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 SORGHUM IN ETHIOPIA

Draft version

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

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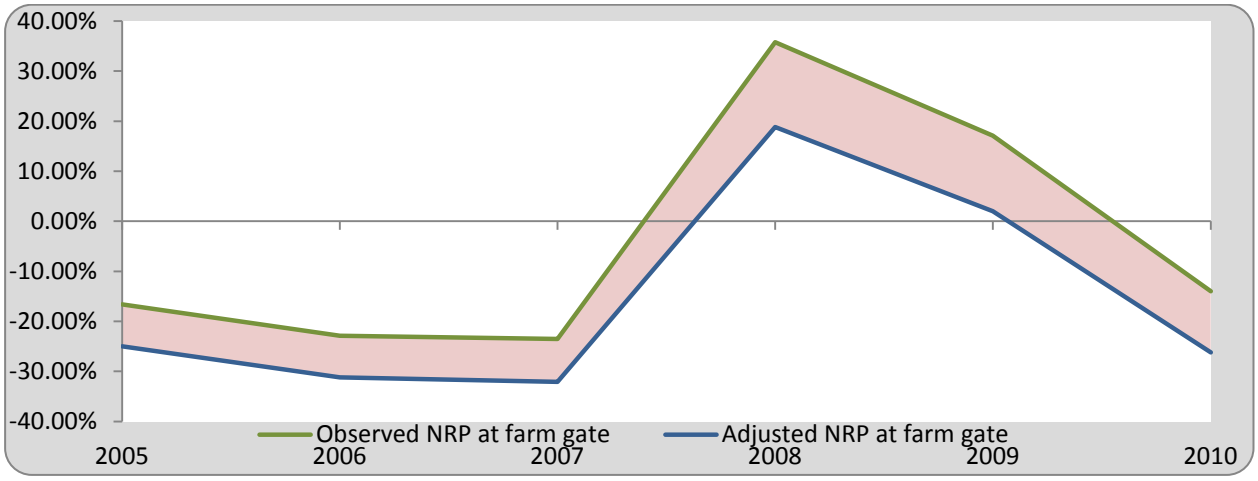
SUMMARY OF THE NOTE

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

- Sorghum accounts for the third largest share of total cereal production;
- Ethiopia is the second largest sorghum producer in Africa, after the Sudan;
- Area under wheat cultivation expanded from 1.30 million ha in 2004/05 to 2 million in 2010/11;
- Sorghum accounted for about 18 percent of the per capita cereal intake in 2001/07;
- Sorghum is the single most important staple in drought prone areas;
- Most of the sorghum import takes the form of food aid;
- The sorghum value chain is long and involves too many small operators.



The observed Nominal Rate of Protection (NRP, green line) and the adjusted NRP (blue line) indicate that sorghum producers were implicitly taxed in all the years except in 2008 and 2009 when domestic prices soared. The negative rate of protection in 2010 suggests that negative policy environment of the past has re-emerged. The adjusted NRP captures the effects of policy distortions and market inefficiencies.

- Our results show that incentives (positive NRP) occur only under special circumstances of very high domestic prices. Disincentives are substantial in normal years and arise from 1) overvalued exchange rate, 2) export ban, 3) distribution of imported wheat at subsidized prices (with negative implications for substitute crops such as sorghum), and 4) weak market structure and high transport costs;
- The change from disincentive (2005-07) to incentive (2008 and 2009) and back to disincentive (2010) imply uncertainty in the incentive environment;
- Sorghum production has increased in recent years due to expansion of area under cultivation but improved and stable policy environment is needed to enhance investment in yield-enhancing technologies;
- Actions to be taken to reduce disincentives could include: (1) addressing currency overvaluation; (2) reducing extreme fluctuations in domestic prices; (3) supporting the development of market structure and the grain value chain; and (4) reducing the distribution of non-targeted, subsidized grain.

CONTENTS

1. PURPOSE OF THE NOTE

This technical note aims to describe the market incentives and disincentives for sorghum in Ethiopia.

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

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

The outcomes of this analysis can be used by those stakeholders involved in policy-making for the food and agricultural sector. They can also serve as input for evidence-based policy dialogue at country or regional level.

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

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

2. COMMODITY CONTEXT

Sorghum is one of the major staple crops grown in the poorest and most food insecure regions of Ethiopia. The crop is typically produced under adverse conditions such as low input use and marginal lands. It is well adapted to a wide range of precipitation and temperature levels and is produced from sea level to above 2000 m.a.s.l (Fetene, 2011). Its drought tolerance and adaptation attributes have made it the favourite crop in drier and marginal areas. Ethiopian is often regarded as the centre of domestication of sorghum because of the greatest genetic diversity in the country for both cultivated and wild forms (Fetene, 2011).

PRODUCTION

With an annual production of approximately 4 million tonnes (2010, sorghum is the second most important cereal produced in Ethiopia, accounting for 19 percent of the total cereal produced in the country and covering some about 20 percent of the total area under cereals. Sorghum production has significantly increased in recent years, from 1.7 million tonnes in 2004/05 to nearly 4.0 million in 2010/11(130 percent) (see Table 1). Ethiopia is also the second largest producer of sorghum in Eastern and Southern Africa after the Sudan.

The large improvement in sorghum production is driven by both land expansion and yield improvement: yield increased from an average of 1.4 tonne/ha in 2004/05 to an average of 2.1 tonne/ha in 2010/11, increasing by 50 percent, while area under sorghum production increased by 51 percent (from 1.2 million ha in 2004/05 to 1.9 million ha in 2011. It should be noted that FAOSTAT yield and production figures during the period 2007 to 2011 are lower than the government (CSA) figures.

Table 1: Cereals area, production, yield and annual change (Smallholder farms, Meher season) 2004/05-2010/11

	2004/2005				2010/2011				Expansion rate			
	Area 000 ha	Production 000 tonnes	Yield (tonnes/ha)	Share in Total Cereals Area (%)	Area 000 ha	Production 000 tonnes	Yield (tonnes/ha)	Share in Total Cereals Area (%)	Area 000 ha	Production 000 tonnes	Yield (Tonnes/ha)	Share in Total Cereals Area (%)
Grain	9811	1190			11823	20349			20.5	70.9		
Cereals	7638	1003			9691	17761			26.9	77.1		
Teff	2136	2026	0.95	28.0	2761	3483	1.26	28.5	29.3	72.0	33.0	1.9
Barley	1095	1328	1.21	14.3	1047	1703	1.63	10.8	-4.5	28.3	34.2	-24.7
Wheat	1398	2177	1.56	18.3	1553	2856	1.84	16.0	11.1	31.2	18.1	-12.4
Maize	1393	2394	1.72	18.2	1963	4986	2.54	20.3	40.9	108.3	47.8	11.1
Sorghum	1254	1716	1.37	16.4	1898	3960	2.09	19.6	51.4	130.8	52.4	19.3
Finger millet	313	333	1.06	4.1	408	635	1.56	4.2	30.4	90.8	46.3	2.8
Oats / 'Aja'	45	57	1.26	0.6	31	48	1.54	0.3	-31.6	-16.1	22.7	-46.1
Rice	-	-	-	-	30	90	3.03	0.3	-	-	-	-

Source: Author's computation using CSA data

**Total Area cultivated and total production include: Grain, Vegetables, root crops, Fruit crops, Chat, Coffee and Hops*

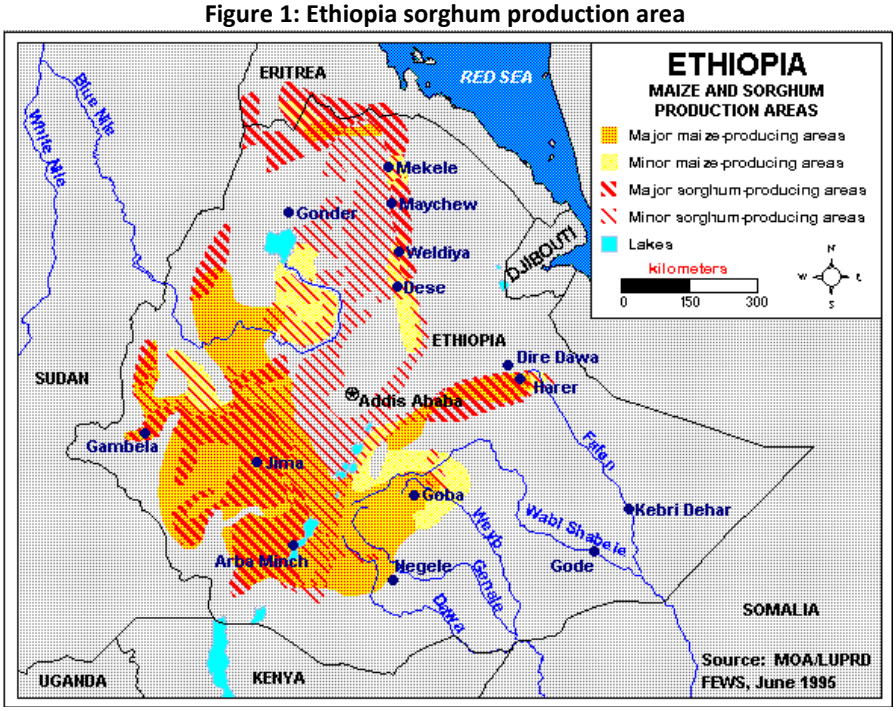
Sorghum is cultivated by nearly 4.5 million smallholders located in the eastern and northwest parts of the country (Figure 1), where the weather is dry and soil fertility is poor. Table 2 shows that the main sorghum producing regions are Oromia and Amhara, accounting for nearly 80 percent of the total production. The leading sorghum producing zones are East and West Hararge in Oromiya and North Gondar and North Shoa in Amhara. Two regions, SNNPR and Tigray, are relatively less important, contributing 11 and 4 percent of the national production, respectively. Ethiopia is the second largest producer of sorghum, after the Sudan.

