MAFAP
SPAAA

Monitoring African Food and Agricultural Policies

Suivi des politiques agricoles et alimentaires en Afrique

ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR SUGAR CANE IN MOZAMBIQUE

JANUARY 2013

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.

MAFAP is implemented by the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Organisation for Economic Co-operation and Development (OECD) and national partners in participating countries. It is financially supported by the Bill and Melinda Gates Foundation, the United States Agency for International Development (USAID), and FAO.

The analysis presented in this document is the result of the partnerships established in the context of the MAFAP project with governments of participating countries and a variety of national institutions.

For more information: **www.fao.org/mafap**

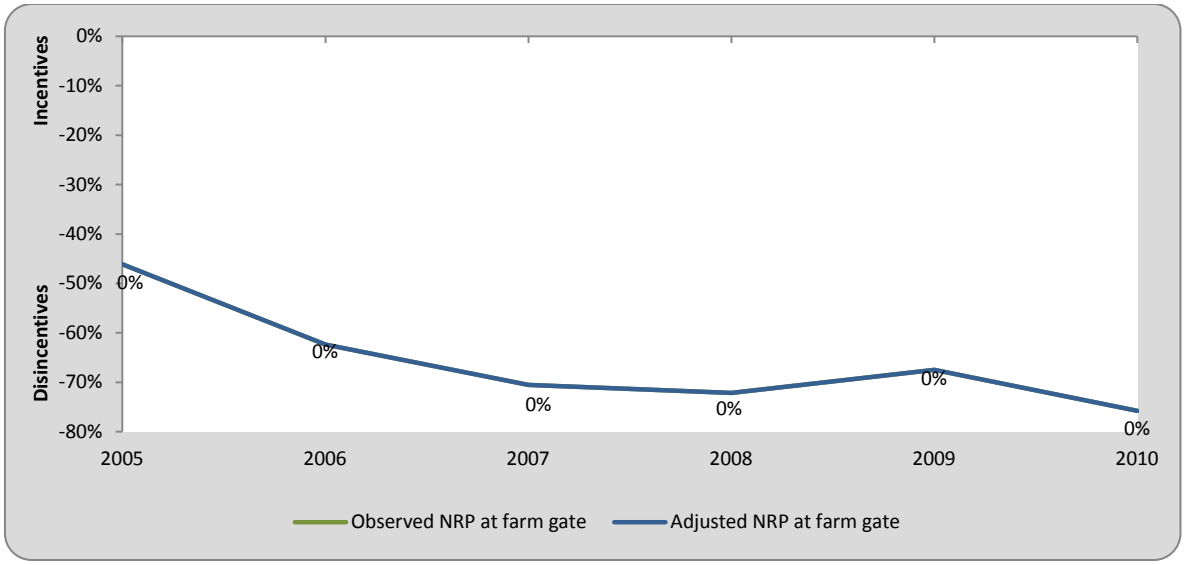
Suggested citation:

Dias P., 2013. Analysis of incentives and disincentives for sugar cane in Mozambique. Technical notes series, MAFAP, FAO, Rome.

SUMMARY OF THE NOTE

Product: Sugar cane (raw equivalent)
Period analyzed: 2005 – 2010
Trade status: Export in all years

- Sugar cane is one of the most important export crops in Mozambique, along with tobacco, cotton, cashew and tea. On average it accounts for 20 percent of total agricultural exports, and in 2010 production covered 215 000 ha out of 5.6 million ha of the entire cultivated area in Mozambique.
- Production increased significantly from about 397 276 tonnes in 2000 to 2.8 million. The increase on production was strongly correlated with increases in total area planted to sugarcane rather than increases in yield (Figure 1).
- The Mozambican sugar sub-sector is highly concentrated and dominated by four commercial industries located in Maputo and Sofala provinces.
- Mozambique exports sugar mainly to the European Union benefiting from the preferential trade agreements, which allows Mozambique to export raw sugar to the European Union market through its share of the preferential tariff-rate import quota.



The observed Nominal Rate of Protection (NRP, green line) indicates that sugar cane farmers have not received price incentives under the prevailing cost structure in the value chain. The adjusted NRP (blue line) captures the effects of market inefficiencies on farmers.

- Overall our indicators show disincentive at farm gate in the whole period under review, indicating that producers are receiving lower prices than they would in the absence of government policies. This suggest that the policy decisions and measures, such as the preferential trade agreement with the European Union which the Mozambican sugar industry benefits and the government objective of increasing sugarcane production have not translated into incentives for sugarcane producers.
- Disincentives cannot be explained by policies and regulations alone, as there are no explicit taxes on export of raw sugar. A large share of it can be explained by issues related to market structure, such as: i) lack of competition due to both monopsony and oligopoly in the demand and supply

side; and ii) unbalanced bargaining power between farmers and millers due to weak farmers association.

CONTENTS

1. PURPOSE OF THE NOTE

This technical note aims to describe the market incentives and disincentives for sugar cane in Mozambique. The note is a technical document and serves as input for the MAFAP Country Report.

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 Part 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

Sugar-cane is one of the most important agricultural export crops in Mozambique, along with cotton, tobacco, cashew and tea. The sugar sub-sector is mainly composed of four commercial companies (figure 3), *each of them owning a sugar estates and mills*. These companies are: i) Xinavane and Marragra, located in Maputo province, and ii) Marromeu and Mafambisse, located in Sofala province. After independence (1975), all the existing sugar companies were nationalized and became state property under the socialist system adopted by the Mozambican government during this period. Following the introduction of economic reforms in the late 80's, the majority of state owned companies were privatized - including the sugar companies above mentioned.

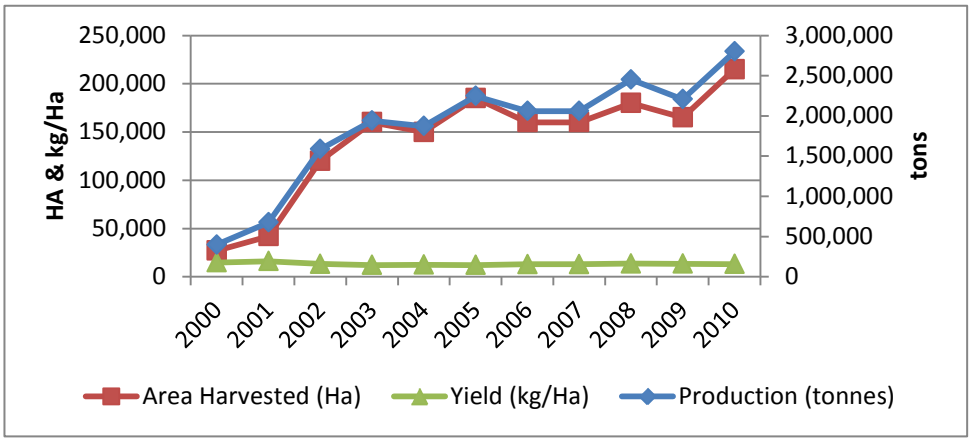
At present, the Mozambican Government owns a small amount of shares in three of the four sugar companies, although government shareholding in the companies is decreasing due to the ongoing privatization reforms in the country. Following the end of the civil war in 1992 and after the introduction of the second wave of economic reforms in the early 90's, the sugar industry is one of the fastest growing sectors, compared to other export crops, such as cotton, and has become a prospective sector for foreign direct investment with potential for high impact on job creation (table 1).

In the recent years, a new strategy for development has emerged which focuses on creating an environment conducive for attracting foreign direct investments (FDI) in mining and gas sectors. These sectors provide more than 80 per cent of Mozambique's total export earnings, compared to 1.67 percent of the sugar sector in 2010 (National Institute of Statistics - INE, 2012). Despite the importance of the mining/gas sector in the Mozambican economy, the sugar sub-sector continues to play an important role by creating direct or indirect employment opportunities and generating income for 21 500 workers in rural areas (Machemedze et al. 2011).

