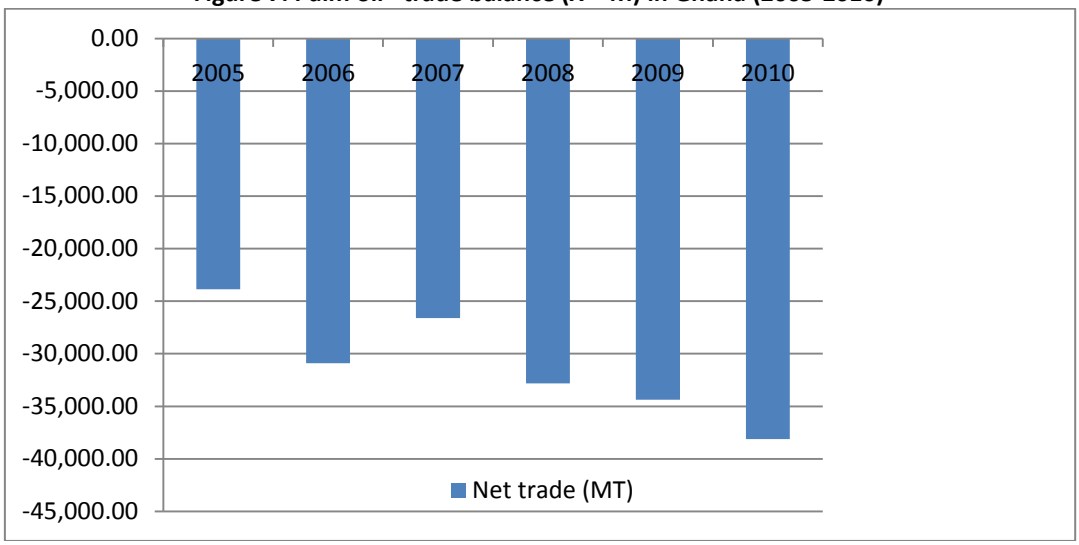
Table 1: Palm oil production, import and export of Ghana (2005-2010)

	2005	2006	2007	2008	2009	2010
Palm kernels production(MT)	39,000	40,000	36,000	36,000	36,000	36,000.00
Palm oil Production (MT)	117,000	121,000	122,000	128,000	130,000	120,000
Total production (MT)	156,000	161,000	158,000	164,000	166,000	156,000
Exports (MT)	4,311	1,929	2,116	2,018	6,787	11,634
Imports (MT)	28,161	32,814	28,714	34,830	41,148	49,740
Exports as a % of production	2.8%	1.2%	1.3%	1.2%	4.1%	7.5%
Imports as a % of production	24.1%	27.1%	23.5%	27.2%	31.7%	41.5%

Source: FAOSTAT, 2013

Figure 7 shows the increasing deficit which is mainly due to an increasing demand primarily from the local industry and a supply which is increasing at a much lower pace.

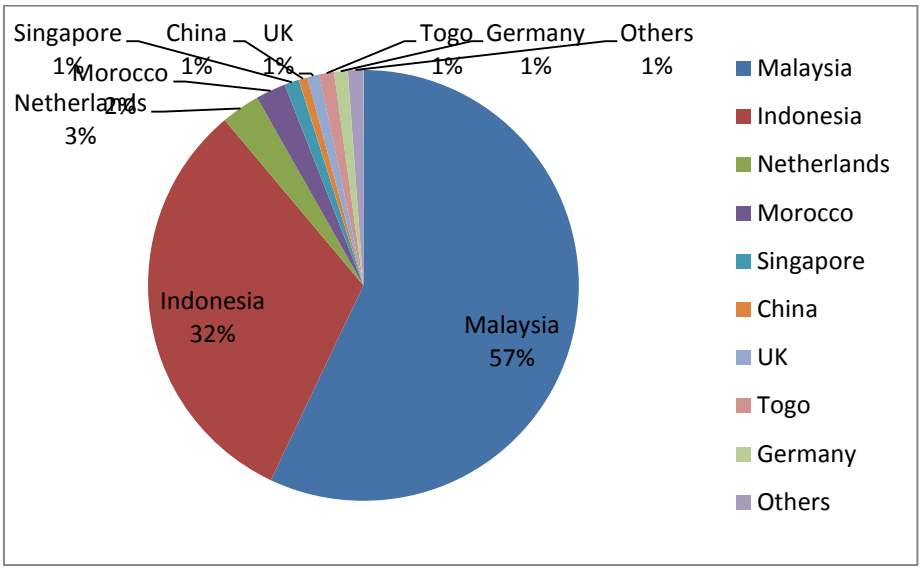
Figure 7. Palm oil* trade balance (X – M) in Ghana (2005-2010)



*refers to HS code 1511 "palm oil and its fractions"
Source: UNComtrade, 2012

Malaysia and Indonesia are the main palm oil suppliers with a total average share of almost 90% over the last six years. The only two African countries which supply small quantities are Morocco (2%) and Cote d'Ivoire (1%). It is difficult to assess to which extent imported volumes are used to feed the local market or mainly absorbed by the large processors to produce oil palm products exported to other West Africa countries, mainly Togo and Cote d'Ivoire (Figure 9).

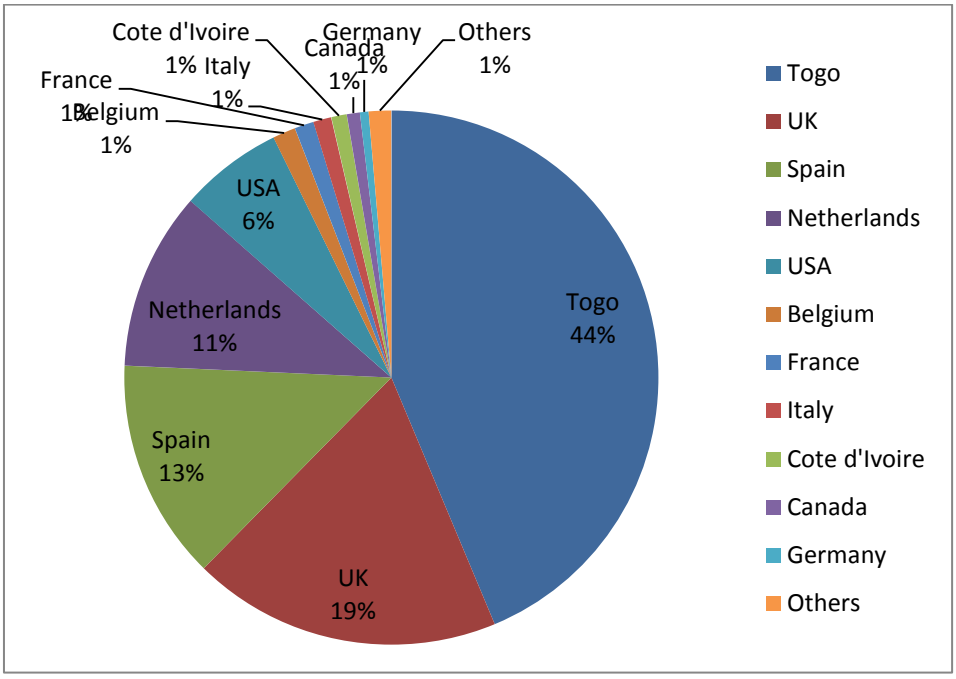
Figure 8: Countries exporting palm oil to Ghana (average shares, 2005-2010)



Source: UN Comtrade, 2012

Togo is the main destination market for crude palm oil from Ghana. On average 44% of exports were directed to Togo and 1% to Cote d'Ivoire over the period of analysis.

