



MAFAP SPAAA

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

ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR SORGHUM IN NIGERIA

JULY 2013



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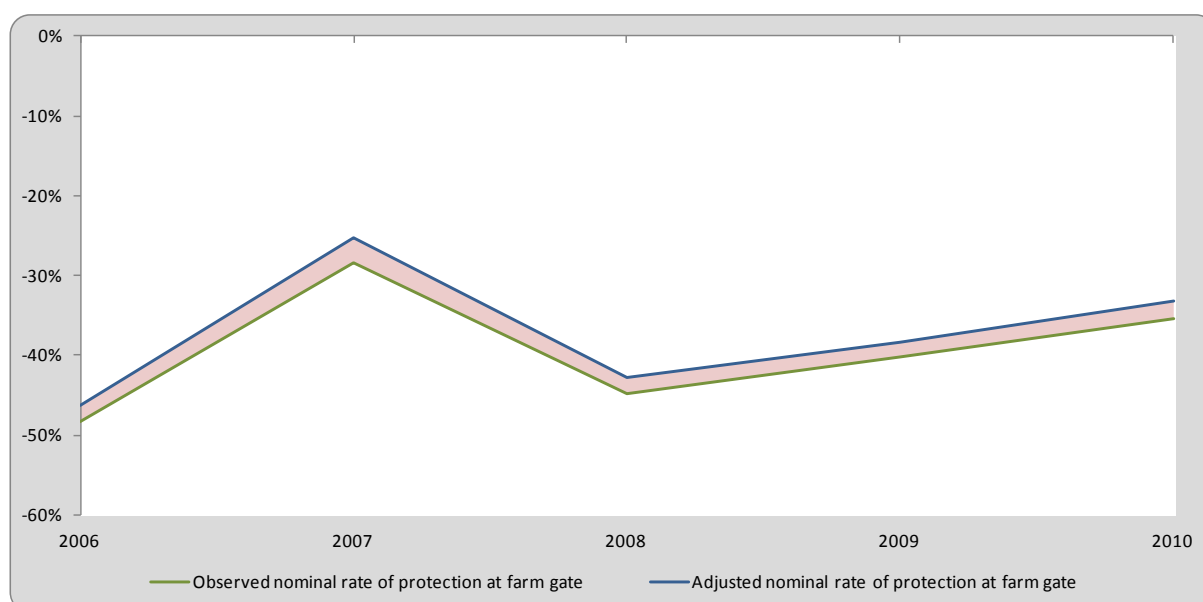
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SUMMARY OF THE NOTE

Product: Sorghum
Period analyzed: 2006 – 2010
Trade status: Net importer in all years

- Nigeria is the largest producer of sorghum in West Africa accounting for about 71% of the total regional sorghum output. Sorghum is the 3rd cereal in terms of quantity of production in Nigeria.
- Production declined since 2009 due to the strong reduction of both area harvested and yields.
- Sorghum is considered as a thinly traded commodity owing to the small amount of exports and imports. A large part of the production is self-consumed.



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

- Marketing sorghum offers low financial return and the market opportunities are limited because of the lack of connection between producer, industries and international markets ;
- The market information is weak preventing producers from being aware of prices and market needs and opportunities;
- Production level is declining because producers are switching to more profitable crops despite a strong potential demand from the brewery industry.

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1. PURPOSE OF THE NOTE

This technical note is an attempt to describe the market incentives and disincentives for sorghum in Nigeria.

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 the extent to which 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 2006-2010. The indicators have been calculated using available data from different sources for the period 2006-2010 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.

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

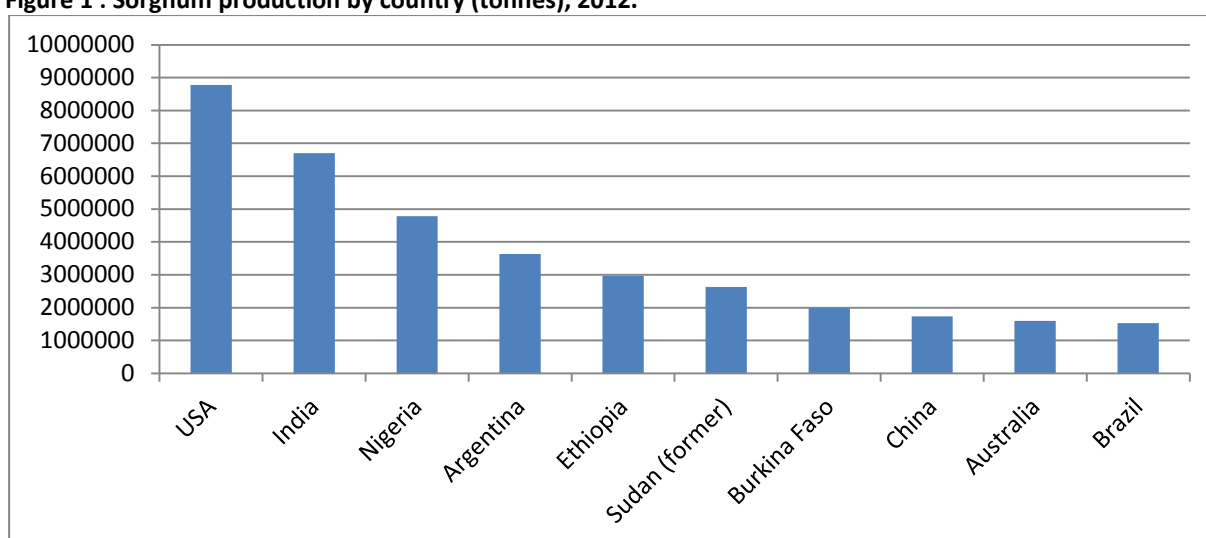
2. COMMODITY CONTEXT

Sorghum represents 1.6% of the global GDP in 2006 and 5.4% of the agricultural GDP, being the 6th most important product after cassava, yams, rice, maize and fruits (IFPRI, 2010).

PRODUCTION

Nigeria is the largest sorghum producer in West Africa, accounting for about 71% of the total regional sorghum output (Ogbonna, 2011). Nigeria's sorghum production also accounted for 35% of the African production in 2007 (AATG, 2011). The country is the third largest world producer after the United States and India (FAOSTAT, 2012) (Figure 1). However, 90% of sorghum produced by United States and India is destined to animal feed, making Nigeria the world leading country for food grain sorghum production.

Figure 1 : Sorghum production by country (tonnes), 2012.

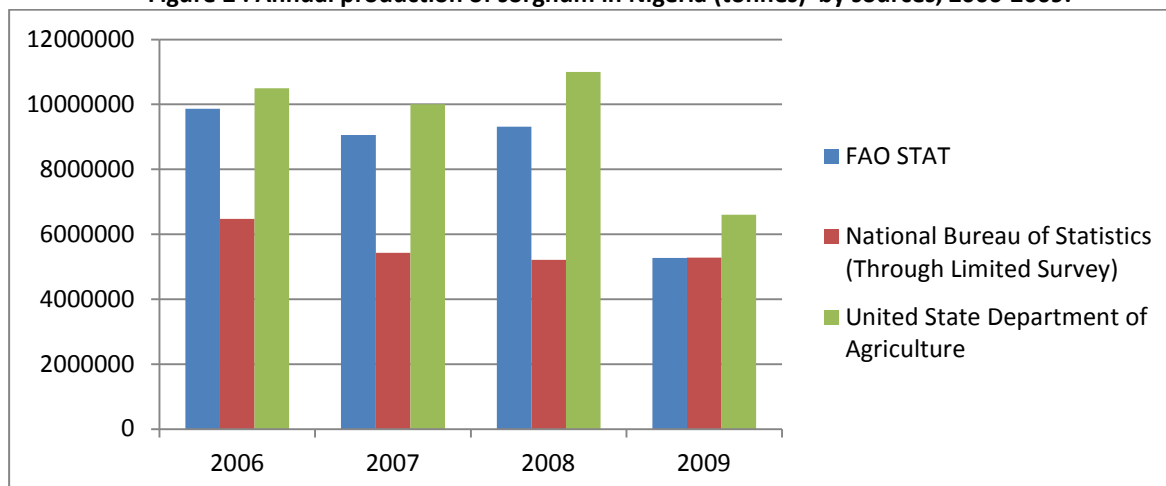


Source: FAOSTAT, 2012

In Nigeria, sorghum is the third cereal in terms of production after maize and millet (FAOSTAT, 2012), with more than 4.5 million tonnes harvested in 2010 representing 25% of the total cereal production (FAOSTAT, 2012). In virtually all the North of the country, it is the primary food crop (USAID, 2011).

Data on the level of national production varies substantially between national and international sources (Figure 2).

