



MAFAP
SPAANA

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

**ANALYSIS OF INCENTIVES AND DISINCENTIVES
FOR TEFF IN ETHIOPIA**

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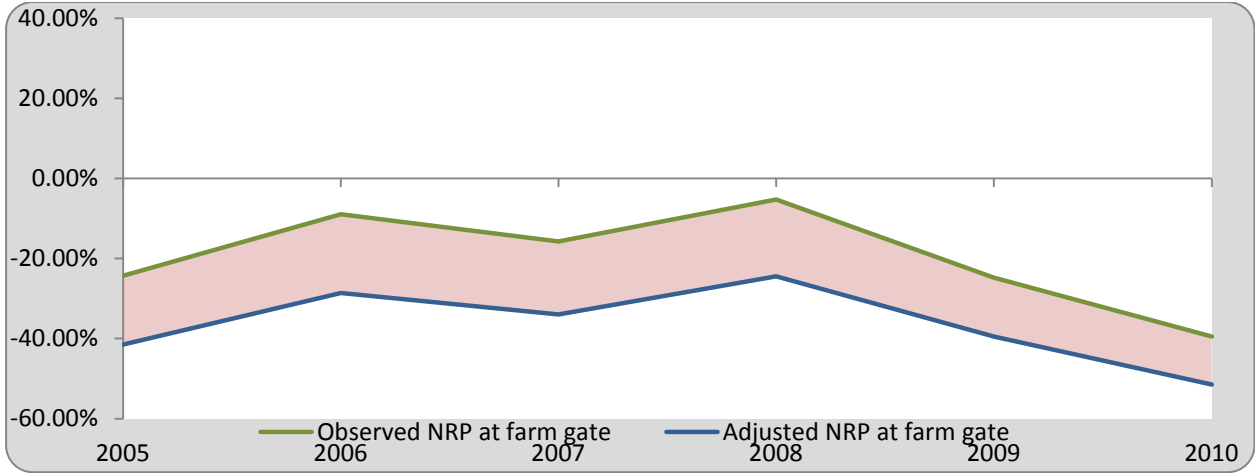
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SUMMARY OF THE NOTE

Product: Teff
 Period analyzed: 2005 – 2010
 Trade status: Export in all years

- Teff accounts for the largest share of cereal area under cultivation;
- Ethiopia and Eritrea are the only producers of teff in the world;
- Area under teff cultivation expanded from 2.14 million ha in 2004/05 to 2.76 million in 2010/11;
- Teff accounted for about 11 percent of the per capita calorie intake in 2001/07;
- Teff is the single most important staple in urban areas, accounting for 30% per capital calorie intake in 2001/07;
- Teff is grown mainly as a cash crop by most farmers;
- The teff 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 teff producers were implicitly taxed between 2005 and 2010. The high negative rate of protection in 2010 suggests that policy environment tended to improve in 2008 has worsened in recent years.

- Our results show that disincentives are substantial and arise from 1) export ban, especially on export to Eritrea, overvalued exchange rate, 3) distribution of imported wheat at subsidized prices (with negative implications for substitute crops such as teff), and 4) weak market structure and high transport costs;
- Less implicit taxation and improved prices of teff will improve the livelihood of around 50% of small farmers in the country;
- There are new technologies of teff which can dramatically increase yield but farmers are unlikely to adopt them unless teff market is expanded to include export and prices are attractive;
- Actions to be taken to reduce disincentives could include: (1) lifting export ban; (2) addressing currency overvaluation; (3) supporting the development of market structure and the grain value chain; and (4) reducing the distribution of non-targeted, subsidized grain.

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1. PURPOSE OF THE NOTE

This technical note aims to describe the market incentives and disincentives for teff 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. POLICY CONTEXT

Grown as food grain only in one other country, Eritrea, teff is the most important cereal, both in terms of production and consumption in Ethiopia. As the most preferred cereal among better off households, especially urban areas, teff fetches relatively high price in the market, making it attractive cash crop to farmers. It is nutritionally rich with high levels of iron and calcium, as well as highest amount of protein among cereals consumed in Ethiopia. It ranks low on the glycemic index (making it suitable for consumption by Type II diabetics), is gluten free and is high in fibre. Teff is relatively resistant to many biotic and abiotic stresses and can be grown under different agro-ecological conditions, ranging from lowland to highland areas. Teff can also be stored for many years without being seriously damaged by common storage insect pests.

PRODUCTION

Table 1 shows the total area, yield and production of the main crops cultivated for the period 2004/05-2010/11. Among cereals, teff accounts for the largest share of the cultivated area (28.5 percent in 2011), followed by maize (with 20.3 percent). Teff is second (to maize) in terms of quantity of production. However, because its market price is often two or three times higher than maize, teff accounts for the largest share of the total value of cereal production. Teff is grown by a total of 6.2 million farmers. Since teff farm operations such as land preparation, weeding and harvesting are highly labor intensive, with limited availability of suitable mechanical technology, there are no large scale teff farmers in the country. Many farmers grow teff as cash crop because of its higher and more stable market price (see below).

According to the data of the Central Statistical Agency (CSA), teff production expanded by 72 percent between 2004/05 and 2010/11. This growth was achieved mainly due to 29 percent expansion in area under cultivation and 33 percent increase in yield levels (Table 1). The share of teff in total cultivated areas increased by 2 percent, compared to the decline in barely (25 percent) and wheat (12 percent), and rapid expansion in coarse grains (maize, 11 percent, and sorghum, 19 percent).

With only 1.3 tonnes per hectare, teff yield is the lowest among cereal crops. This is mainly due to limited use of improved seeds, inefficient agronomic practices and fragmented farm plots.

Table 1: Cereals area and production (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	11907			11823	20349			20.5	70.9		
Cereals	7638	10031			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

Table 2 shows teff area cultivated and production by major administrative regions and zones. Teff is grown mainly in Amhara and Oromiya, which together accounted for 84 and 86 percent of the total cultivated area and production in 2011. East and West Gojam of Amhara and East and West Shoa of Oromiya are particularly known teff producing areas in the country. A smaller quantity of teff is also produced in Tigray and SNNP regions.

Region	Area (ha)	% share of total area planted	Production (Qt)	% share of total production
Tigray	165,804	6.01	2,095,066	6.02
Amhara	1,014,268	36.77	12,791,077	36.75
Oromia	1,289,405	46.74	16,718,025	48.04
SNNPR	265,377	9.62	2,967,594	8.53
Benishangul	23,648	0.86	231,073	0.66
Total/average	2,758,502	100.00	34,802,836	100.00

CONSUMPTION / UTILIZATION

Teff bread (locally known as injera) is a major staple food for many Ethiopians. Most Ethiopians like to consume teff but only middle and high income people in urban areas can have access to the grain. It contributes approximately 600 kcal/day in urban areas, compared to about 200 kcal in rural areas

(Table 3). Less expensive grain such as maize and sorghum dominate cereal consumption in rural areas.

Studies have shown that income elasticity of teff is the highest among cereals and greater than one in both urban (1.1) and rural (1.2) areas: a one percent increase in income increases demand by more than one percent. For rural households and urban poor, teff is more of a luxury while maize and wheat are necessity food grains. As teff prices go up, even middle income households tend to mix teff flour with cheaper cereals such as sorghum maize or rice in preparing *injera* (Berhane, et al, 2011). Hence, from food security perspective, maize, sorghum and wheat are more critical than teff. Policy makers may rather need to consider higher teff prices as an opportunity for poor rural households to earn more income from the sale of the grain, which is grown as cash crop.