Figure 9: Countries importing palm oil from Ghana (average shares, 2005-2010)



Source: UNComtrade, 2012

DESCRIPTION OF THE VALUE CHAIN AND PROCESSING

The palm oil sector in Ghana includes two different markets: home consumption and industrial use in domestic manufacturing. The latter consists mainly of large and medium palm oil plantations and milling facilities which enjoy economies of scale, high productivity on farms and mills as well as better quality of oil extracted. There are four large scale oil palm plantations that have their own processing mills and eight medium mills. After the privatization of the large scale plantations, foreign capital and multinationals like Unilever took over the majority of the shareholding of two of the largest companies even if one of them BOPP was sold to another multinational. However, the large estates are not self sufficient and buy most of the raw material (60%) from smallholders outside the main plantation or source the raw material from abroad. On the other hand, the home consumption value chain is based on small scale producers who sell to small scale mills or households doing manual processing. There are around 400 small-scale processing units in Ghana characterized by a weak milling capacity as well as the low quality of the oil produced.

Table 2: Leading large and medium palm oil estates in Ghana

Companies	No. of plantations	No. of outgrower/smallholders	Total area planted (Ha)	Milling capacity (tons per hour)
GOPDC (Ghana Oil Palm Development Company Ltd.)	8,000	14,352	22,352	60
TOPP (Twifo Oil Palm Plantations Ltd.)	4,234	1,690	5,924	30
BOPP (Benso Oil Palm Plantations Ltd.)	4666	1,650	6,316	27
NORPALM GH. LTD.	4000	-	4000	30
JUABIN OIL MILLS	424	1,100	1,524	15
AYIEM OIL MILLS	250	-	250	10
GOLDEN STAR (A mining company)	-	720	720	-
TOTAL	**21,574**	**19,512**	**41,086**	**172**

Source: MOFA, 2012 (http://mofa.gov.gh/site)

The diagram below describes the five main actors of the palm oil value chain in Ghana:

1. Large industrial plantations with large scale processing facilities and a network of smallholders/out-grower farmers;

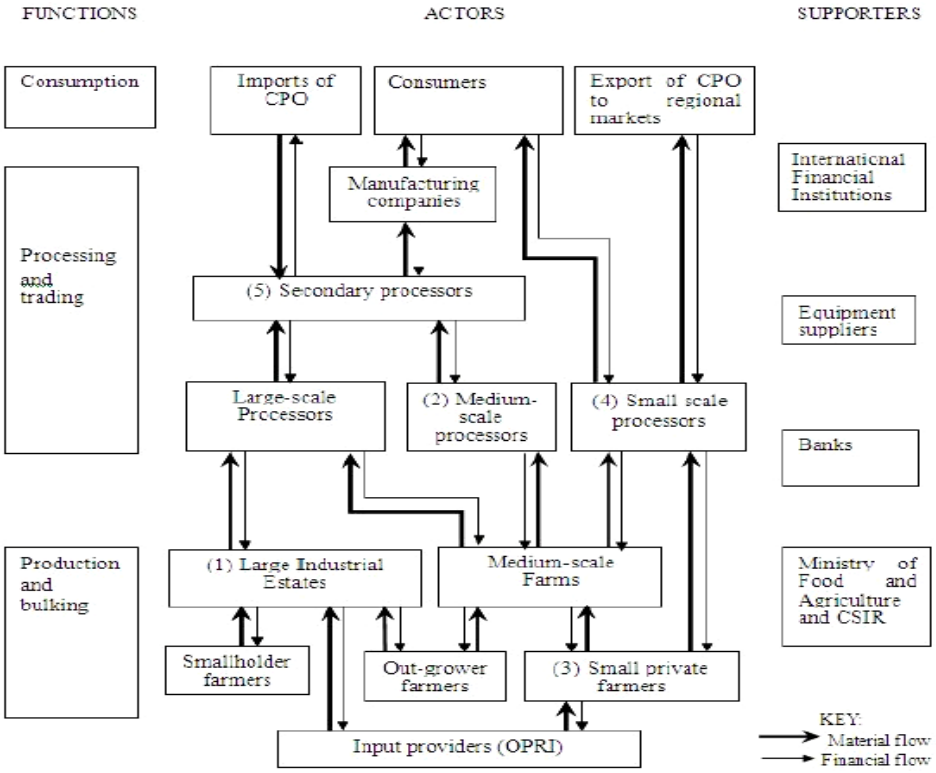
2. Medium scale plantations with medium scale industrial mills and a network of out-growers;

3. Small private farmers cultivating less than 10 ha;

4. Small scale processors using semi-mechanized mills with processing capacities of 6/8 Tons per day; 5. secondary processors who process crude palm oil into olein.

The industry is supported by an ad hoc research body the Oil Palm Research Institute (OPRI) which is part of the Council of Scientific and Industrial Research (CSIR). According to recent estimates, small scale village mills process about 68% of palm oil fruits, with a share of 55% on the total palm oil production; the medium sized mills and the large scale ones absorb 12% and 19-20% of total fruits, respectively; household production uses the remaining 10%.

Figure 10: Value chain diagram for the Oil Palm Industry in Ghana



Source: Adjei-Nsiah et al, 2012

The dichotomy between palm oil production based on small scale processors and large/medium scale ones is evident when looking at processing techniques. There are several activities involved in the processing of fresh fruits which include: removal of fruits containing spikelet; fruit loosening and storage; boiling and digestion of fruits; pressing and clarifying treatments. The fact that some of this activities are carried out manually entails low level of extraction and low processing capacity per day. Furthermore, household and other small scale/manual processors may store fruits from 1 to 4 weeks before processing. The non processing of fruits within 48 hours from harvest can lead to tremendous increase of fatty acids in the oil produced (Adjei-Nsiah et al, 2012). As a consequence, palm oil produced by small scale processors cannot be sold to industrial refineries given its high Free Fatty Acid (FFA) and moisture content as well as the high rate of impurities.

The different production and processing methods result in three different types of palm oil being produced in Ghana. These three types are ranked according to the FFA and moisture contents which in turn makes the different palm oil types suitable for different end-products: 1. The first type accounts for 90% of the palm oil produced by village small scale mills with an FFA between 5% and 12% and moisture content of around 10%. This is the most popular vegetable oil used to prepare food in Ghana as well as in other African countries; 2. The second type of vegetable oil has the highest FFA content (more than 12%) and moisture above 10%. This second type is processed in commercial quantities by small scale farmers to produce the local soap *alata samina*; 3. The third type of vegetable oil, compliant with international standards, is the one with the lowest FFA content (less than 5%) and moisture (0.4%) and is produced by large scale mills and refined at the industrial level to produce: soap, cooking oil and margarine.

The small scale processing industry faces several constraints being the inaccessibility to a remunerative market during the peak fruit production period, February to May, lack of credit and processing skills. It was estimated that processors experience a loss of 38% for every cedi of palm oil sold during the peak period of fruit production and that the processing and sale of palm oil becomes a profitable business for small scale processing only during the period between September and December (Adjei-Nsiah et al, 2012).

POLICY DECISIONS AND MEASURES

Background

Since independence the palm oil industry in Ghana has been structured to address the main policy objective of meeting internal demand and thus reducing import bills. The four large scale palm oil plantations which were created upon initiative of the Government were privatized between the 1990s and early 2000s. The privatization triggered private foreign investment by multinationals - Unilever, SIAT Belgium and Norpalm Norway – which are exporting part of their products to other countries in the West Africa Region, mainly Togo and Cote d'Ivoire.