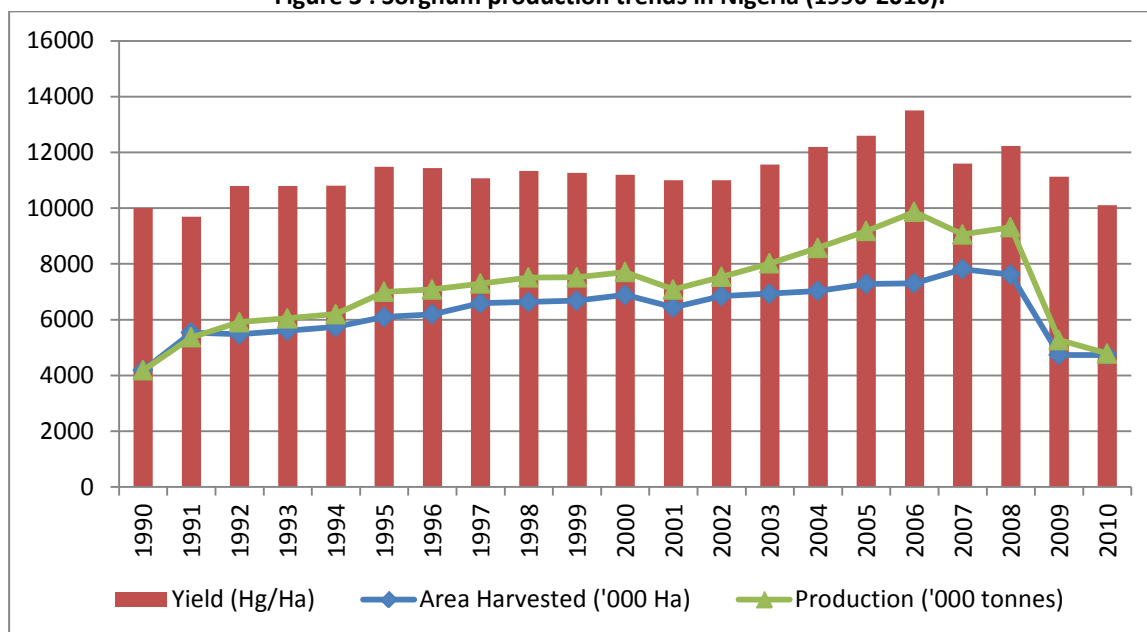
Figure 2 : Annual production of sorghum in Nigeria (tonnes) by sources, 2006-2009.



Source: FAOSTAT, 2012; NBS, 2012; USDA, 2009

We observe an overall alignment between sorghum production and area harvested in the 1990-2008 period, with production going upwards. Crop yields might have increased because of the growing acceptance of improved varieties by farmers (USDA, 2011).

Figure 3 : Sorghum production trends in Nigeria (1990-2010).

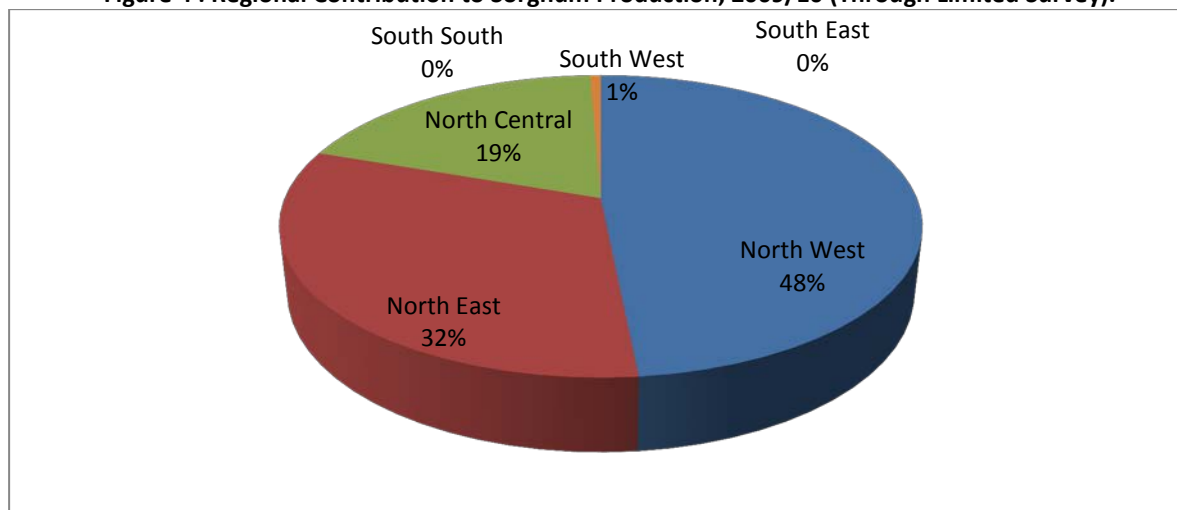


Source: FAOSTAT, 2012

However, since 2009, production and area harvested decreased in the same proportion with yields going back to 1990 levels. The decline rate between 2008 and 2009 was about 40% (USDA, 2011). This production decline is mainly due to the reduction of area harvested but the declining yields level also contributed. This probably occurred because of the increasing local prices as well as growing demand for corn and soybean. These encouraged farmers to extend the planted area for corn and soybean in the Northern regions, hence penalizing the sorghum and millet production. Indeed, the millet production also fell by 46% between 2008 and 2009 (FAOSTAT, 2012).

With regard to the growing conditions, sorghum grows well on deep, fertile and well-drained loamy soils (USAID Markets, 2009). In Nigeria, these soils are common in the Northern Guinea Savannahs and in the Sudan Savannah of Nigeria (Ogbonna). Sorghum is grown mostly in the North West and North East of the country (Figure 4).

Figure 4 : Regional Contribution to Sorghum Production, 2009/10 (Through Limited Survey).



Source: USAID Markets, 2009

The red and yellow sorghums are used for animal feed and human consumption. By contrast only the white sorghum with large diameter grains can be processed into malt (USAID Markets, 2009).

The most extensively grown sorghum in Nigeria are *Vulgare* and *S. bicolor* (L.) Moench, locally called guinea corn, these are also two of the best known sorghum species in the country (Department of Food Science & Technology, University of Uyo). Both varieties can be white or yellow.

The improvement of the varieties through breeding has started in 1965 in order to develop and release sorghum varieties suited to the specific ecological zones (Aba et al, 2004) and with suitable qualities for industrial uses (Ogbona). Indeed, significant efforts have been made to support research and development of improved sorghum varieties and production practices by both the public and private sector (USAID Market, 2009). However, there is still a severe shortage of improved varieties and hybrids commercialized in the country. The main reason is the absence of a seed industry. Therefore the Nigerian farmers source seeds through the local market or retain seeds from previous harvest (USAID Market, 2009). Improved varieties used for brewing are some of the most widely used, especially varieties known as SK5912, KSV8, ICSV400 (Ogbonna, 2002).

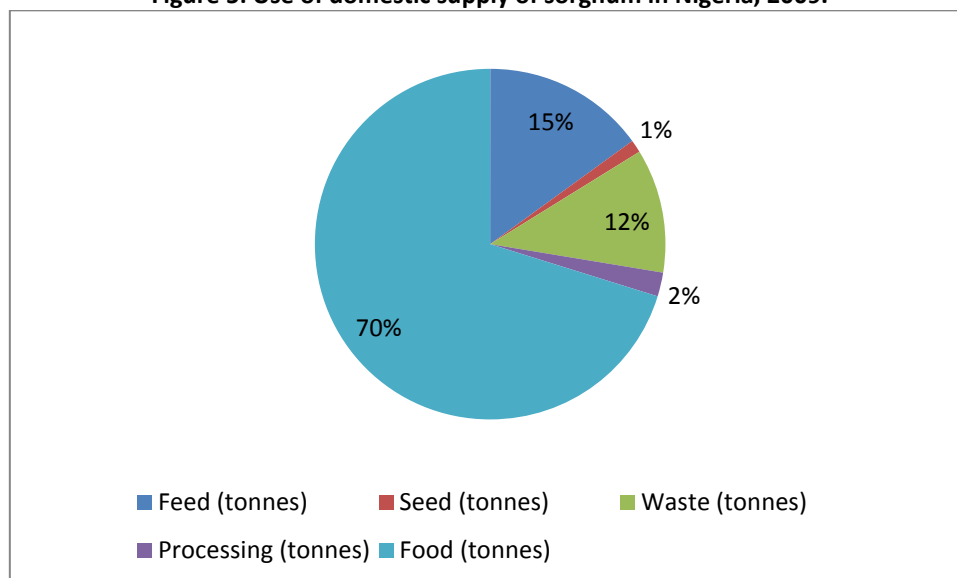
Even so, the production is far from being optimal while there is room to improve sorghum yields and amount of varieties produced in Nigeria (USAID, Sorghum fact sheet).

CONSUMPTION/UTILIZATION

There are two uses for sorghum in Nigeria: traditional and industrial uses. The traditional uses include a variety of foods, beverages and drinks. Moreover, sorghum is traditionally used for thatching of roofs and fencing of compounds (Ogbonna). Regarding the industrial production, the cereal is used for brewing.

The majority of domestic production is used for household consumption and fodder (Figure 5). Indeed, producers first use their sorghum to meet household requirements, only a small proportion being traded, mostly on the local market (USAID Markets, 2009). Sorghum is mainly eaten in the form of flour or paste. It has a high caloric and nutritional value and is therefore recommended for infants, pregnant and lactating mothers, the elderly and the convalescents (Olbina, 2005).