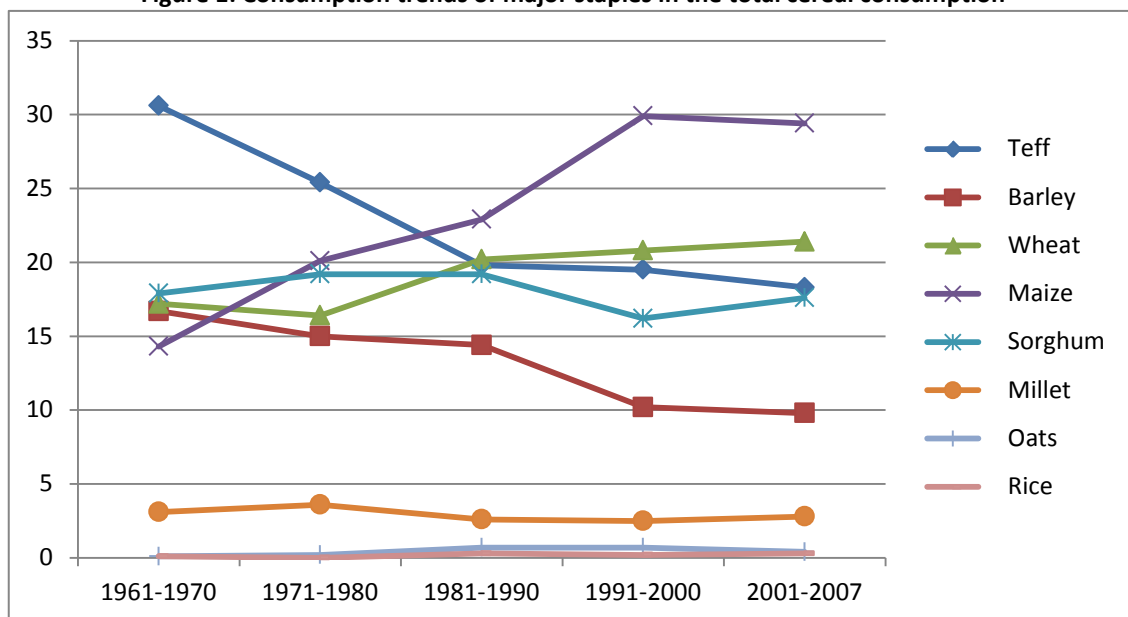
Table 3: Rural vs. urban per capita calorie consumption of food items (2004/05)

Food item	Per capita calories			%
	Urban	Rural	National	
Cereals				
Teff	601.70	196.69	254.13	10.91
Wheat	200.59	309.79	294.30	12.63
Barley	38.16	144.58	129.48	5.56
Maize	107.53	435.99	389.40	16.71
Sorghum	94.72	366.21	327.70	14.06
Other- cereals	25.21	53.29	49.31	2.12
Processed-cereals	195.15	17.10	42.35	1.82
Enset/kocho/bulla	27.18	215.15	188.49	8.09
Total cereals & enset	1290.24	1738.79	1675.17	71.90
Non-cereals				
Pulses	123.94	167.06	160.95	6.91
Oil-seeds	2.49	5.43	5.01	0.22
Animal-products	65.43	58.07	59.12	2.54
Oil & fat	145.18	31.91	47.98	2.06
Vegetables & fruits	60.78	59.43	59.62	2.56
Pepper	6.89	3.57	4.04	0.17
Coffee/tea/chat	30.62	42.72	41.01	1.76
Root-crops	72.36	124.52	117.12	5.03
Sugar & salt	93.54	51.67	57.61	2.47
Other-foods	96.47	103.28	102.31	4.39
Total (National)	1987.96	2386.46	2329.94	100.00

Source: Guush Berhane, et al., *Foodgrain Consumption and Calorie Intake Patterns in Ethiopia, ESSP II Working Paper 23, IFPRI/ EDRI, May 2011*

The share of teff in total cereal consumption has sharply declined since 1961: its share declined from 31 percent in 1961-70 to 18 percent in 2001-2007 (Figure 1). There is a considerable shift from teff to maize consumption which is likely to have been influenced by a number of factors but mainly by the relatively cheaper price of the latter.

Figure 1: Consumption trends of major staples in the total cereal consumption



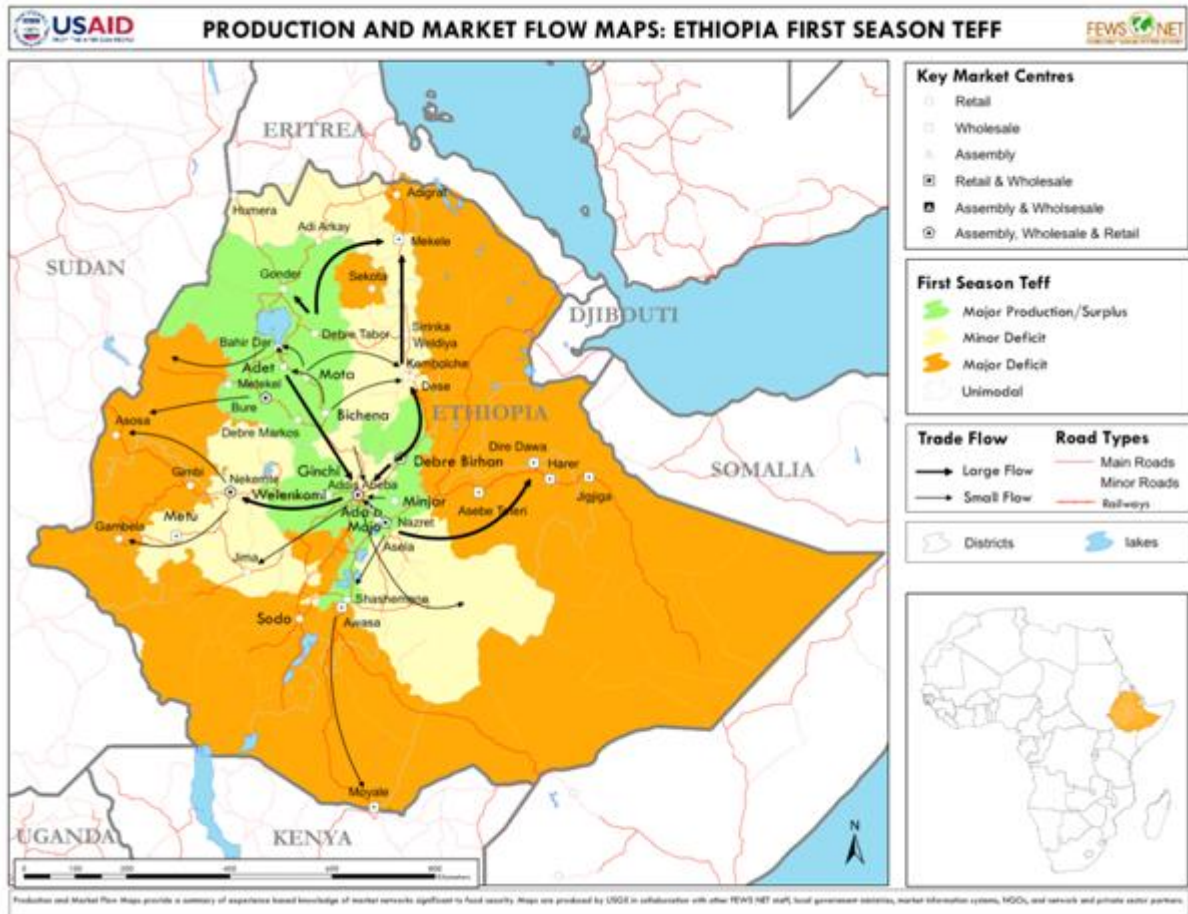
Source: Author's elaboration based on FAOSTAT data

MARKETING AND TRADE

Teff is largely produced for market mainly because of its high price and absence of alternative cash crops (such as coffee, tea or cotton) in the major teff producing areas of Gojam (Amhara) and Shoa (Oromiya) (which have different agro-ecological conditions). Assemblers in village markets and wholesalers in regional markets pay significant attention to the quality of teff. There are three general color based grades of teff: white, mixed and red, with the white fetching the highest and red the lowest price. There are also important sub-grades within each grade such as *magna* (very white) which is grown in East Shoa and is sold at a premium price.

The central market in Addis plays an important role in determining prices in the major production areas. While the bulk of the grain moves to Addis Ababa, some urban consumption centers such as Mekele and Dessie get their supplies directly from the production areas. Other urban centers such as Harar and Dire Dawa are supplied from Nazeret (Adama) (East Shoa) (Figure 2).

