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

ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR MAIZE IN UGANDA

DECEMBER 2012

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

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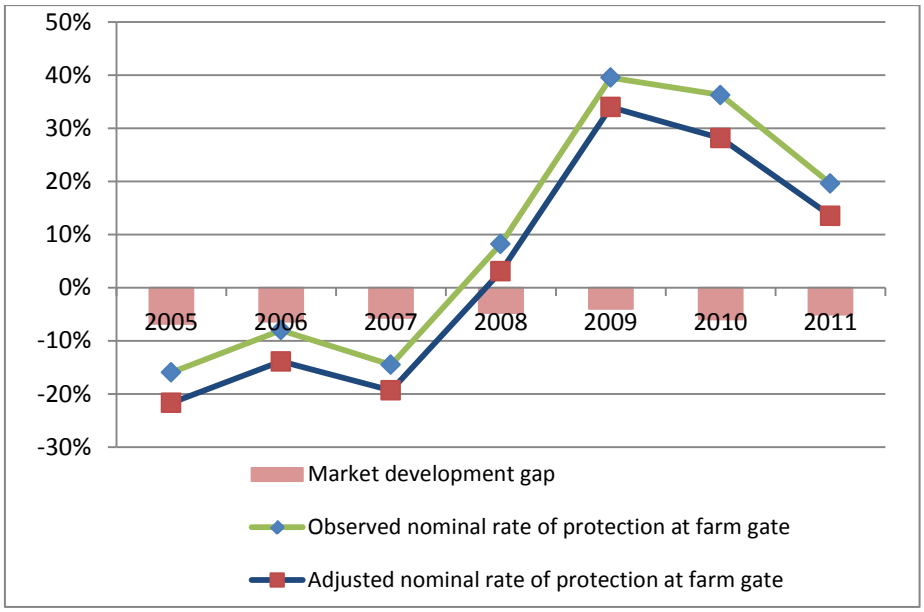
SUMMARY OF THE NOTE

Product: Maize
Period analyzed: 2005 – 2011
Trade status: Export in all years

- One of Uganda's non-traditional exports and food security commodities. Much of the production of maize aims to supply export markets in the region, mostly especially Kenya and recently Southern Sudan, which are in chronic maize deficits.
- Over the last two decades (1990-2010), both maize area and production in Uganda increased dramatically from about from 0.57 million tons in to 1.37 million tons in 2010 mostly as a result of area expansion rather than yield improvement.
- While maize has been grown for a long time in Uganda, nonetheless, unlike in neighboring countries (Kenya, Tanzania, etc), it does not form a major part of the population's traditional diet.
- the transactions involved in the marketing of maize are complex but the main channels for the commodity flow include (i) from farmer (farm gate) to agents/traders/village markets in rural areas; (ii) from rural markets to secondary markets in regional towns (iii) from urban markets to major buying centers outside the district and (iv) the export market.
- Maize markets in Uganda are highly liberalized with minimum government interventions.



Both, the observed Nominal Rate of Protection (NRP, green line) and the adjusted NRO (blue line) indicate that maize farmers have received both disincentives (2005- 2007) and incentives (2008-2011). The adjusted NRP (blue line) is net of the effects of market inefficiencies and local taxes on farmers. The extent of market development gap (pink line) shows the cost that these inefficiencies represent for producers. Although quite variable, the incentives appear to be related to the high export prices during the world food crisis. As the maize market in Uganda is highly liberalized, these indicators cannot be attributed to policy measure and are related to the functioning of the domestic maize market.

CONTENTS

1. PURPOSE OF THE NOTE

This technical note aims to describe the market incentives and disincentives for maize producers in Uganda. 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 the farm-gate and wholesale level. In relative terms, the price gaps are expressed as Nominal Rates of Protection (NRP). 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 commodity's production and consumption as well as trade and policies affecting the commodity. It also provides a detailed description of how the key components of the price analysis have been obtained. Using this data, the MAFAP indicators are then calculated and interpreted in light of existing policies and market characteristics. The analysis 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 the country or regional level.

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

Additionally, all information presented in this note is preliminary and still subject to review and validation.

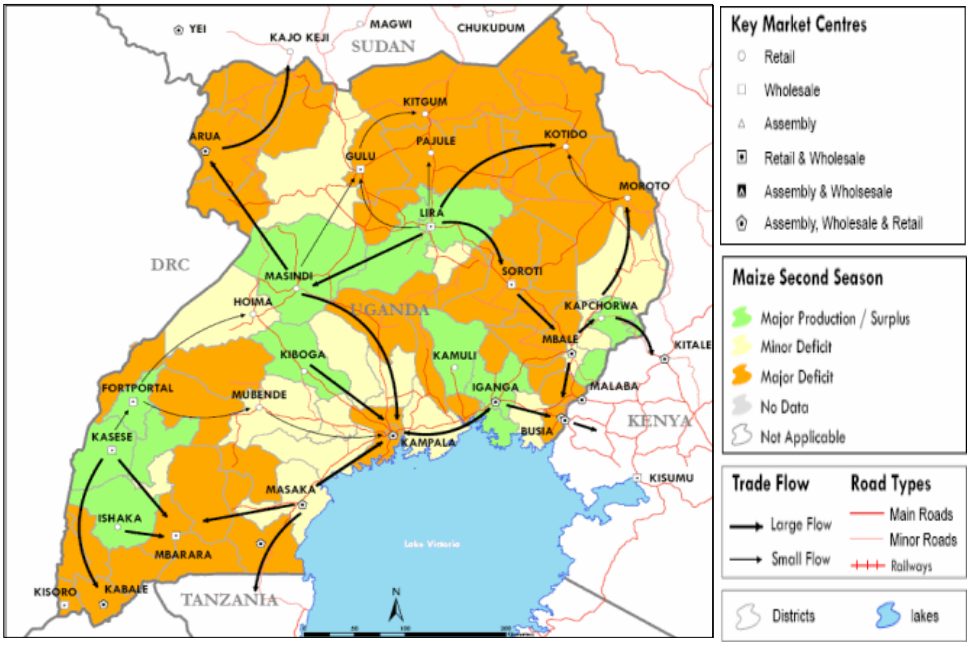
2. COMMODITY CONTEXT

Maize was introduced in Uganda in 1861 and has since become a major part of the farming system, ranking third in importance among the main cereal crops (finger millet, sorghum and maize) grown in the country (USAID, 2010). Much of the production of maize aims to supply export markets in the region, mostly especially Kenya and recently Southern Sudan, which are in chronic maize deficits. The maize sub-sector is estimated to provide a livelihood for about 3 million Ugandan farm households, close to 1,000 traders and over 20 exporters (UBoS, 2011). Therefore, maize is a growing source of household income and foreign exchange through exports. Providing more support to the maize industry is therefore a key part of Uganda's strategy to strengthen its positioning in regional and world markets.

Production

Uganda's small-scale farmers have traditionally cultivated maize for food and for income generation. It forms an important part of the farming system, particularly in Eastern Uganda. Maize is widely grown in Uganda. The main production agro-ecological zones are in the west, east, north and southeast Uganda (NRI/IITA, 2002) with the Eastern region accounting for over 50percent of annual production (USAID, 2010). The crop is cultivated on about 1.5 million hectares of land. In terms of area planted, maize is the third most cultivated crop after banana and beans. In some regions of the country, the crop has now become a staple food, replacing crops like sorghum, millet, cassava and banana. Maize is presently considered a major source of income in the districts of Kapchorwa, Mbale, Iganga, Masindi and Kasese (Figure 1), with about 75–95 percent of the household harvest being sold to earn money (NRI/IITA, 2002).

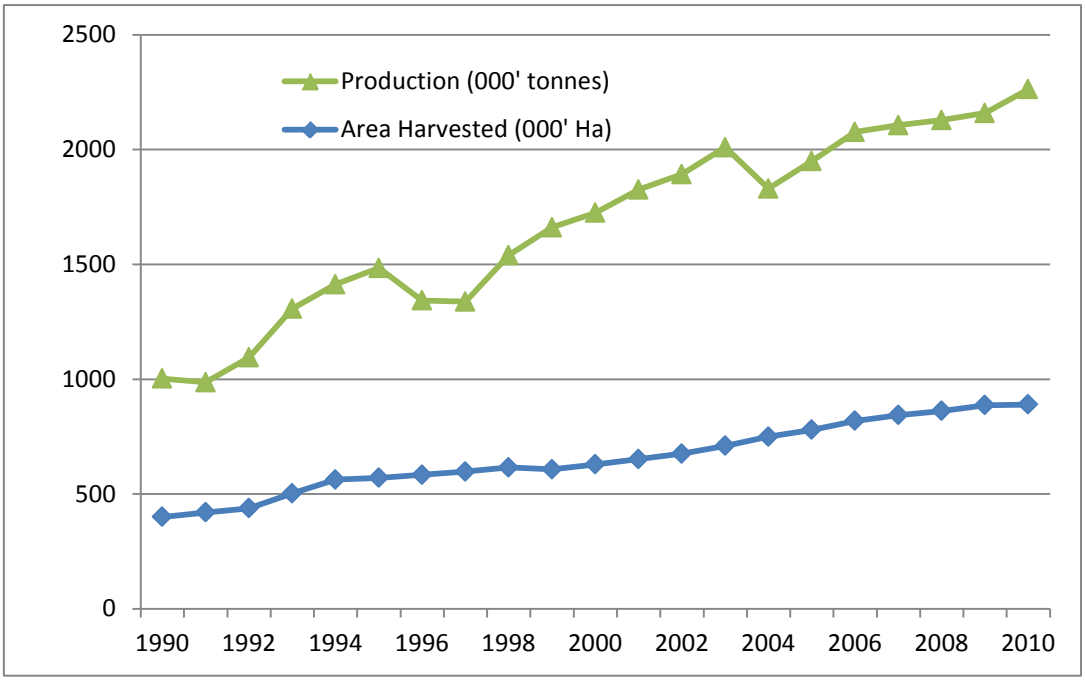
Figure 1. Map of Uganda illustrating flow of maize



Source: FEWSNET, 2012.

