

## NOTES ON STAPLE FOOD (MAIZE) COMPONENT

George T-M. Kwadzo

### Introduction

Maize is the most important cereal crop on the domestic market in Ghana. However, it is only the 7th largest agricultural commodity in terms of value of production over the period 2005-2010 accounting for 3.3 percent of total agricultural production value (FAOSTAT, 2012). Root crops such as yam, cassava and cocoyam, together with plantains are by far more important in terms of production value due to their paramount importance in the Ghanaian diet. Maize accounts for 55 percent of grain output followed by paddy rice (23 percent), sorghum (13 percent) and millet (9 percent). Maize is also an important component of poultry feed and to a lesser extent the livestock feed sector as well as a substitute for the brewing industry.

Maize average yield registered by the Ministry of Food and Agriculture in 2010 was 1.9 Mt/ha against an estimated achievable yield of around 2.5 to 4 Mt/ha resulting in 76 percent achievement level (Ministry of Food and Agriculture, 2010). Maize production over the period 1990-2010 (Table 1) shows significant increases starting from year 2008. However, it was not possible to explain to what extent the production increase was due to any of these: favourable rain patterns, the introduction of the fertilizer subsidy in 2008, the high food prices which could have stimulated domestic production over the period 2008-2010.

Table 1: Production of Selected Food Crops ('000 Mt)

Crop	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>Maize</b>	<b>1,013</b>	<b>938</b>	<b>1,400</b>	<b>1,289</b>	<b>1,158</b>	<b>1,171</b>	<b>1,189</b>	<b>1,220</b>	<b>1,470</b>	<b>1,620</b>	<b>1,872</b>
Millet	169	134	159	176	144	185	165	113	194	246	219
Rice (paddy )	215	253	280	239	242	237	250	185	302	391	492
Rice (milled )	129	152	168	143	145	142	150	111	181	235	295
Sorghu m	280	280	316	338	287	305	315	155	331	351	324
Cassav a	8,107	8,966	9,731	10,239	9,739	9,567	9,638	10,218	11,351	12,231	13,504
Cocoy am	1,625	1,688	1,860	1,805	1,716	1,686	1,660	1,690	1,688	1,504	1,355
Plantai n	1,932	2,074	2,279	2,329	2,381	2,792	2,900	3,234	3,338	3,563	3,538

Yam	3,363	3,547	3,900	3,813	3,892	3,923	4,288	4,376	4,895	5,778	5,960
Total	16,83	18,03	20,09	20,37	19,70	20,00	20,55	21,30	23,75	25,91	27,55
	3	2	3	1	4	8	5	2	0	9	9

Source: SRID, MOFA

Note: Milled rice is estimated to be 60% of paddy

Table 2: Indices of Production of Selected Food Crops (average of 1996-97 = 100)

Crop	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Maiz	101	94	140	129	116	117	119	122	147	162	187

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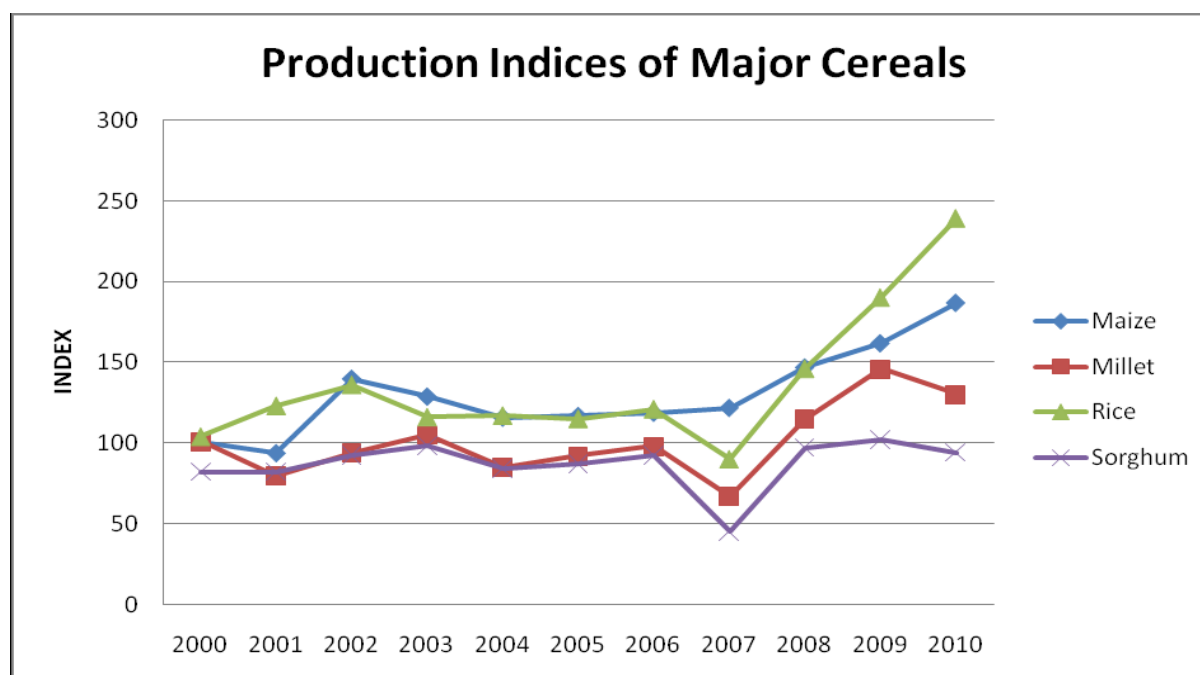