The donor community provided support in an attempt to integrate smallholders in the palm oil industry through the development of out-grower schemes. None of the out grower schemes in place is financially sustainable due to the high costs of providing seeds, fertilizer to smallholders as well as setting up a monitoring system to avoid side-selling which remains a generally adopted practice. Smallholders account for a large share of fresh fruits production and want to maintain the option to sell either on the domestic market or to plantations depending on the price they receive. Hence a significant share of smallholders prefer to operate independently and not being embedded in an out-grower scheme as the incentives to choose this option and improve the quality of fresh fruit cannot compete with the price incentive they receive on the market given the increasing demand for FFBs from buyers.

In 2001 Palm Oil became one of the four targeted commodities by the Presidential Special Initiative. In the case of Palm oil the presidential initiative aimed at upgrading the rural industry by empowering smallholders. However, as other PSIs, planning was not designed in consultation with the industry. Indeed the idea of creating new mills where smallholders had a share was rejected by the industrial players who supported the idea of linking smallholders to existing mills with the support of the Government instead of creating new small scale milling facilities. Implementation resulted being under-funded and poorly managed. As of 2006 the initiative managed to increase area under oil palm cultivation by 10.000 hectares without providing support to the newly established farmers during the three years period before palm oil trees begin yielding fruits.

The strategic document "Food and Agricultural Sector Development Policy" (FASDEP II) which consists in a revision of the first "Food and Agriculture Sector Development Policy (FASDEP)" developed in 2002 has among its main objectives to modernize agriculture and to increase the productivity of the Ghanaian farmer. The FASDEP II elaborated by the Ministry of Agriculture, introduced a number of programs, projects and initiatives. The palm oil sector as the majority of crops in Ghana benefits from the fertilizer subsidy. In Ghana, fertilizer is primarily used on cash crops like cotton, palm oil, and cocoa (Banful, 2009). For now the note only describes the main characteristics of the program as a tool to interpret the results. However, at a later stage, we expect

to identify a suitable allocation key that will allow including part of the program cost as budget and other transfers (BoT) for the commodity and thus calculating also Nominal Rates of Assistance. The Government of Ghana introduced a 50 percent subsidy for fertilizer in 2008 to make it affordable for producers and increase fertilizer use. Fertilizer agents are required to sell their fertilizer at a fixed price defined for each region in agreement with the Government. The rationale behind the introduction of this subsidy is to absorb the operational cost of fertilizer - port handling charges, loading and transport costs as well as commissions and margins for the actors - to make it affordable for the farmers. The programme has been revised in 2010 by replacing the voucher based system with the waybill system due to the high overhead and administrative costs that the Government was incurring under the voucher scheme. In 2010/2011 the GOG made GH¢37 million available to support the fertilizer subsidy program (GAIN report, 2011).

Furthermore, fertilizer in combination with other inputs is distributed to farmers by large plantations under the out-growers schemes in place. However we are not aware of the specific terms of contract applied in the different out-growers schemes and to what extent inputs' costs are discounted1.

In addition to cross-cutting programmes of support such as the fertilizer subsidy, the Government of Ghana under the framework of the FASDEP II has launched the Programme for the Promotion of Perennial Crops. The Programme became effective in 2006 when the Government of Ghana signed Credit Facility Agreements with Agence Francaise de Developpement (AFD), a French development agency and Kreditanstalt fur Wiederaufbau (KfW), a German development bank. The programme will end in December, 2013.

As far as the Palm Oil sector is concerned, the programme initially consisted of two main components: i. Institutional support to MOFA through the development of a Palm Oil Sector Master Plan; ii. Establishment of the Buabin Oil Palm Out-grower Project (BOPOP). This was technically started in December, 2006 when out-grower agreements were established for rubber and oil palm plantations. The Crop Services Directorate of the Ministry of Food and Agriculture has oversight responsibility for the two projects. The National Investment Bank (NIB) is the Financial Operator, and therefore, the institution administering the credit component of the loan for BOPOP. The Agriculture Development Bank (ADB) is administering the credit component for Phase II farms of the ROPP. The Consortium GOPA-Nkum has been recruited to build the capacity of the farmers' associations over a two-year period. The Applied Research component of the oil palm project is being implemented by the Oil Palm Research Institute (OPRI).

Other programme objectives within the framework of the Programme for the Promotion of Perennial Crops include: strengthening of the linkage between smallholder production and industry; promoting the formation of viable farmer-based organisations with gender equity, to enhance their knowledge, skills, and access to resources along the value chain, and for stronger bargaining power in marketing; Improving rural infrastructure.

Table 3. Summary of policy interventions for Palm Oil under the Programme for the Promotion of Perennial Crops (2006-2013)

Type of measure/intervention	Description of activities	Progress of activity
Cultivate 3,000ha of oil palm in the Central Region	3,200ha of oil palm cultivated for 945 farmers	106% completion
Roads	227km of internal roads for the oil palm has been constructed by Technical Operator (TOPP) with programme funding. Construction of feeder roads, currently on-going	100% completed
Policy for Perennial Crops in Ghana	Meetings of stakeholders are regularly held.	45% completed
Socio-economic survey	The study is completed.	100% completed
Master plan for oil palm sector	Final draft of the Master Plan produced	95% completed

Source: MOFA, 2012

Trade policy

According to WTO Ghana Trade Policy review (2008), the MFN import tariff on palm oil is 20%, with the exception of palm oil for soap production which is subject to a reduced tariff of 10%. The WITS database corroborates this information for the years 2007, 2008, 2009. No information on import tariff and duties is available for the years 2005, 2006 and 2010.

3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS

In order to calculate the indicators necessary for estimating market incentives and disincentives (NRP, NRA) and the market development gap, data on prices and costs are required. These have been collected and are presented and analyzed below.

TRADE STATUS OF THE PRODUCTS

Ghana is a net importer of Crude Palm Oil as imports outpace exported volumes during all years under analysis (Table 1 above).

BENCHMARK PRICES

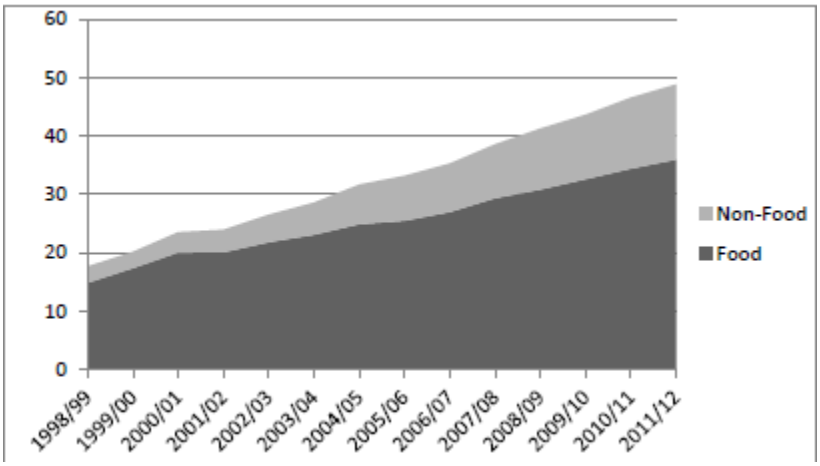
The benchmark price considered for the analysis is the Ghana c.i.f. unit value of Crude Palm Oil which was calculated on the basis of trade data on imported volumes and values, extracted from UNComtrade database. Table 4 shows a dramatic increase of CIF prices between 2007 and 2010 with a pick value of 1,052 USD per tonne in 2008. This is mainly attributed to the boom of the palm oil industry in last decades. In the last 30 years, palm oil production experienced a nine fold increase, with almost all production growth concentrated in Malaysia and Indonesia. Several analyses have associated the palm oil boom with the increase in biofuel demand in developed nations as a main driver of this phenomenon. This is clearly visible in the non food use increase (Figure 11). Other demand drivers, are related to the food sector. In particular, regulations on genetically modified (GM) food in European nations and on trans fats in a number of developed countries have reportedly induced food companies to switch from soybean oil to palm oil and could therefore have contributed to additional demand for palm oil (IFPRI, 2012). The increase in global demand of palm oil for both food and non-food uses has resulted in a dramatic increase of international prices (Figure 12)