Table 2. Sorghum area, production and yield by Regions (2010-11)

	Area in hectare	Production in tonnes	yield(t/ha)	Share of production (%)
Oromia	739361	1580545	2.1	39.9
Amhara	710732	1533586	2.2	38.7
Tigray	216879	466394	2.2	11.8
S.N.N.P.	107735	175125	1.6	4.4
Other	123027	204247	2	5.2
Ethiopia	1897734	3959897	2.1	100

Source: Author's calculation based on CSA 2010/2011 data

Figure 1: Ethiopia sorghum production area



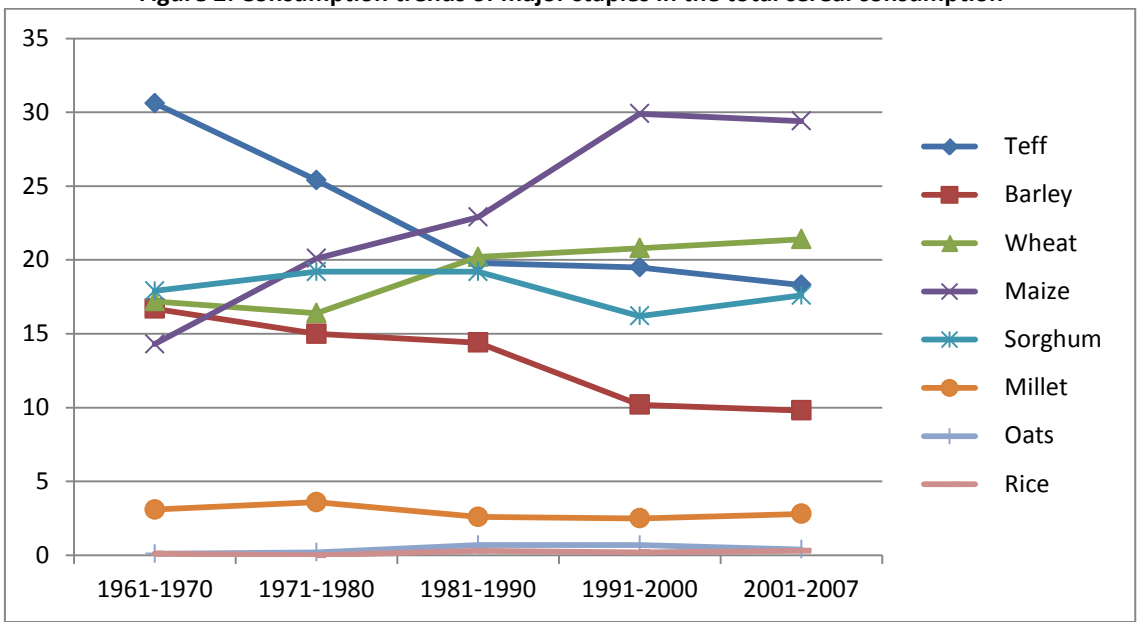
Source: USDA 2002

CONSUMPTION/UTILIZATION

Sorghum accounts for an average 10 percent of daily caloric intake of households living in the eastern and northwest areas of the country (USDA, 2012). About three-quarters of the sorghum grain in Ethiopia is used for making injera (the traditional bread, made from teff in more productive areas of the country). Another 20 percent is used for feed and for local beer production, with the remainder held for seed. The entire plant is utilized, with sorghum stalks used for cooking (as firewood) and construction of houses while leaves are used as animal fodder.

As a close substitute of teff, consumption of sorghum declines when teff prices decline and vice versa. Per caput consumption of sorghum has increased in areas affected by adverse climate conditions which favour the production of sorghum (as drought tolerant crop) instead of other cereals. Moreover, because of the high prices of teff in recent years, even middle class households increased sorghum consumption, mixing sorghum with teff to make injera (USDA, 2012). The share of sorghum in total cereal consumption at national level has been tended to increase in recent years (Figure 2). It accounted for about 18 percent of the total cereal consumption in 2001-07.

Figure 2: Consumption trends of major staples in the total cereal consumption



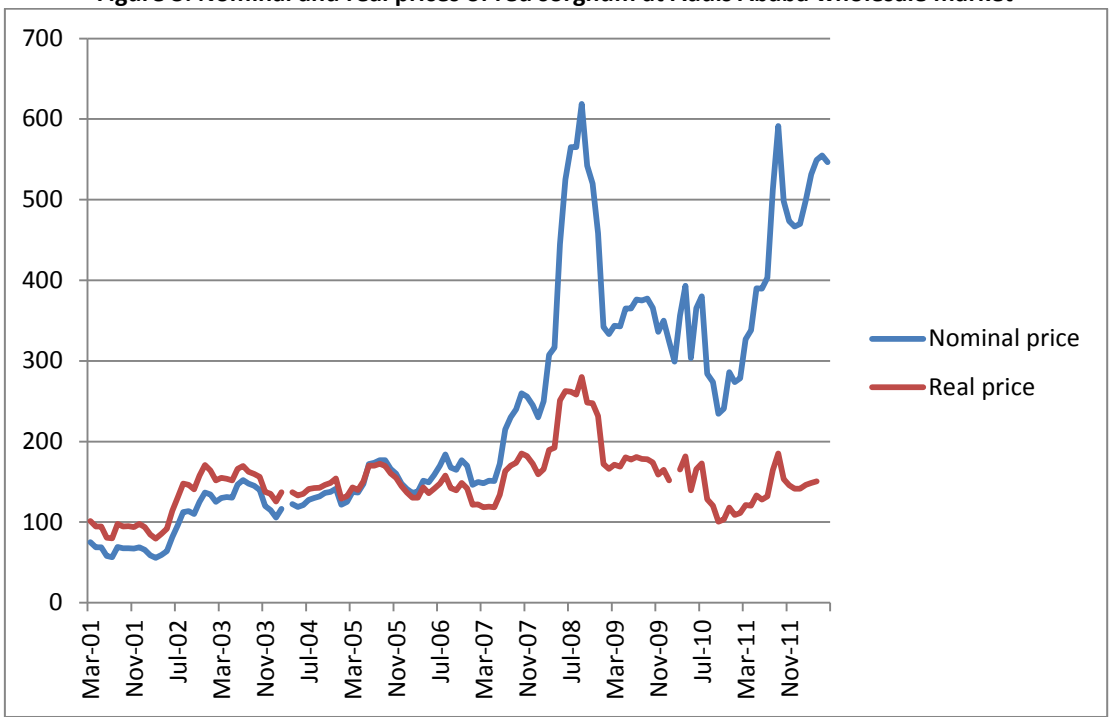
Source: Author's elaboration based on FAOSTAT data

MARKETING AND TRADE

The marketing system for sorghum in Ethiopia is poorly developed, and has limited industrial use. In the country, only 11.5 percent of the crop is sold with 74.0 percent being consumed at the local level. The remaining 9.2 percent is retained as seed and the rest is used as payment of wages in kind (1.2 percnet) and animal feed (0.9 per cent) (AATF, 2011).

Nominal prices of sorghum started rising in recent years, with major spikes towards the end of 2008 and early 2012 in the Addis Ababa central grain market. Howeer, real prices increased marginally in 2008 and have been falling for much of 2009 and 2010. Owing to high inflation rates, changes in real prices were minimal compard to the huge changes in nominal prices. Real sorghum prices in 2011-12, for instance, were mostly below the levels in 2000 (Figure 3).