PRODUCTION

As shown in Figure 1, sugarcane production was relatively volatile over the period under analysis, reaching its peak of 2.8 million tonnes in 2010, which is however still below the maximum historic production of 3.2 million tonnes achieved in the colonial period (FAOSTAT, 2012). Yields were relatively stable over the period of analysis and reached a maximum of 16 086 kg/ha in 2001 compared to 56 250 kg/ha achieved in the colonial period (FAOSTAT, 2012). Since 2000, production of sugarcane has seen a significant increase, in part driven by economic and political stability in the country after the end of the civil war in 1992, which attracted massive significant Foreign Direct Investment (FDI) to the sector (GAIN, 2012 and DNEAP, 2010). The increase in sugarcane production was also attributed to the rehabilitation of the sugar mills in the 1990's which resulted in increase of cultivated area and productivity at both the farm and mill levels. In 2010, production of sugarcane covered 215 000 ha compared to 27 000 ha in 2000, constituting almost 4 percent of the entire cultivated area in Mozambique, i.e. 5.6 million ha (TIA, 2008). The increase of cultivated area in the period of analysis is also attributed to the rehabilitation program above mentioned.

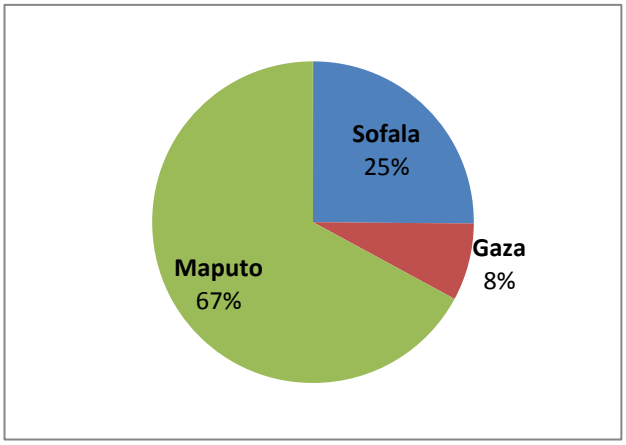
Figure 1: Sugar-cane production, area harvested and yield trends in Mozambique



Source: FAOSTAT

Figure 2 below shows that cultivation of sugarcane is mainly carried out in three provinces: Maputo, Gaza and Sofala. Among the producing provinces, Maputo is where 67 percent of the total sugarcane is cultivated. This is partly attributed to the fact that the southern region, more specifically Maputo and Gaza, have good infrastructural facilities (such as roads and port) and share a border with South Africa – the biggest economy of Africa and the most important trade partner for Mozambique. Additionally, the most important system of irrigation for Mozambique "*Regadio do Xhokwe*" is located in the producing areas of Maputo and Gaza, this partly explains the high concentration of sugarcane production in these provinces.

Figure 2: Distribution of sugar-cane cultivation in Mozambique by provinces



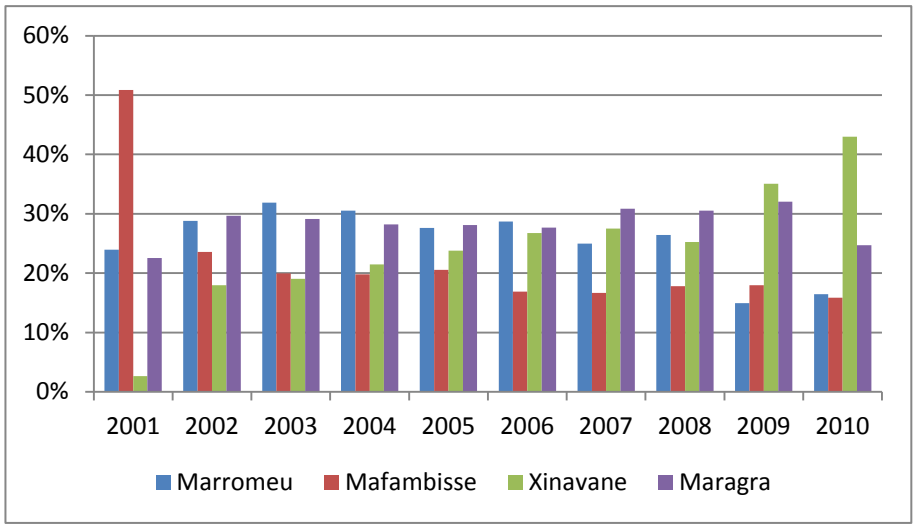
Source: CENSUS[1] (2009/2010)

Figure 3 below shows the share of sugarcane production by individual firms. Mafambisse emerges as the biggest producing firm in 2001, accounting for almost 50 percent of total sugarcane produced in that year. From 2002, its production reduced drastically to a minimum of 16 percent in 2010, the lowest in the group of firms under analysis (figure 3). The reduction of total production of Mafambisse (located in the Beira corridor) under the period in analysis can be partly attributed to the fact that the majority of foreign investors (notably South Africans) invested in Maputo because of infrastructural facilities above mentioned as well as its proximity to South Africa - which constitutes a competitive advantage.

[1] Censo Agro-Pecuário, National Institute of Statistics, Mozambique

Figure 3 below also shows that Xinavane was the smallest sugar company in 2001, accounting for 3 percent of total production of sugarcane in this year. From 2002, its share of production increased strongly and it became the biggest producing company in 2010, accounting for 43 percent of total sugarcane produced in this year. The increase is partly attributed to the rehabilitation of the sugar mills in 90's which resulted in the increase of productivity at both the farm and mill levels. Additionally, the infrastructural facilities and its proximity to South Africa, contributed to attracting foreign investors, notably South Africans. For example, the acquisition of the majority of shares of Xinavane by Tongaat-Hulett[2] (88 percent), and consequent investment in the company, could have contributed to increasing the capacity of production of Xinavane.

Figure 3: Share of production of sugarcane by individual firms



Source: Ministry of Planning and Development

Table 1 below shows the typology of employment (permanent and temporary workers) in the sugar industry. Overall, both permanent and temporary workers increased significantly in the period of analysis, reaching the maximum of 29,922 workers in 2010 compared to 18,519 workers in 2002. Table 1 below also shows that the majority of workers employed in the sector are temporary (60 percent), this can be partly attributed to the differences on the demand of labor associated to the cycle of production/processing of sugarcane, which consists of harvesting, cleaning, transportation of the cane stalks (i.e. cane without roots and leaves) to the milling and processing – some stages of the cycle of production/processing requires the use of additional labor force. According to the INE, the Mozambican sugar industry is the largest private employer and overall the second largest after the public sector – evidencing its importance as a source of wage income of the majority of rural households in the producing villages.

[2] One of the biggest South African sugar company

Table 1: Permanent and temporary workers in the sugar industry

Employment	2002	2004	2006	2008	2010	2011
Permanents	4,574	8,370	10,100	10,279	12,384	12,515
Temporary	13,945	13,085	11,532	15,353	17,538	15,637
Total	18,519	21,455	21,632	25,632	29,922	27,834

Source: CEPAGRI[3], 2012

CONSUMPTION/UTILIZATION

After processing of sugarcane, almost the totality of sugar (raw equivalent) is exported to the international market, notably to the European Union under the new Economic Partnership Agreements (EPA) introduced in 2009 which accelerated the trade flows. The remaining part of raw sugar (very small part) is processed by the local companies into brawn/unrefined sugar and sold in the local market. The other derivates of sugarcane, such as molasses, are used by the local industries, notably Coca-Cola and *Cervejas de Moçambique* - the biggest industrial sugar users in Mozambican.

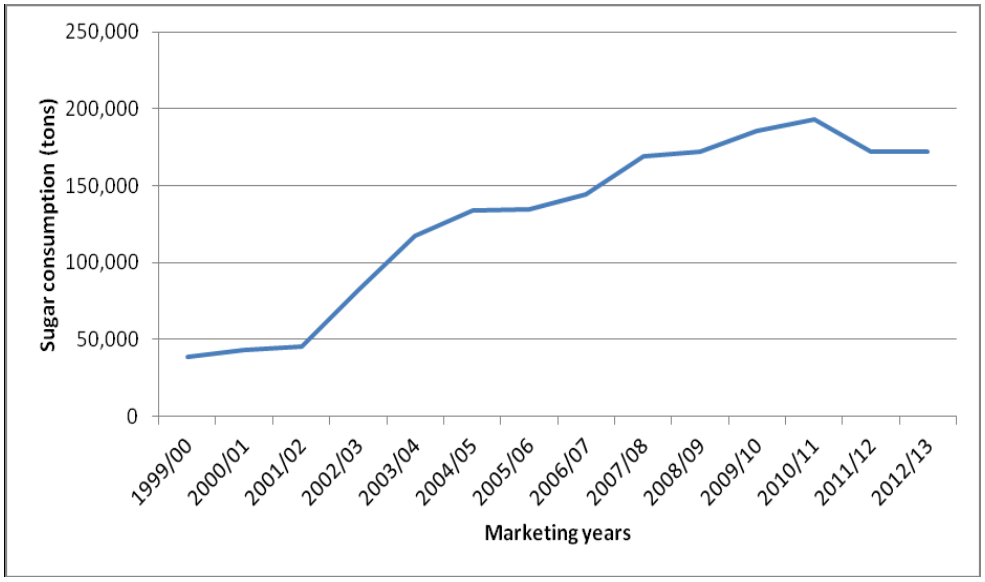
Regarding the household sugar consumption, given Mozambique's cultural and historical patterns of consumption, brown unrefined sugar constitutes almost 70 percent of total sugar consumed in Mozambique, because it is cheaper and can be bought in the local market using unconventional units of measure (such as spoons, small bags, etc.), which is important to accommodate different purchasing-capacity of poor households, notably in the rural areas where the majority of the population live. Regarding the refined white sugar, it is mostly consumed in urban areas, because it is relatively expensive compared to brawn unrefined sugar and the majority of wealthy consumers who prefer white sugar live in urban areas.