Table 4: Unit value of imports used as benchmark price for the analysis (USD/MT)

	2005	2006	2007	2008	2009	2010
Ghana Crude Palm Oil c.i.f price (US$/MT)	593.60	554.30	864.91	1,052.81	846.72	946.42

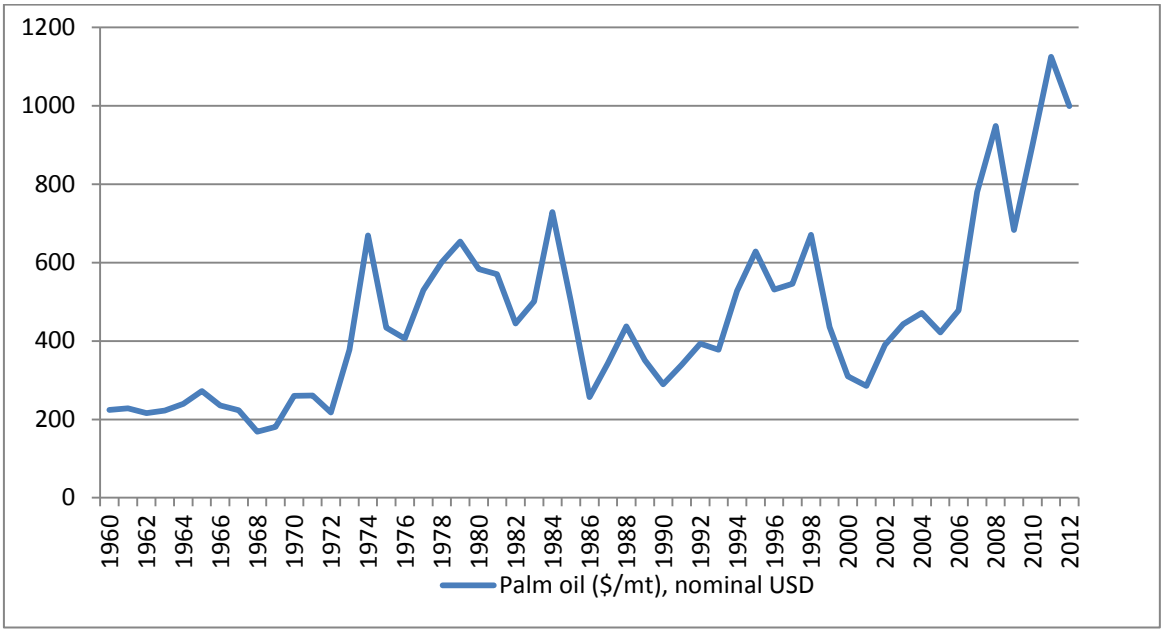
Source: author's calculations based on data from UNComtrade

Figure 11. Global consumption in million metric tons of palm oil: food versus non-food use



Source: IFPRI, 2012

Figure 12. World annual nominal prices of palm oil (USD/TONNE), 1960-2012



Source: World Bank Commodity Price Data, 2013

Adjusted

No adjustment was made to the benchmark price

DOMESTIC PRICES

Although, value chain analyses highlight the clear separation between the production of fresh fruits and palm oil extraction, no price information was made available at the farm gate level on the price of the raw product from which palm oil is extracted, the Fresh Fruit Bunches (FFB).
A plausible explanation emerging from several value chain studies is that farmers sell the fresh fruit bunches to small/medium processors in the village or within the district and the prices they receive are not recorded by Ministry of Food and Agriculture (MOFA).
Farm gate prices for FFBs are probably recorder by palm oil companies as the prices paid to out-growers or farmers who occasionally sell to the companies.
In view of obtaining data on observed farm gate prices from the main palm oil companies, prices at the farm level were not inputted in the analysis.

The analysis of market incentives and disincentives for palm oil in Ghana was undertaken using the wholesale prices of crude palm oil in Kumasi, provided by MOFA. Kumasi in the Central region was chosen as the wholesale market/point of competition for the analysis given its proximity with palm oil fresh fruits production areas and processing activities of two of the largest estates as well as small and medium processors facilities. Kumasi should also be one of the markets where imported palm oil is also traded.

Table 5: Average annual wholesale price of CPO in Kumasi (GHC/Ton)

	2005	2006	2007	2008	2009	2010
GHC/Ton	502.71	501.04	705.06	1,025.33	1,073.79	1,253.42

Source: annual averages calculated on monthly wholesale price data (Kumasi, Central Region) from SRID-MOFA

Nevertheless, it was possible to estimate price gap and Nominal Rate of Protection at the farm gate by adopting a different approach which consists in using wholesale prices instead of farm gate prices for comparison with border prices (OECD, PSE manual, 2009).

This approach assumes that the *absolute price gap* measured at a higher level of the processing chain,, is the same as occurs at the farm gate level. However, this approach which implies perfect price transmission, was modified by inputting data on access costs from the farm gate to the wholesale market which allowed for an estimate of the reference price at the farm gate. NRPs at the farm gate were thus obtained by dividing the price gap at point of competition by the reference price at farm gate.

EXCHANGE RATES

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.

Observed

Table 6: Exchange rate Ghana Cedis/USD

	2005	2006	2007	2008	2009	2010
National Currency per US Dollar (principal rate, period average)	0.91	0.92	0.94	1.06	1.41	1.43

Source: IMF

Adjusted

No adjustment to the exchange rate was needed

MARKET ACCESS COSTS

From farm gate to point of competition

Information on access costs between the farm gate and the wholesale market may vary significantly between small/medium processors/traders and large scale processors which experience economies of scale.

The calculation of access costs draws from a sample survey on the cost structure and revenue from palm oil production undertaken in December 2010 and covering selected small and medium size processors (Adjei-Nsiah, 2012). According to the results of this survey, the average costs incurred between the farm gate and the wholesale market, including processing costs and processors' margins, are of 406 GHC.

Table 7. Access costs for processing 8 MT of FFB (GHC/MT) in 2010

Operational costs	**2010**
Transport	160.0
Quartering of fruits (removal of spikelets)	20.0
Cleaning of fruits	24.0
Loading of fruits into boilers	8.0
Cooking (sterilization)	16.0
Unloading of fruits from boilers	8.0
Water	8.0
Milling	42.0
Sub-total (oil)	286.0
Processors margin (palm oil sale)	120.0
Total access costs (palm oil)	**406.0**
Removal of nuts	18.00
Pressing of fermeted oil from fiber	9.60
Cost Sub-total (kernels)	27.60
Processors margin (palm kernels sale)	40.00
Total costs	**433.60**

Source: Adjei-Nsiah et al 2012

Observed

The below access costs for the period 2005-2009 were obtained by deflating observed data available for year 2010 using the IMF data for the Ghana GDP deflator. Cost items considered are netted of the processing cost and margins for palm kernel.

Table 8: Observed access costs from Farm Gate to Processor/Trader (GHC/MT of FFB)

Operational costs	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Transport	65.1	73.7	88.1	110.4	132.4	160.0
Quartering of fruits (removal of spikelets)	8.1	9.2	11.0	13.8	16.5	20.0
Cleaning of fruits	9.8	11.1	13.2	16.6	19.9	24.0
Loading of fruits into boilers	3.3	3.7	4.4	5.5	6.6	8.0
Cooking (sterilization)	6.5	7.4	8.8	11.0	13.2	16.0
Unloading of fruits from boilers	3.3	3.7	4.4	5.5	6.6	8.0
Water	3.3	3.7	4.4	5.5	6.6	8.0
Milling	17.1	19.4	23.1	29.0	34.7	42.0
Sub-total (oil)	116.3	131.8	157.4	197.3	236.6	286.0
Processors margin (palm oil sale)	48.8	55.3	66.0	82.8	99.3	120.0
Total access costs (palm oil)	**165.2**	**187.1**	**223.5**	**280.0**	**335.8**	**406.0**

Source: authors calculation based on a 2010 survey (Adjei-Nsiah et al, 2012)

Adjusted

No adjustment was made as processors margins for the sale of palm oil represent 8.5% of the full financial costs borne by processors. A value which could be considered as efficient.