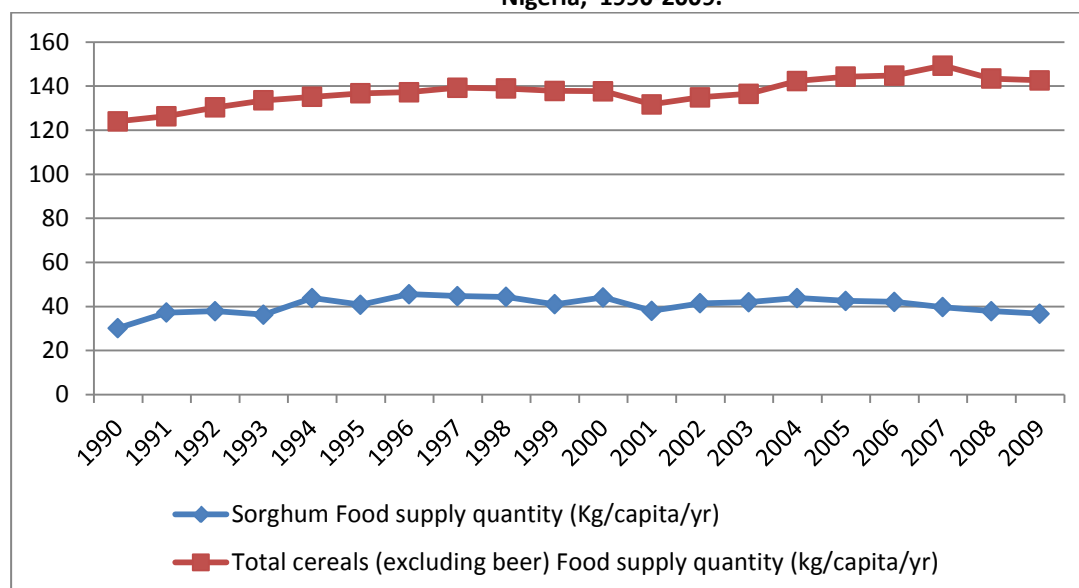
Figure 5: Use of domestic supply of sorghum in Nigeria, 2009.



Source: FAOSTAT, 2012

Over the past two decades, sorghum contributed to about 30% of calorie intake per capita among all cereal crops consumed in Nigeria (FAOSTAT, 2012). Likewise, in terms of quantity, sorghum consumption represents in average 30% of the total cereal consumption (excluding beer) (Figure 5). Sorghum is especially consumed in the north of the country (USAID, 2010).

Figure 6 : Sorghum consumption per capita in comparison with total cereal consumption (excluding beer), Nigeria, 1990-2009.



Source: FAOSTAT, Food Balance Sheets

Furthermore, sorghum is used in brewing in a small proportion. Nonetheless, industrial demand for sorghum by beer manufacturers is rising steadily. Indeed, in Nigeria, beer had been produced exclusively from sorghum and corn following a ban placed on barley and barley malt importation in the mid-1980s. Although the ban was lifted in 1999, breweries have continued to use sorghum and corn as the key raw materials (USDA, 2011).

MARKETING AND TRADE

The volume of international trade is very low in comparison with production (Figure 7). Over the last decade, formal imports and exports represented less than 1% of production. Indeed, most of the production is used to meet the national demand making exportable surplus negligible.

Table 1: Sorghum production, import and export of Nigeria, 2000-2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Production ('000 tonnes)	7711	7081	7534	8016	8578	9178	9866	9058	9318	5271	4784
Import quantity (tonnes)	0	0	0	200	38	18524	0	24	12601	12000	13000
Export quantity (tonnes)	2476	860	0	360	47	4739	699	378	17	30	45
Formal imports as % of production	0	0	0	0	0	0,20	0	0	0,14	0,24	0,27
Formal export as a % of production	0,03	0,01	0	0	0	0,05	0,01	0	0	0	0

Source : FAOSTAT, 2012

The low amount of international trade for sorghum can be explained by a ban on exports until 2011 while imports have only been recently removed from the prohibition list (section POLICY DECISIONS AND MEASURES). Despite of this, market opportunities exist for imports of sorghum by breweries located in southern Nigeria (USDA).

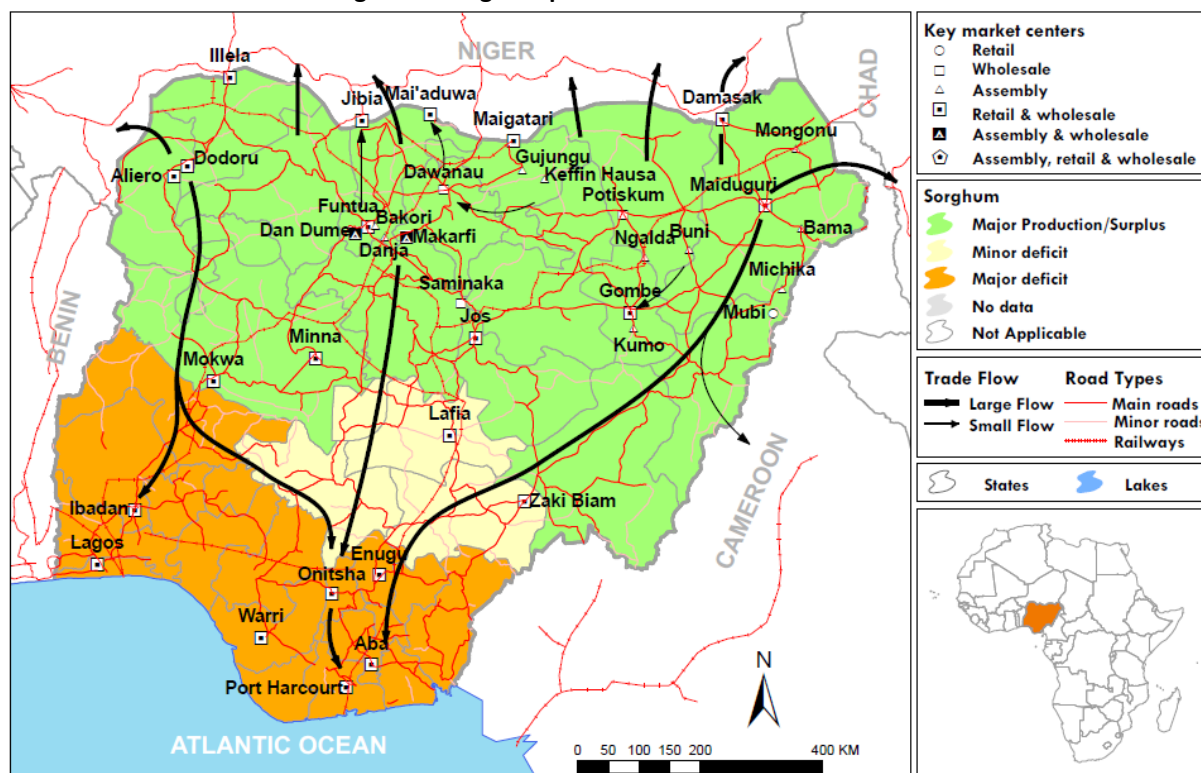
However, data on imports are conflicting between national sources (the National Custom Service) and international sources (FAOSTAT).

It should be noted that minimal amounts are exported and in some cases imported informally to and from the neighboring countries. Indeed, these exports are destined to Chad and Niger in order to balance their deficit in domestic supply and improve their food security. It is difficult to estimate the cross-border flows as there are no custom registration procedures at the borders (West African Borders and Integration, 2006). Between Niger and Nigeria, it is estimated that several hundred thousand tons of cereal (including millet and maize) cross the border each year, especially through the Kano-Katsina-Maradi corridor.

In some cases, especially when the harvest is bad in Nigeria, sorghum from Niger harvested close to the border is sold in Nigeria. This can be explained by the higher financial resources of Nigerian traders allowing them to stock larger quantities than the traders from Niger.

The flows are mostly internal and towards the neighboring countries (Figure 7).

Figure 7 : Sorghum production and market flows.

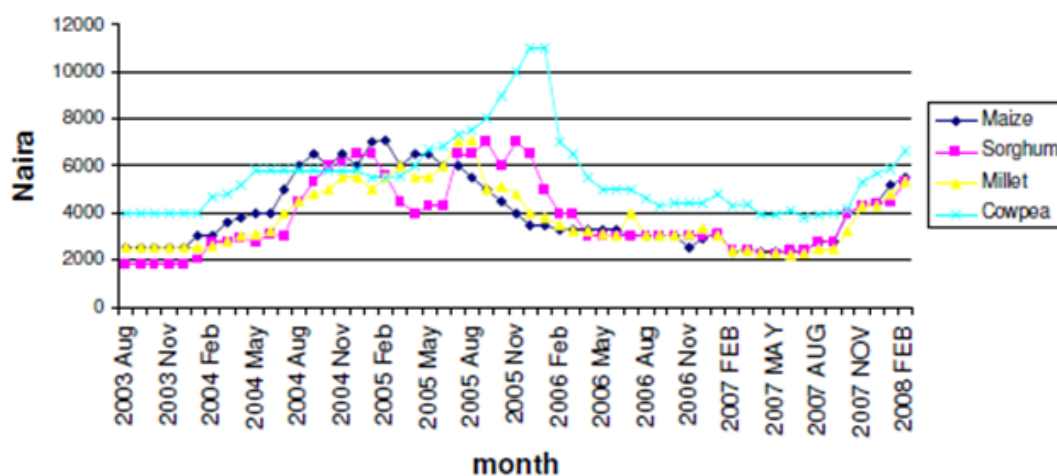


Source: USAID, 2012

Illela, Maidu and Damasak are cross-border markets with Niger. Saminaka, Giwa, Dandume and Kaura are important grain markets in the North and they are interconnected with the Dawanu market in Kano. Nigeria, and especially the southern and central parts of Nigeria (Minna, Abuja, Kaduna...), has higher market prices than Niger and Benin.

Dawanu, situated in Kano, is the largest wholesale market in West Africa where grains from neighboring countries are also traded. The sorghum wholesale prices in Dawanu can be compared with that of other commodities (millet, cowpea and maize). Sorghum prices follow approximately the trend of the other cereals and legumes except for cowpea (Figure 8).