Figure 4 below shows the recent trends in sugar consumption in Mozambique. As can be seen, the consumption of sugar increased significantly over the period under review, reaching its maximum of 172,073 tons in 2010/2011 compared to 47,000 tons in 1999/2000. The increase in sugar consumption was partly influenced by two factors: i) increase of domestic supply as a result of increase of cultivated area (figure 1), and ii) the improvement of the standard of living of the majority of population more specifically in the urban areas[4].

[3] Center for Agriculture Promotion

[4] The improvement of the standard of living was also translated on increased consumption per capita of sugar in the period under analysis (Food Balance Sheets, FAOSTAT).

Figure 4: Sugar consumption trends in Mozambique since 1999



Source: GAIN report 2012

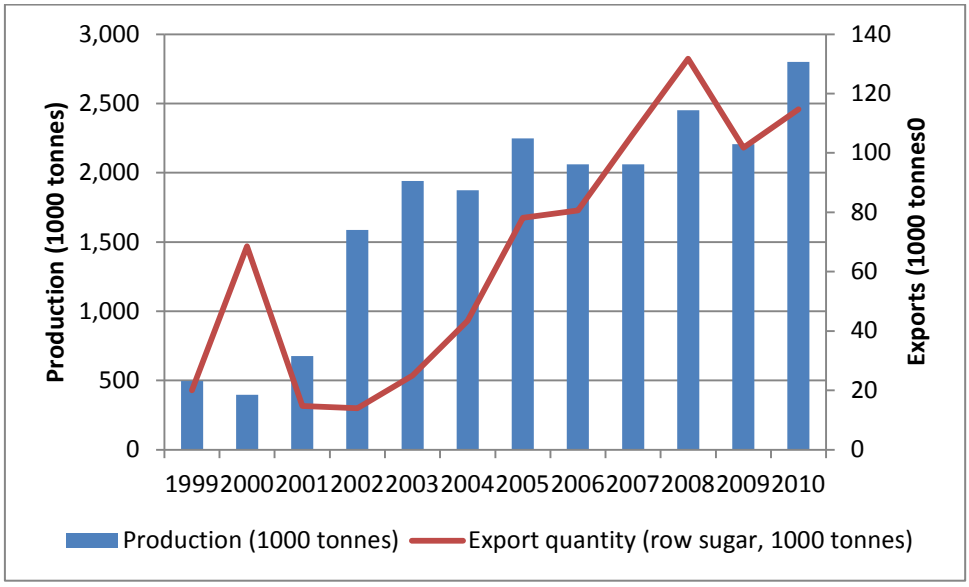
The increase of domestic supply of sugar due to increase of domestic capacity of production partly contributed to reducing the import of refined white sugar through import substitution, i.e. substitution of the imported refined white sugar with the domestic produced brown unrefined sugar. Despite the increase of domestic capacity of production, the domestic supply of sugar is insufficient to satisfy the domestic demand and the country relies on imports of sugar for human consumption from South Africa. Official projections indicate that the domestic supply of sugar is expected to increase in the coming years - this will contribute to reducing the import bill of sugar by substituting the imports with the domestic production.

MARKETING AND TRADE

During the colonial period, the Mozambican economy was structured mainly as a service economy for neighbouring states, and integrated into a region dominated by South African industrial capital mainly through the provision of transport services and mining labor. Geographical and historical factors between the regions also contribute to the large differences in sugarcane production and trade in Mozambique. In terms of regional distribution of economic activities, the country was divided into two regions: the southern region was specialized in providing labor to the mining industry in South Africa, while central and northern regions were dedicated to agriculture. This economic structure still exists, but with some changes due to foreign direct investment in a number of large industrial projects (the so-called “mega-projects”) in the central and southern regions (notably Maputo and Tete).

Unlike the other agricultural cash crops, production and processing of sugarcane is concentrated in Maputo Province (Figure 2), this is partly attributed to the strategic geographical location of Maputo, more specifically its proximity to South Africa. Additionally, Maputo has good infrastructures, such as good roads and well equipped port, compared to other provinces, which facilitate its integration to the international market - with low trade costs.

Figure 5: Mozambican sugar (raw equivalent) exports trends



Source: FAOSTAT

Given the importance of the sugar sub-sector in the Mozambican economy, the government, in collaboration with the Cane Growers Association (APAMO[5]) created the National Distributor of Sugar (DNA[6]) in 2002, whose responsibility is to coordinate the distribution and marketing of sugar and to ensure a better function of the sugar market. The DAN is also responsible for the marketing and trade of sugar in the international market.

Figure 5 above shows the recent trends in Mozambican raw sugar exports to the international market. As illustrated, raw sugar exports increased significantly under the period of analysis, reaching its maximum of 131 783 tonnes in 2008 compared to 14 000 tonnes in 2002.

The increase on exports is in line with increased domestic production of sugar. On the other hand, imports of raw sugar were not reported by FAOSTAT (our source of data for trade of raw sugar), probably because the quantities imported are very small. Also the UN COMTRADE reports very small quantities of import of raw sugar in the period of analysis. This indicates that Mozambique is net exporter of raw sugar in the whole period under analysis.

Regarding the refined white sugar and brown unrefined; despite the existence of domestic capacity of production, the official statistics indicates that Mozambique is a net importer of both varieties of sugar in all years under analysis (INE, 2012). This is mainly determined by the market opportunities at international level, i.e., for Mozambican sugar companies it is more convenient to export raw sugar, notably to European Union (EU), rather than refine it and sell domestically as the prices in the EU are high and they are able to make profits. To satisfy the domestic demand for refined white and unrefined brawn sugar they import it from the world market, notably from South Africa. The DNA in its role of national distributor of sugar has the responsibility to intermediate the imports of refined sugar (mainly from South Africa) to satisfy the domestic demand. It is important to note that there might be significant informal cross border trade on refined sugar in the central and southern regions,

[5] Associação das Empresas Produtoras de Açúcar de Moçambique
[6] Distribuidora Nacional de Açúcar

for example sugar smuggled into Mozambique from Zimbabwe, which is mostly sold to local traders who sell it to larger wholesalers.

For the purpose of this study, we selected our segment value chain from the point of competition to the border, i.e. Xinavane/Marragra to Maputo port, taking into consideration the export data of sugar raw mentioned above.