From border to wholesale

Information on access costs from the border, port of Tema-Accra, to Kumasi the point of competition is not available. Estimates were based on the access costs for cooking oil transiting on one of the main international corridors in West Africa, from the port of Tema to the border with Burkina Faso (Paga). The cost components were obtained from USAID "West Africa Trade Hub" report and refer to year 2010. As costs refer to a 20' stripped container, an approximate weight of 24 tons was applied to calculate the costs per ton while transport costs were adjusted for the distance from Tema to Kumasi (272 km) and converted in GHC. Obviously, border crossing and transport within Burkina were excluded from computation.

Observed

Observed costs were calculated on the basis of the West Africa Trade Hub report (USAID, 2010) where costs for cooking oil transport and handling are estimated. Cost figures for the previous year's 2005-2009 were obtained by deflating data using the IMF GDP deflator for Ghana.

Table 9: Estimated access costs from the border (Port of Tema) to Kumasi (Central Region), GHC/Ton

	2005	2006	2007	2008	2009	2010
Port operations (port, transit, customs, off loading), GHC/MT	9.56	10.95	13.37	18.89	30.13	36.94
Transport (GHC/MT)	12.47	14.28	17.43	24.63	39.29	48.17
Informal costs (port operations), GHC/MT	0.87	1.00	1.22	1.72	2.75	3.37
Informal costs (transport), GHC/MT	0.43	0.49	0.59	0.84	1.34	1.64
TOTAL (GHC/MT)	**23.33**	**26.72**	**32.60**	**46.07**	**73.50**	**90.12**

Source: Author's calculations based on USAID West Africa Trade Hub 2010 (Main components of Tema-Ouaga transit traffic – 20'stripped container of cooking oil)

Adjusted

Access costs were adjusted by subtracting the informal costs inherent to both port operations and road transportation as estimated in the Trade Hub report. Eventual excessive margins could not be netted out as information on those was not available.

Table 10. Adjusted access costs from the border (Port of Tema) to Kumasi (Central Region), GHC/MT

	2005	2006	2007	2008	2009	2010
Adjusted access costs (GHC/MT)	22.03	25.23	30.79	43.51	69.42	85.11

Source: Author's calculations based on USAID West Africa Trade Hub 2010 (Main components of Tema-Ouaga transit traffic – 20'stripped container of cooking oil)

EXTERNALITIES

Palm oil industry is considered as a large-scale contributor to greenhouse gas emissions through deforestation. The WB has advocated the importance to apply measures and practices to make palm oil industry environmentally sustainable. Unfortunately, no data is yet available to quantify this impact.

BUDGET AND OTHER TRANSFERS

Producers of Fresh Fruit Bunches benefit from the fertilizer subsidy and/or discounted inputs from the nucleus plantations with which they have out-grower agreements. Information on applicable allocation keys in the case of the national fertilizer subsidy is not available for the time being.

QUALITY AND QUANTITY ADJUSTMENTS

The oil extraction rate considered in the analysis refers to the average national extraction rate which has been estimated at 12.5% (MOFA, Palm Oil Master Plan, 2012). On the other hand, according to a study by SOMO (2006) about Unilever operations in Ghana, the fruits yield about 20-22% of oil. The difference in extraction rates between small and large processors is one of the elements which contribute to explain the inefficiency in small scale processing operations in Ghana.

DATA OVERVIEW

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 Palm Oil in Ghana. While the table reflects general approaches, specific changes are discussed in Section 4, data reflects the final data used.

Table 11. Summary table for data description Ghana Palm Oil

		Description	
Concept		***Observed***	***Adjusted***
Benchmark price		▪ Ghana is a net importer of Palm Oil. CIF prices were calculated using UNComtrade data on imported values and volumes.	*N.A.*
Domestic price at point of competition		▪ Annual average wholesale prices for Palm Oil in Kumasi (Central region) provided by MOFA. Kumasi is one of the major markets for palm oil in Ghana.	*N.A.*
Domestic price at farm gate		▪ N. A	*N.A.*
Exchange rate		▪ Annual average of exchange rate as reported by IMF	*N.A.*
Access cost to point of competition		▪ Calculated by deflating information on access costs for cooking oil for the corridor TEMA-Ouagadougou available from the West Africa Trade Hur report (2010)	*N.A.*
Access costs to farm gate		▪ Information on access costs was calculated on the basis of a value chain study (Adjei et al 2012). Figures collected refer to year 2010. These were adapted to the route Tema-Kumasi and deflated to estimate access costs in the previous years 2005-2009	Informal costs as estimated by USAID (2010) were subtracted
QT adjustment	Bor-Wh	*N.A*	*N.A.*
	Wh-FG	N.A	*N.A.*
QL adjustment	Bor-Wh	*N.A.*	*N.A.*
	Wh-FG	*N.A.*	*N.A.*

The data used for the analysis is summarized in the following table:

		Year	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
		trade status	*m*	*m*	*m*	*m*	*m*	*m*
DATA	*Unit*	*Symbol*						
Benchmark Price								
Observed	USD/TON	$P_{b(int\$)}$	593.60	554.30	864.91	1,052.81	846.72	946.42
Adjusted	USD/TON	P_{ba}						
Exchange Rate								
Observed	GHC/USD	ER_o	0.91	0.92	0.94	1.06	1.41	1.43
Adjusted	GHC/USD	ER_a	0.91	0.92	0.94	1.06	1.41	1.43
Access costs border - point of competition								
Observed	GHC/TON	AC_{owh}	23.33	26.72	32.60	46.07	73.50	90.12
Adjusted	GHC/TON	AC_{awh}	22.03	25.23	30.79	43.51	69.42	85.11
Domestic price at point of competition	GHC/TON	P_{dwh}	502.71	501.04	705.06	1,025.33	1,073.79	1,253.42
Access costs point of competition - farm gate								
Observed	GHC/TON	AC_{ofg}	165.2	187.1	223.5	280.0	335.8	406.0
Adjusted	GHC/TON	AC_{afg}						
Farm gate price	GHC/TON	P_{dfg}	N/A	N/A	N/A	N/A	N/A	N/A
Externalities associated with production	GHC/TON	E						
Budget and other product related transfers	GHC/TON	BOT						
Quantity conversion factor (border - point of competition)	Fraction	QT_{wh}						
Quality conversion factor (border - point of competition)	Fraction	QL_{wh}						
Quatity conversion factor (point of competition – farm gate)	Fraction	QT_{fg}						
Quality conversion factor (point of competition – farm gate)	Fraction	QL_{fg}						

CALCULATION OF INDICATORS

The indicators and the calculation methodology used is 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 each at the wholesale and 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 $NRPo_{fg}$ captures all trade and domestic policies, as well as other factors which impact on the incentive or disincentive for the farmer. The $NRPo_{wh}$ 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, however, 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 added to the NRP*o* generate the NRP*a* indicators. Comparison of the different rates of protection identifies where market development gaps can be found and reduced.

The estimated indicators include the observed and adjusted price gaps and the associated observed and adjusted nominal rate of protection at the farm gate and the wholesale market for processors/traders. Table 12 presents the estimated price gaps at the two markets for 2005-2010 while Table 13 presents the estimated rates of protection for the same time period.