Figure 3: Nominal and real prices of red sorghum at Addis Ababa wholesale market



Source: Giews Food Price Data and Analysis Tool

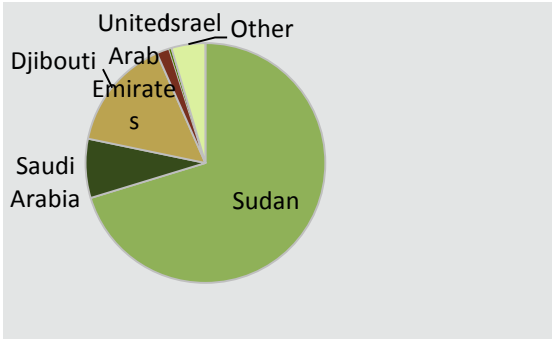
Commercial import or export of sorghum has not been significant in recent years. Sorghum Import is limited to food aid imports, amounting to 16 120 tonnes in 2005 and 253 000 tonnes in 2008. On the other hand, sorghum export is largely made up of informal in the northwest of the country closer to North Sudan.

According to UN COMMTRADE data, the country which was a net exporter in the first three years of the study period (2005-07) was a net importer in 2008-10 (Table 3). However, the volume of import was relatively significant in 2008 and 2010 (113 000 tonnes) and this is mainly attributed to food aid import, originating mainly from the US (Figure 4).

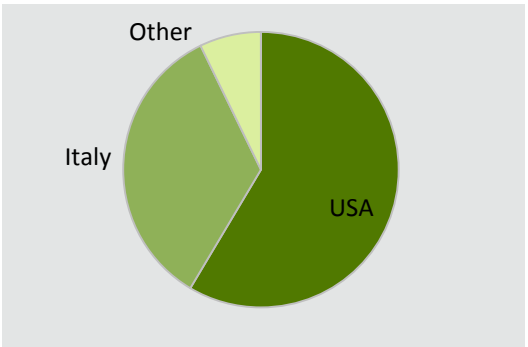
Table 3 Sorghum trade in Ethiopia (2005-2010)

Sorghum	2005	2006	2007	2008	2009	2010
Import Qt (T)	2 861	-	-	252 697	69 770	113 260
Export Qt (T)	13 420	1 371	2 402	2 224	-	21 786
Net trade	10 559	1 371	2 402	-250 473	-69 770	-91 474
Import (1 000 USD)	400	-	-	84 503	26 081	40 758
Export (1 000 USD)	13 420	1 371	2 402	2 224		21 786
Net trade (1 000 USD)	3 164	284	516	-83 868	-26 081	-33 317
Implicit value exports (USD/T)	266	207	215	286		342
Implicit value imports (USD/T)	140			334	374	360

Figure 4: Sorghum – exports from and import to Ethiopia



Export



Import

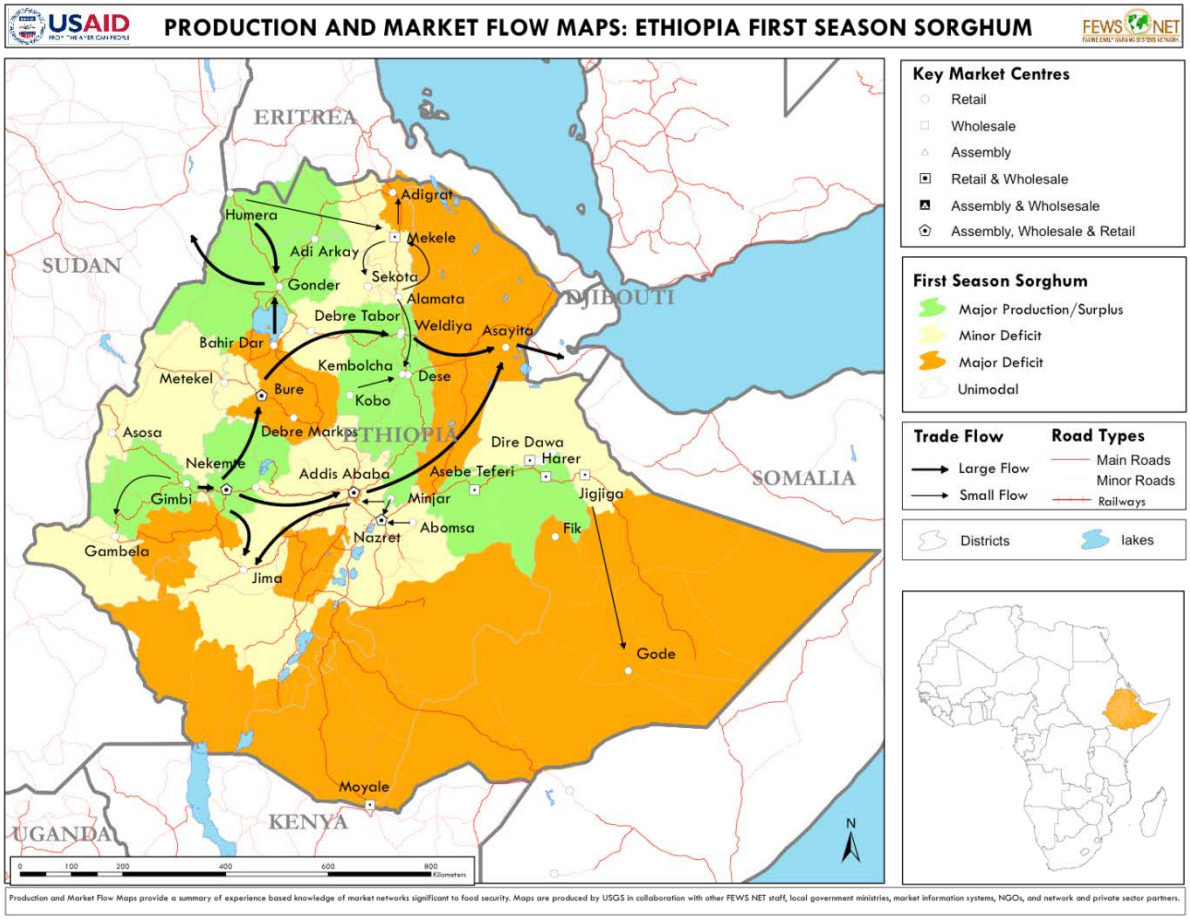
Source: Author's elaboration based on UNCOMTRADE data

DESCRIPTION OF THE VALUE CHAINE AND PROCESSING

Given that only about 13 percent of the national sorghum production is marketed, the value chain of sorghum remains underdeveloped. It is more widely traded in deficit, marginal and pastoral areas where transport and communication infrastructure is less developed. As shown in Figure 5 below,

sorghum from surplus areas is transported to deficit areas such as Mekele, Asayita, Dire Dawa (not shown in the figure), Jijiga and Gode, as well as Addis Ababa. The commodity flow pattern shows that cross-border export to the Sudan comes from Gonder, a major market for surplus producing areas in the north.

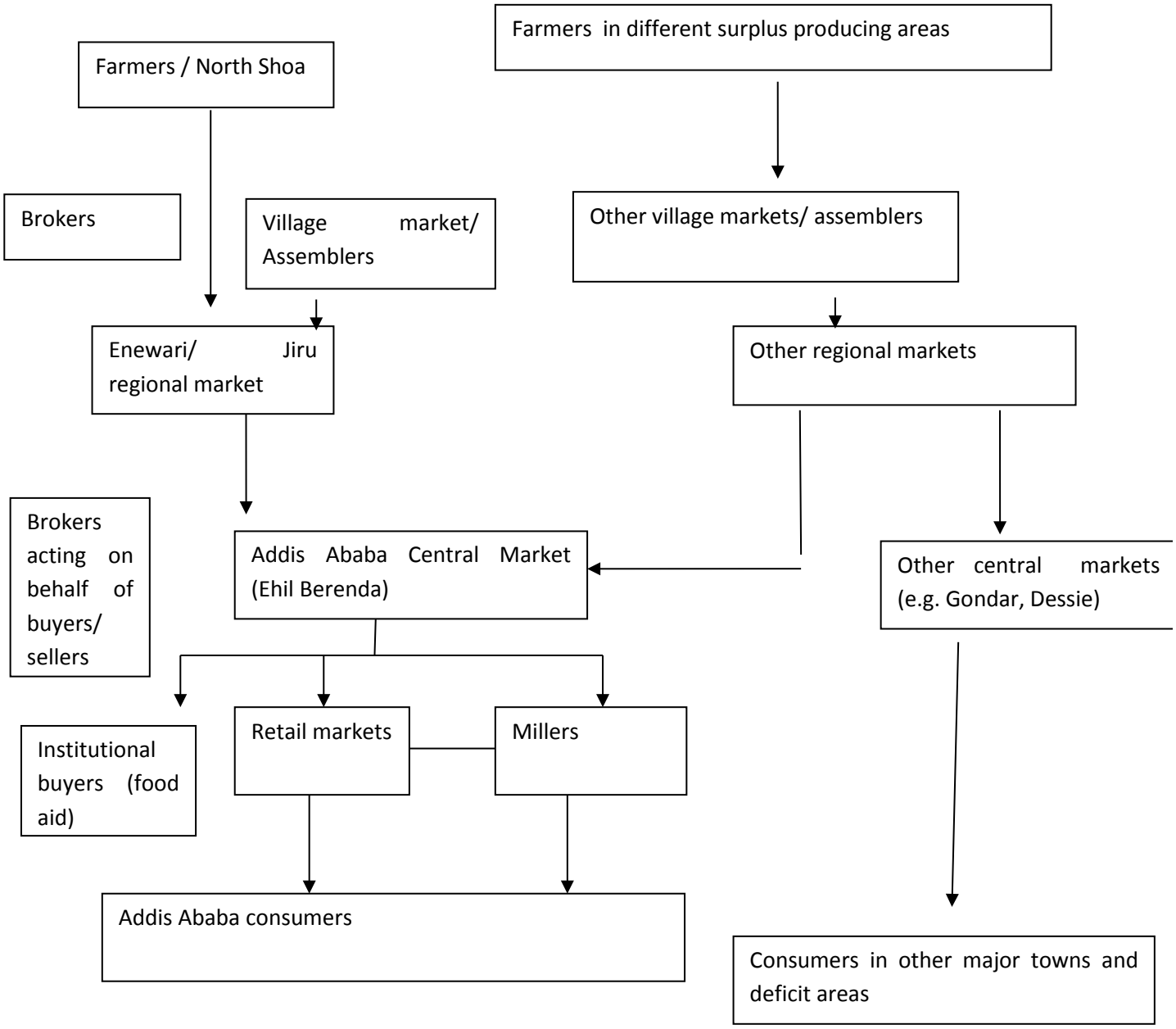
Figure 5: Production and market flow maps of sorghum