Table 3: Cereal production growth rates 199 - 2010

CROP	Average Production (‘000MT)		Growth Rate (%)	Average Production (‘000MT)		Growth Rate (%)
	1999 – 2001	2002 – 2004		2005 – 2007	2008-2010	
<b>Maize</b>	<b>988.4</b>	<b>1,282.2</b>	<b>8.67</b>	<b>1,193.3</b>	<b>1,653.8</b>	<b>10.88</b>
Millet	154.5	159.6	1.08	144.2	219.4	13.99
Sorghum	287.2	313.7	2.95	256.3	335.3	8.96
Rice (Paddy)	225.9	253.6	3.86	223.9	395.0	18.92

*Source: SRID, MOFA, 2012*

*The average of 2005 to 2007 compared with average of 2008 to 2010 and average of 1999 to 2001 compared with average of 2002 to 2004.*

## **MAIZE SUPPLY IN GHANA**

Maize is the largest staple crop in Ghana and contributes significantly to consumer diets. It is the number one crop in terms of area planted and accounts for 50-60% of total cereal production. Additionally, maize represents the second largest commodity crop in the country after cocoa. Maize is one of the most important crops for Ghana’s agricultural sector and for food security. The vast majority of maize is produced by smallholder farmers under rain fed conditions, leading to annual variations. However, overall maize production in the country has remained relatively stable both in terms of area harvested and volume because of reliance on traditional farming methods. Under traditional production methods and rain fed conditions, yields are well below their attainable levels – maize yields in Ghana average approximately 1.9 metric tons per hectare. However, yields as high as 5.0-5.5 metric tons per hectare have been realized by farmers using improved seeds, fertilizer, mechanization and irrigation.

### **Maize Demand**

In addition to the current shortfall in domestic supplies to fulfil demand, maize consumption is projected to grow at a compound annual growth rate of 2.6% based on population growth and increasing per capita income. Based on the most recent domestic production data, the shortfall between domestic production and domestic consumption would reach 267,000 metric tons by 2015. Further, beyond these projected figures for household consumption, there is considerable unfulfilled demand for processed maize uses and for the growing animal feed sector within Ghana.

Maize is a principal human food and livestock feed in Ghana. Its production is essentially performed by smallholder farmers under traditional tillage and rain-fed conditions. Although production occurs in all of Ghana's ten administrative regions, more than 70% of maize output comes from five regions in three of the six agro-ecological zones. The five principal growing regions are Northern, Brong-Ahafo, Ashanti, Central and Eastern and the three

agro-ecological zones are guinea savanna, forest savanna transition and semi-deciduous rainforest (Table 3). Forest savanna transition and the semi-deciduous agro-ecological zones have a bimodal rainfall distribution pattern, with the major season beginning in March and ending in July and the minor season beginning in September and ending in October/November. The guinea savanna agro-ecological zone has a uni-modal rainfall distribution that starts in May and ends in September.

Table 4: Distribution of Maize Production by Region and Agro-Ecological Zones (2006)

Region	Agro-Ecological zone	Output(MT)	Area (Ha)	Yield(MT/Ha)
Brong-Ahafo	Forest savannah transition	363,595	191,691	1.90
Eastern	Semi-deciduous rainforest	209,542	133,844	1.57
Central	Semi-deciduous rainforest	166,847	102,648	1.63
Ashanti	Semi-deciduous rainforest	164,226	138,793	1.18
Northern	Guinea savanna	98,157	85,644	1.15
Western	Rainforest	73,210	51,102	1.43
Volta	Coastal savanna	48,286	35,330	1.37
Upper West	Sahel savanna	48,128	36,714	1.31
Upper East	Sahel savanna	14,712	14,355	1.02
Greater Accra	Coastal savanna	2,134	2,879	0.74

Source: Statistical Research and Information Directorate (SRID), 2006).