Table 12: MAFAP price gaps for Palm Oil in Ghana 2005-2010 (GHC per Mt).

	2005	2006	2007	2008	2009	2010
Trade status for the year	m	m	m	m	m	m
Observed price gap at wholesale	(60.79)	(35.63)	(140.56)	(136.72)	(193.58)	(190.09)
Adjusted price gap at wholesale	(59.50)	(34.15)	(138.74)	(134.16)	(189.49)	(185.08)
Observed price gap at farm gate	N/A	N/A	N/A	N/A	N/A	N/A
Adjusted price gap at farm gate	N/A	N/A	N/A	N/A	N/A	N/A

Source: Own calculations using data as described above.

Table 13: MAFAP nominal rates of protection (NRP) for Palm Oil in Ghana 2005-2010 (%).

	2005	2006	2007	2008	2009	2010
Trade status for the year	m	m	m	m	m	m
Observed NRP at wholesale	-10.79%	-6.64%	-16.62%	-11.77%	-15.27%	-13.17%
Adjusted NRP at wholesale	-10.58%	-6.38%	-16.44%	-11.57%	-15.00%	-12.87%
Observed NRP at farm gate	-15.26%	-10.19%	-22.59%	-15.50%	-20.78%	-18.32%
Adjusted NRP at farm gate	-14.98%	-9.81%	-22.37%	-15.25%	-20.43%	-17.93%

Source: Own calculations using data as described above.

Table 14: MAFAP Market Development Gaps for Palm Oil in Ghana 2005-2010 (GHC per Mt).

	2005	2006	2007	2008	2009	2010
Trade status for the year	m	m	m	m	m	m
International markets gap (IRG)	0	0	0	0	0	0
Exchange policy gap (ERPG)	0	0	0	0	0	0
Access costs gap to point of competition (ACG_{wh})	1.30	1.49	1.81	2.56	4.09	5.01
Access costs gap to farm gate (ACG_{fg})						

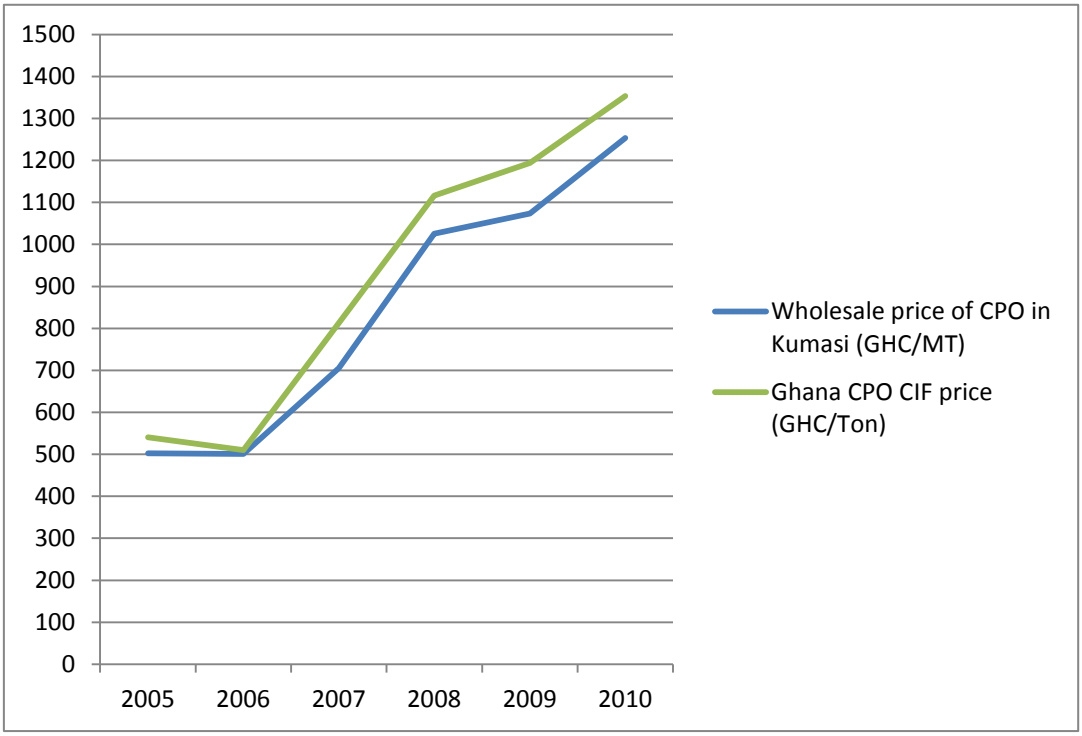
ND: No data available for calculation

Source: Own calculations using data as described above.

4. INTERPRETATION OF THE INDICATORS

Palm oil prices have been characterized by a significant increase during the last decade both in Ghana and on the international markets up to reaching more than double prices if compared to years 2005 and 2006. The high prices can be attributed to the increasing importance of palm oil as the main source of edible vegetable oil in many countries with high demographic pressure as well as the use of palm oil for bio-fuel production. Despite the correlation of Ghana wholesale prices with international prices, palm oil stakeholders, namely producers and to a lower extent processors are facing significant disincentives.

Figure 13. Comparison between wholesale prices and reference price at wholesale for palm oil in Ghana (GHC/MT)