Source: FEWSNET

Sorghum marketing begins with rural assemblers who are the primary sales outlets. The assemblers operate in villages and small rural markets (Figure 6). They transport and sell to buyers such as wholesalers, retailers and consumers in the nearest bigger markets. The wholesalers in major production areas transport and sell most of their supplies to traders in the central markets with the help of brokers. They also sell to traders in food deficit areas and major consumption centers as well as to surrounding consumers. In recent years, cooperatives and their unions have started participating in sorghum marketing and it is estimated that they account for 15 percent of the marketable sorghum of small producers. They often act as assemblers and sell to wholesalers.

Figure 6: Sorghum value chain



Source: Based on USAID and COMPETE (2010)

POLICY DECISION AND MEASURES

Following the overthrow of the former military Government and the introduction of policy reforms in 1992, the market for sorghum, along with other cereals, has been liberalized. The sorghum market is dominated by small scale private traders with little or no participation of government or large scale operators.

The Ethiopian Commodity Exchange (ECX) was established in 2008 to provide a marketplace where buyers and sells can come together to trade. The Exchange has plans to expand its operation from export crops (coffee, sesame and haricot beans) to food crops but sorghum is not among the food crops identified (maize, wheat and teff) for ECX trading.

Sorghum production is predominantly based on traditional seeds with limited use of commercial fertilizer or other chemicals. There is a relatively strong sorghum research program in Ethiopia. In particular, the Ethiopian Institute of Agricultural Research has a long history of research on striga, parasitic weed. However, striga resistant/ tolerant varieties are not widely adopted. Among the main reasons is farmers' preference for local varieties in meeting their food and biomass needs (fuelwood, animal feed and construction). Research capacity to confer striga resistance to preferred sorghum varieties seems to be weak1.

The Agricultural Transformation Agency (ATA) has been established (2010) to enhance productivity and production of smallholder farmers and pastoralists as part of the current Five year (2011-15) Growth and Transformation Plan (GTP). The primary aim is to promote agricultural sector transformation by supporting existing structures of government. The Agency has identified its priority crops as teff, wheat, maize, barley, pulses, oilseeds, rice and livestock. It appears that sorghum is not one of the priority crops.

In short, sorghum is a neglected crop despite its considerable importance as a food security crop for the vast majority of vulnerable population. Sorghum production and marketing are affected by lack of government attention and inadequate support from research, agricultural programs and rural development policies.

[1] African Agricultural Technology Foundation (2011), Feasibility study on Striga control in Sorghum, Nairobi, AATF.

3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS

TRADE STATUS OF THE PRODUCT

Table 3 shows that Ethiopia was a net exporter of sorghum from 2005 to 2007, but a net importer in subsequent years. However, the quantity exported was very small. It is also difficult to trace the route through which the commodity was exported to the Sudan. The transaction seems to have taken place along one of the border towns with North Sudan (see Figure 5 above) and there is no information about access to the border town or the wholesale or producer market. Furthermore, export opportunities are limited because of the country's low level of productivity, significant unmet local demand and insignificant export opportunity (except in the form of a small cross-border trade). By contrast, sorghum import in deficit years is significant, and the trade flow is clear with the port of Djibouti serving as the point of entry. Hence, Ethiopia is treated as net importer of sorghum for the period 2005 to 2010.

BENCHMARK PRICES

Observed

The basis for calculating a reference parity price to determine whether sorghum producers receive market incentives or disincentives is to establish a benchmark (border) price, which represents the market price for sorghum that would prevail in the absence of domestic policy interventions and market inefficiencies. Since Ethiopia is generally considered an importer of sorghum, a nominal CIF price was taken as the benchmark price in this analysis.

Given that data on CIF prices for sorghum imports in Ethiopia was inconsistent and highly irregular, CIF (benchmark) prices were constructed using average annual unit value FOB prices for sorghum exports to Ethiopia from the United States (Ethiopia's main import partner for sorghum), which were adjusted by adding freight and other costs to arrive at the CIF (benchmark) prices in Djibouti (see Table 4). Average annual FOB prices used in this analysis is derived from monthly U.S Gulf FOB prices as reported by UNCOMTRADE for sorghum. Freight and other costs associated with transporting sorghum from the U.S. Gulf to Djibouti (obtained from USAID Bellmon study[2]) are then added to arrive at CIF Djibouti price

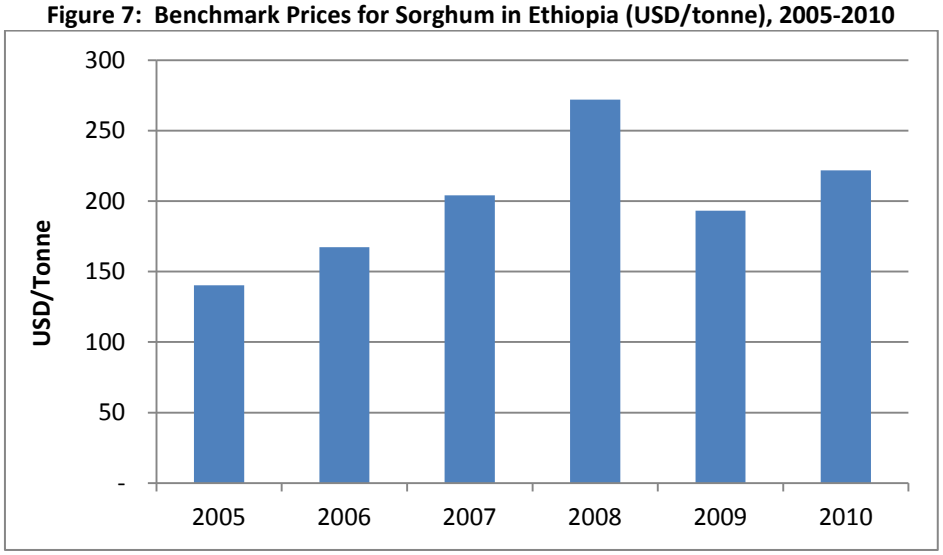
[2] *USAID, USAID Office of Food For Peace Ethiopia, Bellmon Estimation, Annex 1 Economic Data and Trends, September 2011*. The study is based on wheat but freight and other costs for sorghum are assumed to be the same as wheat.

Table 4: Benchmark Prices in Djibouti (USD/tonne), 2005-2010

	2005	2006	2007	2008	2009	2010
FOB U.S. Gulf	100.72	130.24	171.51	211.88	159.63	189.78
Ocean freight	38.05	35.00	30.00	56.67	31.08	30.00
Insurance	1.58	2.00	2.66	3.44	2.36	2.07
Unit value CIF price in Djibouti (Benchmark Price)	**140.35**	**167.23**	**204.17**	**271.99**	**193.07**	**221.85**

Source: *UNCOMTRADE data*

Figure 7: Benchmark Prices for Sorghum in Ethiopia (USD/tonne), 2005-2010



Source: Author's own calculation based on data obtained from *UNCOMTRADE data*

Adjusted

No adjustments to benchmark prices were made.