### Macroeconomic Environment

Ghana's economy has been steadier than most in the West African region, making Ghana the destination of choice for recent foreign direct investments (FDI). According to the World Bank (2011), the total FDI flowing into Ghana topped \$2.53 billion in 2010 compared to \$165.9 million in 2000, indicating the strong confidence foreign investors have in Ghana's economy. On a per capita basis, Ghana's net FDI, at about \$132 in 2010 (compared to about \$7.56 in 2005) exceeded that of Middle Income Countries' at \$113 (\$71.14 in 2005) and that of its neighbor, Nigeria's at \$48.90 (\$40.28 in 2005). The World Bank also reports that Ghana's new oil production and rebound in construction boosted economic growth to 14.4% per annum in 2011, a figure expected to decline to a respectable 7.5% in 2012 as oil production plateaus. These trends in the macroeconomic environment have contributed to Ghana's successes with its Millennium Development Goals. By 2006, Ghana had reduced the population living below the national poverty line from 51.7% to 28.5% and the undernourished population from 28% in 1991 to 5% in 2007. The foregoing and other performance indicators have been attributed to Ghana's stable and growing democratic political environment. This macroeconomic environment frames the price trends that confront the various commodities, including agricultural commodities such as maize and cocoa and extractive commodities such as gold.

### Maize Price Trends

Table 5 shows the summary statistics of the monthly wholesale prices over the covered duration. Table 5 shows that Ghana's maize market did not escape the commodity price crisis

that engulfed global commodity markets in the 2007 to 2010 period. The price range in the 2007/08 crop year, for example, was GH35.35 per 100kg compared to GH12.51 in the previous crop year and GH17.91 two crop years later. This turbulent year (2007/08) also posted the highest variability in market prices, with a standard deviation of GH11.76 and a coefficient of variation of 32.6%, the highest estimated in the last five crop years. Indeed, the variability in prices in all other crop years was in the single digit. Despite this low price variability within each crop year, what is observed is that the mean price over the crop year has been trending upwards.

Table 5: Summary Statistics of Monthly Maize Prices (2006/07-2011/12) per 100kg Bag

Crop year	N (months)	Range	Minimum	Maximum	Mean	Standard deviation	Coefficient of variation
2006/07	12	12.51	16.58	29.09	23.26	4.24	18.2%
2007/08	12	35.35	24.63	59.98	36.03	11.76	32.6%
2008/09	12	28.49	41.15	69.64	54.42	9.79	18.0%
2010/10	12	17.91	43.15	61.06	49.69	4.95	10.0%
2010/11	12	28.30	43.10	71.40	53.02	8.75	16.5%
2011/12	6	22.42	58.12	80.54	71.05	8.79	12.4%

Source: Statistical Research and Information Directorate (SRID), MoFA – Ghana, 2013.

### Maize Consumption/Utilization

Domestic maize production seems to be meeting the local demand for human consumption. The maize supply in Ghana has been increasing steadily over the past few years with an average supply at 1.4 million MT over the period 2005-2010. However, human consumption is competing with the poultry industry and to a lesser extent the livestock industry. While there is no reliable data for maize used in animal feed, the Government of Ghana estimates that 85 percent of all maize grown in Ghana is destined for human consumption and the remaining 15 percent is used for the animal feeding sector (mainly poultry). Data obtained from major feed mills in Ghana suggests that about 250,000 MT of maize is used for poultry feed annually. This is in line with the data on consumption of white maize in 2006 where the poultry industry absorbed 170,000 MT of domestic production. Figure 5 below shows a deficit of around 110,000 metric MT in 2006 which most probably was filled mainly with informal imports of maize given the negligible volumes of formal imports in 2006.

The same deficit of around 115,000 metric tons has been registered in the year 2010 (Table 6). In the North, millet and sorghum are the main cereals produced and consumed, but in times of scarcity maize, which is usually a surplus crop, is used as a substitute for these grains.