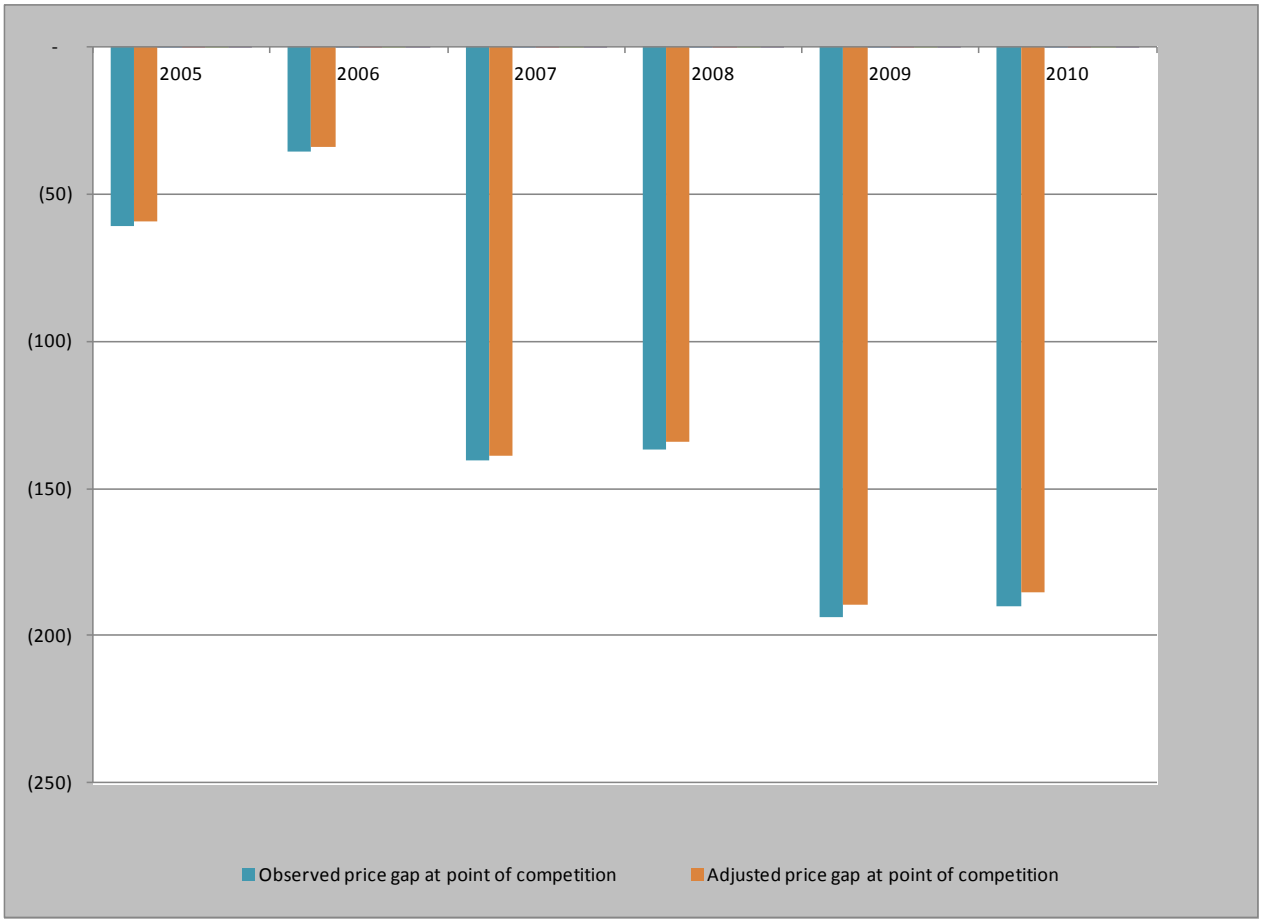


Processors in the wholesale market

At the processors/traders level, the observed price gaps are negative and increasing under the period of analysis from 60.79 GHC per ton in 2005 to 190 GHC per ton in 2010 (Table 12). Over the period 2005-2010, the observed price gap averages GHC 126 per ton. The adjusted price gaps follow a similar trend as the adjustment was only done with reference to the informal costs/bribes that the imported commodity incurs between the port of entry and the wholesale market.

The nominal rates of protection (Figure 15) translate into a similar pattern with a negative value at -11% in 2005 up to -13.17% in 2010 (Figure 11). Furthermore, negative incentives do not seem to decrease in those years when there is evidence that a 20% import duty is in place, 2007, 2008 and 2009. The above indicators suggest that palm oil small and medium scale processors are experiencing negative incentives as many of the small scale processing techniques for palm oil in Ghana are very costly and penalizing.

Figure 14. Observed and adjusted price gaps at the point of competition for palm oil in Ghana (GHC per MT)



Farm gate indicators

As mentioned above, domestic prices used for the analysis are those referring to annual wholesale prices for crude palm oil as farm gate prices for Fresh Fruit Bunches were not available. In addition to wholesale prices, information on access costs from wholesale to farm gate was also available and this allowed for an estimation of the reference price at the farm gate. NRPs at the farm gate level were obtained by dividing the price gap at point of competition by the estimated reference price at farm gate.

Consistently with indicators for small scale palm oil processing, both observed and adjusted nominal rates of protection at farm gate level are significantly negative and increasing over time. The observed NRPs range from -15.3% in 2005 to -18.3% in 2010. Contrary to what one would expect the NRP level is below the tariff level suggesting that disincentives in the value chain are either the result of inefficiencies or implicit taxation of the farmers (bribes or any other tax effect). The adjusted NRPs range from 15% in 2005 to 18% in 2010.

The overall picture described by the various indicators is as follows:

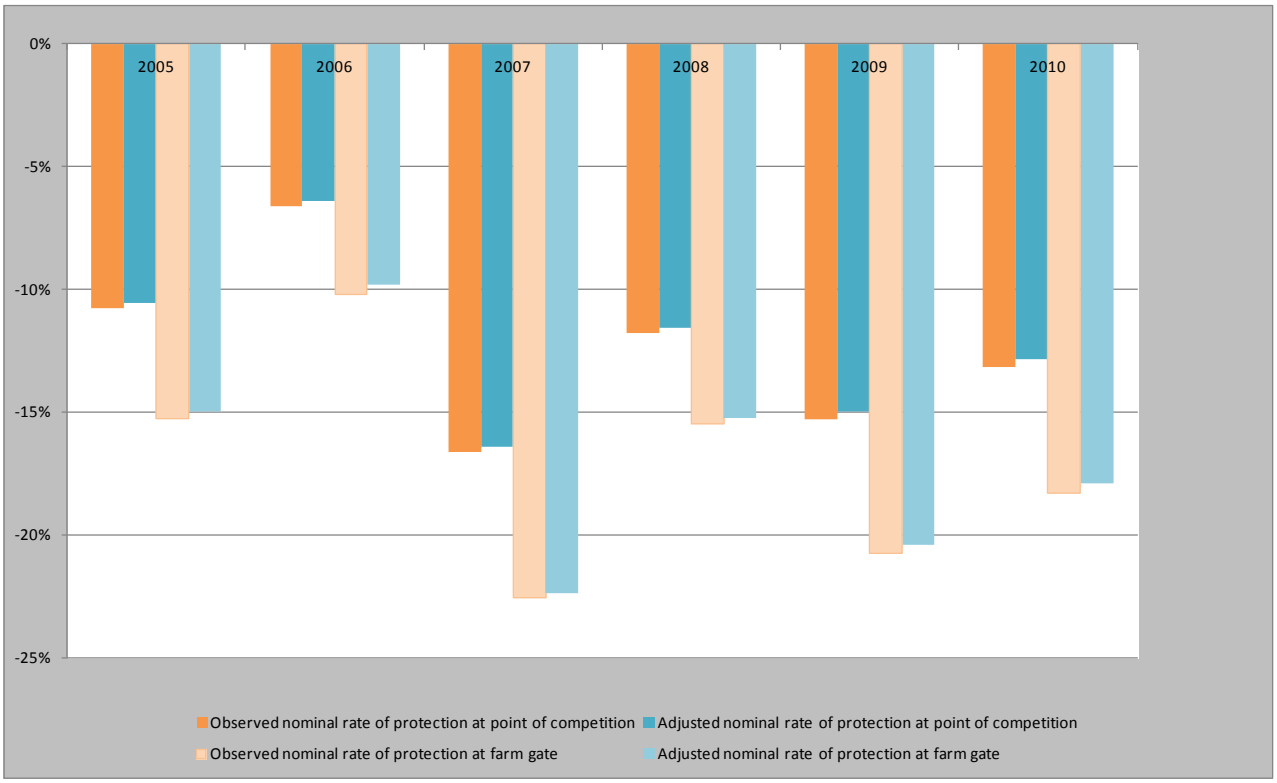
- producers receive disincentives which are mainly generated by inefficiencies in the value chain and the high logistics costs;

- small scale processors are penalized by high costs of production and transport as well as the high costs of purchasing the FFB from farmers. The high incidence of the cost of FFB for processors in Ghana was highlighted as one of the main constraints affecting small scale processing activities, as opposed to countries like Nigeria.

Although the level of profitability of processors cannot be established in this note, other analyses estimated that processors operate at a loss during the pick palm oil fruit production period.

Ghana is pursuing a liberalized economic policy for the palm oil sector except for the trade measures that are intended to provide a 20% level of protection to the agents in the value chain as of 2007. Furthermore, the prices that small and medium scale processors receive on the local market are not rewarding enough to compensate for the high transformation and transport costs.

Figure 15. Observed and adjusted NRPs at the point of competition and farm gate levels for palm oil in Ghana (percentage values)



5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

MAIN MESSAGE

The analysis of price incentives and disincentives contributed to highlight the negative incentives that small scale palm oil processors and producers are facing in Ghana. Despite the high levels of consumption, primarily in rural areas, of the type of palm oil produced at the village level for both food consumption and soap, prices do not constitute an incentive for small scale processors and producers. The analysis highlighted the negative impact that high access costs, illicit taxation and inefficient processing techniques are generating on producers and small scale operators/processors.