Whilst production is influenced by climate patterns, farmers' planting intentions, in excess of subsistence requirements, are largely influenced by price levels and overall output tends to fluctuate accordingly. The country has a potential of producing up to 7.5 million metric tons utilizing the current area under maize by utilizing improved varieties and crop management technology (AATF/NARO, 2010). However, this is never achieved largely due to various production constraints including low soil fertility, lack of improved maize varieties, erratic rainfall patterns and drought stress during some seasons. Maize production is generally characterized by low yields, which result in high unit costs and thus low returns. Regardless of the farm sizes, Uganda's maize yield levels are low and are generally between 1.0 and 1.8 metric tons/ hectare. Crop failure due to drought can cause losses of up to 80 percent. The magnitude of the problem is high in districts such as Kasese where losses can reach catastrophic levels. Other drought-prone regions include eastern, northeastern and northern Uganda.

Figure 2. Maize area and production trends in Uganda (1990-2010)



Source: FAOSTAT (2012).

Over the last two decades (1990-2010), both maize area and production in Uganda increased dramatically (Figure 2). Harvested area increased from about 0.4 million hectares in 1990 to 0.65 million hectare in 2001 reaching 0.89 million hectares in 2010 (FAOSTAT, 2011). Similarly, production more than doubled during the same period, i.e., from 0.57 million tons in to 1.37 million tons in 2010. Clearly, most of the production increase is the result of area expansion rather than yield improvement as crop yield stagnated at around 1.5 t/ha in recent years (FAOSTAT, 2012).

Consumption

While maize has been grown for a long time in Uganda, nonetheless, unlike in neighboring countries (Kenya, Tanzania, etc), it does not form a major part of the population's traditional diet, but is grown primarily for income generation, rather than for food security. However, the growing cost of traditional staple foods (such as cooking bananas locally called *Matooke)* has had the impact of

increasing maize consumption, especially in urban areas. Kampala alone accounts for about 50percent of formal trade in maize (USAID, 2010).

The domestic market for maize in Uganda is estimated at 350,000 - 400,000 metric tons per annum1 (NRI/IITA, 2002). In 2007, domestic consumption remained at 400,000 MT out of a national availability of approximately 638,000 MT (USAID, 2008). Maize is consumed in various forms – grilled or whole, as a cake *[Posho, or Ugali]*, or as porridge – especially in urban centers. Over 70percent of the maize is consumed as food, and about 10percent is used as animal feeds (maize bran). There is also increasing demand for value-added products (maize flour, poultry feeds, etc) especially in urban centers where maize is gaining importance both as a major food item and for income generation.

Marketing and Trade

Uganda's maize export market is mainly regional, comprising of markets within Eastern and Southern Africa, the Democratic Republic of Congo and Southern Sudan. Exports of maize to Kenya alone more than doubled from 2004 to 2008 (MAAIF, 2010). Uganda's export potential for maize is estimated between 200,000 and 250,000 MT per year (USAID, 2010). Nonetheless, the country has only managed to formally export half of this amount, reflecting a low level of penetration into the regional markets due to the poor rural road network, and limited business exposure (USAID, 2010). Maize is sold across borders through Mutukula for Tanzania, Busia for Kenya, and Gatuna for Rwanda (Figure 1). The challenge for the cross-border trade, however, has been the increasing informal (unofficial) cross-border trade with neighboring countries for difficulty of controlling both quantity and quality of commodity flow. Of all the five neighboring countries, Kenya dominates the informal export destinations followed by DRC, Southern Sudan, Rwanda and Tanzania.

There has been a vibrant cross-border trade in maize with these regional markets. According to USAID (2010), internal procurement and trade in maize along Uganda's eastern and southern borders with Kenya and Rwanda, respectively, remains brisk, as high demand for maize in the neighboring countries increased the follow of maize from production centers in Uganda. Trade in maize to these markets is entirely informal. Consequently there are no accurate data on volume and values of exports to these countries.

Official figures indicate that in 2008 alone, maize is estimated to have generated over USD 18.5 million in export earnings from an estimated 66,671 tons (MAAIF, 2011). Table 2 presents maize production, import and export of Uganda (2004-2010). The data on exports of maize reported mainly reflects the formal export. According to this data, Uganda exported 8-12percent of its maize production between 2004 and 2010. However, informal (unofficial) maize exports appear to far exceeding the formal (official) exports through. According to Bank of Uganda (2011), the value of informal maize grain and flour exports to neighboring countries in 2009 and 2010 were estimated at USD 36.67 and 45.83 million, respectively. In contrast, the value of formal maize grain exports in the same years were USD 29.07 and 38.21 million, respectively (MAAIF, 2010).

1 Annual series data for domestic consumption is unavailable.

Table 1. Maize production, import and export of Uganda (2004-2010)

	2004	2005	2006	2007	2008	2009	2010
Production (000 mt)	1,080.00	1,170.00	1,258.00	1,262.00	1,266.00	1,272.00	1,373.00
Imports (000 mt)	153.03	78.79	59.526	42.54	N/A	N/A	N/A
Formal exports (000 mt)	89.32	90.36	118.49	107.08	66.67	94.44	166.25
Formal export as a % of production	8.27%	7.72%	9.42%	8.48%	5.27%	7.42%	12.11%

N/A = data not available.
Source: FAOSTAT, 2011 and MAAIF (2011).

Data obtained from FAOSTAT (2012) indicates that formal imports of maize have been declining since 2004. The same conclusion is also reported by USAID (2010). Imports of maize have been high in seasons of low harvest (e.g., 2004) especially on account of variations in rainfall patterns. By and large, however, Uganda has always been self sufficient in maize production and has not been dependent on imports.

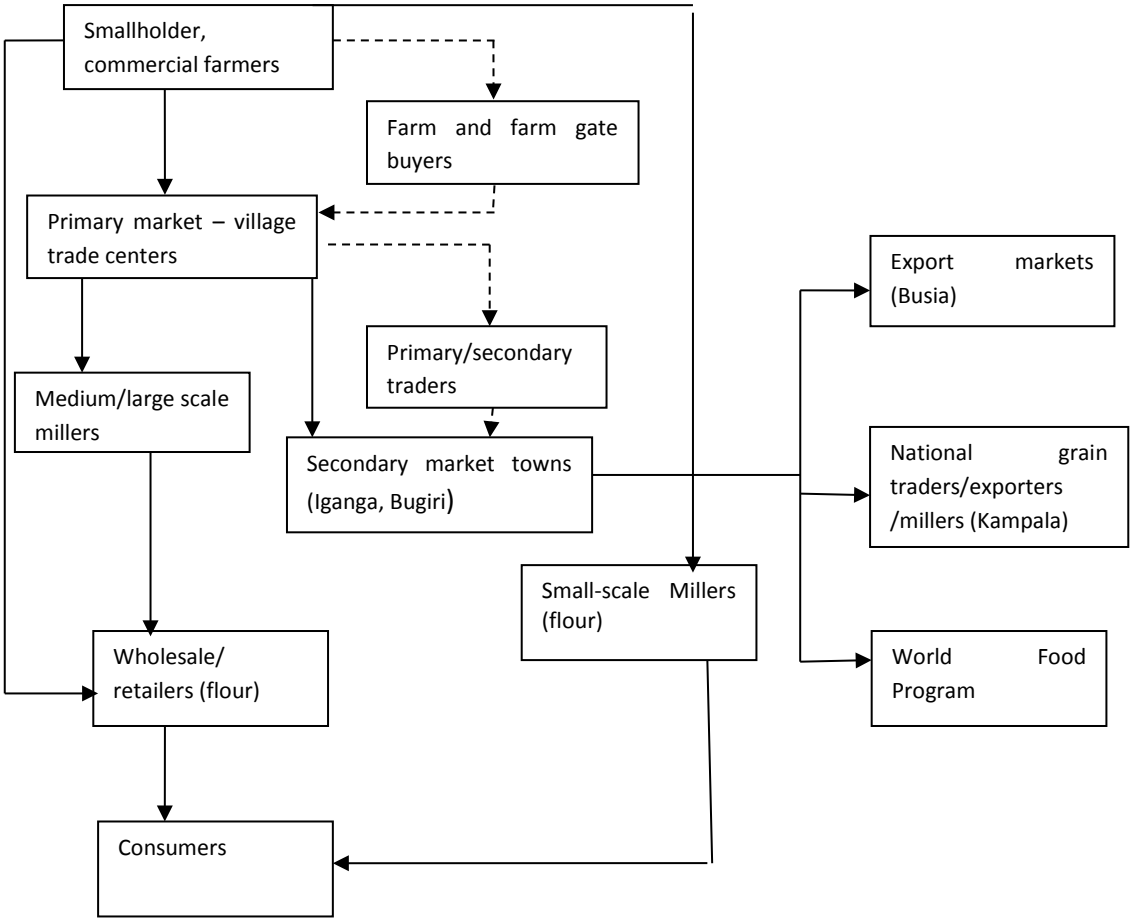
Description of the Value Chain and Processing