DOMESTIC PRICES

Red and white sorghum are the two main types of sorghum consumed in Ethiopia. White sorghum is most preferred for human consumption, so its price is often 40 to 80 percent higher than red sorghum. Since sorghum exported from the United States to international markets is primarily used for animal feed (Clay, 2003), it was assumed that the benchmark (CIF) price reflects the price for red sorghum, which is lower quality and less preferred by consumers. Based on this assumption, red sorghum was selected as the focus for this analysis. Thus, all domestic prices were collected and calculated for red sorghum as opposed to white.

Observed

Wholesale

Average annual wholesale prices for red sorghum in Addis Ababa were used in this analysis (see Table 5). These prices were derived from monthly wholesale prices available on the Ethiopian Grain Trade Enterprise's (EGTE) website (http://egtemis.com/marketstat.asp).

Table 5: Observed Wholesale Prices for Red Sorghum in Addis Ababa, 2005-2010

	2005	2006	2007	2008	2009	2010
ETB/tonne	1,536	1,590	1,971	4,453	3,561	3,118

Source: EGTE

Farm Gate

As stated previously, Enewari/Jiru (North Shoa), a major sorghum producing region situated 200 km north of Addis Ababa, was selected as the farm gate in this analysis. Due to lack of available data, farm gate prices were derived by deducting access costs from wholesale prices in Enewari/Jiru. Since the EGTE does not provide wholesale prices for sorghum in Enewari/Jiru, prices in Debre Berhan, located only 70 km from Enewari/Jiru, were used instead. The price difference was assumed to be insignificant due to the proximity of the two markets. However, the wholesale prices in Debre Berhan were only available for white sorghum, so the prices were adjusted to red sorghum prices using the white to red sorghum price ratio in Addis Ababa.

Access costs incurred by traders, who buy sorghum from local farmers and sell in Enewari/Jiru include local transport, handling and the trader's margin, are estimated, based on discussion with traders, as half of the estimated net margin obtained by traders selling sorghum in Addis Ababa (see Table 9). Observed farm gate prices for red sorghum in Enewari/Jiru, after the necessary adjustments, are shown in Table 6.

Table 6: Observed Farm Gate Prices for Red Sorghum in Enewari/Jiru (ETB/tonne), 2005-2010

	2005	2006	2007	2008	2009	2010
Wholesale price for white sorghum in Debre Berhan (taken as the wholesale price in Enewari/Jiru)	2100	2514	3109	6140	5883	5260
Adjustment factor for converting white sorghum to red sorghum	1.40	1.63	1.69	1.41	1.74	1.80
Wholesale price for red sorghum in Enewari/Jiru	1,505	1,547	1,838	4,357	3,373	2,920
Farm gate price for red sorghum in Enewari/Jiru (after deducting costs from Enewari/Jiru to farmgate	1,430	1,472	1,763	4307	3323	2870

Source: EGTE

Adjusted

No adjustments to wholesale or farm gate prices were made.

EXCHANGE RATES

Observed

The observed official mean annual exchange rates are derived from daily exchange rates applied in inter-bank transactions by the National Bank of Ethiopia[3]. The rates increased from Birr 8.67 to 12.89 Birr per USD between 2005 and 2010 (Table 7).

Table 7: Observed and adjusted exchange rate (Ethiopian Birr, ETB, per 1 USD), 2005-2010

	2005	2006	2007	2008	2009	2010
Official Exchange rate ETB/USD	8.67	8.74	9.21	9.80	12.10	12.89
Adjustment factor	1.20	1.20	1.20	1.20	1.20	1.20
Adjusted Exchange rate	10.40	10.49	11.05	11.76	14.52	15.47

Adjusted

Ethiopia has a floating exchange rate regime characterized by strong government control. The National Bank of Ethiopia is the sole provider of foreign exchange, and only authorized banks and investors who are able to bid for at least 0.5 million USD are allowed to participate in the weekly foreign exchange auction. The marginal rate of each auction serves as the official rate until a new rate is established in the next round a week later.

It is believed that the domestic currency, Birr, was overvalued, especially in 2008, 2009 and 2010. According to Rashid (2010), the extent of overvaluation was estimated at 40 percent during this period, and the government was forced to devalue Birr by 25 percent in September 2010. Another study showed that the real exchange rate appreciated by 9.7, 12.8, 14.9, 33.8 and 26.3 percent in July 2005, July 2006, July 2007, July 2008 and June 2009, respectively (Dorosh et al., 2009).

The high rate of inflation (relative to the low inflation rate among its trading partners) and increasing pressure on the country's foreign exchange reserve have been cited as the major causes of currency appreciation in Ethiopia. Between 2005 and 2008, inflation rates hit double digits and then declined to 8.5 and 7 percent in 2009 and 2010, respectively. Furthermore, in 2007 and 2008, the foreign currency reserve fell short of the critical requirement of 12 weeks worth of the country's total imports. As a result, the government instituted foreign exchange rationing in March 2008, which restricted access to foreign exchange for imports in order to curb excessive drawdown of the country's foreign exchange reserve (Rashid, 2010).

[3] http://www.nbe.gov.et/market/dailyexchange.html

Based on this information, it was assumed that the local currency was, on average, 20 percent overvalued during the period 2005-2010. Therefore, the exchange rates were adjusted accordingly for years under review (see Table 8). The adjustment factor approximates the depreciation of the local currency had a more liberal policy been pursued.

ACCESS COSTS

Observed

Border to Wholesale

Observed access costs from the Djibouti Port (border) to Addis Ababa (wholesale) include a surtax and withholding tax, port handling, transport, unloading and miscellaneous costs (equal to 5 percent of the CIF price). These cost estimates (shown in Table 8) were based on a 2010 USAID Bellmon study. Margin for traders is included under miscellaneous costs. Access costs obtained from major grain traders and their associations are broadly consistent with the USAID cost estimates used in this analysis.

Table 8: Observed and Adjusted Access Costs from Djibouti to Addis Ababa

		2005	2006	2007	2008	2009	2010
Surtax & Withholding tax	ETB/quintal	5.14	6.20	8.27	11.85	9.74	9.22
Port Handling	ETB/quintal	23.30	23.30	23.30	23.30	23.30	23.30
Transport costs	ETB/quintal	38.00	38.00	38.67	43.75	52.75	57.00
Unloading	ETB/quintal	3.20	3.20	3.20	3.20	3.20	3.20
Miscellaneous (5% of CIF)/ quintal	8.57	10.34	13.79	19.76	16.23	15.37	8.57
Total costs - observed	ETB/quintal	782	810	872	1,019	1,052	1,081
Total costs – adjusted (less surtax & withholding tax	ETB/tonne	731	748	790	900	955	989

Source: Based on USAID, 2011

Farm Gate to Wholesale

Access costs from Enewari/Juru (farm gate) to Addis Ababa (wholesale) for the different years are based on information gathered from group discussion with traders/brokers and traders associations at the Addis Ababa central grain market. These costs include loading, transport, fees for brokers of truck service, unloading, storage, losses, fees for brokers selling sorghum in Addis Ababa and margins for traders. Some of these costs are only faced under rare occasions. For example, in cases where brokers are unable to sell the grain on truck, they are forced to unload at a nearby warehouse, incurring unloading and storage costs as well as losses due to rodents and other problems. All itemized costs as well as the total observed access costs from the farm gate to wholesale are provided in Table 9.

As shown in Table 8, estimated margins[4] are relatively high, but have tended to decline between 2005 and 2010. A recent study also found that net margins declined significantly in 2008 compared to 1996 and 2002 (Rashid and Negassa, 2011). One possible reason is that prices are already too high,

[4] Traders believe that actual profit margins are not well known as purchase prices vary by the day and so is the sales price.

so traders find it difficult to increase their margins. It is also possible that trade has become more competitive and margins have been squeezed. Traders have indicated that profits decline with soaring prices, as most customers cut back on their purchases.

Table 9: Observed Access Costs from farmgate to Enewari/Jiru and to Addis Ababa, 2005-2010

	Unit	2005	2006	2007	2008	2009	2010
Enewari/Jiru to Addis Ababa							
Loading	ETB/tonne	20	20	20	20	30	30
Transportation costs	ETB/tonne	100	100	150	200	250	300
Broker fees for truck service - per tonne	ETB/tonne	4	5	10	10	12	13
Brokers' fee for selling grain in Addis	ETB/tonne	10	10	15	20	25	30
Estimated margins for traders	ETB/tonne	150	150	150	100	100	100
Total costs	ETB/tonne	284	300	365	395	452	513
Farmgate to Enewari/ Jiru							
Local transport, handling and the trader's margin (from farmgate to Enewari/Jiru)	ETB/tonne	75	75	75	50	50	50

Source: Based on information collected from traders and trader association at the central grain market, Ehil Berenda, Addis Ababa

Adjusted

Border to Wholesale

Since transport costs used in this analysis (as obtained from the USAID study) are less than .06 USD/tonne/km, which is considered reasonable by African standards[5] (though not by the Ethiopian Government's standards[6]), no adjustments were made to the observed transport costs.