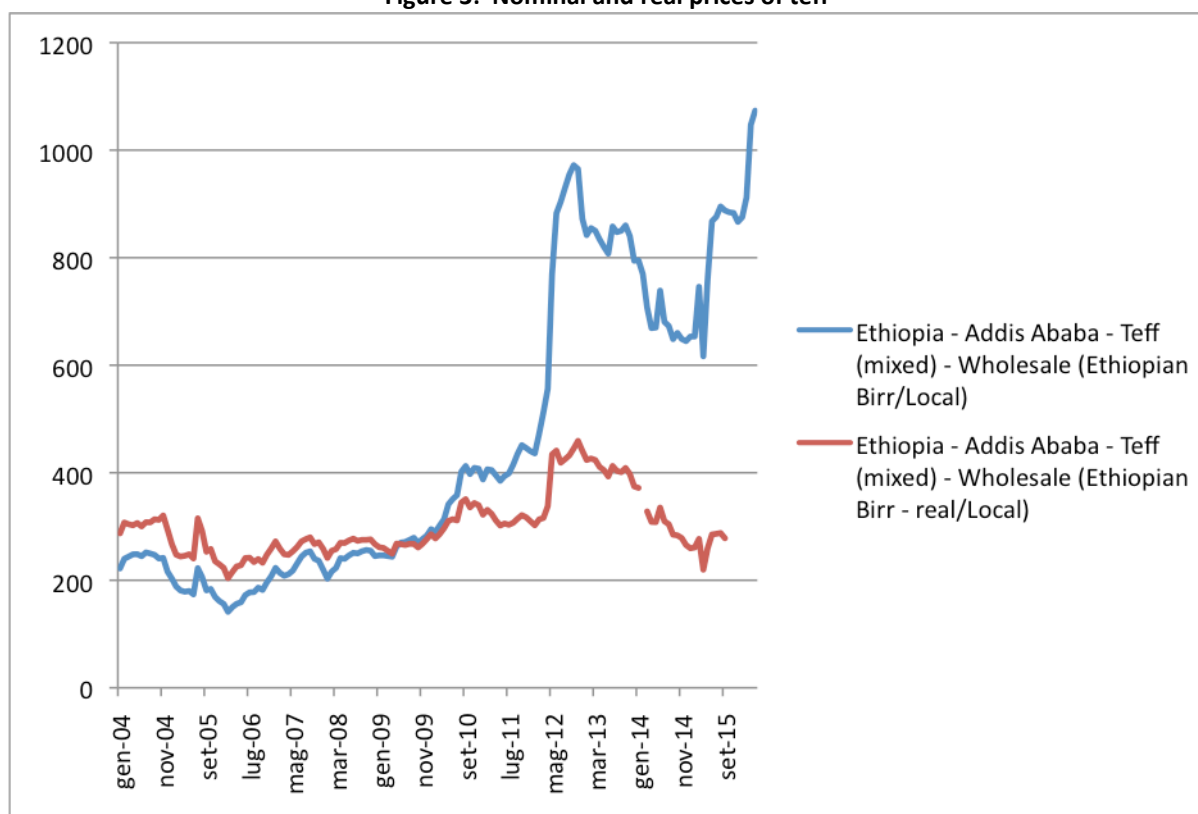
Figure 2: Production and market flow maps of teff



Traders in regional markets set prices based on information obtained from brokers in Addis Ababa. Between 2002 and 2008, nominal prices of teff in Addis increased continuously and the rising trend was interrupted in 2009 and 2010 when prices fell from their peaks in October 2008 (Figure 3). Nominal prices have soared again in 2011 and 2012, surpassing the level reached in 2008. On the other hand, the increases in real prices were less pronounced. Real prices increased in 2006 and 2008 but declined significantly between 2009 and 2011. In fact, real prices in April 2011 were the lowest in the entire period of 2000 to 2012. The gap between nominal and real prices has widened since 2008, and much of the nominal increases were due to the high general inflation rates in the country.

Compared to other staples, the price of teff has increased at faster rate in recent years, hence the price gap between teff and other staples is widening. In particular, the price gap between teff and maize has widened considerably since 2008 (Fufa, et al, 2011). The incentive to grow teff as a cash crop has improved further. Poor farmers growing teff have benefited in recent years as the relative price of teff (which they sell) has increased while that of other staple crops such as maize (which they buy for consumption) has declined.

Figure 3: Nominal and real prices of teff



Source: GIEWS

Teff is not known as food crop outside Ethiopia and Eritrea. Until the 1998 war between the two countries, Eritrea was one of the major markets for teff traders in major production areas. Formal trade relations with Eritrea have not resumed since 1998. However, teff has become an export crop due to Ethiopians living abroad. Teff is exported to different countries, mainly to the Middle East, North America and to many European countries, where Ethiopians or Ethiopian origin live. The volume of export has fluctuated and relatively a larger quantity was exported in 1995-97, 2000 -03 and 2005 (Table 4). Export has declined since 2006, mainly due to high domestic prices and government ban on export. It has been reported that teff is smuggled (after the ban) through the port of Djibouti to the port of Ashdod in Israel¹, where some 80,000 Ethiopian Jews live. Demand is thought to be very high in the United States where a large number of Ethiopians and Ethiopian origin live.

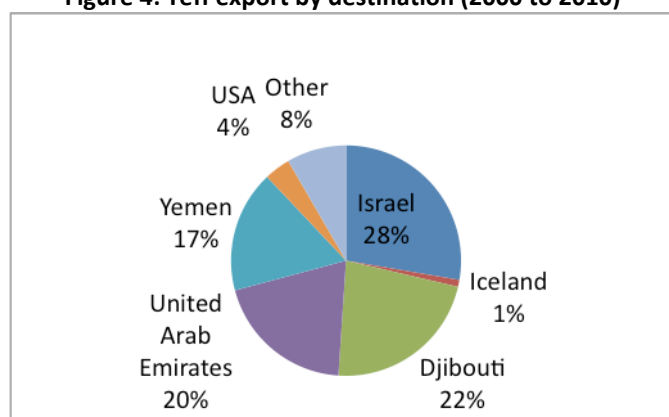
1 Ethiopian bread virtually worth own weight in gold: By Ayanawo Farada Sanbetu <http://www.haaretz.com/print-edition/news/ethiopian-bread-virtually-worth-own-weight-in-gold-1.226237>.

Table 4: Teff trade in Ethiopia (1993-2009)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Export (tones)	27	64	34563	32163	39563	2587	2237	3936	39601	25921	14324	12619	33627	7175	2849	2353	30
Export value (1000 USD)	42	29	9018	8518	11018	2034	2023	3337	12022	11975	11333	7385	12963	2940	772	674	32

Source: FAOSTAT (teff is considered as cereal, nes (not elsewhere mentioned)).

During the period 2000 to 2010, Israel accounted for the largest share of Ethiopian teff export, followed by Djibouti, United Arab Emirates and Yemen (Figure 4). It is believed that many Ethiopian restaurants in the Middle East import fresh *injera* (made of teff)². Export of *injera* is not affected by the ban on teff grain and the business is reported to have been expanding, especially to the United States, very recently³.

Figure 4: Teff export by destination (2000 to 2010)

Source: UNCOMTRADE

DESCRIPTION OF THE VALUE CHAIN AND PROCESSING

The teff value chain in Ethiopia is not very different from maize: it involves input suppliers, producers, traders (local assemblers and wholesalers), retailers and processors, and consumers (Figure 5). As the vast majority of farmers use own seed, teff growers rarely require the services of the Ethiopian Seed Enterprise (ESE). However, they are heavily dependent on fertilizer supplied through the Agricultural Input Supply Enterprise (AISE): teff accounted for the highest share (54 percent) of the total fertilizer consumed in grain production (Fufa, et al., 2011). Since teff is not one of the staples distributed as food aid, the parastatal, Ethiopian Grain Trade Enterprise (EGTE), does not intervene in the teff market under the present government.

Teff supply chains are long and complex. The regional markets in surplus producing areas get their supplies from farmers and assemblers. Farmers often use animals (e.g. donkey) to transport grain to village or regional markets. They also sell to rural assemblers who assemble and transport the grain using small trucks for sale in the regional markets such as Debre Zeit / Bishoftu in East Shoa. Brokers in regional markets work as agents of traders and negotiate prices and grade levels with farmers who often have limited bargaining power (Fufa, et al., 2011).

² Fresh *injera* is transported by air, mainly by the Ethiopian Airlines. See Fufa, et al., 2011.