Due to the importance of maize in Uganda, several studies of marketing, transaction costs and value chain analysis are available including USAID (2010), NRI/IITA (2002), World Bank (2009) and PMA (2009). The description provided here is mainly based on USAID (2010) which focused on market assessment of staple foods in Uganda, World Bank (2009) and PMA (2009). According to these studies, the transactions involved in the marketing of maize are complex but the main channels for the commodity flow include (i) from farmer (farm gate) to agents/traders/village markets in rural areas; (ii) from rural markets to secondary markets in regional towns such as Iganga, Bugiri and Sironko; (iii) from urban markets to major buying centers outside the district and (iv) the export market. Each one of these channels involves a number of key players. Figure 3 depicts the typical maize supply chain in Uganda.

Rural agents are the main buyers of all maize traded in the sub-counties (smaller administrative units in the districts). Their main function is to buy and/or assemble maize from the numerous scattered farmers, often located in inaccessible rural areas. They find market for the maize (often the urban traders and processors) when they have accumulated sufficient quantities. The urban traders and processors arrange transport to collect the maize either directly from the farmers whom they pay on a cash basis, or from the collection points of the agents. Since the agents live in the rural areas, they are a reliable linkage between the farmers and urban traders and processors/millers.

Urban traders are found in major urban centers in producing districts. Their main activities include networking with rural agents, serving as a market outlet for farmers, and collecting maize grain before selling it to the various clients, including institutions and processors, located in the districts. Urban traders are also sources of bagging materials (sacks) used by farmers as well as market information in their areas of operation. Urban traders sell their maize mostly to millers.

Figure 3. Typical supply chain for maize in Uganda



Source: Adapted from USAID (2010) and PMA (2009), World Bank (2009).

Maize grown and traded undergoes some level of value addition – conversion of maize grain into flour and a variety of other by-products, such as bran and germ. The principle players in this value chain are the processors/millers, grouped into three categories, namely: small-scale millers, medium-scale millers and large-scale millers. Majority of the processors/millers fall under the small-scale category and they are scattered in various rural trading centers in the districts, carrying out primarily customized milling. Processing costs range from U Sh 50 to 100 per kg, depending on the location.

The medium-scale processors are based in the main town centers – the district capitals and offer both contract and trade-based milling services to institutions and urban traders. The medium-scale millers first hull the maize to remove bran and then produce "No.1" flour, which is not very nutritious. The medium-scale millers charge a price of U Sh 70-100 per kg for milling. For every 100 kg of maize grain, about 70-73 kg of No.1 maize flour is produced. The millers sell the No. 1 flour at U Sh 800-1 100 to wholesalers and retailers. The normal price of maize bran is U Sh 100 per kg to poultry and animal farmers and manufacturers of feed meals. The medium-scale millers make a profit of U Sh 87-383 per kg or about 11-35 percent of the price of the flour.

Large-scale processors are only found in Kampala. They buy their maize from urban traders and large-scale traders from the western, central and eastern regions. They sell more than three quarters (75 percent) of their maize products to the World Food Programme (WFP) for export and distribution to war displaced people in Northern Uganda. The processors carry out activities such as cleaning, de-stoning, drying, fumigating and milling into flour.

Transport costs are the major marketing cost and, therefore, are key in determining the prices offered to farmers by rural traders. The relative share of transportation cost in total marketing costs averages 84 percent in Uganda (World Bank, 2009). These costs are quite high because a maize bag often goes through a number of markets before reaching the final consumer in large cities and thus requires loading and unloading at each intermediate stop. For sales, maize is brought from farm to primary markets mainly by traders but sometimes by farmers themselves. The common mode of transportation on this route is either bicycle or carts. In Uganda, a 10MT truck is the mostly common mode of transportation beginning already from the rural market, while some traders use trucks with a capacity of between 24 and 32 metric tons (World Bank, 2009). Average distances between market pairs are short and the average distance between secondary and wholesale markets is about 80 km in Uganda (from Jinja to Kampala)

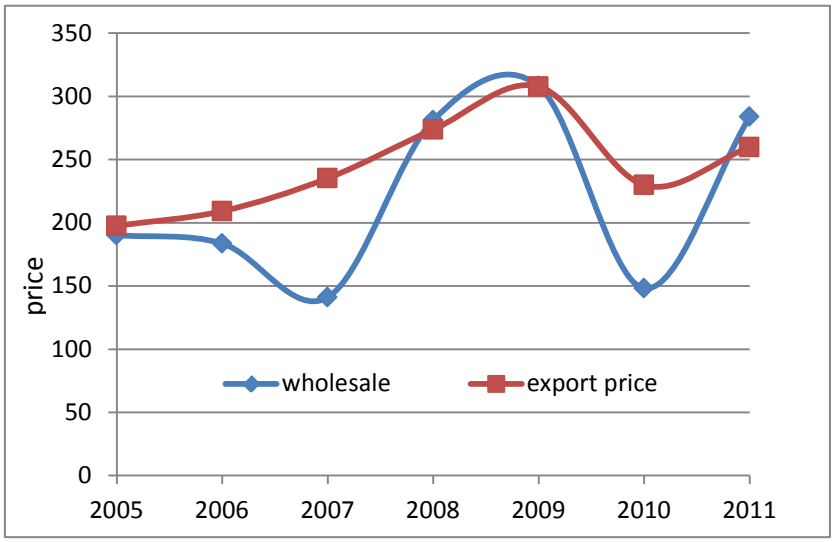
A number of large scale traders and exporters of maize have emerged over the years. The main ones include: (i) the World Food Programme, (ii) the Uganda Grain Traders (UGT), (iii) the Masindi Seed and Grain Growers Association (MSGGA), and (iv) the Uganda National Farmers Federation (UNFFE).

The informal export market to Kenya is uncontrolled and involves the sale of low and variable quality maize. This constrains the penetration of the formal Kenya market represented by large millers. Furthermore, Uganda lacks an authoritative price determination point, e.g., a central commodity exchange or futures market, national maize quality standards, and a legal and regulatory framework covering grain warehousing and handling operations (NRI/IITA, 2002). These deficiencies, together with inadequate finance to enable the development of an efficient warehouse receipt financing system, constrain the holding of stocks, essential for the exploitation of export marketing opportunities in particular (NRI/IITA, 2002).

Most farmers sell most of their maize at low prices to traders who in turn sell to exporters (PMA, 2009). Further, PMA analysis of the trend of maize farm prices indicates that, on average, there has not been any significant increase in the deflated national average farm price received by farmers during the period 1970-2005 2 (PMA, 2009). At the end of the chain are large scale traders/processors, large scale distributors and exporters, and big millers. They rent or have big warehouses and modern cleaning and drying equipment, own transport facilities such as pick-up, trucks, Lorries and trailers. They engage in maize cleaning, consolidation and bulking and sell maize to relief agencies, or export to regional markets.

Ugandan maize exporters appear to receive profitable prices for their exports in most of the years (Figure 4). With the exception of 2008/09, the export price of maize exceeds wholesale price in Kampala considerably in most of the years. In 2008/09, export prices were slightly below the whole sale market prices. This does not necessarily mean the exporters are selling at loss as maize exported was probably purchased earlier at lower wholesale prices. It is to be noted that export prices reported here are the average unit value of exports to all countries. In contrast, trade data from Kenya Ministry of Agriculture indicate much lower average value of maize imports from Uganda. Wholesale maize prices in Uganda, especially in Kampala, are well often above the world market prices, except few very short periods when they were below the world market prices (World Bank, 2011).

Figure 4. Wholesale prices and export unit value (USD per ton) of maize in Uganda



Source: Whole sale price data from www.ratin.net. Export prices calculated from data from MAAIF (2011).

Policy Decisions and Measures[3]

As common in most African countries, post-independence grain production and marketing in Uganda were subject to state control. However, Government intervention through its parastatals, the Produce Marketing, and Food and Beverage Boards, ceased in the 1990s. The market is now

2 However, no empirical evidence is presented to support this statement and maize producer prices cannot be obtained.

3 This section draws heavily on the material in USAID (2011).

completely liberalized for all agricultural products including maize. However, it should be noted that Uganda does not have, as yet, a formal trade structure for the marketing of maize.