Figure 8 : Average monthly wholesales prices in Dawanu, Kano (NGN/100Kg), 2003-2008.



Source: CILSS/FAO/FEWNET/SIM/WFP

From 2003 to 2012, we observe that the prices spiked several times during the period and especially in 2005, 2008 and 2009.

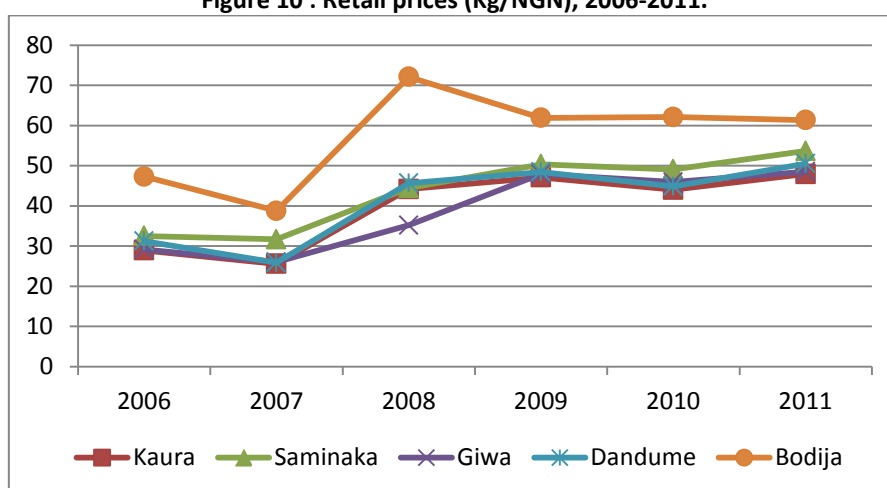
Figure 9 : Sorghum wholesale prices in Dawanu, Kano (NGN/100Kg), 2003-2012.



Source: Fewsonet, 2012

Retail prices for the last 5 years in Dawanu market follow the same trend as the wholesale prices (Figure 10). Retail prices observed in the south of the country (Bodija and Saminaka) are higher than the ones in the North, sorghum being mostly produced in the Northern regions.

Figure 10 : Retail prices (Kg/NGN), 2006-2011.

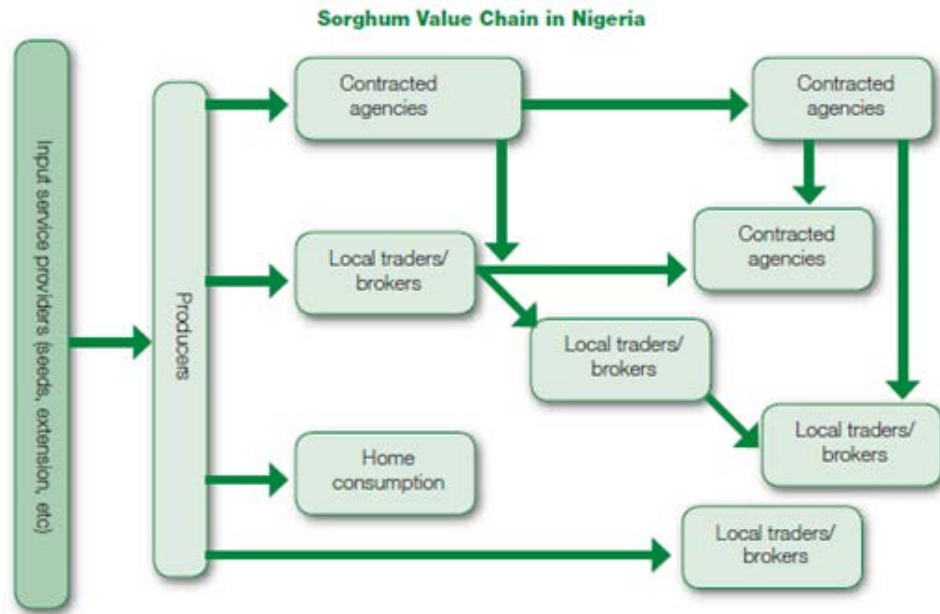


Source: USAID, 2012

DESCRIPTION OF THE VALUE CHAIN AND PROCESSING

Two main supply chains are identified for sorghum in Nigeria. The most important in terms of quantity is the one for sorghum destined for human consumption, the other one refers to sorghum for processing (mostly for brewing). However, the value chain is not well developed because sorghum is mostly self-consumed and there is a lack of marketing opportunities, producers not being well interconnected to the market.

Figure 11 : Sorghum supply chain in Nigeria.



Source: African Agricultural Technology Foundation, 2011

Overall, the main actors of the value chain are:

Seed producers and research institutes. They produce the basic seeds and most of them have low capacity. Furthermore, the seeds are mainly sourced from retained grain and a negligible share of producers use improved seeds.

Sorghum producers. The inputs for sorghum production are very basic (Table 2). Roughly, sorghum production includes seeds, labour, land and, to a limited extent, fertilizers. Generally, sorghum is produced by family farms. The family most often owns the land as well. Most of the households produce sorghum for self-consumption, only a small proportion being sold on local markets. Smallholders experience difficulties in increasing their incomes due to the lack of credit, the inadequate extension services and the poorly developed market linkages (USAID Market study). The gross margin of sorghum producers on average at country level is estimated at 25 100 Nairas/ha, with an average cost of production reaching 64 900 Nairas (Table 2).

Table 2: Costs & benefits of sorghum production, 2008/09.

Operations	Quantity	Unit Price (N)	Naira
Ploughing	1 ha		5000
Harrowing	1 ha		2500
Ridging	1 ha		2500
Seed	8 kg	100	800
Planting	5 man-days	500	2500
First weeding/thinning	20 man-days	500	10000
Cost of fertilizer	4 bags	5500	22000
Fertilizer application	10 man-days	500	5000
Harvesting	10 man-days	500	5000
Threshing	20 man-days	400	8000
Bags & labor for handling	20 bags	80	1600
Sub-total			64900
Gross revenue per hectare	2000 kg	45	90000
Production costs per hectare			64900
Gross margin			25100
Benefit/Cost ratio			1.39
Production costs per kg			32.45

Source: USAID, 2009

Local traders and brokers. They gather and trade the sorghum. Even if the crop is more commercialized than in neighboring countries because of the industrial use, only a small fraction of the production is marketed.

Wholesalers and retailers. As explained above, the main market is Dawanu in Kano State. According to a survey in Benue state, 70% of price fixing was by bargaining, 12% was due to quantity traded, 15% was due to current price, and 3% from group decision (International Journal of Business and Social Science). In addition, producers obtained their marketing information mostly from middlemen. In some cases, they obtained information from traders association or media.

Processors. Sorghum is the most amenable grain to different processing technologies; three methods exist (Olibana, 2005). The primary processing involves fermentation, malting, wet and dry milling, boiling, roasting and popping. The second one corresponds to brewing, beverage and drinks production, balking and confectionary making, steaming and extrusion (for pastes and noodles). Finally, the tertiary processing involves composite flours, biofortification and chemical fortification with additives.

Consumers. Sorghum is mainly consumed within the household. The supply chain for the brewing and malting industry has a good potential but the grain need to fulfill special requirements for this kind of use in terms of quality and consistency. It is still a challenge in Nigeria to produce sorghum that meets the requirements of the brewing industry. The sorghum producers are linked to the brewing companies through agents like seed companies or cereal traders.

The marketing structure is competitive in terms of price formation, with reasonable marketing margins (African Agricultural Technology Foundation). Despite of this, there is a weak inter-relation between markets in the country, a study comparing prices in 15 markets in 4 Northern States, having shown that price differentials exceeded the transfer costs in many cases (AATF, 2011).

POLICY DECISIONS AND MEASURES

In relation to trade policies, imports were banned from 2005/06 to 2007. The government of Nigeria removed the sorghum from the import prohibition list since 2008, probably because of the decrease in production that year, and applied a 5% duty on imports (USDA, 2009). Sorghum exports were also banned (USDA, 2011), at least from 2006 to 2008.

In 2008, the government attempted to introduce a Guarantee Minimum Price (GMP) for cereals including sorghum. The mechanism is still in place but it is barely applied because of funding and logistic constraints.

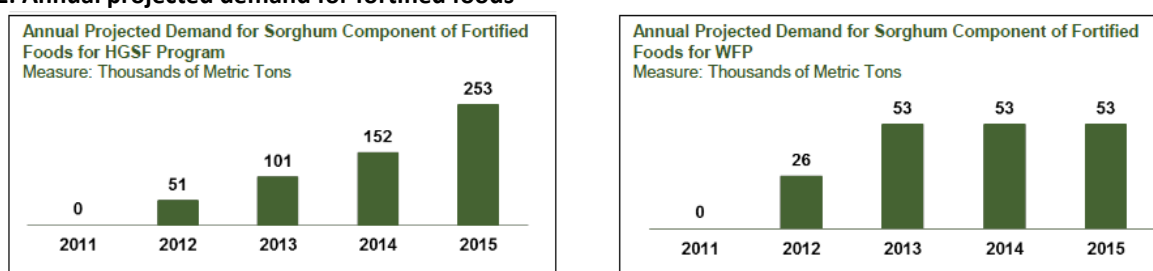
Moreover, in 2008, in order to restrain the increase in food prices and to mitigate the impact on consumers, the Federal Government of Nigeria has decided to release grains from its Strategic Grain Reserve (SGR) silos to markets across the country. The operation targets the northern states and the population hit by crop losses.