[5] Transport prices in Africa are, on average, higher than in South Asia or Brazil. In 2007, prices (per ton-kilometer (tkm)) on the Central African Douala–N'Djame´na route (linking Cameroon with Chad) are more than three times higher (11 US cents/ per ton/km) than in Brazil (3.5 cents per ton per km) and more than five times higher than in Pakistan (2 cents per ton per km). Only the Durban–Lusaka corridor (6 cents per ton per km) in Southern Africa approaches the price level of other regions of the world. Our observed cost varied between 4.5 and 4.8 cents, which is not too high, given the inefficiency and long delays at the points of loading and unloading, the recent high cost of fuel, and poor road conditions, among other factors. See for instance, Teravaninthorn, S. and Gaël Raballand, Transport Prices and Costs in Africa: A Review of the Main International Corridors, Africa Infrastructure Country Diagnostic (AICD), Working Paper 14, July 2008 (http://www.infrastructureafrica.org/system/files/WP14_Transportprices.pdf).

[6] A recent government report indicated that the price/ton/km of transporting commodities via the Djibouti corridor is very high compared to other countries: the price/ton/km in Ethiopia is 6 US cents, compared to 2.3 cents in Pakistan or 4 cents in Brazil. The high cost is associated with excessive downtime and high inefficiency in fuel consumption. On average, a vehicle can make a maximum of 3 round trips per month, while it is possible to do 5. See for instance, The

However, surtax and withholding tax has been deducted from the observed access cost to arrive at adjusted access cost from border to wholesale market in Addis Ababa (see Table 8).

Farm Gate to Wholesale

Transport costs, the major component of the total access costs, more than doubled between 2005 and 2010 in nominal terms. This was mainly due to the high cost of fuel, high inflation rates and the use of smaller trucks (often less than 10 tonne capacity) rather than larger trucks with lower costs per unit. In terms of USD/tonne/km, the price increased from .06 USD in 2005 to .12 USD in 2010, indicating that the observed transport costs far exceeded the transport costs reported along the Djibouti-Addis Ababa roadway as well as the costs considered reasonable by African rates (as discussed above). Consequently, transport costs from Enewari/Juru to Addis Ababa were reduced by 20 percent in 2008 and 2009 and by 25 percent in 2010 (Table 10). This adjustment was intended to lower transport cost to between .06 and .09 USD/tonne/km, which is only slightly higher than the rates used along the Djibouti-Addis Ababa road.

Table 10: Observed and adjusted transport costs

		2005	2006	2007	2008	2009	2010
Transportation costs	USD/km/tonne	0.058	0.057	0.081	0.102	0.103	0.116
Adjustment factor (transport cost reduced by 20 – 25% to arrive at 6 to 8.7 US cents/km/tonne		0%	0%	0%	20%	20%	25%
Adjusted transportation costs	USD/km/tonne	0.058	0.057	0.081	0.082	0.083	0.087
Transport cost difference (unadjusted less adjusted)	ETB/tonne	-	-	-	40	50	75
Adjusted total cost	ETB/tonne	274	290	350	325	365	395

EXTERNALITIES

No externalities are taken into consideration at this stage of the analysis.

BUDGET AND OTHER TRANSFERS

There are no fertilizer subsidies in Ethiopia, as the government removed input subsidy in 1997.

Reporter (newspaper), 11 February, 2012: http://www.thereporterethiopia.com/News/govt-to-tighten-grip-on-trade-logistics.html

QUALITY AND QUANTITY ADJUSTMENTS

Quality differences between domestic and foreign sorghum were taken into account, since the latter is mainly used for animal feed and ethanol, while the former is mainly used as human food. The price of lower quality, red sorghum is used for the analysis to address this quality difference.

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 Ethiopia.

Table 11: Sources of Data Used in the Calculation of Indicators

		Description	
Concept		***Observed***	***Adjusted***
Benchmark price		*CIF Djibouti price calculated by adding freight and other costs to FOB* US No.2 Yellow. U.S. Gulf (Friday) *(see Table 5)*	*N.A.*
Domestic price at point of competition		*Annual average of wholesale price in Addis Ababa market as reported by Ethiopia Grain Trade Enterprise (see Table 6)*	*N.A*
Domestic price at farm gate		*Annual average of wholesale price in main producing area (D/Berhan) as reported by Ethiopia Grain Trade Enterprise (see Table 6)*	*Farm gate price is obtained by deducting local traders' margin from the wholesale price of D/Berhan.*
Exchange rate		*Annual average of exchange rate as reported by National Bank of Ethiopia*	*Increased by 20 per cent assuming an overvaluation as reported by Rashid (2010)*
Access cost to point of competition		*Loading, Transportation costs, Broker fees for truck - per tonne, Broker's fees for selling grain in Addis, Estimated margins for traders (seeTable 8)*	*Transport cost adjusted*
Access costs to farm gate		*Gross margin of local traders and assemblers who buy from farmers*	*N.A.*
QT adjustment	Bor-Wh	*N.A.*	*N.A.*
	Wh-FG	*N.A.*	*N.A.*
QL adjustment	Bor-Wh	*N.A.*	*N.A.*
	Wh-FG	*N.A.*	*N.A.*

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

Table 12: Data used for the analysis

		Year	2005	2006	2007	2008	2009	2010
		trade status	m	m	m	m	m	m
DATA	*Unit*	*Symbol*						
Benchmark Price								
Observed	USD/TONNE	$P_{b(intD)}$	140	167	204	272	193	222
Adjusted	USD/TONNE	P_{ba}						
Exchange Rate								
Observed	ETB/TONNE	ER_o	8.67	8.74	9.21	9.8	12.1	12.89
Adjusted	ETB/TONNE	ER_a	10.4	10.49	11.05	11.76	14.52	15.47
Access costs border - point of competition								
Observed	ETB/TONNE	ACo_{wh}	782	810	872	1,019	1,052	1,081
Adjusted	ETB/TONNE	ACa_{wh}	731	748	790	900	955	989
Domestic price at point of competition	ETB/TONNE	P_{dwh}	1,536	1,590	1,971	4,453	3,561	3,118
Access costs point of competition - farm gate								
Observed	ETB/TONNE	ACo_{fg}	284	300	365	395	452	513
Adjusted	ETB/TONNE	ACa_{fg}	284	300	365	355	402	438
Farm gate price	ETB/TONNE	P_{dfg}	1,430	1,472	1,763	4307	3323	2870
Externalities associated with production	ETB/TONNE	E	1	1	1	1	1	1
Budget and other product related transfers	ETB/TONNE	BOT	1	1	1	1	1	1
Quantity conversion factor (border - point of competition)	Fraction	QT_{wh}	1	1	1	1	1	1
Quality conversion factor (border - point of competition)	Fraction	QL_{wh}	1	1	1	1	1	1

CALCULATION OF INDICATORS

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

Box 1: MAFAP POLICY INDICATORS

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

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

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

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

The $NRPo_{fg}$ captures all trade and domestic policies, as well as other factors which impact on the incentive or disincentive for the farmer. The $NRPo_{wh}$ helps identify where incentives and disincentives may be distributed in the commodity market chain.

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

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

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

4. INTERPRETATION OF THE INDICATORS

Price gaps

MAFAP analysis is based on comparison between domestic prices, both at farm gate and wholesale levels, and reference prices. Reference prices reflect prices that producers could get in the absence of policies. Indicators of price difference between domestic and references prices are calculated at wholesale and farm level (see Box 1 for details of the methodology used to calculate the different indicators).

Figure 7 (extracted from Annex 1 of the complete excel sheet) shows that the price gaps between domestic and reference prices are negative in four years and positive in two years of the study period (see also Table 13). Unadjusted prices at wholesale level or at the point of competition were above the reference prices in 2008 and 2009, when domestic prices were generally very high. Adjusted wholesale price gap was positive only in 2008. Wholesale prices (adjusted and unadjusted) were negative in the rest of the study years (2005-07 and 2010). Low wholesale prices do not encourage import of sorghum. Traders may not consider import even when domestic prices are high because such situations may be short-lived. On the other hand, export is not an option because of high transport and transaction costs. Limited quantity of sorghum available for export and lack of export facilitating infrastructure and institutions (e.g. safety and quality standards) may also imply the country cannot be export competitive.

The situation is similar at farm gate level: unadjusted and unadjusted price gaps were positive in 2008 and 2009. The incentive to produce sorghum is weak, except in 2008 and 2009 when domestic prices were relatively high. Positive incentives (positive price gaps) do not appear to last long and producers may consider high prices as temporary departures from a more general pattern of low prices. As shown above (Figure 3), sorghum prices have remained very low until 2007, and even after 2007, real prices have not shown a marked increase.