The policy environment for the agriculture sector and the maize subsector in Uganda in the last decade has been shaped by the *Plan for Modernization of Agriculture (PMA).* The PMA is a strategic and operational framework for the transformation and structural change of the subsistence farming sector through policy, institutional and organizational reforms and changes in the type and methods of service delivery leading to increased profitability and competitiveness in the agriculture sector. The PMA has been part of the wider planning framework for the country – the *Poverty Eradication Action Plan (PEAP)*.

The need to fill the gaps in PMA implementation led to emergence of alternative thinking about agriculture and rural development. Thus, in 2005 the *Rural Development Strategy (RDS)* was formulated, with the overall objective of raising household incomes, like the PMA, but proposing a more focused approach to supporting farmers through input provision and formation of cooperative societies. The focus of RDS was the sub-county, and this led to the development of the Sub-County Development Model.

In 2006, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) developed the so-called *Development Strategy and Investment Plan (DSIP)* as medium-term plan. The DSIP was intended to translate the national goals and priorities contained in the PMA into a plan for public sector activities in the agriculture sector. It was also designed to clarify the objectives and outputs for the sector and to bring out priority areas for spending in the period 2005/06 – 2007/08. The DSIP drew from the PMA priority areas in which public sector action was required in the medium term to support the modernization of agriculture, especially those that fell within the mandate of MAAIF and its agencies. It is these priority areas that informed the DSIP investment areas and have been the basis for the Ministry's planning and budgeting in recent years.

In 2006, Government formulated a much broader vision - the *Prosperity for All (PFA).* The PFA not a policy as such, but a programme, which attempts to put in place varied but integrated socio-economic programmes targeting mainly the rural poor in order to transform them into productive and prosperous communities. The programme seeks to achieve prosperity for all through production, value addition, agro-processing, improved marketing, savings and accessibility to affordable credit. In 2007, Cabinet directed the MAAIF to coordinate all agriculture-related programs of the PFA through the PMA Secretariat.

Some of the policies affecting maize trade include:

Customs Tariff and Non-Tariff Barriers: After ratification of the Customs Union, some tariffs were reduced while others were totally abolished as a step towards harmonizing trade policies and taxes within the EAC region. Uganda, Kenya and Tanzania have all adopted zero rate VAT on maize imports from within the EAC.

Export policies: Consistent with its commitment to all liberal trade policy, Uganda has emphasized that her maize export sector remains as open as possible. Uganda has no maize export taxes, charges or levies. Given this observation, it is imperative to argue that exporters of Uganda's maize grain are largely regulated by the importing countries. Despite the fact that no policy per se discourages maize

exportation, exporters must have a fumigation certificate, a phytosanitary certificate, and a quality standards certificate.

Exchange rate policy: Of relevance to maize production is the exchange rate policy addressed by Bank of Uganda (BOU). Uganda's BOU continued to pursue a flexible exchange rate policy regime, whereby it intervenes in the foreign exchange market primarily to dampen short term volatility in the exchange rate (BOU, 2011). Dampening short term volatility is important to avoid its possible adverse impact on trade. Net sales of foreign exchange amounted to USD 37.7 million over the review period. Overall the shilling depreciated against the US dollar by 5.1 percent in 2009/10, from an average rate of U Sh 1 903.03 per USD in 2008/09 to U Sh 2028.88 per USD.

Though generally the Government of Uganda has been implementing private sector friendly policies, its specific policy on agriculture remains unclear (USAID, 2010). There are no known incentives for farmers to increase production and no attempts to ensure farmers receive an economic return for their efforts. This results in wildly fluctuating prices for farmers (USAID, 2010).

With the progressive liberalization of Uganda's economy – a process which included trade – among others, price regulation was abandoned as a trade policy tool. Both domestic and international trade in all agricultural products has since remained in private hands. There are no more state trading companies operating in competition with the private sector or acting as major buyers and guarantors of a minimum farm-gate price. Similarly, price control as a development and trade policy measure is no longer practiced by the government. There is no export duty on maize (as well as other agricultural products), nor the government instituted any bans or other restrictions on trade in food commodities (World Bank, 2009). As such, all prices are determined by the market but this does not imply well functioning markets.

3. DATA REQUIREMENTS, DESCRIPTION AND INDICATORS

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

The analysis of price incentives/disincentives is carried out for the period of 2005-2011 and aims at estimating price gaps and rates of protection at wholesale and farm-gate levels. This analysis requires the following variables.

trade status of the commodity

During the period of analysis (2005-2011), Uganda exported 8-12percent of its maize production (see Table 1) in addition to substantial informal (unofficial) exports to neighboring countries estimated at USD 36.67 and 45.83 million in 2009 and 2010, respectively. Imports were small and declining. As such, Uganda is considered as net exporter of maize.

BENCHMARK PRICES

Observed

As maize is an important export commodity for Uganda, the analysis starts with FOB price as benchmark price. The average unit value of maize export with all trade partners is considered as the most relevant benchmark price for Ugandan maize for two reasons. First, although Uganda produces maize surplus to sell to its neighbors, the volumes of Uganda maize exports are too small to trade elsewhere given that the country is land-locked and transportation cost to Mombasa is prohibitively high. Second, the qualities of the produce do not match international specifications (World Bank, 2009). This price data, computed by dividing value of maize exports by its quantity, is obtained from MAAIF (2011) and UBOs (2012). The benchmark price ranges from USD 198 to 307 per ton during 2005-11. The average unit value of maize exports to all destination reported by MAAIF (2011) and Uganda Bureau of Statistics (UBoS) (2012) is generally higher than the average value of Kenya maize import from Uganda reported by Kenya Bureau of Statistics (KBoS) (2012). Despite the fact that Kenya is a major importer of Ugandan maize, the average unit value of maize export is likely to be influenced by the higher prices received in Uganda for the sale to World Food Program (WFP). Average values of Kenya maize imports from Uganda reported by KBoS (2012) were below the Kampala wholesale prices and, therefore, are considered unrealistic.

Adjusted

In this analysis, no adjustment to the reference price is considered.

DOMESTIC PRICES

Two domestic prices are needed for the analysis: at the wholesale markets and at the farm gate. Busia, near the border with Kenya and a surplus producing area in Eastern Uganda, is assumed to be

the point of competition4. The wholesale price in Busia is reported by Regional Agricultural Trade Integration Network (RATIN) for 2005-2010 is available and is used here (Table 2).

Producer or farm-gate price data is unavailable from any formal source. This type of data is rarely collected and published particularly for food crops in Uganda. In this analysis, producers' prices (2005-2011) are collected from various sources including several value chain studies and data from Infotrade (2012) and presented in Table 2).

EXCHANGE RATES

Observed exchange rate: The exchange rate between the Ugandan shilling and US dollars are reported by UBoS (2012). These represent the observed exchange rate (Table 2).

Adjusted exchange rate: For lack of data at the time, real (equilibrium) exchange rate is assumed to be equal to the observed exchange rate. For the years considered, this assumption is close to reality as exchange rate misalignment is likely to be minimal since the foreign exchange market in Uganda has been fairly liberal.

Table 2. Wholesale and farmgate prices of maize and observed exchange rate in Uganda (2005/2011)

	2005	2006	2007	2008	2009	2010	2011
Wholesale prices (U Sh/tonne)[a]	297,371.2	302,189.8	334,357.4	593,553.1	836,561.1	572,697.6	650,060.9
farmgate prices (U Sh/tonne)	185,189.2	223,844.3	222,954.6	338,000.0	619,674.9	424,220.5	495,948.3
Exchaneg rate (U Sh/US $)	1,780.67	1,831.45	1,723.49	1,720.44	2,030.49	2,177.56	2,453.06

a. Average wholesale in Busia.
Source: RATIN (2012), UBoS (2012).

ACCESS COSTS

Access costs between farm-gate and wholesale market and between the wholesale market and the country's border are needed to compute the reference price parities at these respective points along the value chain. Based on value chain and commodity flow, there are three major segments of the supply chains: (i) from farm-gate to primary market (usually located in village trading centers); (ii) from primary to secondary markets (usually located in regional capital towns such as Iganga, Bugiri and Sironko); and (iii) from secondary to wholesale markets (mainly located in large regional cities and countries' capitals); and (iv) from the wholesale markets to neighboring countries (Kenya, South Sudan, Congo and Rwanda).

Observed access costs

The access costs associated with these four segments are estimated5 based on survey data for 2008 reported by World Bank (2009). Access costs involved in moving grain in the first, second and the

4 The analysis could be repeated for Masindi, the major export market to Southern Sudan but wholesale price for this market is unavailable.

5 The grain moves from farm-gate to primary markets, which are usually small rural town trading centers. Maize is usually brought to these centers either by primary traders or in rare cases by farmers themselves. Grain then moves into the secondary markets; these are usually maize collection points found in the big towns like Iganga, Jinja, Bugiri, Mbale, and Sironko. Maize is brought to these points either by primary traders or secondary traders who collect the maize from the rural towns. At higher levels of the supply chain, beginning

third segments represent access costs from farm-gate to the wholesale market while those in the forth segment are access costs from the wholesale market to the border. This analysis focuses on grain movement from producing areas to Busia wholesale market through various rural and urban markets Busia to the Kenyan borders. Busia controls the export to Kenya, the major importer of maize from Uganda.