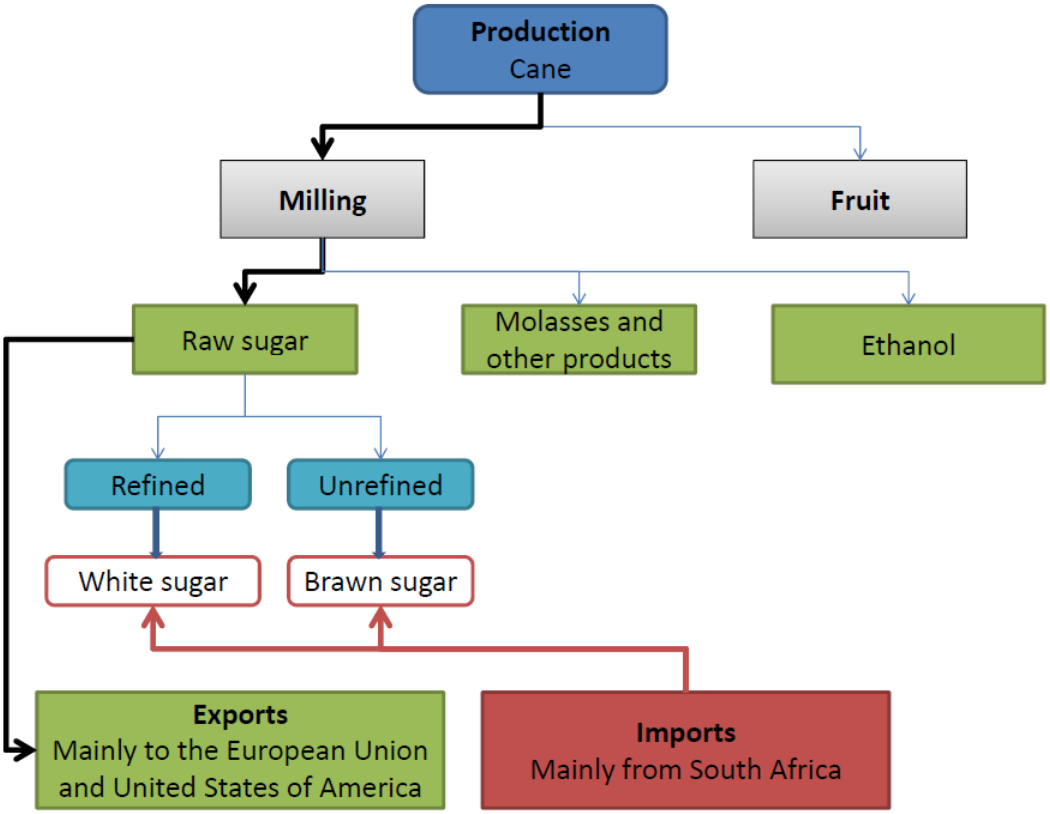
DESCRIPTION OF THE VALUE CHAIN AND PROCESSING

Unlike other export cash crops, production of sugarcane in Mozambique is based on plantation system of production, i.e. system of production dominated by large commercial industries. Under this system of production, each of the sugar company owns a sugar estate and mills, permitting the companies to manage efficiently the cycle of production and processing of cane. Consequently, sugar cane needs to be processed immediately after harvesting which entails a very close relationship between growers and processors.

After harvesting, the cane is transported without roots, leaves and tops to the milling factory in specially designed vehicles that facilitate easy loading and offloading. Regarding the processing cycle, for one ton of cane crushed, 30 percent is fibrous residue (*bagasse*), 12 percent is sugar (raw equivalent), 4 percent is molasses, and the remaining part is water. For the segment of the sugar value chain (mill – Maputo port) this study will focus on price incentives and disincentives for *raw sugar*, as it represents the main source of income of the sugar companies.

After processing, sugar has different products (such as raw sugar, molasses, voermont and ethanol) which are traded in the domestic and international market (figure 6). Regarding the export of raw sugar (the focus of this study), this is exported directly by the sugar companies though the intermediation of the DNA. In this segment of the sugar value chain, raw sugar is shipped from Xinavane/Marragra to Maputo port by train. According to the DNA, southern region has good/extensive infrastructures (railway and port) and facilities for export, which results in low transport cost (trade cost) and overally gives Mozambique a competitive advantage compared to other countries in the region (notably landlocked countries such as Malawi, Zimbabwe Swaziland and Zambia). The competitive advantage is in terms of transport cost and duration/time needed to ship raw sugar from the processing factory to Maputo port – this is estimated to be less than two hours.

Figure 6: Simplified market chain for sugarcane in Mozambique



Source: Authors

POLICY DECISIONS AND MEASURES

International and Regional Trade Policy Measures

In the last two decades, trade reforms such as the elimination of *exchange controls* and *quantitative restriction on imports and exports* have been implemented by the Mozambican Government in compliance with the *Washington consensus* which was based on market liberalization, fiscal discipline and privatization. Under these reforms, the prices of agricultural commodities and services were liberalized. However there are exceptions – the government fixes the minimum prices for sugar (i.e. retail price for white refined and brown unrefined in the local market), cotton and petroleum products (MozSAKSS, 2012).

At the international level, Mozambique is a member of the World Trade Organization (WTO) and the African Caribbean and Pacific Group of States (ACP), with preferential trade agreements with member countries. At the regional level, Mozambique is a member of the Southern African Development Community (SADC) which commits its members to the removal of trade barriers. This should also include the elimination of the application of VAT (value-added tax) on trade among the SADC countries.

International preferential trade agreements

Preferential trade agreements with the European Union (EU): Preferential access to the EU market under the new economic partnership agreement (EPA) introduced in 2009 is an important factor in sugar trade for Mozambique.

This preferential agreement allows Mozambique to export raw sugar to the EU market through its share of the preferential tariff-rate import quota (TRQ), and the price paid per tonne of raw sugar is higher than the world market price and the price paid through other preferential treatments. So far, the EU market price continues to be higher than the world market price and this explains the preference of Mozambican producers/millers in exporting raw sugar to the EU market.

Preferential trade agreements with the United States of America (US): Mozambique has access to the US domestic market through its share of the preferential tariff-rate import quota (TRQ). Similarly to the preferential agreement with the EU, this agreement allows Mozambique to export to the USA on duty-free raw sugar at higher price than the world price (except EU prices). The quota of Mozambican raw sugar exported to the US market under the preferential agreement above mentioned was 13 700 tonnes in 2003 and has not been changed from the previous years (Cagnan et al. 2005). In 2010, Mozambique exported 24 989 tonnes of raw sugar to the US market (GAIN, 2012), representing an increase of almost 82 percent compared to 2003.

Price policies, marketing, regulation and licensing activities

Under the National Agricultural Policy (PROAGRI II), more emphasis is given to the production of higher value crops, including value-added processing, aiming to create employment opportunities and generate income for the rural population - sugarcane is among the high value crops targeted by PROAGRI II. Over the last few years, the sugar industry has been one of the fastest growing sectors in Mozambique economy. It has been successful in attracting a significant level of foreign direct investment and creation of wage employment – one of the main goals of PROAGRI II.

All the four commercial industries operating in the Mozambican sugar subsector are registered in the DNA, in order to benefit from the policies and trade agreements negotiated by the DNA (such as the preferential agreements above mentioned). The registration is subject to a tariff (*Taxa de Inscriçâo*), and the amount of the tariff depends on the quantity of sugar-cane produced and processed by the company. Similarly to the tobacco subsector, the revenue from the registration of the companies serves to finance the activities of DNA.

Export tax

As mentioned before, the export of raw sugar benefits from the preferential trade agreements with the EU and USA. Different to other export crops (such as cotton), raw sugar is exempt from export taxes in order to incentivize the domestic industry to export to the lucrative markets, notably in EU (MozSAKSS, 2012).

Import tariff

Raw and refined sugar are subject to import surtaxes, in addition to the basic duty of 7.5 percent applied on the CIF value of imports. Surtax was levied on raw sugar imports to assure profitability of local industry, the imports surcharge on sugar varied depending on the world price. LMC (2012) argues that raw sugar imported has to pay a surcharge-inclusive tariff of 90 percent, while refined white sugar imported by traders is subject to a surcharge-inclusive tariff of 61 percent. White sugar imported by eligible industrial sugar users is not subject to a surcharge-inclusive tariff at present - as a political strategy aiming to promote the domestic industry, and pays only the tariff of 7.5 percent. The high level of import tariff on raw sugar can be considered as a government strategy to protect the domestic industries.

Regarding the import of refined white and unrefined brown sugar for human consumption, differently from other imported agricultural products, they are exempted from 17 percent of VAT. This is part of the government strategy aiming to keep the prices lower and accessible for the most vulnerable population. Also the government policy of fixing the minimum price of sugar, is implemented though import subsidies and other government measures, as the country relies on imports (mainly from South Africa) to satisfy the domestic demand. Under SADC trade protocol, importers of sugar (for human consumption) from the region have the preferential tariff rate of 0 percent; this partly explains why Mozambique imports sugar (white refined and brawn unrefined) from South African rather than from Brazil (the world largest exporter of sugar).