Figure 8: MAFAP price gaps for sorghum in Ethiopia 2005-2010 (Birr/tonne)

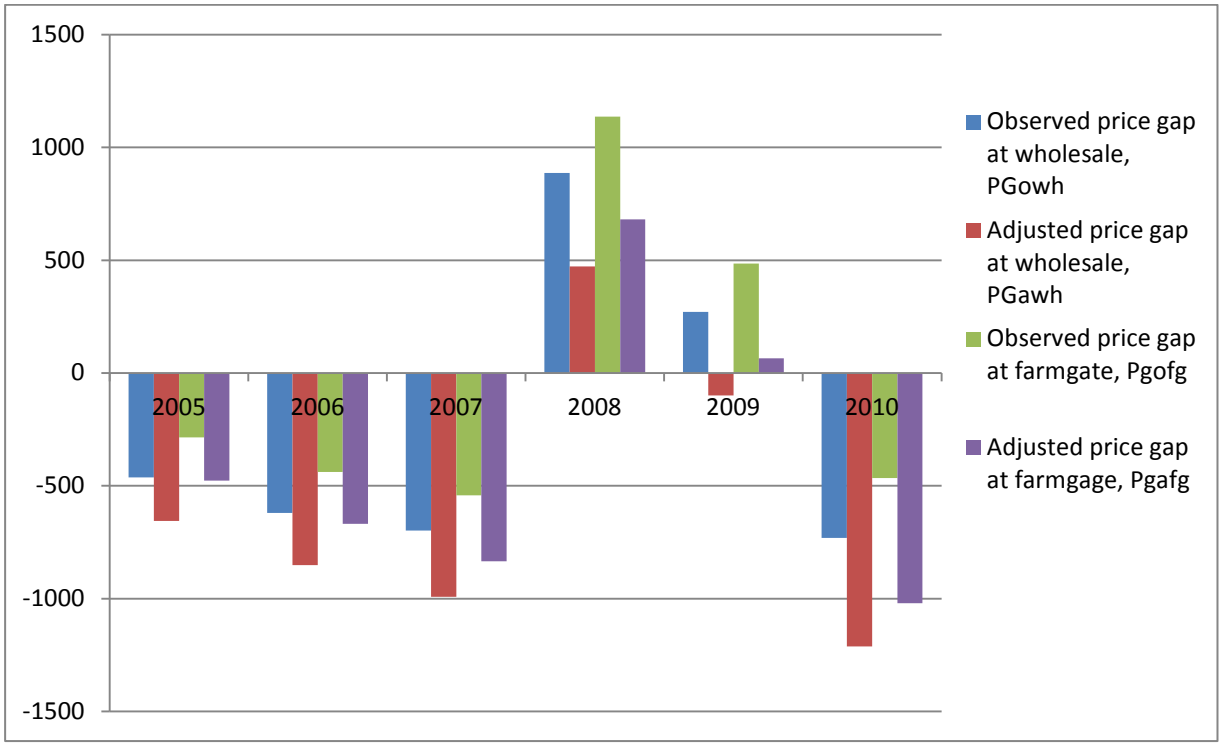


Table 13: MAFAP price gaps for sorghum in Ethiopia 2005-2010 (Birr/tonne)

	2005	2006	2007	2008	2009	2010
Trade status for the year	m	m	m	m	m	m
Observed price gap at wholesale	-463	-620	-698	887	270	-731
Adjusted price gap at wholesale	-655	-851	-991	472	-99	-1211
Observed price gap at farm gate	-285	-438	-541	1136	484	-466
Adjusted price gap at farm gate	-477	-668	-835	682	65	-1020

Source: Author's calculations based on our estimation.

Nominal rate of protection

The nominal rate of protection (NRP) is negative at the wholesale as well as at the farm gate levels except in 2008 and 2009 (Figure 8 and Table 12, based on Annex 1). The observed (unadjusted) NRP at wholesale level (NRPowh) averaged -10 percent in 2005-10, with a high of +25 percent in 2008 and a low of -28 percent in 2006. The extent of the disincentive worsens with adjusted NRP, averaging -20 percent during the study period. The results confirm that sorghum buyers or consumers are generally paying less than the equivalent border prices, while producers are implicitly taxed.

Figure 9: MAFAP nominal rate of protection sorghum in Ethiopia 2005-2010 (%)

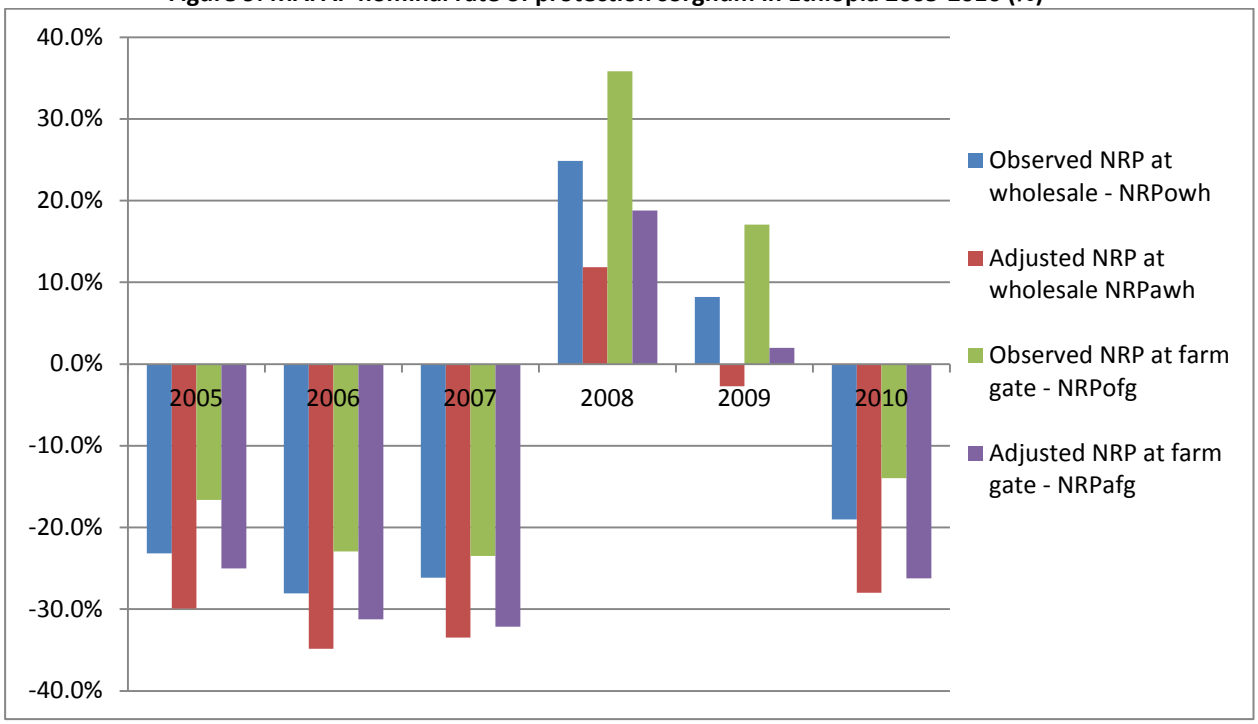


Table 14: MAFAP nominal rates of protection (NRP) for sorghum in Ethiopia 2005-2010 (%)

	2005	2006	2007	2008	2009	2010
Trade status for the year	m	m	m	m	m	m
Observed NRP at wholesale	-23.2%	-28.1%	-26.1%	24.9%	8.2%	-19.0%
Adjusted NRP at wholesale	-29.9%	-34.9%	-33.5%	11.9%	-2.7%	-28.0%
Observed NRP at farm gate	-16.6%	-22.9%	-23.5%	35.8%	17.1%	-14.0%
Adjusted NRP at farm gate	-25.0%	-31.2%	-32.1%	18.8%	2.0%	-26.2%

Source: Author's calculations based on our estimation.

5. CONCLUSIONS AND RECOMMENDATIONS

MAIN MESSAGE

The results of the MAFAP price indicators show that the level of disincentive in sorghum production is significant. Producers gained as a result of the recent high world prices (2008 and 2009) but the favorable environment did not last long. Overvalued exchange rates and the Government policy of banning export and distributing imported cereals at subsidized prices (at times of high food prices) have kept domestic cereal prices relatively low. Food aid, which accounts for a significant share of cereal consumption, may have also contributed to the lower domestic price levels[7].

On the other hand, reference prices are high in Ethiopia because of high transaction and transport costs, in addition to the fact that the country is land-locked. These problems have also meant a substantial gap between import and export parity prices, implying limited opportunity to moderate price fluctuations between extreme of import and export parity prices.