Sorghum is also considered as a key crop in Nigeria's Agriculture Transformation Action Plan (ATAP). The ATAP has been set up in August 2011 in recognition of the role of agriculture as the leading economic activity in the country. The goal of the new plan is to make agriculture a business rather than a development issue with emphasis on public private sector partnership (PPP). Apart from sorghum, ATAP will focus on 4 crops: rice, cassava, cocoa and cotton. Since the program has started in 2011, this impact cannot be taken into account in our analysis.

The sorghum development plan focuses on the following uses for sorghum:

- ✓ Fortified food. Sorghum can be utilized to produce nutritious fortified foods. This product is designated to the Home Grown School Feeding Program (HGSF) and to the World Food Program (WFP) aid to neighboring countries.

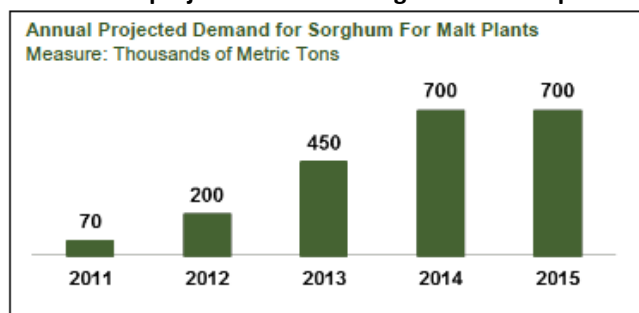
Figure 12: Annual projected demand for fortified foods



Source: GON, 2011

- ✓ Malt. The aim is to develop the malt industry to produce beverage like Maltina, Ovaltine, Mila, the government insisting on the malt not being used for beer.

Figure 13: Annual projected demand sorghum for malt plants



Source: GON, 2011

An increase of the volume of lands, improved seeds and fertilizers will be required to achieve the production targets. Production and commercialization should increase via the mechanization of cultivation, crop management, harvesting, post harvest and processing. The development of production will stimulate employment: 150 000 jobs might be created in 2015 in the fields of primary production and other related activities, such as input supply, service delivery, aggregation of output and processing.

Finally, the program aims to cancel malnutrition and reduce poverty affecting the North-East and North-West regions.

3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS

To calculate the indicators measuring incentives and/or disincentives for sorghum, several types of data are needed. They were collected and are presented and explained hereafter.

TRADE STATUS OF THE PRODUCTS

Nigeria is not a major player in the regional and international trade of sorghum, despite being the largest producer in West Africa. Sorghum is mainly traded internally and very small amounts were exported in the last decade and imports represented less than 1% of the production. As a result, sorghum is considered as a thinly traded commodity. However, in the context of the methodology, as imports are slightly higher than exports, sorghum will be treated as an import commodity.

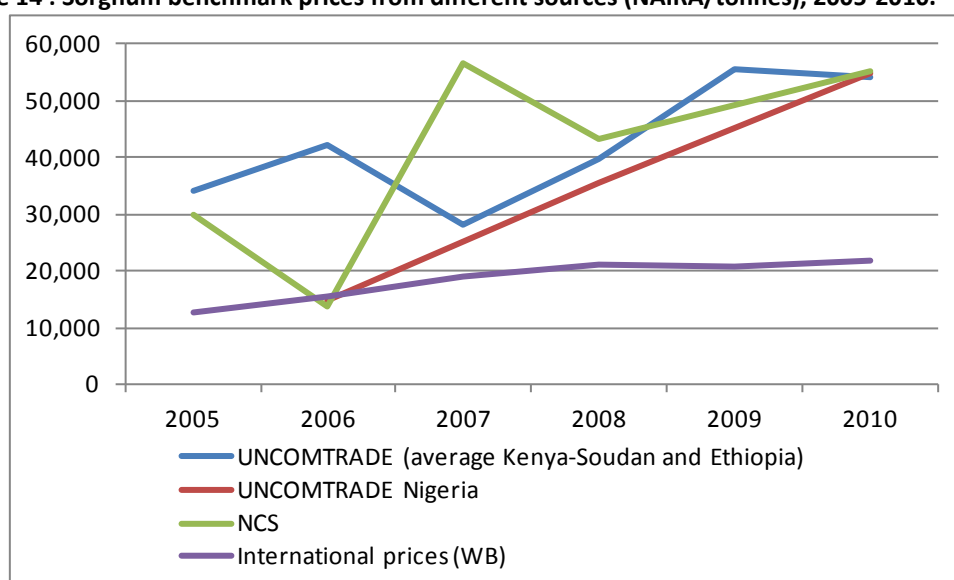
BENCHMARK PRICES

Observed

Since Nigeria is an importer of sorghum, the CIF price was taken as the benchmark price. However, being international flows very limited, especially prices reported by national sources are not representative (Figure 14):

- Data reported by Nigeria to UN COMTRADE are incomplete (data for 2005, 2007 and 2009 are missing)
- Data reported by the National Custom Service (NCS) are based on very few trade flows. For instance, in 2005, the average price is only calculated with imports from United Kingdom.

Figure 14 : Sorghum benchmark prices from different sources (NAIRA/tonnes), 2005-2010.



Source: NCS, 2013; UNCOMTRADE, 2012; GEMS-WB, 2013

As a consequence, we used an average CIF price for Kenya, Ethiopia, and Sudan in our analysis (Table 3). Those 3 countries are the main sorghum importers in Africa (International Grain Council, 2012). CIF prices were obtained from UNCOMTRADE.

Table 3 : Average benchmark prices for sorghum at Kenya, Sudan, and Ethiopia borders (USD/t), 2005-2010,

	2005	2006	2007	2008	2009	2010
Average CIF price in Kenya, Sudan, and Ethiopia USD/t	260.3	327	223.7	334.4	373.8	359.7

Source: UNCOMTRADE, 2012

Adjusted

No adjustments to the benchmark price have been made.

DOMESTIC PRICES

Observed wholesale prices

Dawanu market in Kano state was chosen as the point of competition, that is to say the place where imported sorghum competes with locally produced sorghum. Dawanu is the international cereal market in Nigeria. Wholesale prices in Dawanu are available for the period 2005-2010 (Table 4).

Table 4 : Wholesale prices in Dawanu market (NGN/t), 2005-2010.

	2005	2006	2007	2008	2009	2010
Wholesale prices, Dawanu (NGN/t)	57,250	33,333	29,546	54,075	48,333	45,917

Source: USAID

Observed farm gates prices

A national survey conducted by the Federal Ministry of Agriculture, the National Bureau of Statistics and the Central Bank of Nigeria reported national average producer prices (Table 5). However, these prices do not reflect the regional and annual disparities.

Table 5 : Farm gates prices, (NGN/t), 2005-2010.

	2005	2006	2007	2008	2009	2010
Farm gates prices (NGN/t)	N.A	24,790	23,710	25,000	37,030	39,410

Source: Fed. Min. of Agric./NBS /Central Bank of Nigeria, 2012

EXCHANGE RATES

In this case, we applied the exchange rate between US dollar and Naira (NGN) as the benchmark price is in USD (Table 6).

Table 6 : Exchange rate (NGN/USD), 2005-2010.

	2005	2006	2007	2008	2009	2010
Echange rate NGN per USD	131	129	126	119	149	150

Source: World Bank, 2012

ACCESS COSTS

Observed

The market access costs reflect the costs of transporting sorghum from the border to the wholesale market and from the wholesale market to the farm gate (Table 7, Table 8). They are calculated here as the sum of transport costs, bribes, and handling costs. Since data on profit margins for importers is not available, we apply a 10% margin to the border price.

Table 7 : Observed access costs from the border to the point of competition, (NGN/t), 2005-2010.

	2005	2006	2007	2008	2009	2010
Border price, NGN/t	43471.0	36459.1	29066.2	32308.9	35652.1	41554.4
Transport cost, NGN/Km/t - average 99/07 - millet and cowpea	6.6	6.6	6.6	7.4	8.2	9.3
Distance between Lagos, border to Kano, Km	1002.0	1002.0	1002.0	1002.0	1002.0	1002.0
Bribes, NGN/Km/t, 2008- USAID	1.2	1.3	1.3	1.5	1.7	1.9
Transport cost NGN/t	7786.5	7882.8	7952.0	8871.9	9896.4	11248.5
Handling	932.5	1008.9	1063.9	1187.0	1324.1	1505.0
Profit margin of importers, 10%	4347.1	3645.9	2906.6	3230.9	3565.2	4155.4
Access cost to the competition point NGN/t	13066.1	12537.6	11922.6	13289.9	14785.7	16908.9

Source: Author's own calculations using data as described above and based on the Niger's Agricultural Market Information

Data on transport costs for sorghum were not available hence we used data for millet in the North of Nigeria for our analysis. The wholesale margins are based on the data available about the margins for sorghum wholesalers in Adamawa state, in the center East of Nigeria. Data are available for 2008 and are interpolated and extrapolated for the previous and following years, using the inflation rate.

Table 8 : Observed access cost from the wholesale market to the farm gate (NGN/t), 2005-2010.