Agriculture inputs subsidies and support services

In 2010, the Mozambican Government introduced a production subsidy consisting of a 10 percent reduction of electricity price per kilowatt-hour aiming to incentivize the domestic industry, more specifically for farmers who use electricity for food production. The sugar industry also benefited from this government subsidy, as one of the industries which consumes substantial quantity of energy. Also in 2010, the government introduced credit subsidy of USD 25 million with low interest loans to farmers to support cereal production growth as the planting season get underway, also the cash crop producers benefited from this government subsidy. Overall, the difficulty to access data on a specific amount of subsidies received by farmers/millers hampers the identification of the real impact of agricultural policy on sugar sub-sector and to determine the exact level of budgetary transfers to sugar producers that were realized. This problem can be solved by public expenditure analysis, which is expected to take place under MAFAP in the future

.

3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS

To calculate the indicators to estimate incentives or disincentives to production (NRP)[7] as well as the Market Development Gaps (MDGs), several types of data are required. These data were collected and are presented and explained hereafter.

TRADE STATUS OF THE PRODUCTS

Raw sugar is an export commodity in Mozambique for the whole period under analysis. Therefore, in our analysis, the trade status of the country is exporter for all years.

BENCHMARK PRICES

Observed

Calculating a reference parity price to determine whether Mozambique sugarcane producers receive market incentives or disincentives requires establishing a benchmark border price. Since raw sugar is an export commodity in Mozambique, a FOB[8] price was calculated based on the unit value using data from FAOSTAT. The FOB price is the average annual unit value of the raw sugar and is shown in table 2 below.

Table 2: Estimating the benchmark price of raw sugar with unit value of Mozambican exports to the international market

Item	2005	2006	2007	2008	2009	2010
FOB prices (USD/tons)	377	454	542	629	522	589

Source: FAOSTAT

Adjusted

No adjustments to the benchmark price have been made.

DOMESTIC PRICES

Observed

Since raw sugar is exported directly by the millers, the wholesale market where the domestic raw sugar competes with the international production will be at the border (Maputo Port), and no price at the gate of the factory is reported. Therefore we only have one domestic price, i.e. farm gate price. We have constructed an artificial factory gate price by deducting the observed access costs from border to factory which leads to a zero nominal rate of protection at wholesale level.

It is important to note that, the industrial structure of sugar in Mozambique means that, each of the sugar company owns a sugar estate and mills, i.e. the millers are both producers and processors of sugarcane. Smallholder farming accounts for very little in cultivation of sugarcane in Mozambique,

[7] NRP - Nominal Rate of Protection.

[8] FOB stands for Free on Board. It is the cost of an export good at the exit point in the exporting country, when it is loaded in the ship or other means of transport in which it will be carried to the importing country.

because the production cycle of sugarcane requires high level of investments (source) and the majority of rural households do not have the economic capacity for the large scale investment required in the cultivation of sugarcane. Given these facts, the producer price reported by FAOSTAT could be related to a very small percentage of farmers who supply their production to the commercial industries at a very low price (Figure 7). The low price paid to such farmers can be partly attributed to the asymmetrical distribution of market power between small farmers and millers, as the millers also cultivate sugar in a large scale and they have the power to influence prices at farm level. Despite the producer price being related to a very small percentage of sugarcane growers, a decision was made to use these prices in the calculation of indicators in order to better understand if the current policy framework has created incentives or disincentives to farmers.

Table 3 below shows that producer price of sugarcane increased over the period of analysis, reaching its maximum of 353 tonnes in 2010, compared to 247 tonnes in 2005. Similar to the other export crops, producer price of sugarcane is partly driven by the international prices (table 2), evidencing that the volatility of prices and demand conditions in the international market is transmitted to producers.

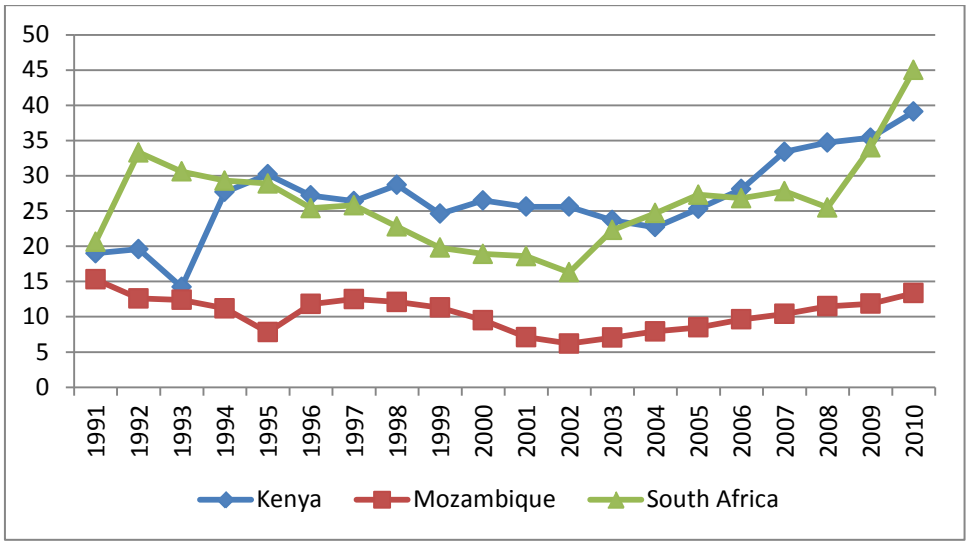
Table 3: Producer price of sugarcane (tonne)

Sugar-cane	2005	2006	2007	2008	2009	2010
Producer price	247	261	279	308	314	353

Source: FAOSTAT

As shown in the figure 7, the price paid to farmers in Mozambique is very low compared to the prices of the other countries in the figure below. This is partly attributed to the fact that the Mozambican sugar industry is mainly dominated by four commercial industries (oligopoly), each of them with their own sugar estates and mills. On the demand side, these companies operate as a *monopsony* (as they are the only purchasers of sugarcane). They have the power to influence the producer prices, by pulling down the prices in order to increase their profit margins. Additionally, the Mozambican farmers association is one of the weakest in Africa (World Bank, 2010); which influences negatively the bargaining power of farmers.

Figure 7: Producer price differences between Mozambique, Kenya and South Africa (USD/tonne)



Source: FAOSTAT

Adjusted

No adjustment to the domestic prices has been made.

EXCHANGE RATES

Observed

The exchange rate between the Mozambican Metical and the United States Dollar has been taken from the IMF database on exchange rates. The average of the exchange rate for each year has been calculated from the monthly data reported in that database.

Table 4: Nominal exchange rate (tonne/USD)

Year	2005	2006	2007	2008	2009	2010
Nominal Exchange Rate	23.06	25.40	25.84	24.30	27.52	33.96

Source: IMF

As shown in table 4, from 2006 to 2008 the nominal exchange rate was stable, with slight reduction in 2008. The stability of Metical against the dollar (from 2006 to 2008) was due to the good performance of the Mozambican economy as well as the results of monetary reforms introduced by the Central Bank of Mozambique during this period. From 2008, the nominal exchange rate increased slightly reaching its maximum of 33.96 MT/USD in 2010 compared to 23.06 MT/USD in 2005. This was driven largely by the discovery of new vast reserves of coal and natural gas in 2008/2009, which prompted several billion dollar investments by the world's largest mining and oil companies, contributing to real exchange rate appreciation, with negative impact on the real economy, notably export sector, including sugarcane sub-sector. Official projection indicates that the nominal exchange rate is expected to continue appreciating as Foreign Direct Investments (as well as foreign aid) rise.

Adjusted

As there is no explicit exchange rate policy nor foreign currency controls there is no justification to consider an adjusted exchange rate.

ACCESS COSTS

Access costs are calculated for two different segments of the sugarcane value chain, namely: i) the access cost from the farm gate to the factory; and ii) from factory to Maputo. They cover all costs that are involved with taking sugarcane in both segments of the value chain (Table 5).

Observed

Farm gate to factory:

Under the plantation system of production, each of the sugar company owns a sugar estate and mills; this permits the companies to manage efficiently the cycle of production and processing of sugarcane, as the sugarcane needs to be processed immediately after harvesting. The total observed access cost from the farm gate to factory ranges from 392 to 560 MT/ton in 2005 and 2010, respectively - as shown in Table 5. The costs in this segment of the sugarcane value chain are relatively low (compared to the costs from the factory to port), driven largely by the industrial structure of the sugar sub-sector above mentioned.