Table 6: Maize balance sheet 2009/2010 (MT)

Gross biological production	1,620,000
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Available total domestic production for human consumption	1,134,000
Total imports of commodity	34,000
Total exports of commodity	150
Total supply of commodity	1,167,850
Per capita consumption (kg/head)	44
Estimated net consumption of commodity	1,052,100
<b>Net deficit/surplus</b>	<b>115,750</b>

**Source:** SRID, MOFA 2010

White maize consumption is projected to increase due to population growth and increasing per capita incomes. Based on the most recent domestic production data, the shortfall between domestic production and domestic consumption would reach 267,000 MT by 2015 without further productivity improvement (MOFA 2011). This deficit will mostly affect consumers in the urban areas and the poultry industry.

### **Marketing and Trade**

Domestic maize trade relies largely on a network of traders linked by personal and ethnic ties. The so-called “market queens”, women engaged in maize trading, dominate the local and regional markets while larger groups of wholesalers engage in spatial arbitrage across regions/districts. In the Techiman district wholesalers normally obtain their maize either directly from farmers with whom they have long standing relationships or from district assemblers, brokers. The local wholesalers then sell to long-distance traders serving urban markets throughout the country (FAO, 2006). Techiman serves as one of the main feeder markets in Ghana because of the maize coming from the main producing areas in Brong-Ahafo. From Techiman the maize is then directed to Accra and/or Bolgatanga, to Burkina Faso, and/or Cote d’Ivoire.

The other important feeder market for maize is Tamale located in the Northern region. Despite the unavailability of time series for the different prices, the graph (Figure ?) is quite informative in showing the significant correlation between one of the major rural feeder markets for maize, Tamale, in the Northern Region, and the average farm gate prices. It also seems that the spread between prices in Accra and the rural wholesale and farm gate prices is widening. This can be a consequence of both the increasing maize deficit in Accra that might generate some degree of speculation but also the impact of rising market access costs (transport/fuel cost) between remote rural areas and main urban centers. The distance between Tamale and Accra is 450 km.

Ghana is almost self-sufficient in white maize. The small volumes imported are mainly if not entirely constituted by yellow maize which is used in the poultry feed industry which absorbs roughly 250,000 Mt of maize annually. Maize is also exported, but often through informal channels, and hence not captured by official data. Official statistic available suggest Ghana’s main trading partner in West Africa is Cote d’Ivoire while Argentina was the maize exporter during the 2005-2010 period.

Table 7: Maize production, import and export\* in Ghana (2004-2010) – ‘000 MT

	2005	2006	2007	2008	2009	2010
Production	1,171.40	1,188.80	1,219.60	1,470.08	1,619.59	1,871.70
Imports	73.95	6.55	0.60	63.87	34.23	0.89
Exports	0.02	0.01	0.02	0.11	0.01	0.05
Net Imports	73.92	6.54	0.58	63.76	34.22	0.84
Exports/ production	0.00	0.00	0.00	0.01	0.00	0.00
Trade Intensity (X+M)/P	0.06	0.01	0.00	0.04	0.02	0.00
Food Aid Imports	1.70	2.17	n.a.	2.06	1.13	0.95

Source: UN COMTRADE data refers to maize other than seed

### Policy Decisions and Measures

The maize sector in the recent past attracts the following interventions: fertilizer subsidy, mechanization programme, block farms programme and the buffer stock scheme. For now the note only describes the main characteristics of each program and their existence is used 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. Apart from these direct support programs, trade policy in Ghana makes maize imports subject to import duties and other fees described later.

#### *Fertilizer Subsidy*

The Government of Ghana introduced a 50 percent subsidy for fertilizer in 2008 to make it affordable for producers and to increase fertilizer use. Fertilizer agents (private sector actors) 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 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 GHS37 million available to support the fertilizer subsidy program from a starting amount of GHS 25.3 million in 2008 (GAIN report, 2011). The use of fertilizer had shown a significant drop starting from 2006 (SRID, 2012). Unfortunately, data is only available up to 2008, the year when the fertilizer subsidy was introduced. However, fertilizer imports have grown exponentially from 2007 onwards. A more in-depth

assessment of the share of the subsidy used for maize as opposed to other crops will have to be carried out to understand the level of incentive it creates for the maize sector and different types of maize producers and their current levels of commercialization of maize especially in those areas where the crop is crucial for food security.

Coupled with the introduction of the fertilizer subsidy programme the government has liberalized the fertilizer market. This means that all companies are entitled to operate under the waybill system as long as they have registered to the programme.