	2005	2006	2007	2008	2009	2010
Transport cost, NGN/Km/t	6.6	6.6	6.6	7.4	8.2	9.3
Distance between Kano to Borno, Km	591.0	591.0	591.0	591.0	591.0	591.0
Bribes, NGN/Km 2008	1.2	1.3	1.3	1.5	1.7	1.9
Transport cost NGN/t	4592.7	4649.4	4690.2	5232.8	5837.1	6634.6
Handling	932.5	1008.9	1063.9	1187.0	1324.1	1505.0
Profit margins of marketing agents - wholesale margins NGN/t	1046.3	1132.1	1193.9	1332.0	1485.8	1688.8
Access cost to the competition point NGN/t	6571.5	6790.5	6948.1	7751.9	8647.0	9828.4

Source: Author's own calculations using data as described above and based on the Niger's Agricultural Market Information, Borderless, Abuja Securities and Commodity exchange.

Adjusted

Adjusted access costs reflect the cost of transporting the commodity from the border to the wholesale market and from the wholesale market to the farm gate in an efficient, well-functioning

market (Table 9, Table 10). As a consequence, the adjusted access costs omit illicit taxes and excess margins.

Table 9 : Adjusted access cost from the border to the wholesale market (NGN/t), 2005-2010.

	2005	2006	2007	2008	2009	2010
Border price, NGN/t	43471.04	36459.13	29066.23	32308.85	35652.10	41554.45
Transport cost, NGN/Km/t - average 99/07 - millet and cowpea	6.6	6.6	6.6	7.4	8.2	9.3
Distance between Lagos to Kano, Km	1002	1002	1002	1002	1002	1002
Transport cost NGN/t	7786.55	7882.76	7951.99	8871.94	9896.43	11248.47
Handling	932.47	1008.93	1063.94	1187.03	1324.10	1505.00
Profit margin of importers, 5%	2173.55	1822.96	1453.31	1615.44	1782.61	2077.72
Access cost to the competition point NGN/t	10892.56	10714.64	10469.24	11674.41	13003.13	14831.20

Source: Author's own calculations using data as described above and based on the Niger's Agricultural Market Information.

The wholesale margin was not adjusted because it already appears to be efficient. Indeed, the average margin between 2005 and 2010 is 3.10%. Therefore, only bribes were omitted to calculate these costs.

Table 10 : Adjusted access costs from the wholesale market to the farm gate (NGN/t), 2005-2010.

	2005	2006	2007	2008	2009	2010
Transport cost, NGN/Km/t	6.6	6.6	6.6	7.4	8.2	9.3
Distance between Kano to Borno, Km	591	591	591	591	591	591
Transport cost NGN/t	7786.55	3900.60	3900.60	4351.85	4854.38	5517.59
Handling	932.47	1008.93	1063.94	1187.03	1324.10	1505.00
Profit margins of marketing agents - wholesale margins NGN/t	1046.35	1132.15	1193.88	1332.00	1485.81	1688.80
Access cost to the competition point NGN/t	6571.48	6790.49	6948.07	7751.88	8647.03	9828.38

Source: Author's own calculations using data as described above and based on the Niger's Agricultural Market Information, Borderless, Abuja Securities and Commodity exchange.

EXTERNALITIES

No externalities were accounted for in this analysis.

QUALITY AND QUANTITY ADJUSTMENTS

There are no differences between the domestic and the regional price used as a benchmark price since the sorghum quality is similar in Niger and Nigeria. Therefore, no adjustments were made in this analysis.

DATA OVERVIEW

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

Table 11 : Data and source used for the analysis.

Concept		Description	
		Observed	Adjusted
Benchmark price		→The CIF price used in our analysis is the average CIF price for Kenya, Ethiopia, and Sudan from UNCOMTRADE.	N.A.
Domestic price at wholesale		→The wholesale prices in Dawanu are collected by USAID.	N.A.
Domestic price at farm gate		→Farm gate prices were reported in a survey conducted by the Min.Ag, the NBS and the Central Bank	N.A.
Exchange rate		→The exchange rate is available in the Central Bank of Nigeria.	N.A.
Access cost from wholesale to the border		→Transport costs correspond to the average transport costs for millet and cowpea from 1999 to 2007 in North Nigeria. The Niger's Agricultural Market Information System collected this data. The transport costs from 2008 to 2010 were calculated using the inflation rate in Nigeria from IMF. →The data on bribes is collected by USAID through the Borderless initiative. →Handling data are collected by the Abuja Securities and Commodity exchange. Data available correspond to the average handling costs in markets in Nigeria in 2010. The handling costs for the previous years are calculated using the consumer price index →Importer margins were not available and we estimate a 10% margin.	Adjusted access costs were calculated the same way as observed access costs. However, bribes were omitted and the importer margins were reduced.
Access costs from wholesale to farm gate		→Transport costs correspond to the average transport costs for millet and cowpea from 1999 to 2007 in North Nigeria. The Niger's Agricultural Market Information System collected this data. The transport costs for 2008 to 2010 have been calculated using the inflation rate in Nigeria from IMF. →The amount of bribes is collected by USAID through Borderless initiative. →Handling data are collected by the Abuja Securities and Commodity exchange. Data available correspond to the average handling costs in markets in Nigeria in 2010. The handling costs for the previous years are calculated using the consumer price index →Wholesale margins correspond to the margin get by sorghum wholesalers in Adamawa States in 2008. It corresponds to a survey from Jongur, B Ahmed.2008	Adjusted access costs were calculated the same way as observed access costs. However, bribes were omitted. Wholesale margins were not considered excessive and therefore were not adjusted.
QT adjustment	Bor-Wh	N.A.	N.A.
	Wh-FG	N.A.	N.A.
QL adjustment	Bor-Wh	N.A.	N.A.
	Wh-FG	N.A.	N.A.

The data used for this analysis is summarized below.

		Year	2005	2006	2007	2008	2009	2010
		trade status	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>x</i>
DATA	Unit	Symbol						
Benchmark Price								
Observed	USD/t	$P_{b(int\$)}$	260.31	327.02	223.66	334.40	373.81	359.86
Adjusted	NGN/t	P_{ba}						
Exchange Rate								
Observed	fCFA/NGN	ER_o	131.00	129.00	126.00	119.00	149.00	150.00
Adjusted	fCFA/NGN	ER_a						
Access costs border - wholesale								
Observed	NGN/t	AC_{owh}	13,066.12	12,537.60	11,922.55	13,289.85	14,785.74	16,908.92
Adjusted	NGN/t	AC_{awh}	10,892.56	10,714.64	10,469.24	11,674.41	13,003.13	14,831.20
Domestic price at wholesale	NGN/t	P_{dwh}	57,250.00	33,333.33	29,545.80	54,075.00	48,333.33	45,916.70
Access costs wholesale - farm gate								
Observed	NGN/t	AC_{ofg}	6,571.48	6,790.49	6,948.07	7,751.88	8,647.03	9,828.38
Adjusted	NGN/t	AC_{afg}	6,571.48	6,790.49	6,948.07	7,751.88	8,647.03	9,828.38
Farm gate price	NGN/t	P_{dfg}	N.A	24,790.00	23,710.00	25,000.00	37,030.00	39,410.00
Externalities associated with production	NGN/t	<i>E</i>						
Budget and other product related transfers	NGN/t	<i>BOT</i>						
Quantity conversion factor (border - point of competition)	Fraction	QT_{wh}						
Quality conversion factor (border - point of competition)	Fraction	QL_{wh}						
Quantity conversion factor (point of competition – farm gate)	Fraction	QT_{fg}						
Quality conversion factor (point of competition – farm gate)	Fraction	QL_{fg}						

CALCULATION OF INDICATORS

The indicators and methodology applied in this analysis are described in Box 1. A detailed description of the calculations and data requirements is available on the MAFAP website.

Box 1: MAFAP POLICY INDICATORS

MAFAP uses four measures of market price incentives or disincentives. *First*, it uses two observed nominal rates of protection (NRPs), one at the wholesale and one at the farm gate level. These compare the commodity's observed domestic prices to reference prices free from domestic policy interventions.

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

The **Nominal Rate 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 gate 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 structural factors affecting incentives and disincentives for the farmer, while the $NRPo_{wh}$ helps identify where incentives and disincentives may be distributed along the commodity's marketing chain.

Second, MAFAP uses the **Nominal Rate of Protection - adjusted (NRPa)** at the wholesale and farm gate level, in which the reference prices are adjusted to eliminate excessive access costs and other distortions found in the commodity's marketing chain. The equations to estimate the adjusted rates of protection, however, follow the same general pattern:

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

MAFAP also analyzes **Market Development Gaps (MDGs)** caused by market power, exchange rate misalignments, externalities and excessive access costs, which, when taken out of the observed reference prices, generate the adjusted reference prices and NRPa indicators. A comparison of the different rates of protection identifies where market development gaps can be found and reduced in the marketing chain.

Table 12 : MAFAP Price Gaps for Sorghum in Nigeria, (NGN/t), 2006-2010.

	2006	2007	2008	2009	2010
Trade status for the year	m	m	m	m	m
Observed price gap at wholesale	(21,389)	(10,558)	991	(22,151)	(24,971)
Adjusted price gap at wholesale	(19,566)	(9,105)	2,606	(20,368)	(22,894)
Observed price gap at farm gate	(23,142)	(9,446)	(20,332)	(24,807)	(21,650)
Adjusted price gap at farm gate	(21,319)	(7,993)	(18,717)	(23,024)	(19,572)

Source: Author's own calculations using data as described above.

Table 13 : MAFAP Nominal Rates of Protection (NRPs) for Sorghum in Nigeria, 2006-2010 (%).