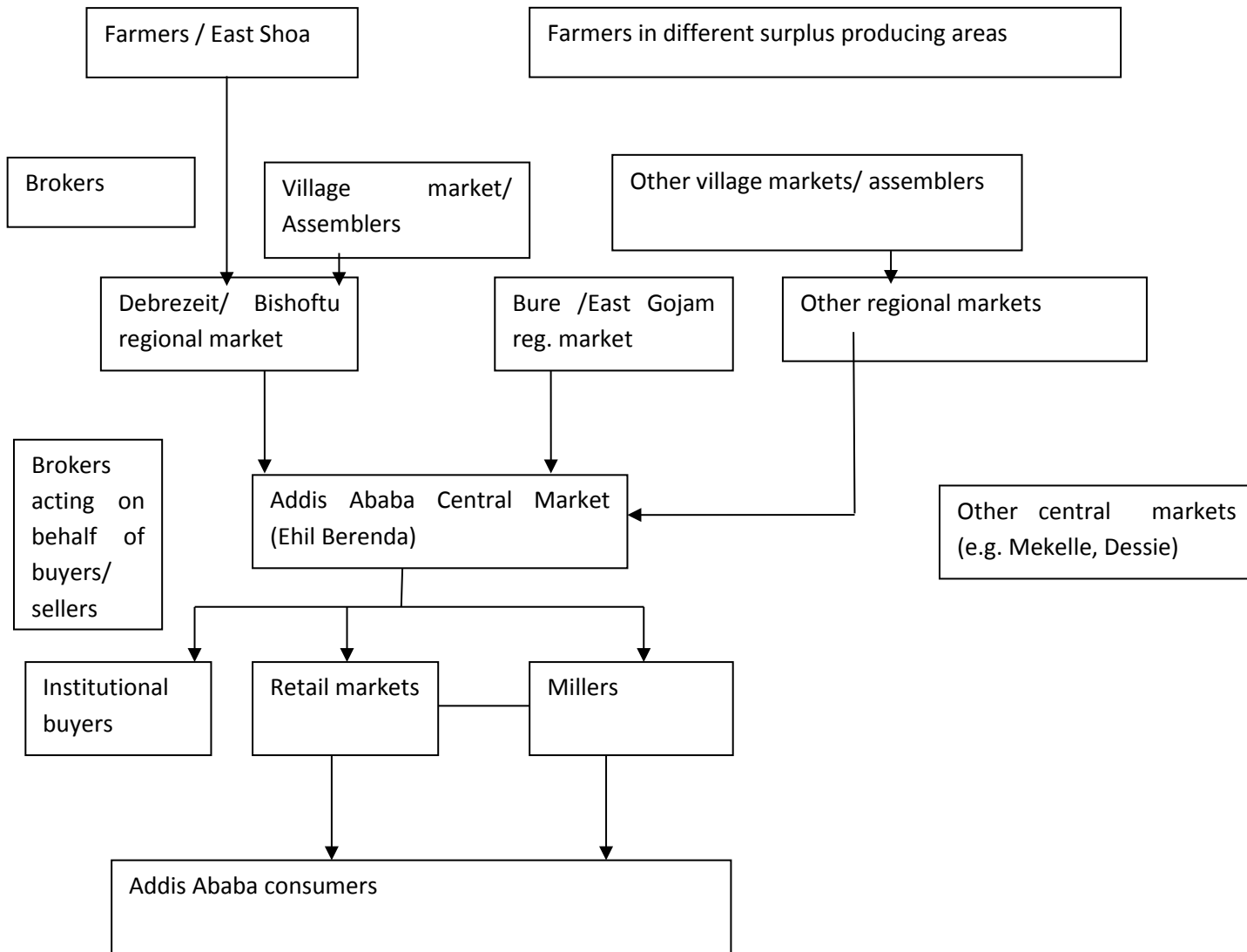
³ See for instance: <http://www.thereporterethiopia.com/Interview/that-booming-injera-business.html>

Major wholesale markets in surplus producing regions of Shoa and Gojam supply the central market in Addis Ababa (Ehil Berenda). Brokers at the central market play an important role in linking the regional sellers to buyers at the central market, and they are paid fees which range between one and three Birr per 100 kg. With no large scale teff milling companies, the main buyers in the central markets are retailers and small millers that sell to consumers in Addis. Some regional traders in deficit markets also buy from the central market.

With no big traders with significant storage and trucking capacity, small scale traders dominate the regional and central teff markets. Significant price difference between different grades of teff has not encouraged bulking and large scale operations. Grades and quality have to be checked visually throughout the supply chain and every time the commodity changes hands. Like other cereals, high marketing costs and risk have contributed to inefficient teff markets. The market is affected by lack of formal grades and standards, lack of adequate warehouse facilities, lack of reliable market information, and inadequate contract enforcement mechanisms.

Processing teff grain into flour and injera is limited to a small scale millers (using hammer mills) and individual bakers (using the traditional clay pan). The millers sell teff flour or provide milling services to customers with the grain. Making and selling injera is a major source of livelihood in major towns and cities in the country.

Figure 5: Teff value chain



Source: Based on Fufa et al., 2011

POLICY DECISIONS AND MEASURES

Between 1976 and 1990, the former government controlled grain trade through a government parastatal, the Agricultural Marketing Corporation (AMC). Farmers and traders were forced to sell grain to the AMC at administratively fixed low prices. The AMC sold food grain it purchased to urban consumers, mainly in the city of Addis Ababa, through food ration shops (Gabre-Madhin, 2001)⁴. The former government attempted to discourage teff production because of its low yield but its high demand and adaptation to various ecological conditions of the country has sustained it.

⁴ Gabre-Madhin, E. (2001) Market Institutions, Transaction Costs, and Social Capital in the Ethiopian Grain Market, Research Report 124, IFPRI, Washington D.C.

Following the overthrow of the former military government and the introduction of policy reforms in 1991, private trade was restored and the AMC was transformed and renamed as the Ethiopian Grain Trade Enterprise (EGTE). The EGTE now operates in the open market in competition with the private sector with the objective of: (i) stabilizing prices for producers and consumers; (ii) earning foreign exchange through exporting grain; and (iii) facilitating the purchase and distribution of Emergency Food Security Reserve. Over the years, the public enterprise has moved away from its price stabilization role to exporting pulses and oilseeds (Rashid and Negassa, 2011). The number of traders at primary, secondary or central market levels has increased considerably and many operate without licenses, undercutting formally registered traders (Demeke, et al. 2012). Teff is the most preferred trade commodity in the market place because of its high demand.

The most recent and important attempt towards market development in Ethiopia has been the establishment of the Ethiopian Commodity Exchange (ECX) with a vision to transform agricultural trade through creating a new marketplace that better serves farmers, traders, processors, consumers and other actors. The ECX commenced its trading operations in April 2008. Among its members are cooperative unions, industrial processing enterprises, commercial farmers, private exporters, and domestic trading firms engaged in the agricultural commodity businesses. ECX currently operates warehouses in major market centers, including Addis Ababa, Adama, Shashemene, Nekempte, Humera, Metema, and Bure. However, teff is not among the major commodities traded at ECX thus far: trade is largely limited to coffee, sesame and pea-bean at the moment (Rashid and Negassa, 2011).

The government has responded with several measures following the 2008 price surge: (i) imposition of export ban on cereals; (ii) re-introduction of urban food rationing; (iii) informal suspension of local procurement by WFP and others; and (iv) direct government imports for open market sales and price stabilization. The government officially banned teff export in January 2006 on the ground that export is the main reason for the price surge. The Agricultural Transformation Agency (ATA) has identified teff as one of its value chain programs.

Another policy factor affecting teff production is input support. Public provision of R&D services, extension advice, inputs and credit has been the dominant set of policy instruments. The government initiated a 100 percent credit guarantee scheme on fertilizer purchases in 1994, allowing farmers to purchase fertilizer at below-market interest rates. However, the program has been gradually scaled down and farmers are being encouraged to buy on cash or credit provided through cooperatives. The extent of interest rate subsidies is expected to be very small.

3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS

TRADE STATUS OF TEFF

As shown above, a small quantity of teff is exported even when the government ban is in place. Since there is no import of teff, the country is apparently a net exporter. However, the export market is currently very small (less than 0.5 percent of production) and this is mainly due to the ban on teff export. Teff export has the potential to expand significantly given the huge demand in Eritrea and among Ethiopians and Ethiopian origins living in the Middle East, Europe and America. Being a major staple crop, Eritrea used to get most of its teff supplies from Ethiopia before the 1998 - 2000 War between the two countries⁵. Demand of teff in Djibouti is also high as many communities share the same culture of consuming teff *injera*. Because of its nutritional value (high levels of iron and calcium, high fibre, low on the glycemic index and gluten free) and its storage quality, many other countries could also potentially import teff.