The policy environment needs to improve to enhance long term investment in sorghum production and structural transformation of agriculture. Ethiopia has a huge and rapidly growing domestic market for sorghum. As teff prices have soared in recent years, sorghum has become the most affordable substitute for low income people in urban areas. Sorghum is also a preferred substitute among rural communities who produce teff as cash crop (for sale). As a food security crop, the government needs to improve the incentive environment and increase investment to boost the production and productivity of sorghum.

There is no evidence of monopolistic pricing by traders as trade margins appear to have declined, especially in years of very high prices. The grain market is dominated by small traders with little market power. On the other hand, transport costs from farm gate to wholesale market in Addis Ababa were found to be high and this can be attributed to the use of smaller trucks rather than bigger trucks and bulk transport systems. Household production and market supply levels are particularly low and scattered for sorghum. In addition to building roads, the Government should facilitate the dissemination of improved sorghum technologies along with measures to encourage the transition from small scale to large scale grain transport and trading practices.

With expansion in production and improved marketing system, it is possible to increase demand for sorghum through diversifying its use into animal feed, ethanol and malt for breweries, and promoting export to regional markets. A well-developed food processing and feed mill sector would have a positive impact on production incentives. Sorghum can be used to transform the livestock sector.

[7] Food aid flows are estimated to have depressed domestic prices within the ranges of 2 to 26 percent for wheat, 3 to 13 percent for maize, and 2 to 11 percent for teff during the period 1981 to 2002 (Rashid, Assefa and Ayele, 2007).

PRELIMINARY RECOMMENDATIONS:

- As a drought tolerant crop, a preferred grain for making ingera (traditional bread) among the rural and urban poor, and as cereal grown by most vulnerable households, sorghum deserves special attention as one of the most important food security crops in government policies and investment programs. The Agricultural Transformation Agency (ATA) needs to include sorghum as one of its priority crops for enhanced support.
- Policy makers need to reconsider policies, including currency overvaluation and export bans, that resulted in implicit taxation of cereal production, including sorghum;
- Policies that transform the current state of limited trade and support regional export and import of sorghum can have a significant positive impact in stabilizing and improving the price incentive for producers and value chain operators;
- Transforming the current subsistence-oriented sorghum production needs to start with improving the market and the incentive environment followed by measure to improve access to new technologies such as striga-resistent cultivars;
- Given that major sorghum production areas are located in low-lying remote areas, the incentive environment cannot improve without attractive schemes for investors in the value chain of sorghum and significant investment in transport and storage infrastructure;
- Government policy should be informed by the fact that low domestic prices are good for consumers only in the short run. Long-term and sustained gain to consumers can only be achieved through improved incentive to producers that translate into increased production, hence lower prices in the long term.

LIMITATIONS

Data on price and access costs are more limited for sorghum than the other major staples (teff, maize and wheat). Information on access costs was collected by an assistant who collected primary data through interviews with a small number of traders and representatives of trader associations. The data reveals a lot of interesting features of the maize market but further investigation and consultations with relevant Government and private organizations are required to validate the access data.

FURTHER INVESTIGATIONS AND RESEARCH

Farm gate prices were estimated based on wholesale prices observed in a town (Enewari/Jiru) located in one of the major maize producing area. Refinement of the results should include obtaining actual farm gate prices for Jimma as well as other locations in different maize producing areas.

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ANNEX I: Methodology Used

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

ANNEX II: Data and calculations used in the analysis

Name of product	Sorghum
International currency	

Local currency	ETB

	DATA		Unit	Symbol	Year trade status	2005	2006	2007	2008	2009	2010
						m	m	m	m	m	m
	Benchmark Price										
1		Observed	USD/TON	$P_{b(int\$)}$		140.35	167.23	204.17	271.99	193.07	221.85
1b		Adjusted	USD/TON	P_{ba}							
	Exchange Rate										
2		Observed	ETB/US$	ER_o		8.67	8.74	9.21	9.80	12.10	12.89
2b		Adjusted	ETB/US$	ER_a		10.40	10.49	11.05	11.76	14.52	15.47
	Access costs border - point of competition										
3		Observed	YYY/TON	ACo_{wh}		730.68	748.37	789.52	900.05	954.81	988.65
3b		Adjusted	YYY/TON	ACa_{wh}							
4	Domestic price at point of competition		YYY/TON	P_{dwh}		1,535.63	1,589.75	1,971.17	4,452.64	3,560.51	3,117.61
	Access costs point of competition - farm gate										
5		Observed	YYY/TON	ACo_{fg}		284.00	300.00	365.00	395.00	452.00	513.00
5b		Adjusted	YYY/TON	ACa_{fg}		284.00	300.00	365.00	355.00	402.00	438.00
6	Farm gate price		YYY/TON	P_{dfg}		1,429.53	1,471.87	1,762.56	4,306.70	3,322.61	2,870.29
7	Externalities associated with production		YYY/TON	E							
8	Budget and other product related transfers		YYY/TON	BOT		1.00	1.00	1.00	1.00	1.00	1.00
	Quantity conversion factor (border - point of competition)		Fraction	QT_{wh}		1.00	1.00	1.00	1.00	1.00	1.00
	Quality conversion factor (border - point of competition)		Fraction	QL_{wh}		1.00	1.00	1.00	1.00	1.00	1.00
	Quantity conversion factor (point of competition - farm gate)		Fraction	QT_{fg}		1.00	1.00	1.00	1.00	1.00	1.00
	Quality conversion factor (point of competition - farm gate)		Fraction	QL_{fg}		1.00	1.00	1.00	1.00	1.00	1.00

	CALCULATED PRICES		Unit	Symbol	2005	2006	2007	2008	2009	2010
	Benchmark price in local currency									
9		Observed	YYY/TON	$P_{b(loc\$)}$	1,216.37	1,461.61	1,879.39	2,665.54	2,335.36	2,860.15
10		Adjusted	YYY/TON	$P_{b(loc\$)a}$	1,459.65	1,753.93	2,255.27	3,198.65	2,802.44	3,432.18
	Reference Price at point of competition									
11		Observed	YYY/TON	RPo_{wh}	1,947.05	2,209.98	2,668.91	3,565.59	3,290.17	3,848.80
12		Adjusted	YYY/TON	RPa_{wh}	2,190.32	2,502.30	3,044.79	4,098.70	3,757.24	4,420.83

	Reference Price at Farm Gate									
13		*Observed*	YYY/TON	RPo_{fg}	1,663.05	1,909.98	2,303.91	3,170.59	2,838.17	3,335.80
14		*Adjusted*	YYY/TON	RPa_{fg}	1,906.32	2,202.30	2,679.79	3,743.70	3,355.24	3,982.83

	INDICATORS		*Unit*	*Simbol*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
	Price gap at point of competition									
15		*Observed*	YYY/TON	PGo_{wh}	(411.42)	(620.23)	(697.74)	887.05	270.34	(731.19)
16		*Adjusted*	YYY/TON	PGa_{wh}	(654.70)	(912.55)	(1,073.62)	353.94	(196.74)	(1,303.22)
	Price gap at farm gate									
17		*Observed*	YYY/TON	PGo_{fg}	(233.52)	(438.11)	(541.35)	1,136.11	484.44	(465.51)
18		*Adjusted*	YYY/TON	PGa_{fg}	(476.79)	(730.43)	(917.22)	563.00	(32.63)	(1,112.54)
	Nominal rate of protection at point of competition									
19		*Observed*	%	$NRPo_{wh}$	-21.13%	-28.06%	-26.14%	24.88%	8.22%	-19.00%
20		*Adjusted*	%	$NRPa_{wh}$	-29.89%	-36.47%	-35.26%	8.64%	-5.24%	-29.48%
	Nominal rate of protection at farm gate									
21		*Observed*	%	$NRPo_{fg}$	-14.04%	-22.94%	-23.50%	35.83%	17.07%	-13.95%
22		*Adjusted*	%	$NRPa_{fg}$	-25.01%	-33.17%	-34.23%	15.04%	-0.97%	-27.93%
	Nominal rate of assistance									
23		*Observed*	%	NRAo	-14%	-0.2288534	-0.23453418	0.3586418	0.17104089	-0.13924964
24		*Adjusted*	%	NRAa	-24.96%	-33.12%	-34.19%	15.07%	-0.94%	-27.91%

	Decomposition of PWAfg	*Unit*	*Symbol*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
25	International markets gap	YYY/TON	IRG	-	-	-	-	-	-
26	Exchange policy gap	YYY/TON	ERPG	(243.27)	(292.32)	(375.88)	(533.11)	(467.07)	(572.03)
27	Access costs gap to point of competition	YYY/TON	ACG_{wh}	-	-	-	-	-	-
28	Access costs gap to farm gate	YYY/TON	ACG_{fg}	-	-	-	(40.00)	(50.00)	(75.00)
29	Externality gap	YYY/TON	EG	-	-	-	-	-	-

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