	2006	2007	2008	2009	2010
Trade status for the year	m	m	m	m	m
Observed NRP at wholesale	-39%	-26%	2%	-31%	-35%
Adjusted NRP at wholesale	-37%	-24%	5%	-30%	-33%
Observed NRP at farm gate	-48%	-28%	-45%	-40%	-35%
Adjusted NRP at farm gate	-46%	-25%	-43%	-38%	-33%

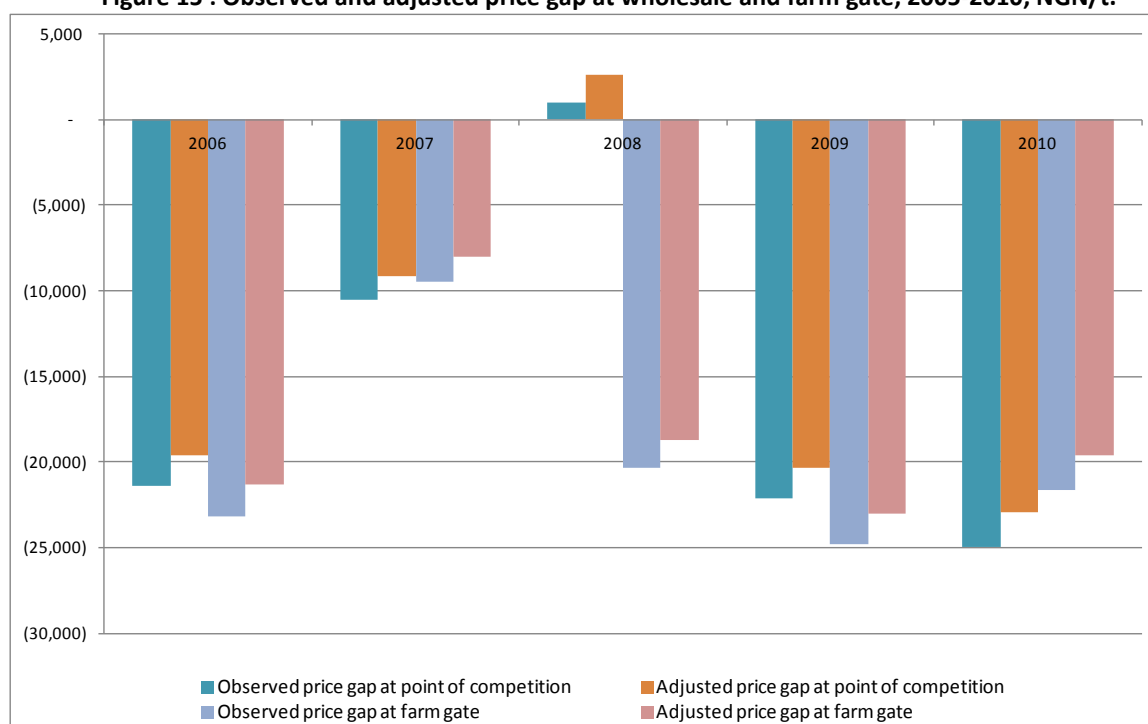
Source: Author's own calculations using data as described above.

4. INTERPRETATION OF THE INDICATORS

Figure 15 to Figure 16 show the results for the set of MAFAP indicators generated, which include price gaps and Nominal Rates of Protection (NRPs). Price gaps are market price differentials between the commodity's domestic and reference parity price in each respective year. More conceptually, they provide an absolute measure of the extent to which producers and wholesalers are protected under the existing market conditions and structure, while NRPs express this measure of protection as ratios that are comparable across countries and commodities.

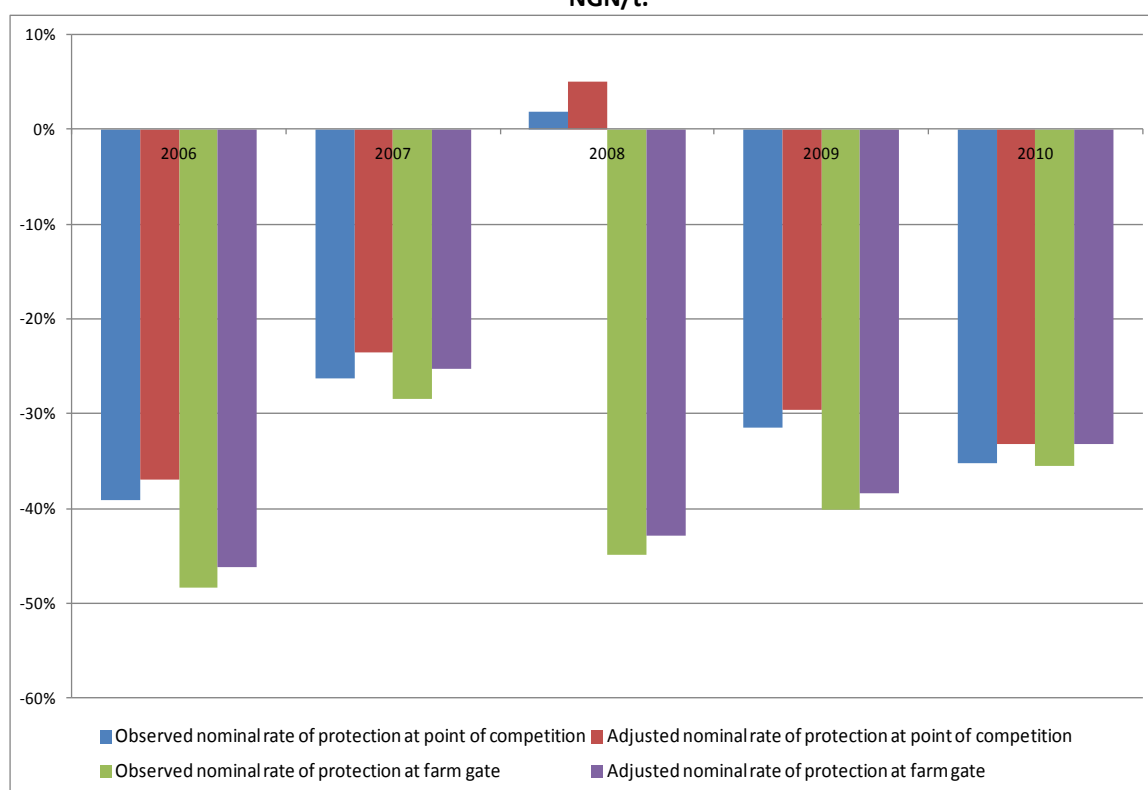
The analysis focuses on the results for the period 2006-2010 because producer prices were not available for 2005.

Figure 15 : Observed and adjusted price gap at wholesale and farm gate, 2005-2010, NGN/t.



Source: Author's own calculations using data as described above.

Figure 16 : Observed and adjusted NRP at wholesale and farm gate for sorghum in Nigeria, 2005-2010, NGN/t.



Source: Author's own calculations using data as described above

During the period under review, both producers and wholesalers were penalized except the wholesalers in 2008 who received low incentives. This means that farmers and wholesalers received prices lower than international prices. However, there is a significant variation in the two trends (NRPs for producers and NRPs for wholesalers) and especially for the 2006 and 2007 period.

The main policy decisions affecting the sorghum value chain are:

- The price fixation mechanism for cereals introduced in 2008;
- The import ban lifted in 2008 and the 5% imports duty applied in 2009 and 2010.

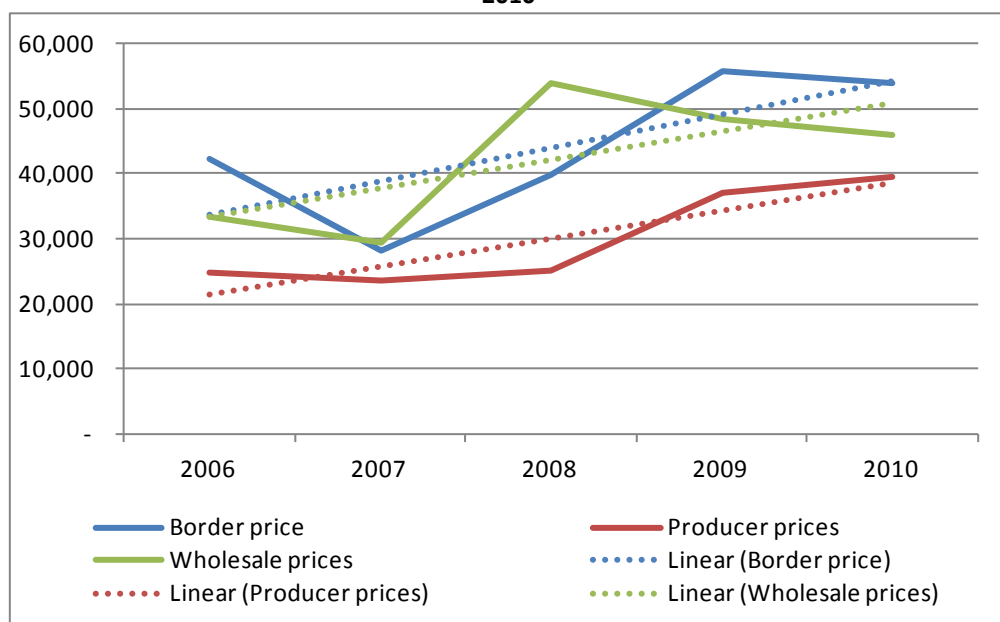
Even if it still in force, the price fixation mechanism is partially applied and is apparently not affecting the sorghum prices. The value chain analysis (section: DESCRIPTION OF THE VALUE CHAIN AND PROCESSING) shows that prices are mostly fixed by bargaining.