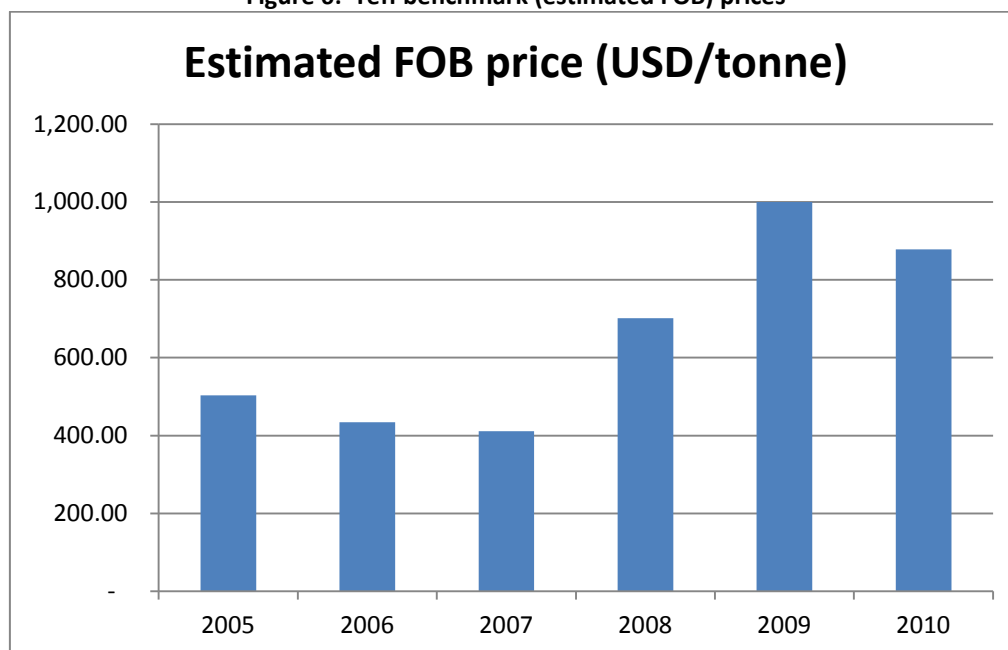
BENCHMARK PRICES

FOB unit values at the Djibouti port have been used to estimate benchmark prices for teff. These unit values are derived from UNCOMTRADE data, specifically from the total volume and value of export to different countries. The average unit value (USD per tonne) is thus used as an estimate of the FOB price in 2005. Because of the official ban since January 2006, the volume of export has declined sharply and unit values varied considerably. We have found the unit value for export to Israel to be relatively more reasonable estimate of the FOB price for the period 2005-10. It should be recalled that Israel accounted for the largest share (28%) of teff export over the same period (Figure 4), although export volumes were significantly lower after the export ban in 2008 (Table 4).

In 2009, FOB price of teff increased to 1,000 USD (Figure 6) and this could be due to the export ban policy. This is relatively very high but It should be noted that prices (unit values) were above 1 000 USD per tonne in 2000 and 2001, when relatively larger quantities of teff were exported, according to UNCOMTRADE data.

⁵ It is reported that many households in Eritrea shifted from the preferred teff grain used for making the staple *injera* to a sorghum after the War. Teff supplies, which were largely imported from Ethiopia before the conflict, have sharply decreased with corresponding price increases. See for instance: FAO/WFP, Crop and food supply assessment mission to Eritrea, 27 November 2003 (<http://www.fao.org/docrep/006/J0981e/J0981e00.htm>).

Figure 6: Teff benchmark (estimated FOB) prices



Source: Author's elaboration based on UNComtrade data

Exchange rates and adjustment to benchmark price

The exchange rate in Ethiopia is characterized by managed floating with 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 USD 0.5 million are allowed to participate in the weekly foreign exchange auction. The marginal rate of each auction (once a week) 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. 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 (Rashid, 2010)⁶. Another study (Dorosh, et al., 2009)⁷, showed that real exchange rate appreciated by 9.7, 12.8, 14.9 and 33.8, 26.3 percent in July 2005, July 2006, July 2007, July 2008 and June 2009, respectively.

High rate of inflation (relative to the low inflation rate among its trading partners) and increasing pressure on foreign exchange reserve are among the major cause 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. In 2007 and 2008, the foreign currency reserve fell short of the critical requirement of 12 weeks worth of imports and the government instituted foreign exchange rationing (Rashid, 2010). In March 2008, access to foreign exchange for imports was restricted (rationed) to curb excessive drawdown of foreign exchange reserve.

It is assumed that the local currency was, on average, 20 percent (a simple average of the rate of overvaluation by Dorosh et al.) overvalued during the period 2005- 2010 and the exchange rate has

⁶ Rashid S. (2010). Staple food prices in Ethiopia, prepared for the COMESA policy seminar on "Variation in staple food prices: Causes, consequence, and policy options", Maputo, Mozambique, 25-26 January 2010.

⁷ Dorosh P, S. Robinson and H. Ahmed (2009), Economic Implications of Foreign Exchange Rationing in Ethiopia, IFPRI/EDRI ESSP2 Discussion Paper 009.

been adjusted accordingly in our calculation of adjusted reference prices. The adjustment factor approximates the depreciation of the local currency had a more liberal policy been pursued.

DOMESTIC PRICES

The Ethiopian Grain Trade Enterprise (EGTE) collects prices for Addis Ababa and several major markets in the country. Monthly wholesale price data of major cereals, pulses and oilseeds are posted in EGTE's website (<http://egtemis.com/marketstat.asp>). The average annual wholesale price of Addis Ababa is considered as the wholesale price at the point of competition.

Located at 410 km north of Addis Ababa, Bure represents one of the major teff producing areas of Ethiopia, i.e. Gojam. Teff traders in Bure buy from farmers and assemblers and sell at the central market in Addis. The wholesale teff price in Bure is adjusted to get farm gate price. The gross margin of traders when selling in Bure (at wholesale price) is estimated to be half of the estimated net margin obtained by selling in Addis by traders. We have deducted this gross margin from observed wholesale price in Bure to arrive at the observed farm gate price of Bure (Table 5).

Table 5: Observed wholesale and farm gate prices

	Unit	2005	2006	2007	2008	2009	2010
Wholesale purchase price observed at the market of A.A (point of competition).	ETB/tonne	2641	3567	4132	7690	8382	6921
Bure wholesale observed price	ETB/tonne	2256	3365	3564	6524	6933	5369
Producer Prices Bure-	ETB/tonne	2,181	3,290	3,489	6,474	6,883	5,319

Source: Ethiopian Grain Trade Enterprise (EGTE)

ACCESS COSTS

From port to point of competition

Addis Ababa is the main wholesale market for most of the agricultural commodities in Ethiopia. The central grain market in Addis, traditionally known as Ehil Berenda, has a network of brokers who sell grain they receive from client traders in the surplus production areas.

Access cost from port to the point of competition (Addis Ababa) includes surtax and withholding tax, port handling, transport, unloading and miscellaneous costs (5 percent of CIF). The cost estimates are based on a recent USAID Bellmon study (USAID, 2010)⁹. Among the major costs are port transport and port handling costs. Transport costs have increased but not by as much as the inflation in the country or fuel price increases in the international market (Table 6). Access costs obtained from major grain traders and their associations are broadly consistent with the USAID cost estimates.

Since transport cost used in this analysis (as obtained from the USAID study) is less than 6 US cents per ton per km (which is considered as reasonable by African standards¹⁰, though not by the

⁸ There is retail and farm gate prices but these are often incomplete.

⁹ USAID (2011), USAID Office of Food For Peace Ethiopia, Bellmon Estimation, Annex 1 Economic Data and Trends, September

¹⁰ Transport prices in Africa are, on average, higher than in South Asia or Brazil. In 2007, prices (per ton-kilometer

government¹¹), no adjustment is made in the observed transportation cost. However, surtax and withholding tax has been deducted to arrive at adjusted total cost (Table 6).

Table 6: Access costs from Djibouti to Addis Ababa – price/tonne/km (nominal prices)

		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 (including margin)	ETB/quintal	8.57	10.34	13.79	19.76	16.23	15.37
Total costs	ETB/quintal	78.21	81.04	87.22	101.86	105.22	108.08
Total costs	ETB/tonne	782	810	872	1,019	1,052	1,081
Adjusted total cost (total cost less surtax and withholding tax)	ETB/tonne	731	748	790	900	955	989
Transport cost – given 925 km distance b/n Djibouti and Addis	USD/km/tonne	0.047	0.047	0.045	0.048	0.047	0.048

Source: USAID, USAID Office of Food For Peace Ethiopia, Bellmon Estimation, Annex II Economic Data and Trends, September 2011

From farm to point of competition

Marketing costs from Bure to Addis are obtained from group discussion with traders/ brokers and traders' associations at the Addis Ababa central grain market, and include costs such as loading, transport, fees for brokers of truck, unloading, storage, losses, fees for brokers selling teff in Addis and margins for traders (Table 7). Some of these costs are incurred only under rare occasions (e.g. when brokers are unable to sell the grain on truck (arriving from Bure) and decide to unload at a nearby warehouse, incurring unloading and storage costs as well as losses due to rodents and other problems).

Transport cost, the major component of the total access cost, has more than doubled between 2005 and 2006 in nominal terms, mainly because of the high fuel cost and high rate of inflation in the country. In terms of USD/km/tonne, the price has increased from 0.089 (8.4 cents) to 0.119 (11.9 cents). The observed transport cost is well above the cost reported along the Djibouti-Addis Ababa road and the international rates (as indicated above). The high cost is also related to the use of smaller trucks (often less than 10 tonne capacity) rather than bigger trucks with lower costs per unit.