The HS Code and Custom Tariffs Schedules, issued by the Ministry of Finance and Economic Planning in 2007 shows that there is no import duty and VAT on all types of fertilizers, but there are administrative fees and levies: an inspection fee (1 percent of CIF), a processing fee (1 percent of CIF for zero rated products), a network charge – GCNet (0.4 percent of FOB), National Health Insurance levy (2.5 percent of CIF), an ECOWAS levy (0.5 percent of CIF) and an EDIF (Export Development and Investment Fund levy) (0.5 percent of CIF), which in total represent approximately 5.9 percent of the fertilizer value which, together with other transaction costs, should be covered by the government subsidy. It is estimated that the current subsidy to fertilizer amount on average to 40 percent of the retail price of fertilizer (NEPAD 2011, MOFA 2012).

### ***Mechanization programme***

The Government of Ghana is providing tractors to producers for mechanized farming. According to the GOG, this direct intervention could increase maize yields to 2.5 MT in 2011/2012 up from 1.89 MT in 2010. The provision of tractors is made through the Agricultural Mechanization Services Enterprises Centers (AMSEC) to assist the private sector to take a lead role in the provision of well-organized and commercially viable agricultural mechanization services. The high initial capital investment needed to purchase farm machinery and related equipment together with the prohibitive costs of borrowing underscored the need for the Government to facilitate private sector access to some agricultural machinery through the establishment of mechanization services centers. It is against this background that Agricultural Engineering Services Directorate (AESD) facilitated the establishment and operation of eighty four (84) AMSEC companies to make agricultural mechanization services readily available in a timely and affordable manner to farmers.

The machinery/equipment allocated to AMSEC operators included tractors and its matching implements, maize shellers, and water pumps. The allocations were based on machinery requirements of the AMSECs operators and their ecological locations. It is planned that all districts in the country will have at least one functional AMSEC in future. Since 2009, MOFA through AESD has introduced and deployed over 45 combine harvesters including maize and rice harvesters. China is one of the main providers of farm machinery. The extent to which mechanization services are available to farmers, the quality and timeliness of these services and the reduction in charges for these services due to competition in the sector is not yet understood and will be the focus of this study.



### ***Block farms***

The introduction of Block Farms Programme (BFP) has the main objective for mechanization and extension services to be spread out to cover a large acreage and a large number of farmers. The BFP, was piloted in 2009 in six regions (Ashanti, Brong-Ahafo, Central, Northern, Upper East, and Upper West). The programme aims at promoting farming as a business by targeting large areas of arable land (in blocks) in different locations for the production of selected commodities which are suitable for specific agro-climatic conditions. This in turn allows bringing several beneficiaries together onto one large production area to provide them with a range of services, including those provided by programmes such as the fertilizer subsidy and or the agricultural mechanization services centres. How this intervention has introduced competition into the private sector services providers, increased mechanization of farm activities and the extent of re-orientation of farmers to operate as businesses is yet to be understood and estimated. This study will attempt to investigate impact.

### ***National Food Buffer Stock Company***

In March 2010, the Government of Ghana set up the National Food Buffer Stock Company (NAFCO), a completely state-owned-enterprise that is intended to buy, preserve, store, sell, and distribute excess grains (including maize) in warehouses across the country. The creation of NAFCO is part of the strategy to reduce post-harvest losses, ensure price and supply stability and establish emergency grain reserves. Specifically, NAFCO mandate consists in: guaranteeing an assured income to farmers by providing a minimum guaranteed price and ready market for farmers in order to reduce post-harvest losses resulting from spoilage due to poor storage; purchasing, selling, preserving and distributing food stuffs in times of crisis; employing a buffer stock mechanism to ensure stability/balance in demand and supply; expanding the market share/demand for food grown in Ghana by selling to state institutions such as the military, schools, hospitals, prisons; acting as a foreign exchange earner as increased food production resulting from MOFA's interventions and storage by NAFCO will afford the country the opportunity to export surplus food items when the local food requirement has been met.

NAFCO keeps two kinds of stocks, operational stocks and emergency Government stocks. Operational stocks are the stocks used to run and operate the company, and the emergency Government stocks, are stocks held for the Government for use in emergency situations. The target quantities for 2012 for maize were 15,000 Mt of white maize and 15,000 Mt of yellow maize; 15,000 Mt of paddy rice; 1,000 Mt of soya. The Emergency Government Stocks include: 10,000 Mt of white maize; 10,000 Mt of milled rice; 1,000 Mt of soya. The share of these stocks in an estimated production of 1.7 Million Mt is around 3 percent. Given the difficulty of NAFCO to reach farmers in remote areas, 73 Licensed Buying Companies (LBCs) are contracted by NAFCO to purchase maize and rice from farmers in the various villages at a minimum purchasing price (i.e. floor price) irrespective of location determined by NAFCO in consultation with the post-harvest committee within MOFA (IFPRI, 2011).