PRELIMINARY RECOMMENDATIONS

The main issue emerging from the analysis is the poor attention received by small processors at the policy level. Despite the still large quantities of fruits being processed in Ghana by small scale operations as opposed to the larger industries, the upgrade of processing facilities is not a priority in the policy agenda. The Master Plan for the Palm Oil sector should address these issue and consider that the improvements in productivity and area planted could have negative implications if they are not combined with up scaling and mechanization of the transformation capacity of the small scale processors. As mentioned in previous sections, small scale processors are not able to process large volumes and are forced to store FFBs for a longer period than the recommended 48 hours. This practice negatively impacts on the quality of the oil they are able to place on the market.

LIMITATIONS

The analysis would benefit from observed farm gate prices for Fresh Fruit Bunches paid to farmers by small processors and large plantations in order to identify eventual price differences depending on the buyers.

The information on access costs, including processing costs, used in the analysis refers to small processing operations. It would be extremely interesting to see the differences with large economies of scale and industrial processors.

Information on the type of palm oil traded on the wholesale market, including the imported one, in Kumasi or any other wholesale market in Ghana would have helped in the definition of a quality adjustment factor which could not be factored in the analysis.

Finally, prices at the wholesale markets in rural areas do not capture the selling prices of high quality palm oil produced by refineries and mostly exported.

FURTHER INVESTIGATION AND RESEARCH

The Ministry of Food and Agriculture collects monthly prices at both the farm gate and wholesale levels for a range of commodities except palm oil and cocoa. While the Cocoa Marketing Board (COCOBOD) collects price information and makes it publicly available there is not such source of information on Palm Oil. More market research should be done on the level of domestic prices either by the Oil Palm Research Institute (OPRI) or the new apex organization.

Bibliography

Adjei-Nsiah , S., Zu, A. K. S and Nimoh F."Technological and Financial Assessment of Small Scale Palm Oil Production in Kwaebibrem District, Ghana Journal of Agricultural Science; Vol. 4, No. 7; 2012 Published by Canadian Center of Science and Education

Adjei-Nsiah, S. Sakyi-Dawson, O.&. Kuyper T. W "Exploring Opportunities for Enhancing Innovation in Agriculture: The Case of Oil Palm Production in Ghana
Journal of Agricultural Science; Vol. 4, No. 10; 2012 Published by Canadian Center of Science and Education

Benso Oil Palm Plantation Ltd. Prospectus – selected years.

Centre for Research on Multinational Corporations (SOMO): "Unilever Ghana", Research report, 2006

Fold N. and Whitfield L. "Developing a Palm Oil Sector: The Experiences of Malaysia and Ghana Compared. Danish Institute for International Studies (DIIS), working paper 2012/08.

Ministry of Food and Agriculture "Master plan Study on the Oil Palm Industry in Ghana". Final Report. MASDAR, November 2011.

Pio-Costa Lahue Santini, C. "Big Business work with Small Farmers: the case of Buabin Oil Palm Outgrower Project" Massachussets Institute of Technology, Master Thesis, 2009.

Sanders Daniel J., Balagtas Joseph V., Gruere Guillaume. "Revisiting the Palm Oil Boom in Southeast Asia. The Role of Fuel versus Food Demand Drivers. IFPRI Discussion Paper01167. Environment and Production Technology Division, March 2012

Väth, Susanne Johanna and Kirk, Michael: Linkages between investors and the local population: Evidence from the oil palm sector in Ghana, Institute for Co-operation in Developing Countries, Faculty of Business Administration & Economics, Philipps-University of Marburg, Am Plan 2, 35037 Marburg/ Germany

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	PALM OIL
International currency	USD

Local currency	GHC

	DATA		Unit	Symbol	Year trade status	2005 m	2006 m	2007 m	2008 m	2009 m	2010 m
	Benchmark Price										
1		*Observed*	USD/TON	$P_{b(int\$)}$		**593.60**	**554.30**	**864.91**	**1,052.81**	**846.72**	**946.42**
1b		*Adjusted*	USD/TON	P_{ba}							
	Exchange Rate										
2		*Observed*	GHC/USD	ER_o		0.91	0.92	0.94	1.06	1.41	1.43
2b		*Adjusted*	GHC/USD	ER_a		0.91	0.92	0.94	1.06	1.41	1.43
	Access costs border - point of competition										
3		*Observed*	GHC/TON	ACo_{wh}		23.33	26.72	32.60	46.07	73.50	90.12
3b		*Adjusted*	GHC/TON	ACa_{wh}		22.03	25.23	30.79	43.51	69.42	85.11
4	**Domestic price at point of competition**		GHC/TON	P_{dwh}		502.71	501.04	705.06	1,025.33	1,073.79	1,253.42
	Access costs point of competition - farm gate										
5		*Observed*	GHC/TON	ACo_{fg}		165.16	187.09	223.46	280.03	335.84	406.00
5b		*Adjusted*	GHC/TON	ACa_{fg}							
6	**Farm gate price**		GHC/TON	P_{dfg}							
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_{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}							

	CALCULATED PRICES		Unit	Symbol	2005	2006	2007	2008	2009	2010
	Benchmark price in local currency									
9		*Observed*	GHC/TON	$P_{b(loc\$)}$	540.17	509.96	813.02	1,115.98	1,193.87	1,353.39
10		*Adjusted*	GHC/TON	$P_{b(loc\$)a}$	540.17	509.96	813.02	1,115.98	1,193.87	1,353.39
	Reference Price at point of competition									
11		*Observed*	GHC/TON	RPo_{wh}	563.50	536.68	845.62	1,162.05	1,267.37	1,443.51
12		*Adjusted*	GHC/TON	RPa_{wh}	562.20	535.19	843.81	1,159.49	1,263.28	1,438.50
	Reference Price at Farm Gate									
13		*Observed*	GHC/TON	RPo_{fg}	398.34	349.59	622.16	882.02	931.53	1,037.51
14		*Adjusted*	GHC/TON	RPa_{fg}	397.05	348.10	620.35	879.46	927.45	1,032.50

	INDICATORS		Unit	Symbol	2005	2006	2007	2008	2009	2010
	Price gap at point of competition									
15		*Observed*	GHC/TON	PGo_{wh}	(60.79)	(35.63)	(140.56)	(136.72)	(193.58)	(190.09)
16		*Adjusted*	GHC/TON	PGa_{wh}	(59.50)	(34.15)	(138.74)	(134.16)	(189.49)	(185.08)
	Price gap at farm gate									
17		*Observed*	GHC/TON	PGo_{fg}	(398.34)	(349.59)	(622.16)	(882.02)	(931.53)	(1,037.51)
18		*Adjusted*	GHC/TON	PGa_{fg}	(397.05)	(348.10)	(620.35)	(879.46)	(927.45)	(1,032.50)
	Nominal rate of protection at point of competition									
19		*Observed*	%	$NRPo_{wh}$	-10.79%	-6.64%	-16.62%	-11.77%	-15.27%	-13.17%
20		*Adjusted*	%	$NRPa_{wh}$	-10.58%	-6.38%	-16.44%	-11.57%	-15.00%	-12.87%
	Nominal rate of protection at farm gate									
21		*Observed*	%	$NRPo_{fg}$	-15.26%	-10.19%	-22.59%	-15.50%	-20.78%	-18.32%
22		*Adjusted*	%	$NRPa_{fg}$	-14.98%	-9.81%	-22.37%	-15.25%	-20.43%	-17.93%
	Nominal rate of assistance									

FOOD AND AGRICULTURE
ORGANIZATION OF
THE UNITED NATIONS

MAFAP
SPAAA

supported by the *Bill and Melinda Gates Foundation*