Observed access costs can be divided into marketing costs (storage, transportation, hired labor for loading/ unloading, council cess, non-tariff measures) and profit margin. Maize marketing cost in Uganda represents 76 percent of the total access cost with the remaining 24 percent covers profit margin of traders, trader licenses and other permits and differences in transportations costs, excluding non-tariff measures (World Bank, 2009). In other words, the profit margin represents approximately 31.3 percent of the marketing costs on average. For lack of sufficient data, this analysis assumes profit margin of 31.3 percent of total marketing costs uniformly at each marketing segment. Transportation cost is the major cost item making up 84 percent of the marketing cost. Transportation costs from Secondary markets to Busia (border) are estimated by multiplying the average distance between production centers and Busia (82km) by the costs per unit distance (USD 0.15/km-ton).

For 2008, access costs between farm-gate to wholesale markets are estimated at USD 71.51/ton as compared to USD 13.64/ton for access costs between the wholesale market and the border.

The above estimates are used to extrapolate access costs for 2006-2010. This is done by converting the above access costs for 2008 into domestic currency using the official exchange rates for each year in the analysis (2006-2010). This implies that access costs in real terms did not change over the period of analysis and only affected by inflation.

Adjusted access costs

To estimate the adjusted access costs, these estimates of observed access costs were further adjusted to remove all policy-related costs and other distortions such as direct taxes (cess) non-tariff measures. The estimated adjusted access costs between farm-gate to wholesale markets (Busia) and between the wholesale market and the border are USD 66.99 and 6.88 per ton, respectively. This slight adjustment is due to the fact that direct taxes and non-tariff measures represent minimal contribution to access cost in Uganda.

Estimates of production externalities are unavailable and thus externalities were not accounted for. Also, estimates of budget and other transfers to producers are unavailable and were not considered in this analysis. As such, nominal rate of assistance is not estimated. These will be included in the analysis as data becomes available.

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from secondary markets, traders usually hire trucks/lorries with an average capacity of 10MT to deliver maize to wholesalers and millers found in the wholesale markets and larger urban areas like Kampala and Busia.

Table 2. Estimated observed market access costs of maize between farm-gate and wholesale market and between the wholesale market and the country's border (USD per ton)

Cost item	Farm-gate to wholesale[a]	Wholesale to the border[b]
Storage	2.63	0.00
Transportation	45.00	0.00
hired labor	3.39	3.56
Council cess (tax)	2.28	2.85
Non-tariff measures	1.41	3.25
profit margins (23.5%)	16.80	7.10[c]
Clearing agents fee		1.68
Total	71.51	13.64

a\ This consists of marketing costs incurred in moving the grain from farm to primary markets and village trading centers to secondary markets in regional towns such as Ignga, Bugiri and Sironoka to Kampala.

b\ This consists of marketing costs from Kampala wholesale market to cross-border traders including border crossings costs.

c\ For lack of data, profit margin for exporters is assumed to be 23.5 percent of the marketing costs based on estimates by World Bank (2009).

Source: Author's calculation based on World Bank (2009**)**

QUALITY AND QUANTITY ADJUSTMENT

According to World Bank (2009), post harvest losses arising from storage and pest management of maize at the farm gate and at various stages of supply chain in Uganda are high. However, these losses appear to take place before maize sales at the farm gate. As such, maize sold and exported are assumed to have the same quality. Therefore, no quality or quantity adjustments are used here.

data overview

Following the discussions above, the main sources of the data used in analysis of price incentives/ disincentives of maize in Uganda described above are summarized in Table 3. Data used in the estimation of the indicators is summarized in Table 4.

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. Indicators computed here includes observed and adjusted price gaps, observed and adjusted nominal rates of protection and access cost gaps at wholesale and farm gate. Exchange rate gap and reference price gaps were not considered here since we assume that observed exchange rate represents the equilibrium exchange rate and no reference price adjustment is considered.

Table 3: Sources of data used in the calculations of indicators of maize in Uganda

		Description	
Concept		***Observed***	***Adjusted***
Benchmark price		*Average FOB price of maize exports from Uganda obtained from UBoS (2012) and MAAIF (2011).*	*N.A.*
Domestic price at point of competition		*Domestic wholesale price in Busia at point of competition obtained from RATIN (2012).*	*N.A.*
Domestic price at farm gate		*Infotrade (2102) and value chain analysis.*	*N.A.*
Exchange rate		*Annual average of exchange rate as reported by UBoS (2012)*	*N.A.*
Access cost from farm-gate to wholesale markets		*Storage cost, transport costs from farm gate to wholesale, CESS, hired labor, non-tariff barriers and profit margins reported by World Bank (2009).*	*Storage cost, transport costs from farm gate to wholesale, hired labor, profit margins reported by World Bank (2009).*
Access cost from wholesale markets to the border		*CESS, hired labor, non-tariff barriers, clearing agent fees and profit margins reported by World Bank (2009).*	*Hired labor, clearing agent fees and profit margins reported by World Bank (2009).*
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.*

Source: Author.

.

Table 4: Summary of Data used in the calculations of maize indicators

Column1	2005	2006	2007	2008	2009	2010	2011
Data	x	x	x	x	x	x	x
Benchmark Price							
Observed	197.6	209.2	235.3	273.7	307.8	229.8	259.9
Adjusted	197.6	209.2	235.3	273.7	307.8	229.8	259.9
Exchange Rate							
Observed	1,780.7	1,831.5	1,723.5	1,720.4	2,030.5	2,177.6	2,453.1
Adjusted	1,780.7	1,831.5	1,723.5	1,720.4	2,030.5	2,177.6	2,453.1
Access costs border - point of competition							
Observed	24,292.0	24,984.8	23,512.0	23,470.4	27,700.1	29,706.4	33,464.8
Adjusted	12,251.2	12,600.6	11,857.8	11,836.9	13,970.0	14,981.9	16,877.3
Domestic price at point of competition	297,371.2	302,189.8	334,357.4	593,553.1	836,561.1	572,697.6	650,060.9
Access costs point of competition - farm gate							
Observed	107,206.6	114,874.1	121,191.3	135,186.1	153,118.9	159,371.3	189,359.9
Adjusted	103,146.7	110,698.4	117,261.8	131,263.4	148,489.4	154,406.4	183,766.9
Farm gate price	185,189.2	223,844.3	222,954.5	338,000.0	619,674.9	424,220.5	495,948.3
Externalities associated with production		-	-	-	-		-
Budget and other product related transfers							
Quantity conversion factor (border - point of competition)	1	1	1	1	1	1	1
Quality conversion factor (border - point of competition)	1	1	1	1	1	1	1
Quantity conversion factor (point of competition - farm gate)	1	1	1	1	1	1	1
Quality conversion factor (point of competition - farm gate)	1	1	1	1	1	1	1

.

Box 2. MAFAP METHODOLOGY AND POLICY INDICATORS

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

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

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

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

The $NRPo_{fg}$ captures all trade and domestic policies, as well as other factors affecting market incentives and disincentives 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 follow the same general pattern:

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

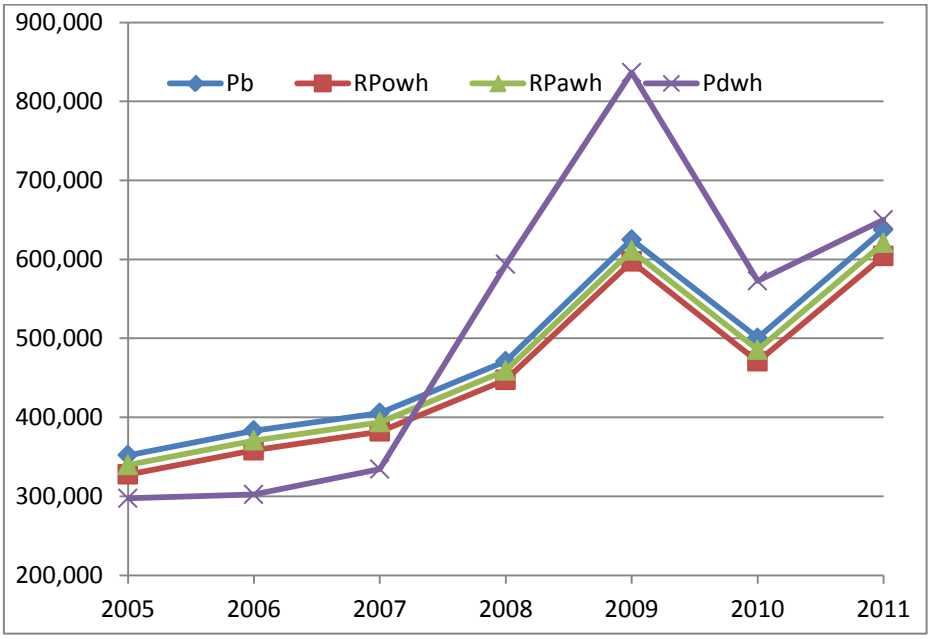
MAFAP analyzes market development gaps caused by market power, exchange rate misalignments, and excessive domestic market costs, which contribute to the NRP*o* and NRP*a* indicators. Comparison of the different rates of protection identifies where market development gaps can be found and reduced.