The committee takes into consideration factors like transportation, sacks, drying, bagging, sewing and handling to come up with this price. The Farm gate prices are calculated on the basis of the production costs described earlier plus a 15 percent profit margin in the case of maize. The farm gate price for maize in 2011 was GHS 480/tonne. The maize price paid to LBC in 2011 was GHS 750/tonne and yield a marketing margin of GHS270/MT of maize. The floor price is the same in all regions of Ghana and if compared with the average rural wholesale market prices at the time, NAFCO was giving to maize producers around GHS 250 (or a subsidy equivalent to 27 percent of the market price) on each tonne of maize sold. The main buyers of maize from NAFCO are poultry farmers, schools and other public institutions.

NAFCO operations are wholly financed by the Government of Ghana with an amount of GHS15 million, made up of GHS5 million from the Government of Ghana and GHS10 million from Donors through the Highly-Indebted Poor Country grants.

What need to be further analyzed are the impact of NAFCO price announcements on the open market price setting especially in those regions and areas that are close to current NAFCO storage facilities and the period of purchase. The second aspect is related to maize sales to the poultry farmers. Essentially, NAFCO creates an incentive for poultry farmers to buy local maize as opposed to imported maize. An analysis of how local maize competes with imported maize will be possible when non-tariff related costs for imported maize is obtained. Lastly, it is claimed that the role of NAFCO is to mop up excess production and release when appropriate to stabilize prices; however it is not clear how the level of excessive production is defined, the quantities of the excess purchased, the displacement of private sector operators in the market and the effect of NAFCO operations in price stabilization and addressing food security crisis.

An evaluation of these four programmes has been carried out by IFPRI and independent consultancy companies in 2011 but not in terms of competition and impact on producers, traders and consumers which is the focus of this study.

## **TRADE POLICY**

The lack of an agreed Common External Tariff (CET) or a functioning customs union in West Africa leads countries to apply their own tariff schedules. According to UNCOMTRADE data, the simple average of Ghana's external tariffs is 12.7 percent (WB, 2012). Even though Ghana is a signatory to the CET agreement, its implementation is doubtful due to tariff rates applied on goods from the sub-region into Ghana.

Maize imports are charged a 20 percent import tariff. It should also be noted that maize imports are subject to restrictions, where a license is required to import Maize from outside Ghana. Moreover, Ghana sometimes blocks the duty-free importation of goods originating in ECOWAS by applying a wide range of additional taxes, levies and fees which are something different from import duties and are charged on all imports. These fees include the statistical fee, various processing fees, or the export development and investment levy. Apart from the VAT (12.5 percent) and National Health Insurance Levy (2.5 percent), which are also applied on domestically produced goods most of these taxes, levies and fees penalize imported goods (2 percent) and can be considered as additional import duties. The West Africa Trade Hub (2012) highlights that Ghana keeps on applying temporary import bans and quotas for selected agricultural commodities even on import from West Africa. It is unclear if maize is included.

### ***Trade status of the products***

While Ghana is more or less self-sufficient in terms of white maize production and consumption, it remains a net importer of yellow maize that is mainly utilized by the animal

feed industry. Information on imports of white compared to yellow maize is difficult to obtain. The main import suppliers of white maize are South Africa and or Cote d'Ivoire, while the US and Argentina are yellow maize exporters. The choice of yellow or white maize prices as the benchmark price appears not to be so relevant. For example, the spread between monthly spot prices of white and yellow maize traded on SAFEX is very close to zero and the coefficient of correlation between the two has been found to be very high, 0.952 (Angelucci 2012).

Ghana was a net importer of maize for the period 2005-2010. Data reported is extracted from UN COMTRADE and refers to "maize corn, other than seed". The zero value of exports in year 2006 and 2009 was replaced with data on imports of maize in those countries that resulted being the main destination markets of Ghana maize exports over the period 2005-2010.