(tkm)) on the Central African Douala–N'Djame'na route (linking Cameroon with Chad) are more than three times higher (11 US cents/ per tonne/km) than in Brazil (3.5 cents per tonne per km) and more than five times higher than in Pakistan (2 cents per tonne per km). Only the Durban–Lusaka corridor (6 cents per tonne 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)

¹¹ A recent government report indicated that the price/tonne/km of transporting commodities via the Djibouti corridor is very high compared to other countries: the price/tonne/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 Reporter (newspaper), 11 February, 2012: <http://www.thereporterethiopia.com/News/govt-to-tighten-grip-on-trade-logistics.htm>

Transport cost from Bure to Addis Ababa has been adjusted by reducing the observed transport cost by 20 to 25 percent. The adjustment is intended to reduce transport cost to between 6.7 and 8.9 USD cents/km/tonne, which is slightly higher than the rates charged along the Djibouti-Addis Ababa road.

Estimated margins¹² are relatively high but have tended to decline between 2005 and 2010. One 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 and 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 also indicated that profits decline with soaring prices as most customers cut back on their purchases.

Table 7: Access costs (observed and adjusted) Bure to Addis Ababa and farmgate to Bure(nominal prices)

	Unit	2005	2006	2007	2008	2009	2010
Loading	ETB/tonne	20	20	20	20	30	30
Transportation costs	ETB/ tonne	200	190	250	300	350	400
Bure to Addis							
Broker fees for trucking - per ton	ETB/ tonne	6	6	10	10	15	15
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	386.0	376	445	450	520	575
Farmgate to Bure							
Gross margin for traders for buying at farmgate and selling at Bure (half of traders` margin)	ETB/ tonne	75	75	75	50	50	50
Adjustments (Bure to Addis)							
Transportation costs	USD/km/ tonne	0.089	0.084	0.104	0.118	0.111	0.119
Adjustment factor (transport cost reduced by 20 – 25% to arrive at 6.7 to 8.9 USD cents/km/tonne)		20%	20%	20%	25%	25%	25%
Transport cost difference (unadjusted less adjusted)	ETB/ tonne	40	38	50	75	88	100
Adjusted total cost	ETB/ tonne	346	338	395	375	432	475

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

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.

¹² Traders believe that actual profit margins are not well known as purchase prices vary by the day and so is the sales price.

QUALITY AND QUANTITY ADJUSTMENTS

No indications of significant quality differences between domestic or foreign produce have been found. Therefore no adjustments are applied in our analysis .

CALCULATION OF INDICATORS

The indicators and the calculation methodology used are 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 NRPo generate the NRPa indicators. Comparison of the different rates of protection identifies where market development gaps can be found and reduced.

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 Rice in Tanzania. While the table reflects general approaches, specific changes are discussed in Section 4, data reflects the final data used (i.e. taking into account deviations from general approach for specific years).

Table 8: Summary table for data description in MAFAP technical notes

<i>Concept</i>	<i>Description</i>		
	<i>Observed</i>	<i>Adjusted</i>	
Benchmark price	<ul style="list-style-type: none"> FOB price calculated as unit value of teff as reported in UN COMTRADE. The rate of increase in the Addis Ababa wholesale price was used to estimate benchmark prices in years with missing data (2007 – 2010) due to export ban.. 	N.A.	
Domestic price at point of competition	<ul style="list-style-type: none"> Average annual wholesale price of Addis Ababa as reported by the Ethiopian Grain Trade Enterprise (EGTE). 	N.A.	
Domestic price at farm gate	<ul style="list-style-type: none"> Average annual wholesale price of Bure (in West Gojam, a major teff production area) as reported by the EGTE. Traders' margin in the wholesale price of Bure is deducted to arrive at farmgate price. 	N.A.	
Exchange rate	<ul style="list-style-type: none"> Annual average of exchange rate as reported by the National Bank of Ethiopia 	<i>Observed increased by 20 per cent assuming an overvaluation as reported by Rashid (2010)</i>	
Access cost to point of competition	<i>As reported in USAID, USAID Office of Food For Peace Ethiopia, Bellmon Estimation, Annex 1 Economic Data and Trends, September 2011.</i>	N.A.	
Access costs to farm gate	<i>Loading, Transportation costs, Broker fees for truck - per tonne, Broker's fees, trader's margin as estimated by a group of traders in the Addis Ababa wholesale market</i>	<i>Transportation costs adjustment to reduce transport cost (6.1-7.4 US cents/km/tonne)</i>	
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 9: Data used for the analysis

		Year	2005	2006	2007	2008	2009	2010	
		trade status	x	x	x	x	x	x	
DATA	<i>Unit</i>	<i>Symbol</i>							
Benchmark Price									
	<i>Observed</i>	USD/tonne	P _{b(intD)}	503	434	411	701	1,000	878
	<i>Adjusted</i>	USD/tonne	P _{ba}						
Exchange Rate									
	<i>Observed</i>	ETB/tonne	ER _o	8.67	8.74	9.21	9.8	12.1	12.89
	<i>Adjusted</i>	ETB/tonne	ER _a	10.4	10.49	11.05	11.76	14.52	15.47
Access costs border - point of competition									
	<i>Observed</i>	ETB/tonne	AC _{owh}	782.07	810.4	872.23	1'018.58	1'052.20	1'080.83
	<i>Adjusted</i>	ETB/tonne	AC _{awh}	730.68	748.37	789.52	900.05	954.81	988.65
		ETB/tonne	P _{dwh}	2'640.56	3'566.53	4'132.08	7'690.21	8'381.91	6'920.75
Domestic price at point of competition									
Access costs point of competition - farm gate									
	<i>Observed</i>	ETB/tonne	AC _{ofig}	376	366	430	440	495	545
	<i>Adjusted</i>	ETB/tonne	AC _{afig}	336	328	380	365	407	445
		ETB/tonne	P _{dfig}	2'181	3'290	3'489	6'474	6'883	5'319
Farm gate price									
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

4. INTERPRETATION OF THE INDICATORS

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 reference 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 II of the complete excel sheet) shows that the price gaps between domestic and reference prices are negative (see also Table 10). Prices at wholesale level or at the point of competition were very much below the reference prices in all the years except in 2008. The unadjusted price shortfall (PGowh) increased over the years, from Birr 616 per tonne in 2005 to Birr 2,407 in 2010. The price gaps sharply increased in 2009 and 2010 (Table 10).

The price gap for adjusted prices at the point of competition (PGawh) were greater than the unadjusted gaps in all the years. The negative price wedge confirms that buyers or consumers benefited since they paid lower price for teff than the equivalent international prices. On the other hand, teff producers lost as they were paid less than international levels. The extent of this disincentive for farmers is more clearly explained by the price wedge at farm gate level: observed price gaps (PGofg) were negative in all the years and ranged from Birr 700 per tonne in 2005 to Birr 3,464 per tonne in 2010. The gaps were much more negative with adjusted price (PGafg). The price gaps increased at farm gate level, implying that farmers are paid a much lower price than the reference price (Figure 7 and Table 10).

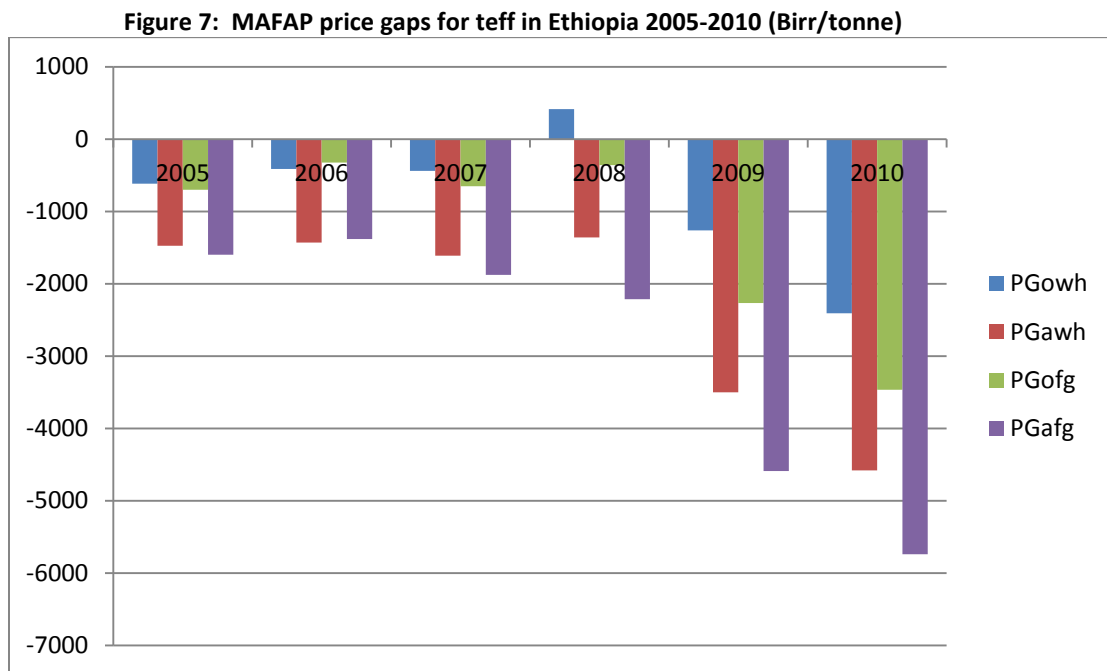


Table 10: MAFAP price gaps for teff in Ethiopia 2005-2010 (Birr/tonne)

	2005	2006	2007	2008	2009	2010
Observed price gap at wholesale PG _{wh}	-616.042	-412.375	-440.806	416.0682	-1261.94	-2407.1
Adjusted price gap at wholesale PG _{awh}	-1475.17	-1432.27	-1612.54	-1361.01	-3498.54	-4581.01
Observed price gap at farm gate PG _{fg}	-699.625	-322.9	-653.448	-359.932	-2265.61	-3464.1
Adjusted price gap at farm gate PG _{afg}	-1598.75	-1380.79	-1875.18	-2212.01	-4589.71	-5738.01

Source: Own calculations using data as described above.