The methodology to compute the indicators at the wholesale level is illustrated in Figure 5. Border price (P_b) of maize is converted into domestic currency using the market exchange rate in absence of foreign exchange misalignment. The observed reference price at the point of competition (RP_{owh}) is computed as the difference between the border price and observed access cost. The vertical distance between the observed reference price at the point of competition and the domestic price at the wholesale (P_{dwh}) is defined as the observed price gap at the point of competition. The observed Nominal Rates of Protection (NRP_{owh}) expresses this price gap as a percentage of the observed reference price at the point of competition.

Similarly, the adjusted reference price (RP_{awh}) at the point of competition is computed as the difference between the border price and the adjusted access cost. The adjusted price gap at the point of competition is defined as the vertical distance between the adjusted reference price and the domestic price at the wholesale (P_{owh}). The adjusted Nominal Rates of Protection (NRP_{awh}) expresses the adjusted price gap as a percentage of the adjusted reference price at the point of competition.

The observed and adjusted price gaps at the farmgate are computed in a similar way as presented in Figure 6. The domestic farmgate price (P_{dfg}) is the price per unit of the commodity received by the producer at the farmgate or the initial sale point of the commodity. The observed reference price at the farmgate (RP_{ofg}) is computed by subtracting the observed access costs between the farmgate and point of competition from the observed reference price at the point of competition. The difference between

Figure 5. Calculation of the observed and adjusted price gaps for maize at the wholesale level

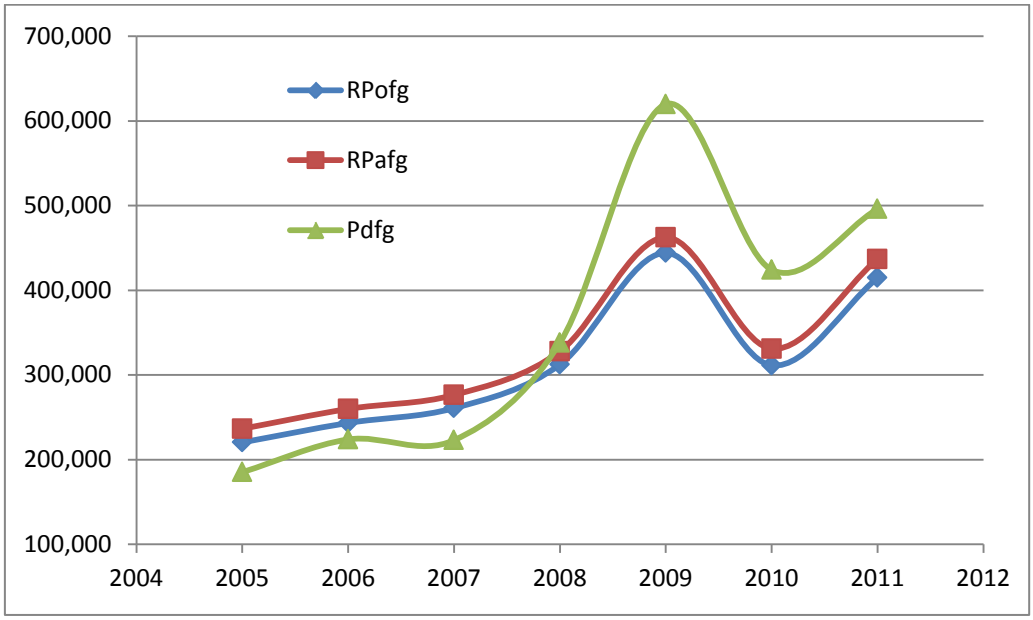


P_{dfg} and RP_{ofg} is defined as the observed price gap at the farmgate and measures the deviation of the farmgate price from the observed reference price given the existing marketing costs of the commodity. The observed Nominal Rates of Protection (NRP_{ofg}) expresses this price gap as a percentage of the observed reference price.

The observed reference price is a function of the efficiency of the value chain of the commodity and the degree of market competitiveness, which determines the extent of profit margins, marketing costs and government taxes and levies. For instance, access costs tend to be higher in an inefficient value chain with too many intermediaries as the commodity changes hands more often and consequently lower the observed reference price. Similarly, government levies and taxes, high transportation costs and high processing costs increases marketing costs, thus, reduce the reference price. As such, the observed price gap measures impact of the above factors on price incentives to producers.

In contrast, the adjusted reference price (RP_{afg}) is computed as the difference between the reference price of the commodity at the point of competition and adjusted access cost. As such, the adjusted access costs exclude excessive profit margins, local taxes and non-tariff barriers. The excessive profit margins and non-tariff barriers are due to inefficiencies in the marketing value chain and lack of competition in the commodity market. Both are undesirable for maximizing producers' incentives. The adjusted reference price measures the social value of one unit of output at the farmgate in terms of the border prices and, therefore, reflects the comparative advantage of the country in producing and exporting the commodity.

Figure 6. Calculation of the observed and adjusted price gaps for maize at the farmgate



Source: Authors.

The deviation of the producers' price from the adjusted reference price at the farmgate is referred to as the adjusted price gap. This price gap measures the impact of marketing inefficiencies, lack of competition and government policy on producers' price. This price gap can be expressed as a percentage of the adjusted reference price, i.e., the adjusted Nominal Rate of Protection (NRP_a).

As long as excessive profit margins exist and taxes are levied along the value chain of the commodity, adjusted reference prices will be higher than the observed reference prices. However, domestic prices at the farmgate can be higher or lower than either. When the domestic price is higher than the reference price, the positive difference represents a price incentive to producers. Such incentives can be attributed to an existing government policy that tends to increase producers' prices, functioning of the market due to high demand for the commodity, lack of efficient price transmission mechanism (e.g., buyers making price decisions based on outdated information, false price expectations) or sudden change in world market prices.

4. INTERPRETATION OF THE INDICATORS

The estimated maize price gaps at farm-gate and wholesale in Uganda for 2005-2011 are presented in Table 5 and Figure 7. As described above, these prices gaps are expressed in terms of nominal rate of protection in Table 6 and Figure 8. Estimated market development gaps associated with maize markets are presented in Table 7.

Table 5. Estimated maize price gaps at farm-gate and wholesale (U Sh/tone) in Uganda for 2005-2011

INDICATORS	2005	2006	2007	2008	2009	2010	2011
Trade status	x	x	x	x	x	x	x
Observed price gap at point of competition	-30,196	-55,994	-47,598	146,083	239,334	101,981	46,059
Adjusted price gap at point of competition	-42,237	-68,378	-59,252	134,449	225,603	87,257	29,472
Observed price gap at farm gate	-35,172	-19,466	-37,810	25,716	175,566	112,875	81,306
Adjusted price gap at farm gate	-51,272	-36,026	-53,393	10,159	157,207	93,186	59,126

Source:Authors.

Table 6. Estimated nominal rates of protection (%) for maize in Uganda for 2005-2011

Indicator	2005	2006	2007	2008	2009	2010	2011
Trade status	x	x	x	x	x	x	x
Observed nominal rate of protection at point of competition	-9.22%	-15.63%	-12.46%	32.65%	40.07%	21.67%	7.63%
Adjusted nominal rate of protection at point of competition	-12.44%	-18.45%	-15.05%	29.29%	36.93%	17.97%	4.75%
Observed nominal rate of protection at farm gate	-15.96%	-8.00%	-14.50%	8.23%	39.53%	36.25%	19.61%
Adjusted nominal rate of protection at farm gate	-21.68%	-13.86%	-19.32%	3.10%	33.99%	28.15%	13.54%

Source:Authors.

Table 7. Estimated market development gaps (%) for maize in Uganda for 2005-2011

Indicator	2005	2006	2007	2008	2009	2010	2011
International markets gap		-	-			-	-
Exchange policy gap			-	-	-	-	
Access costs gap to point of competition	(12,040.8)	(12,384.2)	(11,654.2)	(11,633.6)	(13,730.1)	(14,724.5)	(16,587.5)
Access costs gap to farm gate	(4,059.9)	(4,175.7)	(3,929.6)	(3,922.6)	(4,629.5)	(4,964.8)	(5,593.0)
Externality gap			-	-	-	-	
Market Development Gap	-6.81%	-6.37%	-5.64%	-4.75%	-3.97%	-5.95%	-5.08%

Source:Authors.

***Wholesale indicators**:*

The observed price gap at the wholesale or the point of competition measures the deviation of the domestic wholesale price from the reference price. The observed price gaps at wholesale are positive in 2006, 2008, 2009 and 2011. Maize wholesale prices in Uganda appear to vary considerably over time due to supply and demand factors. For example, the nominal wholesale price in Busia increased from U Sh 334,357.4 per ton in 2007 to U Sh 836,561.1 per ton before decreasing to U SH 650,000 per ton by 2011. This price movement is not necessarily linked to world price movement. As Figure 5 indicates, wholesale prices of maize in Busia are above world prices in 2008-2011.