On the contrary, the import ban could have affected the level of incentives and disincentives for **wholesalers**. As soon as the import ban was lifted in 2008 and import quantity drastically increased, wholesalers received low incentives (2%) as prices at wholesale level became close to international prices. The opening up of the market could have had a temporary positive impact on wholesalers, benefiting from the increasing international price trend this year. However, they received disincentives again in 2009 and 2010 reaching the level of 2006.

On the whole, despite the fact that prices at wholesale and international level increased at a comparable rate (linear line- Figure 17), the trends are different indicating a disconnection between the two markets (Figure 17). The low level of exports and imports prevents local agents from

benefitting from the increasing international prices. National factors may have determined the wholesale price in Dawanu market rather than the international market trends.

Figure 17 : Sorghum prices in Nigeria at producers, wholesalers and international level (NGN/Tonnes), 2006-2010



Source : Authors

On the other hand, the level of disincentives for **producers** does not seem to be affected by the import ban which is consistent with the fact that the linkage between producer markets and international markets is very poor. In addition to the poor connection between markets, a large part of the sorghum production is self consumed because of the low financial return that marketing of sorghum would offer to producers. As a result, the quantity of sorghum marketed internally and externally is limited which explains the poor price transmission. This also affects the bargaining power of producers. Indeed, sorghum prices are mainly fixed middlemen and farmers do not have access to up-to-date information on the market situation (price and demand).

However, even if the market power is unbalanced, the wholesale margins recorded were low (3% on average between 2005 et 2008). This is reflected in the disincentives received also by wholesalers. Moreover, disincentives received by producers and wholesalers are almost similar (average NRPs at producer level: -38% and average NRPs at wholesale level: -33% between 2006 and 2010).

The analysis of the adjusted domain shows that producers and wholesalers would have been less penalized if inefficiencies were removed. However, due to a lack of data, only the excessive margins at import level were taken into account and, for instance, no illicit costs was considered. As a result, the adjusted domain is not fully representative.

The level of disincentives received by producers directly impacts the level of production. Because of the lack of market opportunities and the low financial return, producers prefer to grow other crops. This situation is conflicting with the increasing industrial demand for sorghum from the brewery industry and with the strong national demand for human consumption. Ensuring higher prices to producers by a better connection to markets and industries could lead to production increase.

The lack of access to services and improved inputs for producers is also a major issue in sorghum production directly affecting yields.

The Agricultural Transformation Action Plan (ATAP) implemented in 2011 focuses on improving the production in terms of quantity and quality in order to develop the brewery industry within the country. The MAFAP results need to be monitored to assess the impact of these recent policy measures.

5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

MAIN MESSAGE

The different policy measures in force could have affected the level of incentives and disincentives : the price fixation mechanism although this it was not fully implemented; the import ban lifted in 2008 and the 5% import duty. However, local and international markets are disconnected owing to the very low amount of sorghum traded. As a result, the protectionist trade policies did not prevent producers and wholesalers from receiving low prices.

Wholesalers received price penalization during the period under review except in 2008 when the import ban was lifted. Wholesalers benefited from the opening up of the market and the high international prices this year. The remaining years, they received prices lower than international prices mainly due to the lack of connection between international and domestic markets.

Producers received price penalizations which are also due to the few market opportunities and the low amount of sorghum marketed. A large part of the production is self-consumed as financial returns are low. Moreover, farmers are considered as price takers and have limited access to market information.

This situation results in decreasing level of production. In response to this situation, the government allowed imports in 2008 and launched the ATAP in 2011 to boost production and productivity. In the future, the impact of these recent policy measures would need to be further monitored.

PRELIMINARY RECOMMENDATIONS

In Nigeria, producers and wholesalers received price penalization because of the low amount of sorghum traded and the few market opportunities. The MAFAP analysis suggests that the following measures would increase prices for producers and wholesalers:

- Increase the market opportunities by improving the connection between producers and wholesalers and wholesalers and international markets. Exploring the potential of the sorghum industry as an additional market opportunity bringing value-added to the production.
- Ensure that producers receive prices reflecting domestic and international prices by improving the access to market information for producers. Obtaining higher prices would encourage producers to market their production. In addition farmers need to be aware of market demand to be able to seize opportunities.

Not only the market opportunities need to be increased but also the level of production. Production and productivity could increase by providing more improved inputs and more producers services.

LIMITATIONS

The main limitations are:

- the farm gate prices do not reflect the regional disparities since only average national prices were reported and the price gap between the north and the south is significant;
- the pathways was not well identified as sorghum is thinly traded;
- Information on access costs could be further explored and especially regarding the adjusted domain.

FURTHER INVESTIGATION AND RESEARCH

- Collect detailed information on regional producer prices and access costs;
- Compare the quality of imported sorghum with the most popular and most traded type of domestically produced sorghum.

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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

DATA				Unit	Symbol	Year	trade status	2005	2006	2007	2008	2009	2010
								m	m	m	m	m	m
Benchmark Price													
1	Observed	USD/TON	P _{lit,1}					260.31	327.02	223.66	334.40	373.81	359.86
1b	Adjusted	USD/TON	P _{lit}										
Exchange Rate													
2	Observed	LOC/USD	ER _t					131.00	129.00	126.00	119.00	149.00	150.00
2b	Adjusted	LOC/USD	ER _t					11.00					
Access costs border - point of competition													
3	Observed	LOC/TON	ACo _{lit}					13,066.12	12,537.60	11,922.55	13,289.85	14,785.74	16,908.92
3b	Adjusted	LOC/TON	ACa _{lit}					10,892.56	10,714.64	10,469.24	11,674.41	13,003.13	14,831.20
4	Domestic price at point of competition	LOC/TON	P _{lit}					57,250.00	33,333.33	29,545.80	54,075.00	48,333.33	45,916.70
Access costs point of competition - farm gate													
5	Observed	LOC/TON	ACo _{lit}					6,571.48	6,790.49	6,948.07	7,751.88	8,647.03	9,828.38
5b	Adjusted	LOC/TON	ACa _{lit}					6,571.48	6,790.49	6,948.07	7,751.88	8,647.03	9,828.38
6	Farm gate price	LOC/TON	P _{lit}					24,790.00	23,710.00	25,000.00	37,030.00	39,410.00	
7	Externalities associated with production	LOC/TON	E										
8	Budget and other product related transfers	LOC/TON	BOT										
	Quantity conversion factor (border - point of competition)	Fraction	QT _{lit}										
	Quantity conversion factor (border - point of competition)	Fraction	QL _{lit}										
	Quantity conversion factor (point of competition - farm gate)	Fraction	QT _{lit}										
	Quantity conversion factor (point of competition - farm gate)	Fraction	QL _{lit}										
CALCULATED PRICES				Unit	Symbol			2005	2006	2007	2008	2009	2010
Benchmark price in local currency													
9	Observed	LOC/TON	P _{lit,1}					34,100.31	42,185.01	28,181.61	39,794.10	55,698.12	53,979.18
10	Adjusted	LOC/TON	P _{lit,1}					2,863.38	42,185.01	28,181.61	39,794.10	55,698.12	53,979.18
Reference Price at point of competition													
11	Observed	LOC/TON	RPo _{lit}					47,166.42	54,722.61	40,104.17	53,083.95	70,483.86	70,888.10
12	Adjusted	LOC/TON	RPa _{lit}					13,755.95	52,899.65	38,650.86	51,468.51	68,701.26	68,810.37
Reference Price at Farm Gate													
13	Observed	LOC/TON	RPo _{lit}					40,594.95	47,932.12	33,156.10	45,332.07	61,836.83	61,059.71
14	Adjusted	LOC/TON	RPa _{lit}					7,184.47	46,109.17	31,702.79	43,716.63	60,054.23	58,981.99
INDICATORS				Unit	Symbol			2005	2006	2007	2008	2009	2010
Price gap at point of competition													
15	Observed	LOC/TON	PGo _{lit}					10,083.58	(21,389.28)	(10,558.37)	991.05	(22,150.53)	(24,971.40)
16	Adjusted	LOC/TON	PGA _{lit}					43,494.05	(19,566.32)	(9,105.06)	2,606.49	(20,367.93)	(22,893.67)
Price gap at farm gate													
17	Observed	LOC/TON	PGo _{lit}					(40,594.95)	(23,142.12)	(9,446.10)	(20,332.07)	(24,806.83)	(21,649.71)
18	Adjusted	LOC/TON	PGA _{lit}					(7,184.47)	(21,319.17)	(7,992.79)	(18,716.63)	(23,024.23)	(19,571.99)
Nominal rate of protection at point of competition													
19	Observed	%	NRPo _{lit}					21%	-39.09%	-26.33%	1.87%	-31.43%	-35.23%
20	Adjusted	%	NRPa _{lit}					316%	-36.99%	-23.56%	5.06%	-29.65%	-33.27%
Nominal rate of protection at farm gate													
21	Observed	%	NRPo _{lit}					-100%	-48.28%	-28.49%	-44.85%	-40.12%	-35.46%
22	Adjusted	%	NRPa _{lit}					-100%	-46.24%	-25.21%	-42.81%	-38.34%	-33.18%
Nominal rate of assistance													
23	Observed	%	NRAo					-100%	-0.4828103	-0.28489778	-0.44351408	-0.40116598	-0.35456624
24	Adjusted	%	NRAa					-100%	-46.24%	-25.21%	-42.81%	-38.34%	-33.18%



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