The nominal rate of protection (NRP) is negative at the wholesale as well as at the farm gate levels in all the years, except 2008 (positive NRPowh) (Figure 8 and Table 11, based on Annex II). The observed (unadjusted) NRP at wholesale level (NRPowh) varied from -19 percent in 2005 to a – 26 percent in 2010, and averaged -12% over the period 2005-2010. The adjusted NRP at wholesale level (NRPAwh) averaged -29 percent over the same period. These results confirm that teff buyers or consumers at the wholesale level were paying less than the equivalent border prices. By contrast, producers were implicitly taxed heavily: the observed NRP at farm gate (NRPOfg) and the adjusted NRP (NRPAfg) averaged -20 percent and -37 percent, respectively, during the study period (2005-10). The average level of implicit taxation, as measured by NPR at farm gate level was highest in 2010, rising to -39 percent (observed) and -52 percent (adjusted) (Table 11).

Figure 8: MAFAP nominal rate of protection teff in Ethiopia 2005-2010 (%)

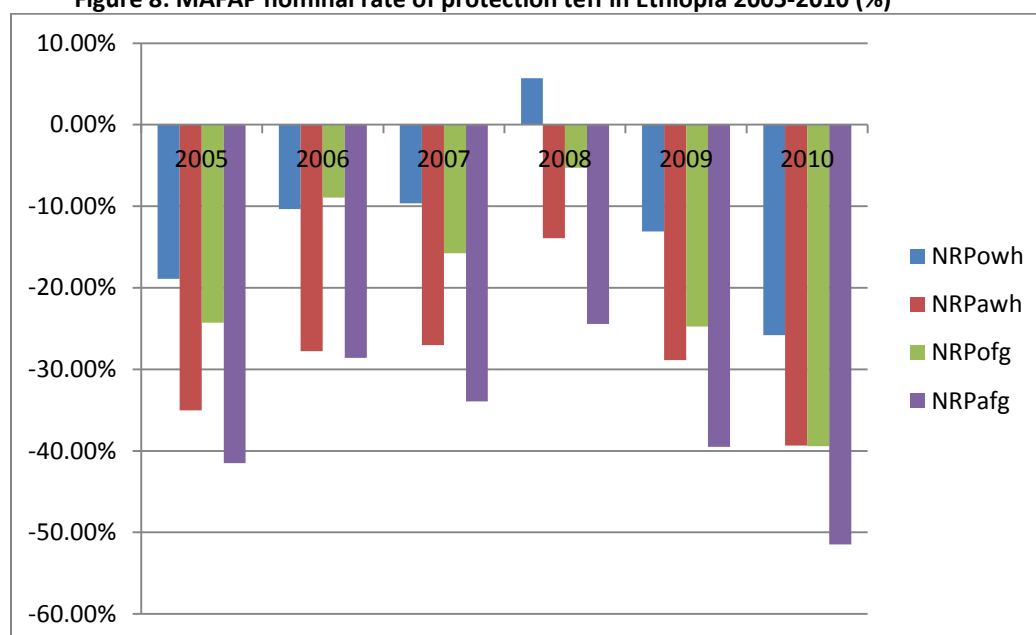


Table 11: MAFAP nominal rates of protection (NRP) for teff in Ethiopia 2005-2010 (%)

	2005	2006	2007	2008	2009	2010	Average
Observed NRP at wholesale - NRPowh	-18.92%	-10.36%	-9.64%	5.72%	-13.09%	-25.81%	-12.01
Adjusted NRP at wholesale NRPawh	-35.03%	-27.76%	-27.02%	-13.91%	-28.86%	-39.34%	-29.48
Observed NRP at farm gate - NRPofg	-24.29%	-8.94%	-15.77%	-5.27%	-24.76%	-39.44%	-19.75
Adjusted NRP at farm gate - NRPafg	-41.50%	-28.61%	-33.94%	-24.43%	-39.49%	-51.49%	-37.36

Source: Own calculations using data as described above

5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

MAIN MESSAGE

Grown only in Ethiopia and Eritrea as food crop, teff is the most valuable cereal crop in Ethiopia. It also accounts for the largest share of land and fertilizer use among staple crops in the country. Because of its nutritional value and cultural preferences, demand for teff is very high, especially in urban areas. Export ban has restricted trade but the export potential is very high, especially in neighboring countries such as Eritrea and Djibouti. Demand is also very high in Israel (where many Ethiopian immigrants live) and a local newspaper reported that “Ethiopian bread [i.e. teff injera] virtually worth own weight in gold¹³ following the export ban.

The results of the MAFAP price indicators show that the level of disincentive to teff farmers is considerable during the period 2005 to 2010. While producers failed to gain fully from recent high world prices, consumers are protected as they pay significantly lower price than the border price equivalent. Ban of cereal export, overvalued exchange rates, underdeveloped markets and distribution of imported cereals at subsidized prices (at times of high food prices) have kept domestic prices below the reference prices. Food aid may have also contributed to the lower domestic price levels¹⁴. In recent years, traders have shifted to the export of processed teff product (injera or bread), which is not affected by the ban, and the volume is reported to be increasing in recent years (Fufa, et al., 2011).

The government is concerned about high prices and takes measures to keep teff prices lower for consumers than they would otherwise have been. However, unlike maize and other cereals, teff consumers are largely middle and high income urban dwellers. Results of income elasticity analysis have shown that teff is more of a luxury food item for rural and poor urban people. As teff prices rise, low income families switch to maize, sorghum and other cereals.

The government policy needs to focus on improving the incentive for teff, which is increasingly considered as a cash crop by many poor farmers. Farmers have continued to grow teff probably because other crops also face the same disincentives. High domestic demand and relatively high prices in the local market have also encouraged teff farmers.

With improved policy environment and enhanced investment to increase teff productivity, the country has the capacity to meet high domestic and export demand. Teff can be grown profitably in a large part of the country, from lowland to highland areas. Recent research works have shown that transplanting young seedlings of teff at 20x20 cm spacing with organic and inorganic fertilization can increase the current yield of a little over 1 ton per ha to 3 to 5 tons per ha. These yields can be

¹³ See for instance, Haaretz, July 26, 2007 (<http://www.haaretz.com/print-edition/news/ethiopian-bread-virtually-worth-own-weight-in-gold-1.226237>).

¹⁴ 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).

almost doubled with small amendments of micronutrients (Zn, Cu, Mg, Mn)¹⁵. Such innovative yield improvement measures, as being promoted by the Agricultural Transformation Agency, require an attractive price incentive to induce the labor intensive work of transplanting, fertilization, weeding and other improved cultural practices. Promoting teff export is thus the best strategy to ensure a remunerative return on investment in new teff technologies. Otherwise, the increase in production can result in price collapse. Higher income from better prices and increased teff productivity can transform the livelihood of more than 50% of rural households (about 6.2 of the 12 million small farmers grow teff).

Addressing explicit or implicit taxes benefits the rural poor and the increased production (due to incentives) can bring down prices for consumers in the long term. As observed in a recent study, policy makers need to recognize that countries that tax the agricultural sector stall both their structural change and their economic growth (Dennis and Iscan, 2011).

There is no evidence of monopolistic pricing by traders as trade margins appear to have declined in recent years. On the other hand, transport costs from farm gate to wholesale market in Addis Ababa were found to be high and this is attributed to the use of smaller trucks rather than bigger trucks and bulk transport systems. In addition to building roads, the government should facilitate the transition from small scale to large scale grain transport, storage and trading practices.

Like other cereals, teff market is characterized by small scale operations with limited scale economies in distribution, transport and storage. Teff traders, millers and processors need to be supported to make the required investment to improve the value chain.