**Table 8: Net trade, maize other than seed (tonne)**

	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Direction of Trade						
<b>Export</b>	22.28	10.71*	16.24	107.08	5.00*	50.00
<b>Import</b>	73,945.74	6,551.98	595.98	63,868.57	34,228.89	886.53
<b>Net Trade (X-M)</b>	<b>-73,923.47</b>	<b>-6,541.27</b>	<b>-579.75</b>	<b>-63,761.49</b>	<b>-34,223.89</b>	<b>-836.53</b>

Source: UN Comtrade (\*calculated on the basis of main destination countries' imports of maize from Ghana)

### ***Benchmark prices of maize***

As per the considerations made on the maize trade status in Ghana it was decided to take the average implicit CIF import prices of maize from those countries that result being the main exporters to Ghana in each of the years considered in the analysis. Argentina, accounting on average for 75 percent of Ghana imports is the main exporter for all years except for 2006 when 95.8 percent of Ghana imports were from the USA. The decision not to consider weighted average value of imports from the whole world was because some of the unit values of maize imports are extremely high especially in those years when imported volumes are low (CIF prices in certain years can reach 1,000 USD per MT).

Other solutions for a more reliable estimate of unit values of maize imports are under consideration, including CIF prices for maize in neighboring countries. Moreover, all trade data will need to be double-checked against other sources of data as well as information on the application criteria of tariff and non-tariff duties as it seems that unit values tend to increase in years when imported volumes are particularly low. According to recent value chain analysis (WABS consulting Ltd, 2008) some of the levies and duties apply per load which is minimum 15,000 tons for large importers. In other words, if an importer is not big enough to purchase a full load he will have to bear a relatively higher tax for his imports. An

alternative explanation could be that instances of over-invoicing stick out more in years of lower volumes of imports as they are not averaged away.

**Table 9: Benchmark prices (USD/Mt) considered for the analysis of price incentives and disincentives for maize in Ghana**

	2005	2006	2007	2008	2009	2010
Main supplier	Argentina	USA	Argentina	Argentina	Argentina	Argentina
Share on Ghana total imports (%)	51.5	95.8	30.0	99.0	98.2	47.0
Implicit CIF import price of maize from main suppliers (USD/Mt)	184.77	201.62	316.21	335.28	236.78	339.37

**Source: UN Comtrade.**

#### *Domestic Maize Prices*

Maize price data exist for wholesale and retail Accra (maize deficit and consuming area) and wholesale/producer Techiman (maize producing area). The human consumption value chain for white maize based on smallholder producers within the Ghanaian maize value chain show that the most representative channel for maize in Ghana is that of production taking place in central and northern districts and internal trade to major deficit areas, the main one being the cities of Accra and Kumasi.

While wholesale prices exist for the consuming areas, it is unclear whether it is only annual average prices and or also monthly average prices. It is also not yet clear for how long back is this data available for the analysis. For Techiman, It is unclear which data series is available and for what period. Wholesale price series for the period 1990 to 2010 has been spotted. The price observed at the Techiman market is not representative of the producer/farm gate price since a small number of producers bring their maize direct to the market and those who do come to the market incur transaction costs over and above the farm gate value. However, in the absence of the average farm gate price the wholesale price will be used as proxy.

Since maize import data is on annual average figures, it becomes necessary to obtain average annual wholesale and farm gate prices for the incentive and disincentive analysis between imported and domestically produced maize..

Graph monthly average wholesale maize prices for Accra and monthly average producer prices for Techiman to establish the correlation between them. Data for this will be obtained from SRID, MOFA.

#### *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 control. In July 2007, Ghana redenominated the national currency by setting 10,000 Cedis to GHS1.00. the exchange rate between the cedi and the USD will be obtained from the Bank of Ghana for the relevant period.

#### **Market Access Costs**

##### *From farm gate to wholesale*

Observed access costs between the farm gate and the wholesale market will be computed based on maize access costs from the farm gate, Techiman, to the wholesale market in Accra and Kumasi for the purpose calculating market incentives and disincentive for maize.

##### *From border to point of competition*

Information on imported maize will be obtained from SRID and CEPS on VAT, insurance levy, the destination and inspection fee, the ECOWAS levy and the EDIF levy for the analysis. To estimate the import parity price, the share of each cost item, including transport, handling, taxes and levies will be applied to the CIF maize price for each year over the period of analysis where data is available.

Estimated access costs will be adjusted by subtracting levies and taxes which are considered excessive. Apart from the VAT and NHIL which are also applied on domestically produced goods, taxes and fees such as the destination inspection fee (1%), the ECOWAS levy (0.5%) and the EDIF levy (0.5%) penalize imported goods and can be considered additional import duties and subtracted from observed costs.

##### *Budget and other transfers*

As shown in the section on description of the different interventions targeting the maize value chain in Ghana, especially concerning the fertilizer subsidy and the mechanization programme, no information is available on any disaggregation of the amount of subsidies absorbed by the maize sub-sector as against other targeted crops.