Factory to Maputo port:

The observed access cost (notably transport, handling and transaction fees) was calculated using the average price/ton provided by the DNA for 2010. We estimated the costs for the period 2005-2009 that we analyze by adjusting the value of 2010 with the consumer price index, as shown in table 5 below. The total observed access cost from the milling to Maputo port ranges from 1 622 to 3 157 tonnes in 2005 and 2010, respectively - as shown in table 5 below.

The costs (notably transport cost) in this segment of the sugar value chain are relatively low, compared to the costs in the central and northern Mozambique (notably in Beira corridor) and the costs in the neighboring countries (notably in landlocked countries such as Zimbabwe, Malawi and Swaziland). According to the DNA, the transport cost (by train) to ship raw sugar from the producing areas in the central Mozambique to the Beira port (Beira corridor) is twice as expensive as from the southern region to the Maputo port (Maputo corridor). The handling cost in the Beira port is also twice as expensive as in Maputo port. This gives Maputo competitive advantage in production and trade of sugar, which explains the high concentration of sugar industries in Maputo.

Table 5: Observed access cost from the factory to Maputo port (tonnes)

Access cost (MT/ton)	2005	2006	2007	2008	2009	2010
Farm gate to mill						
Cost cane transport (MT/metric ton)	42.20	46.48	47.29	44.71	50.63	62.49
Cost field to mill (MT/metric ton)	349.83	393.71	393.81	361.11	396.54	497.18
Total	392.04	440.20	441.09	405.82	447.17	559.66
Mill - Maputo port						
Distance (mill - Maputo port)	Approximately 150 Km					
Transport cost (MT/metric ton)	130	147	159	175	181	204
Cost factory (MT/metric ton)	118	126	128	120	136	168
Handling cost (MT/metric ton)	389	440	476	525	542	611
Margins (10% of export price)[9]	870	1,153	1,401	1,527	1,437	1,773
FOB price Molasses (MT/tons)	-102	-83	-85	-43	-43	-43
Transaction fee (2.5% of export price)	218	288	350	382	359	443
Total	1,622	2,071	2,429	2,686	2,612	3,157

Source: DNA, EST[10], FAOSTAT and own calculations

It is important to note that, the export unit price of molasses was considered as an access cost with negative sign, i.e., it was subtracted from the access costs because it is traded and the millers are getting profits from the sales. The reaction of subtracting the export price of molasses from the access costs is due to the unavailability of data (prices) of other products obtained from the crushing sugarcane (such as the price of bagasse). This hampered us to use the average waged prices in the calculation of the FOP price which takes into consideration the prices of different derivates of sugarcane (after processing). Efforts are being made with country partners in order to get this information which we hope to use in the country report.

Adjusted

[9] We considered 10 percent of profit margins because no detailed information on profit margins was available.
[10] Trade and Market Division (Analysis of Industry Cost Competitiveness)

Overall, we have not encountered strong evidence of excessive costs that justify adjustments to the observed market access costs in both segments of the value chain. As a result, there is no difference between the observed and adjusted access cost, as shown in the Annex II.

EXTERNALITIES

No externalities have been taken into account in the analysis.

BUDGET AND OTHER TRANSFERS

Although we are aware of the existence of some specific budget transfer to producers of sugarcane as a result of subsidies on agricultural inputs to sugarcane farmers, no specific data on the expenditures targeted towards sugarcane production are currently available. As consequence we will only calculate NRPs and not NRAs at this stage.

QUALITY AND QUANTITY ADJUSTMENTS

A quantity conversion factor is required to convert sugarcane to raw sugar – the product under analysis. A quantity adjustment is justified as the sugarcane, after processing is transformed into raw sugar and other sugarcane derivates. The quality conversion factor reported by the Tongaat Hulett Company[11] for raw sugar is 1 tonne of sugarcane is equal to 0.12 tonne of raw sugar.

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 sugarcane in Mozambique.

Table A1: Sources of data used in the calculations of indicators

		Description	
Concept		***Observed***	***Adjusted***
Benchmark price		*FOB price calculated as unit value from export data reported in FAOSAT (see table 2)*	*N.A.*
Domestic price at point of competition		*Constructed by deducting from price difference between the benchmark price in local currency and observed access costs from port to factory (location of processing).*	*N.A.*
Domestic price at farm gate		*Annual average of producer price as reported by FAOSTAT (see table 3)*	*N.A.*
Exchange rate		*Annual average of exchange rate as reported by IMF (see table4)*	*N.A.*
Access cost to point of competition		*Transport cost, cost factory, transaction fees, handling, molasses prices (FOB) and 10% margin profit (see table 5)*	*N.A.*
Access costs to farm gate		*Transport cost and other costs field to mill*	*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.*

Source: authors

[11] One of the biggest sugar companies based in South Africa and holds the majority of shares in Xinavane (88 percent)

The data used for this analysis is summarized below.

Table A2: Data and values used in the calculations of indicators

		Year	2005	2006	2007	2008	2009	2010
DATA	Unit	trade status	x	x	x	x	x	x
Benchmark Price		Symbol						
Observed	USD/TONNE	Pb(int$)	377.40	453.79	542.23	628.50	522.21	588.54
Adjusted	USD/TONNE	Pba						
Exchange Rate								
Observed	MT/USD	ERo	23.06	25.40	25.84	24.30	27.52	33.96
Adjusted	MT/USD	ERa						
Access costs border - point of competition								
Observed	MT/TONNE	ACowh	1,622.18	2,071.06	2,428.76	2,686.43	2,612.30	3,156.54
Adjusted	MT/TONNE	ACawh						
Domestic price at point of competition	MT/TONNE	Pdwh	7,080.98	9,455.59	11,582.58	12,586.60	11,758.08	16,830.31
Access costs point of competition - farm gate								
Observed	MT/TONNE	ACofg	392.04	440.20	441.09	405.82	447.17	559.66
Adjusted	MT/TONNE	ACafg						
Farm gate price	MT/TONNE	Pdfg	246.67	261.20	279.40	307.60	313.60	353.43
Externalities associated with production	MT/TONNE	E						
Budget and other product related transfers	MT/TONNE	BOT						
Quantity conversion factor (border - point of competition)	Fraction	QTwh						
Quality conversion factor (border - point of competition)	Fraction	QLwh						
Quantity conversion factor (point of competition - farm gate)	Fraction	QTfg	0.12	0.12	0.12	0.12	0.12	0.12
Quality conversion factor (point of competition - farm gate)	Fraction	QLfg						

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 NRP*o* generate the NRP*a* indicators. Comparison of the different rates of protection identifies where market development gaps can be found and reduced.

Nominal Rates of Protection are calculated and the results are presented in tables 6 and 7 below.

Table 6: MAFAP price gaps for raw sugar in Mozambique 2005-2010 (tonne)

	2005	2006	2007	2008	2009	2010
Trade status for the year	x	x	x	x	x	x
Observed price gap at farm gate	(211.01)	(433.28)	(669.41)	(796.97)	(650.20)	(1,106.54)
Adjusted price gap at farm gate	(211.01)	(433.28)	(669.41)	(796.97)	(650.20)	(1,106.54)

Source: Own calculations using data as described above.

Table 7: MAFAP nominal rates of protection (NRP) for raw sugar in Mozambique (2005-2010)

	2005	2006	2007	2008	2009	2010
Trade status for the year	x	x	x	x	x	x
Observed NRP at farm gate	-46.11%	-62.39%	-70.55%	-72.15%	-67.46%	-75.79%
Adjusted NRP at farm gate	-46.11%	-62.39%	-70.55%	-72.15%	-67.46%	-75.79%

Source: Own calculations using data as described above.

4. INTERPRETATION OF THE INDICATORS

Figures 8 and 9 below shows price gaps and nominal rate of protection for raw sugar producers in Maputo province. The price gaps provide an absolute measure of the deviation of domestic price from the reference price, while the nominal rate of protection is the price gap in relative terms. In this analysis, only the farm gate indicators were considered, because there is no wholesale market in the segment of the sugar value chain in Mozambique, and the market flow is between farm gate and border – where the domestic raw sugar competes with the international sugar. In terms of export policies, there are no explicit taxes and subsidies on export of raw sugar; the only tax which we considered is the 2.5 percent of export price paid to the National Distributor of Sugar which serves to finance its activities of regulator of the sector. As processors export directly raw sugar to the international market, they receive the full export price which is based on the price of raw sugar in the world market menus the 2.5 percent tax paid to the regulator. As such, our indicators are expected to reflect price gaps resulting from market functioning and the impact of international price fluctuations rather than policy impacts.