Consequently, the observed price gaps for maize at the wholesale in 2005-2007 were negative with a negative gap of U Sh 30,196 (US $ 16.96) to U Sh 55,994 (US $ 31.45) per ton (Table 5). These were

significant disincentives to wholesalers. However, with the inception of the world price crisis in 2007 and the rise in food prices, wholesale prices of maize in Uganda increased rapidly in 2008. As a result, a positive observed price gap has prevailed since 2008. During this period, the gap ranged from U Sh 46,069 (US $ 25.87) to U Sh 239,333 (US $134.41) per ton. Clearly, the positive observed price gaps represent significant incentives to wholesale traders. However, the observed price gaps

The observed price gaps mask significant market and policy distortion including local taxes, non-tariff barriers and excessive profit margins. These distortions create a wedge between the observed and adjusted price gaps. As Table 5 shows, the adjusted price gaps are smaller in magnitude as compared to observed gaps. This means the disincentives are larger and incentives are smaller when these distortions are netted out. The wedge between the observed and adjusted price gap is presented in Table 6 as the access cost gap at the point of competition. For maize, being as an export commodity, the access cost gap represents an additional disincentives caused by the above mentioned distortions.

The estimated nominal rates of protection at the wholesale follow exactly the same tends as the price gaps. The observed nominal rates of protection at the wholesale market for maize in 2005-2007 were negative ranging from -9.2 to -15.6 percent while they were positive in 2008-2011 ranging from 7.6 to 40.1 percent (Table 6). In contrast, the adjusted nominal rates of protection in range from -12.4 to 18.5 in 2005-2007 and 5.8 to 36.9 percent in 2008-2011.

Farmgate (producer's) indicators

The indicators at the farmgate are consistent with those at the wholesale but only differ in magnitude. Both the price gaps and the nominal rates of protection at farm gate were negative in 2005-2007 and positive in 2008-2011. For instance, the observed price gap ranges from U Sh -19,466 (US $10.93) to -37,809 (US $21.23) per ton in 2005-2007 and from U Sh 25,715 (US $14.44) to 175,566 (US $98.6) per ton in 2008-2011 (Table 5). In contrast, adjusted price gaps follow the same pattern but the negative gap is wider.

The adjusted nominal rate of protection at the farmgate ranges from -13.9 to 21.7 percent in 2005-2007 and ranged from 3.1 to 34.0 percent in 2008-2011 (Table 6). After several years of price disincentives where farmers were receiving a price below the reference price till 2007 and as a result of rising world prices, maize producers began to receive price incentive in form of a price higher than the reference price at the farmgate. However, these price incentives are highly variable over the years.

At the farmgate, market costs appear to be somewhat excessive as indicated by the access costs gap at the farmgate (Table 7). This is due to excessive profit margins as a result of the long value chain with too many intermediaries and local taxes. However, the access cost gap at the farm gate is much smaller than at the point of competition (Table 7). Together, the access cost gaps at the two levels give rise to a market development gap ranging from 4.0 to 6.8 percent.

In contrast to the indicators at the wholesale level, the negative price gaps at the farm gate are larger in absolute terms and the positive price gaps are smaller (Figure 6 and 7). In other words, maize producers seem to bear greater share of the burden of price decline and yet gain less than equitable share of price increase. This indicates that maize producers are disadvantaged in both cases. The

fewer but larger traders, millers and exporters of maize in urban centers are likely to have access to better market information than farmers and rural dwellers and thus more control on prices. Smallholder farmers tend to market small quantities of maize and may have limited market power to negotiate the prices. In addition, monopolistic behavior can be attributed to market power in the export market (export market controlled by few powerful traders).

At both wholesale and farm gate levels, the observed price gaps and, consequently the observed nominal rates of protection, are highly correlated with the wholesale prices. Maize prices in Uganda, particularly in the eastern region, have also a long-term equilibrium relationship with prices in Nairobi, the major export market (World Bank, 2009) indicating some degree of market integration. However, despite this integration, price transmission may be slow which explains the variability of price gaps. In other words, changes in export price of Ugandan maize do not translate with the same degree to wholesale and farm gate levels.

According to World Bank (2009), price signals are transmitted both relatively quickly and completely on Ugandan markets. This means that prices offered by buyers of maize at the high level of the chain (traders, millers and exporters) determine prices offered by traders to farmers. In addition, maize price volatility is cited as on the main constraint to traders creating uncertainty and makes the value chain inefficient through creation of speculators who collude to artificially depress or raise the prices (PMA, 2009). If this occurs at the high level of the chain, farmers and traders will bear the burden of price volatility.

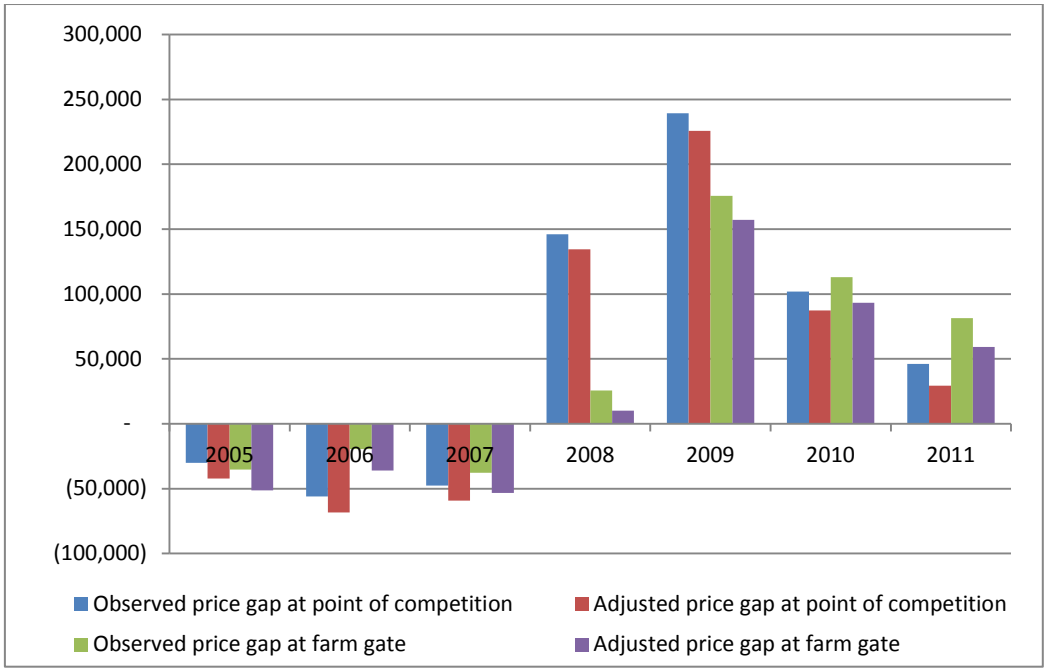
With a highly liberalized maize market in Uganda, minimal government intervention in price setting, insignificant direct taxes on maize marketing and liberalized foreign exchange market, the above results suggest the presence of significant market development gap. Some of the factors that may explain the deviation of the wholesale and farm gate prices from their equivalent reference prices may include:

The complexity and length of the maize value chain in Uganda with many agents involved increases transaction costs and thus reduces farm-gate prices.

Since the majority of producers are small scale farmers, maize is often sold by producers in small quantities of poor quality at low prices (PMA, 2009):

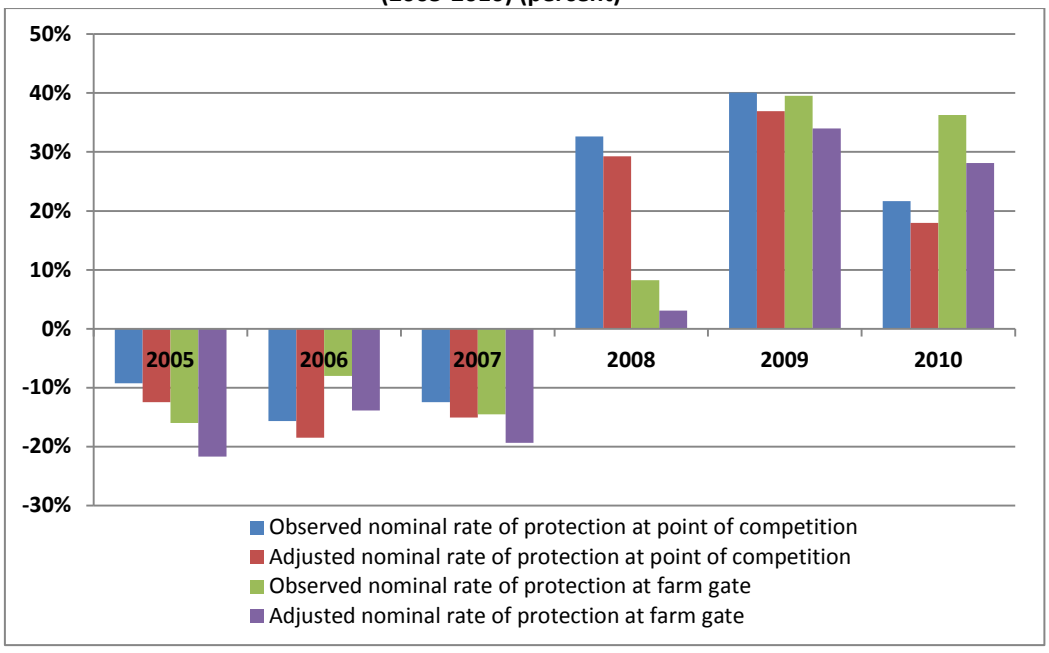
i. Poor condition and lack of adequate storage facilities resulting in significant post harvest losses at various stages of the supply chain (World Bank, 2010). Although Uganda does not currently have quality standards for maize exports, exporters must conform to quality standards of the importers and other buyers such as WFP.
ii. Since the maize market at high levels of the value chain is dominated by large scale traders and exporters of maize who have emerged over the years, this may lead to monopolistic behavior and concentration of market power.
iii. High transportation costs due to poor rural roads and the presence of non-tariff measures.