Our results are broadly consistent with the Anderson and Masters (2008) study on distortions of agricultural incentives, in which the case study on Ethiopia showed that while taxation of the agricultural sector has declined since the 1990s, three forms of distortions still persist: control over input markets, ad hoc government interventions in cereal markets and disincentives through depressed prices due to inflow of food aid (Rashid, Assefa and Ayele, 2007).

PRELIMINARY RECOMMENDATIONS

Export ban on teff cannot be justified on the ground of supporting the poor and ensuring food security; most of the rural poor grow teff for sale and are likely to gain from lifting the ban or higher teff prices. Teff is also the only cereal crop in which the country has comparative advantage;

Policy makers need to recognize that nominal prices of teff are high but real teff prices are not so high and have, in fact, declined significantly in recent years.

It is important for policy makers to reconsider policies, including currency overvaluation and export bans, that resulted in implicit taxation of agriculture;

¹⁵ **Independent Science News**, [How Millions of Farmers are Advancing Agriculture For Themselves](http://independentsciencenews.org/un-sustainable-farming/how-millions-of-farmers-are-advancing-agriculture-for-themselves/), December 3, 2012:

<http://independentsciencenews.org/un-sustainable-farming/how-millions-of-farmers-are-advancing-agriculture-for-themselves/>

Investment in bulk transport and storage facilities, along with grades and standards, would have a significant impact on competitiveness of teff production in Ethiopia; this would also improve opportunities for teff to be traded at the Ethiopian Commodity Exchange;

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

Care has been taken to use data that provides a reasonable reflection of the situation on the ground. Nonetheless, there were limitations that could not be fully addressed with the available time. In particular, data on FOB prices and access costs are hard to come by. The research team had to rely on indirect estimates and an assistant who collected primary data through interviews with a small number of traders and representatives of trader associations. The available data reveals a lot of interesting features of the teff market but further investigation and consultations with relevant government and private organizations are required to validate some of the data.

Teff is categorized as cereal (nes) (not elsewhere mentioned) in the FAO and UN comtrade database. We believe teff is the single most important item under cereal (nes) but further checking is required if there are other cereals included in the export and import data.

FURTHER INVESTIGATION AND RESEARCH

Farm gate prices were estimated based on wholesale prices observed in the town of Bure, located in major teff producing area. Refinement of the results should include obtaining actual farm gate prices for Bure area as well as other locations in different teff producing areas. More effort is also required to acquire FOB prices from cross-border trade.

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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 1: Data and calculations used in the analysis

Name of product	Teff
International currency	

Local currency	
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DATA		Unit	Symbol	Year trade status	2005	2006	2007	2008	2009	2010	Notes
					x	x	x	x	x	x	
Benchmark Price											
1	Observed	XXX/TO N	P _{b(int\$)}		466.00	548	592	846	884	807	FOB Price
1b	Adjusted	XXX/TO N	P _{ba}								
Exchange Rate											
2	Observed	YYY/XXX	ER _o		8.67	8.74	9.21	9.80	12.10	12.89	
2b	Adjusted	YYY/XXX	ER _a		10.40	10.49	11.05	11.76	14.52	15.47	
Access costs border - point of competition											
3	Observed	YYY/TO N	ACo _{wh}		782.07	810.40	872.23	1,018.58	1,052.20	1,080.83	
3b	Adjusted	YYY/TO N	ACa _{wh}		730.68	748.37	789.52	900.05	954.81	988.65	
4		YYY/TO N	P _{dwh}		2,641	3,567	4,132	7,690	8,382	6,921	
Access costs point of competition - farm gate											
5	Observed	YYY/TO N	ACo _{fg}		386	376	445	450	520	575	
5b	Adjusted	YYY/TO N	ACa _{fg}		346.00	338.00	395.00	375.00	432.00	475.00	
6		YYY/TO N	P _{dfg}		2,181	3,290	3,489	6,474	6,883	5,319	
7	Externalities associated with production		YYY/TO N	E							
8	Budget and other product related transfers		YYY/TO N	BOT							
	Quantity conversion factor (border - point of competition)		Fraction	QT _{wh}							
	Quality conversion factor (border - point of competition)		Fraction	QL _{wh}							
	Quantity conversion factor (point of competition - farm gate)		Fraction	QT _{fg}							
	Quality conversion factor (point of competition - farm gate)		Fraction	QL _{fg}							

CALCULATED PRICES			Unit	Symbol	2005	2006	2007	2008	2009	2010	Formula
Benchmark price in local currency											
9	Observed	YYY/TO	N	P _{b(loc\$)}	4,038.67	4,789.30	5,445.11	8,292.72	10,696.04	10,408.67	[1]*[2]
10	Adjusted	YYY/TO	N	P _{b(loc\$)a}	4,846.40	5,747.16	6,534.14	9,951.27	12,835.25	12,490.41	[1]*[2b]
Reference Price at point of competition											
11	Observed	YYY/TO	N	RP _{o_{wh}}	3,256.60	3,978.90	4,572.89	7,274.14	9,643.84	9,327.85	[9]-[3]
12	Adjusted	YYY/TO	N	RP _{a_{wh}}	4,115.73	4,998.79	5,744.62	9,051.22	11,880.44	11,501.76	[10]-[3b]
Reference Price at Farm Gate											
13	Observed	YYY/TO	N	RP _{o_{fg}}	2,870.60	3,602.90	4,127.89	6,824.14	9,123.84	8,752.85	[11]-[5]
14	Adjusted	YYY/TO	N	RP _{a_{fg}}	3,769.73	4,660.79	5,349.62	8,676.22	11,448.44	11,026.76	[12]-[5b]

INDICATORS			Unit	Symbol	2005	2006	2007	2008	2009	2010	Formula	
Price gap at point of competition												
15	Observed	YYY/TO	N	PG _{o_{wh}}	(616.04)	(412.37)	(440.81)	416.07	(1,261.94)	(2,407.10)	[4]-[11]	
16	Adjusted	YYY/TO	N	PG _{a_{wh}}	(1,475.17)	(1,432.27)	(1,612.54)	(1,361.01)	(3,498.54)	(4,581.01)	[4]-[12]	
Price gap at farm gate												
17	Observed	YYY/TO	N	PG _{o_{fg}}	(689.63)	(312.90)	(638.45)	(349.93)	(2,240.61)	(3,434.10)	[6]-[13]	
18	Adjusted	YYY/TO	N	PG _{a_{fg}}	(1,588.75)	(1,370.79)	(1,860.18)	(2,202.01)	(4,565.21)	(5,708.01)	[6]-[14]	
Nominal rate of protection at point of competition												
19	Observed	%		NRPO _{wh}	-18.92%	-10.36%	-9.64%	5.72%	-13.09%	-25.81%	[15]/[11]	
20	Adjusted	%		NRPA _{wh}	-35.84%	-28.65%	-28.07%	-15.04%	-29.45%	-39.83%	[16]/[12]	
Nominal rate of protection at farm gate												
21	Observed	%		NRPO _{fg}	-24.02%	-8.68%	-15.47%	-5.13%	-24.56%	-39.23%	[17]/[13]	
22	Adjusted	%		NRPA _{fg}	-42.14%	-29.41%	-34.77%	-25.38%	-39.88%	-51.77%	[18]/[14]	
Nominal rate of assistance												
23	Observed	%		NRA _o	-24%	0.0868467	0.1546669	0.05127852	-	0.2455775	0.3923406	[(17)+[8])/[13]

24	<i>Adjusted</i>	%	NRAa	-42.14%	-29.41%	-34.77%	-25.38%	-39.88%	-51.77%	$\frac{([18]+[8])}{[14]}$
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Decomposition of PWAfg		<i>Unit</i>	<i>Symbol</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>Formula</i>
25	International markets gap	YYY/TO N	IRG	-	-	-	-	-	-	-
26	Exchange policy gap	YYY/TO N	ERPG	(807.73)	(957.86)	(1,089.02)	(1,658.54)	(2,139.21)	(2,081.73)	$([2]-[2b])*[1]$
27	Access costs gap to point of competition	YYY/TO N	ACG _{wh}	(51.39)	(62.03)	(82.71)	(118.53)	(97.39)	(92.18)	$-([3]-[3b])$
28	Access costs gap to farm gate	YYY/TO N	ACG _{fg}	(40.00)	(38.00)	(50.00)	(75.00)	(88.00)	(100.00)	$[5b]-[5]$
29	Externality gap	YYY/TO N	EG	-	-	-	-	-	-	-

Total values		<i>Unit</i>	<i>Symbol</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>Formula</i>
30	Production volume	tons								
	Market price support									
31	<i>Observed</i>	YYY	MPSo	-						$[17]*[29]$
32	<i>Adjusted</i>	YYY	MPSa	-						$[18]*[27]$



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