The observed and adjusted price gaps at farm gate are negative and indicate a strong deviation of producer price from the reference prices in all years under analysis. The price gaps (observed) range from -211 MT/tons in 2005 to -1,107 MT/tons in 2010. As there are no explicit government policies affecting the export of raw sugar, the negative and strong deviation of the farm gate price from the reference price in part could represent the effect of market structure and lack of competition, as the sugar subsector is highly concentrated and dominated by 4 commercial industries above mentioned. These companies yield strong control over the markets, and they tend to transmit to farmers the negative effects of price shocks in the international markets in order to maintain their margins. For example, the over-valuation of Metical against dollar from 2008 to 2010 (Table 4), which results in negative impact on the export sector, i.e. for raw sugar in this analysis, partly contributed to reducing the price paid to farmers.

Additionally, the non protection to sugar-cane producers is influenced by the very low level of farm gate prices and the 2.5 percent transaction fees charged to exporters by the DNA to finance its activities which is likely to be transmitted to producers. This could partly have contributed to pull down farm gate price, and as a consequence, increase the price gap between the farm gate price and the reference price in the years under review.

Regarding the NRPs, it is negative in all years under analysis and ranges from -46 percent in 2005 to -76 percent in 2010, indicating non protection to sugarcane producers (Figure 9). This suggests that producers of sugar cane are receiving lower prices than they would in the absence of domestic policies. The disincentive of sugarcane producers is not in line with the strong increase of production and exports of raw sugar in the recent years (Figure 5). This suggests that, the increase on production and exports indicates that the producers and millers are making profit margins on the trade of raw sugar (Table 5). While the non protection could be the result of inefficiencies along the value chain due to market structure and lack of competition. A better value chain functioning from farm gate to the point of competition should address the inefficiencies along the value chain above mentioned. This would contribute to increasing the price paid to farmers and reduce the gap between the farm gate price and the comparable export price.

Figure 8: Observed and adjusted price gaps for raw sugar at ex-factory (mill gate) in Mozambique 2005 - 2010 (tonne)

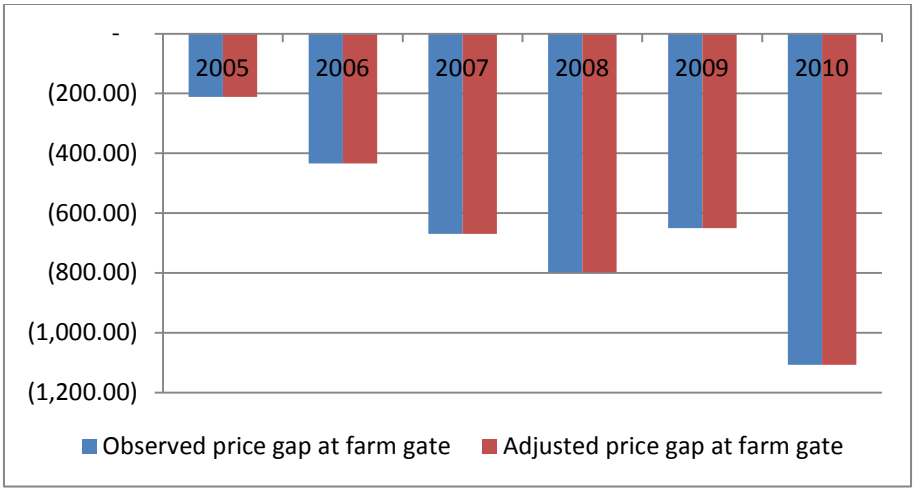
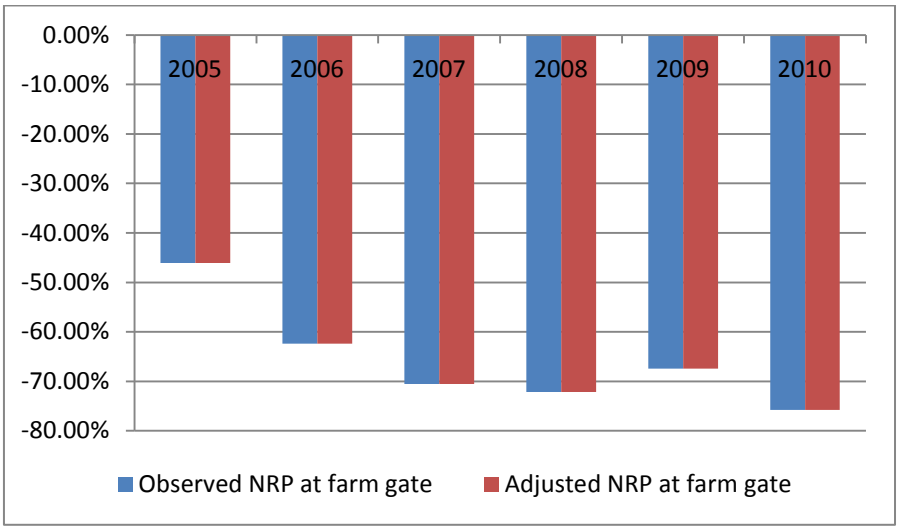


Figure 9: Observed and adjusted NRP for raw sugar at ex-factory (mill gate) in Mozambique (2005 2010)



5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

MAIN MESSAGE

Despite the calculation of indicators being based on a small percentage of farmers who cultivate and sell sugarcane to the millers, the estimated indicators show disincentive at farm gate level in the whole period under review. This suggests that the preferential trade agreement with the EU and USA under which the Mozambican sugar industry is a beneficiary and the government objective of increasing sugarcane production were not translated into incentives for sugarcane producers. However, these disincentives cannot be explained by domestic policies alone, as there are no explicit taxes on export of raw sugar.

A large share of disincentive can be explained by issues related to market structure, such as: i) lack of competition due to both monopsony and oligopoly in the demand and supply side, respectively; ii) low level of farm gate prices; and iii) unbalanced bargaining power between farmers and millers due to weak farmers association.

The investments in rehabilitation and modernization of the sugar industry in the 1990's, partly contributed to increasing the production of sugarcane in the recent years, but was however not sufficient enough to increase the NRP to a positive level. The increase on production and exports (Figure 5) indicates that millers are making profit on the trade of raw sugar but they could pay better prices to farmers if government policies and regulations addressing the inefficiencies along the value chain existed, such as the elimination of monophony.

Furthermore, Table 3 and Figure 7 above shows that producer price increased slightly from 2005-2010, an increase which was not translated into incentives for sugarcane producers (Figure 9). The sugar chain is vertically integrated and therefore profit margins are generally captured at the marketing level and not at production level.

PRELIMINARY RECOMMENDATIONS

Given the growth of the sugarcane production and capacity of processing in recent years, there is a need to adopt/develop specific policies targeting sugarcane producers and exporters. This would contribute to increasing the price paid to farmers and reduce the gaps above mentioned. This will also contribute to attract more investments to the sugar sector and will contribute to increase the competiveness in the sector. Policies aiming to lowering access cost in the Beira corridor (notably transport and handling costs in the Beira port), would contribute to increasing the competitiveness of the Mozambican sugar industry. Additionally, policies aiming to empower farmers association would contribute to improving the negotiation capacity of producer prices. According to the World Bank (2010), the Mozambican farmers association is one of the weakest in Africa.

LIMITATIONS

Data issues:

- the producer prices used in the calculation of indicators are referred to the period 1991/2002, and estimated values for 2005/2010 were calculated using the consumer price

index. This gives the impression of inexistence of smallholder sugarcane producers (from 2002) as the sugar industry is dominated by commercial companies who are both producers and millers. This constitutes one of the main limitations in the calculation of indicators. Efforts are being made with government partners to collect accurate data on producer price at farm level;

- the data on milling cost is available on the briefing paper on industry cost competitiveness in Mozambique provided by Trade and Marketing Division (EST - FAO) is very low compared to other countries (such as South Africa, Tanzania and Kenya), indicating an underestimation of the processing cost of sugarcane in Mozambique;
- the unavailability of value chain analysis on sugar sub-sector in Mozambique, created problems in accessing data on access cost and in the calculation of indicators;
- quality of data constitutes a limitation in the calculation of indicators.