Figure 7. Observed and adjusted price gaps for maize at wholesale and farm gate in Uganda (2005-2010) (USD/ton)



Source: Authors.

Figure 8. Observed and adjusted rate of protection for maize at wholesale and farm gate in Uganda (2005-2010) (percent)



5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Main message:

The estimated price gaps and associated nominal rates of protection indicate substantial disincentives to maize producers and wholesalers in Uganda in early years characterized by relatively low export prices. This is especially evident during years of low export prices (2005-2007). The price incentives to both producers and traders are also high in subsequent years when export prices are relatively high. Given that maize market is highly liberalized in Uganda, the main issue does not concern policy, institutional, and regulatory matters, but relates to the lack of an efficient maize marketing system. The existing price gaps are mainly due to market development gap rather than policy effect. This key issue affects all aspects of the marketing chain, and if resolved, could have a significant influence on the improvement of farmers' incomes and their move towards commercial agriculture. Furthermore, the reform of the maize sector, driven by private sector innovation and initiative, has the potential to contribute significantly to the country's economy, in terms of rural and urban employment and incomes, poverty alleviation, and foreign exchange earnings.

preliminary Recommendations

Following the liberalization of the grain sector, there are minimum policy and regulatory constraints to the development of the sector. However, to realize the potential to develop a vibrant domestic and export market it will be necessary to develop marketing mechanisms to facilitate price transmission to producers to enable smallholder farmers to benefit from possible high prices in regional and international markets for their produce.

Limitations

Two major limitations need to be mentioned. First, conclusions provided are contingent on the quality of the currently available data. Second, the results are based on a single wholesale market in Uganda (Busia) at the border with Kenya and average export price. In light of these limitations, the analysis needs to be extended to examine price incentives/disincentives in multiple production regions, multiple wholesale markets and alternative reference prices.

Further investigations and research

A comparison with the analysis of incentives and disincentives structure for maize producers in Kenya and Tanzania would probably provide interesting additional insights. Given the data limitations, the analysis can be further enriched by examining the profit margins captured by the main players in the market chain, namely wholesalers and exporters. Disaggregation of the analysis by production region will give further insights on the distribution of the price gaps and the extent of market development gap in the maize markets in Uganda.

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ANNEX I: Methodology Used

A guide to the methodology used by MAFAP can be downloaded from the MAFAP website or by clicking here.

ANNEX II. Data and calculations used in the analysis.

Nominal rate of protection at point of competition	Unit	Symbol	Year trade status	2005 x	2006 x	2007 x	2008 x	2009 x	2010 x	2011 x
Benchmark Price										
Observed	US $/TON	$P_{b(int\$)}$		**197.6**	209.2	235.3	273.7	307.8	229.8	259.9
Adjusted	US $/TON	P_{ba}		197.6	209.2	235.3	273.7	307.8	229.8	259.9
Exchange Rate										
Observed	USh/US $	ER_o		1,780.7	1,831.5	1,723.5	1,720.4	2,030.5	2,177.6	2,453.1
Adjusted	USh/US $	ER_a		1,780.7	1,831.5	1,723.5	1,720.4	2,030.5	2,177.6	2,453.1
Access costs border - point of competition										
Observed	USh/TON	ACo_{wh}		24,292.0	24,984.8	23,512.0	23,470.4	27,700.1	29,706.4	33,464.8
Adjusted	USh/TON	ACa_{wh}		12,251.2	12,600.6	11,857.8	11,836.9	13,970.0	14,981.9	16,877.3
Domestic price at point of competition	USh/TON	P_{dwh}		**297,371.2**	**302,189.8**	**334,357.4**	**593,553.1**	**836,561.1**	**572,697.6**	**650,060.9**
Access costs point of competition - farm gate										
Observed	USh/TON	ACo_{fg}		107,206.6	114,874.1	121,191.3	135,186.1	153,118.9	159,371.3	189,359.9
Adjusted	USh/TON	ACa_{fg}		103,146.7	110,698.4	117,261.8	131,263.4	148,489.4	154,406.4	183,766.9
Farm gate price	USh/TON	P_{dfg}		185,189.2	223,844.3	222,954.5	338,000.0	619,674.9	424,220.5	495,948.3
Externalities associated with production	USh/TON	E		-	-	-	-	-	-	-
Budget and other product related transfers	USh/TON	BOT								
Quantity conversion factor (border - point of competition)	Fraction	QT_{wh}		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Quality conversion factor (border - point of competition)	Fraction	QL_{wh}		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Quantity conversion factor (point of competition - farm gate)	Fraction	QT_{fg}		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Quality conversion factor (point of competition - farm gate)	Fraction	QL_{fg}		1.0	1.0	1.0	1.0	1.0	1.0	1.0

CALCULATED PRICES	Unit	Symbol	2005	2006	2007	2008	2009	2010	2011
Benchmark price in local currency									
Observed	USh/TON	$P_{b(loc\$)}$	351,859.6	383,168.9	405,467.4	470,940.9	624,927.6	500,422.6	637,466.7
Adjusted	USh/TON	$P_{b(loc\$)a}$	351,859.6	383,168.9	405,467.4	470,940.9	624,927.6	500,422.6	637,466.7
Reference Price at point of competition									
Observed	USh/TON	RPo_{wh}	327,567.6	358,184.1	381,955.4	447,470.5	597,227.6	470,716.2	604,001.9
Adjusted	USh/TON	RPa_{wh}	339,608.4	370,568.3	393,609.6	459,104.0	610,957.6	485,440.8	620,589.4
Reference Price at Farm Gate									
Observed	USh/TON	RPo_{fg}	220,361.0	243,310.0	260,764.1	312,284.4	444,108.7	311,345.0	414,642.0
Adjusted	USh/TON	RPa_{fg}	236,461.7	259,869.9	276,347.8	327,840.6	462,468.3	331,034.3	436,822.5

INDICATORS	Unit	Symbol	2005	2006	2007	2008	2009	2010	2011
Price gap at point of competition									
Observed	USh/TON	PGo_{wh}	(30,196.4)	(55,994.3)	(47,598.0)	146,082.7	239,333.5	101,981.4	46,059.0
Adjusted	USh/TON	PGa_{wh}	(42,237.2)	(68,378.5)	(59,252.2)	134,449.1	225,603.4	87,256.9	29,471.5
Price gap at farm gate									
Observed	USh/TON	PGo_{fg}	(35,171.8)	(19,465.7)	(37,809.5)	25,715.6	175,566.2	112,875.5	81,306.2
Adjusted	USh/TON	PGa_{fg}	(51,272.4)	(36,025.6)	(53,393.2)	10,159.4	157,206.6	93,186.1	59,125.8
Nominal rate of protection at point of competition									
Observed	%	$NRPo_{wh}$	-9.2%	-15.6%	-12.5%	32.6%	40.1%	21.7%	7.6%
Adjusted	%	$NRPa_{wh}$	-12.4%	-18.5%	-15.1%	29.3%	36.9%	18.0%	4.7%
Nominal rate of protection at farm gate									
Observed	%	$NRPo_{fg}$	-16.0%	-8.0%	-14.5%	8.2%	39.5%	36.3%	19.6%
Adjusted	%	$NRPa_{fg}$	-21.7%	-13.9%	-19.3%	3.1%	34.0%	28.1%	13.5%
Nominal rate of assistance									
Observed	%	NRAo	-16.0%	-8.0%	-14.5%	8.2%	39.5%	36.3%	19.6%
Adjusted	%	NRAa	-21.7%	-13.9%	-19.3%	3.1%	34.0%	28.1%	13.5%

Decomposition of PWAfg	Unit	Symbol	2005	2006	2007	2008	2009	2010	2011
International markets gap	USh/TON	IRG	-	-	-	-	-	-	-
Exchange policy gap	USh/TON	ERPG	-	-	-	-	-	-	-
Access costs gap to point of competition	USh/TON	ACG_{wh}	(12,040.8)	(12,384.2)	(11,654.2)	(11,633.6)	(13,730.1)	(14,724.5)	(16,587.5)
Access costs gap to farm gate	USh/TON	ACG_{fg}	(4,059.9)	(4,175.7)	(3,929.6)	(3,922.6)	(4,629.5)	(4,964.8)	(5,593.0)
Externality gap	USh/TON	EG	-	-	-	-	-	-	-
Market Development Gap	USh/TON	MDG	(16,100.7)	(16,559.9)	(15,583.7)	(15,556.2)	(18,359.6)	(19,689.4)	(22,180.4)
Market Development Gap	%	MDG	-6.8%	-6.4%	-5.6%	-4.7%	-4.0%	-5.9%	-5.1%

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