##### *Quality and quantity adjustments*

The need for quality adjustment between imported yellow maize and domestically produced white maize will be considered depending on information gathered from MOFA and the Ghana Statistical Service (GSS). In a study by IFPRI an adjustment value of 0.5 has been used (IFPRI 2012).

#### *Data Required*

Benchmark price: CIF unit value of imported yellow maize from countries of greatest imports in the year using all available sources.

Domestic price at point of competition: Wholesale prices for maize in Accra and Kumasi from SRID, MOFA

Domestic price at farm gate: Farm gate price in Techiman provided by the MOFA. Yearly average prices.

Exchange rate: Annual average exchange rate as reported by the BoG, IMF, etc

Access cost to point of completion: Estimated using secondary data available and collecting some primary data on transaction costs from farmers and traders.

Adjusted access cost to point of competition: Adjust by subtracting excessive levies and taxes charged on imported maize.

Access cost to farm gate: will be calculated based on the maize value chain analysis.

Quality adjustment on border white maize: Will be estimated based on the price difference between imported yellow maize and local white maize on the Ghanaian market.

CIF Benchmark price (observed) per MT

Exchange rate between the USD and GHS (\$/GHS)

Access cost border- point of competition (observed and adjusted) (GHS/MT)

Domestic price at point of competition (GHS/MT)

Access costs point of competition- farm gate (observed) GHS/MT

Farm gate price (GHS/MT)

Quality conversion factor (border - point of competition)

#### *Estimation of Indicators*

Four measures of market price incentive or disincentives are being analysed. Two observed nominal rates of protection, one each at the wholesale and farm gate level are first computed. These compare observed prices to reference prices free from domestic policy interventions. The reference prices are estimated from a benchmark price such as an imported or exported price expressed in local and brought to the wholesale and farm gate levels with adjustments for quality, shrinkage and loss, and market access costs.

The Nominal Rates of Protection – observed is the price gap between the domestic market price and the reference price divided by the reference price at both the farm gate and wholesale levels.

$$\text{NRPO}_{fg} = (P_{fg} - \text{RPO}_{fg}) / \text{RPO}_{fg}; \quad \text{NRPO}_{wh} = (P_{wh} - \text{RPO}_{wh}) / \text{RPO}_{wh}$$

The  $\text{NRPO}_{fg}$  capture all trade and domestic policies, as well as other factors which impact on the incentive or disincentive for the farmer/producer. The  $\text{NRPO}_{wh}$  helps identify where incentives and disincentives may be distributed in the maize market chain.

The second the Nominal Rates of Protection –adjusted (NRPa) in which the reference prices are adjusted to eliminate distortions found in the Ghanaian maize market supply chain. The equations to estimate the adjusted rates of protection, however, follow the same general pattern:

$$\text{NRPa}_{fg} = (P_{fg} - \text{RPa}_{fg}) / \text{RPa}_{fg}; \quad \text{NRPa}_{wh} = (P_{wh} - \text{RPa}_{wh}) / \text{RPa}_{wh}$$

Market development gaps caused by market power, exchange rate misalignment, and excessive domestic market costs add to the NRPO to generate the NRPa indicators. Comparison of the different rates of protection identifies where market development gaps can be found and reduced.

### *Perception survey*

A perception survey is a study or research project with the goal of collecting impressions about a company, product, program or issue. Such surveys can be given to a variety of audiences for a range of purposes and are often administered by businesses with the intent of uncovering consumer opinions. Surveys may be verbal, written or electronic, and can range in length. The primary distinction of a perception survey is that it is intended to discover opinions rather than factual data.

A perception survey seeks to uncover what people think. This data will be predominantly qualitative, meaning it is based on opinion rather than fact. Questions can be presented as yes/no or multiple choice, or participants could be given a scale of descriptors, such as "very satisfied, satisfied, indifferent, dissatisfied" from which to choose. Other questions may be open-ended, so that the respondent can answer in her own words.

One common use for a perception survey is to collect consumer opinions about a company or product. In this study the intention is to capture the perception and opinions of market actors on the impact of reform measures in the maize sub-sector on incomes, availability, access and welfare. Governmental, political and social organizations often conduct such surveys to find out how the general public feels about a proposed law or a current issue.

The results of a perception survey are important. These findings can tell policy makers what consumers/market actors like and don't like, whether or not they trust the state and whether they would recommend the continuation of the policies. Consumer opinions influence



consumer behaviour, so this type of data is critical to helping identify gaps. As with many surveys, perception surveys routinely include demographic questions, such as age, sex, educational level, income level, location, market actor etc so that data can be more easily sorted.