Other issues:

- the unavailability of data on input subsidies desegregated by commodity, as well as data on other Government measures creates problems in identification of the real impact of the policies.

FURTHER INVESTIGATION AND RESEARCH

Further analysis to better understand the role of smallholder farming on sugarcane production will be helpful to strengthen our understanding of the market development gap in the value chain analysis. Also further analysis to better understand the quantities of sugarcane produced by small farmers and processors would contribute to strengthening the analysis.

Our analysis focused on the southern Mozambique (notably Maputo); because it is the region which produces more than 70 percent of total sugarcane produced in Mozambique. The central region (notably Sofala and Zambezia) are expected to increase their share of production of sugarcane in the coming years. This analysis would benefit from further market analysis considering Beira port as point of competition. A comparison with the analysis of incentives and disincentives for sugarcane producers in other neighboring countries (such as South Africa and Malawi) would probably provide interesting additional insights.

BIBLIOGRAPHY

Bokusheva & Tombez (2011) “Development of risk management strategies for cotton producers in Mozambique”, FAO, Final Report

Cagnan et al. (2005) “The EU Sugar Policy and the Sugar Sector of Mozambique”, *Lunds University*, Master Theseis, the Fall of 2005

DNEAP (2010) “Poverty and Wellbeing in Mozambique: Third National Poverty Assessment”, National Directorate of Studies and Policy Analysis (DNEAP), Ministry of Planning and Development, Maputo, Mozambique.

EST (2010) “Analysis of Industry Cost Competitiveness”, FAO, Trade and Marketing Division (EST), Briefing Paper, Draft.

GAIN (2012) “The Mozambican Sugar Industry”, USDA Foreign Agricultural Service, Global Agricultural Information Network, GAIN Report

GDS (2005) “Value Chain Analysis for Strategic Sectors in Mozambique”, Global Development Solutions (GDS), prepared for the Enterprise Development Project (PoDE), draft 1.

LMC (2000) “Market Potential for Mozambican Sugar”, *LMC International*, Briefing Paper 3

LMC (2012) “Review of Mozambique’s Sugar Pricing Policy”, *LMC International*, Briefing Paper 7

Machemedze et al. (2011) “Impact of Economic Partnership Agreements on Livelihoods in Southern Africa”, Africa Group of Sweden, GRUPPERNA

MozSAKSS (2011) “Monitoring Agricultural Sector Performance, Growth and Poverty Trends in Mozambique”, 2010 Annual Trend and Outlook report, Mozambique Ministry of Agriculture.

MozSAKSS (2012) “Monitoring and Evaluating Agriculture Growth, Trade, and Poverty in Mozambique”, 2011 Annual Trend and Outlook report, Mozambique Ministry of Agriculture.

O’Laughlin (2009) “Rural Social Security and the Limits of 'Associativismo' in Southern Mozambique”, Instituto de estudos Sociais e Economicos, Conference Paper Nº40.

Peires (2008) “Macroeconomic Management of Scaled-Up foreign aid”, In S. J. Peires (eds), *Post-Stabilization Economics in Sub-Saharan Africa - Lessons from Mozambique*, edited by, *International Monetary Fund publications, pp. 205-238.*

PES (2012) “Plano Económico e Social para 2012” Repulica de Moçambique.

Tostão et al. (2010) “Staple food prices in Mozambique”, Prepared for the Comesa policy seminar on “Variation in staple food prices: Causes, consequence, and policy options”, Maputo, Mozambique, 25-26 January 2010.

Tschirley et al. (2006) “Toward Improved Maize Marketing and Trade Policies to Promote Household Food Security in Central and Southern Mozambique”, Mozambique Ministry of Agriculture, Research Report No.60E.

Tschirley et al. (2008) “Comparative Analysis of Organization and Performance of African Cotton Sector: Learning from Reform Experience”, International Bank for Reconstruction and Development / The World Bank, Conference Edition – Final Report (2008), Washington DC

World Bank (2010) “Mozambique Cotton Supply Chain Risk Assessment”, International Bank for Reconstruction and Development / The World Bank, Washington DC.

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		Sugar Cane									
International currency		US Dollars (USD)			Local currency		Meticals (MT)				
				Year	2005	2006	2007	2008	2009	2010	
DATA		Unit	Symbol	trade status	x	x	x	x	x	x	
Benchmark Price											
	Observed	USD/TONNE	$P_{b(int\$)}$		377.40	453.79	542.23	628.50	522.21	588.54	
	Adjusted	USD/TONNE	P_{ba}								
Exchange Rate											
	Observed	MT/USD	ER_o		23.06	25.40	25.84	24.30	27.52	33.96	
	Adjusted	MT/USD	ER_a								
Access costs border - point of competition											
	Observed	MT/TONNE	ACo_{wh}		1,622.18	2,071.06	2,428.76	2,686.43	2,612.30	3,156.54	
	Adjusted	MT/TONNE	ACa_{wh}								
Domestic price at point of competition		MT/TONNE	P_{dwh}		7,080.98	9,455.59	11,582.58	12,586.60	11,758.08	16,830.31	
Access costs point of competition - farm gate											
	Observed	MT/TONNE	ACo_{fg}		392.04	440.20	441.09	405.82	447.17	559.66	
	Adjusted	MT/TONNE	ACa_{fg}								
Farm gate price		MT/TONNE	P_{dfg}		246.67	261.20	279.40	307.60	313.60	353.43	
Externalities associated w ith production		MT/TONNE	E								
Budget and other product related transfers		MT/TONNE	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}		0.12	0.12	0.12	0.12	0.12	0.12	
Quality conversion factor (point of competition - farm gate)		Fraction	QL_{fg}								
CALCULATED PRICES		Unit	Symbol		2005	2006	2007	2008	2009	2010	
Benchmark price in local currency											
	Observed	MT/TONNE	$P_{b(loc\$)}$		8,703.15	11,526.65	14,011.34	15,273.02	14,370.38	19,986.84	
	Adjusted	MT/TONNE	$P_{b(loc\$)a}$		8,703.15	11,526.65	14,011.34	15,273.02	14,370.38	19,986.84	
Reference Price at point of competition											
	Observed	MT/TONNE	RPo_{wh}		7,080.98	9,455.59	11,582.58	12,586.60	11,758.08	16,830.31	
	Adjusted	MT/TONNE	RPa_{wh}		7,080.98	9,455.59	11,582.58	12,586.60	11,758.08	16,830.31	
Reference Price at Farm Gate											
	Observed	MT/TONNE	RPo_{fg}		457.68	694.48	948.81	1,104.57	963.80	1,459.97	
	Adjusted	MT/TONNE	RPa_{fg}		457.68	694.48	948.81	1,104.57	963.80	1,459.97	
INDICATORS		Unit	Symbol		2005	2006	2007	2008	2009	2010	
Price gap at point of competition											
	Observed	MT/TONNE	PGo_{wh}		-	-	-	-	-	-	
	Adjusted	MT/TONNE	PGa_{wh}		-	-	-	-	-	-	
Price gap at farm gate											
	Observed	MT/TONNE	PGo_{fg}		(211.01)	(433.28)	(669.41)	(796.97)	(650.20)	(1,106.54)	
	Adjusted	MT/TONNE	PGa_{fg}		(211.01)	(433.28)	(669.41)	(796.97)	(650.20)	(1,106.54)	
Nominal rate of protection at point of competition											
	Observed	%	$NRPo_{wh}$		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
	Adjusted	%	$NRPa_{wh}$		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Nominal rate of protection at farm gate											
	Observed	%	$NRPo_{fg}$		-46.1%	-62.4%	-70.6%	-72.2%	-67.5%	-75.8%	
	Adjusted	%	$NRPa_{fg}$		-46.1%	-62.4%	-70.6%	-72.2%	-67.5%	-75.8%	
Nominal rate of assistance											
	Observed	%	NRAo		-46.1%	-62.4%	-70.6%	-72.2%	-67.5%	-75.8%	
	Adjusted	%	NRAa		-46.1%	-62.4%	-70.6%	-72.2%	-67.5%	-75.8%	

FOOD AND AGRICULTURE
ORGANIZATION OF
THE UNITED NATIONS

MAFAP
SPAAA

supported by the *Bill and Melinda Gates Foundation*