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Technical note: Analysis of price incentives for rice in Tanzania for the time period 2005-2013

November 2014

Monitoring and Analysing Food and Agricultural Policies (MAFAP)

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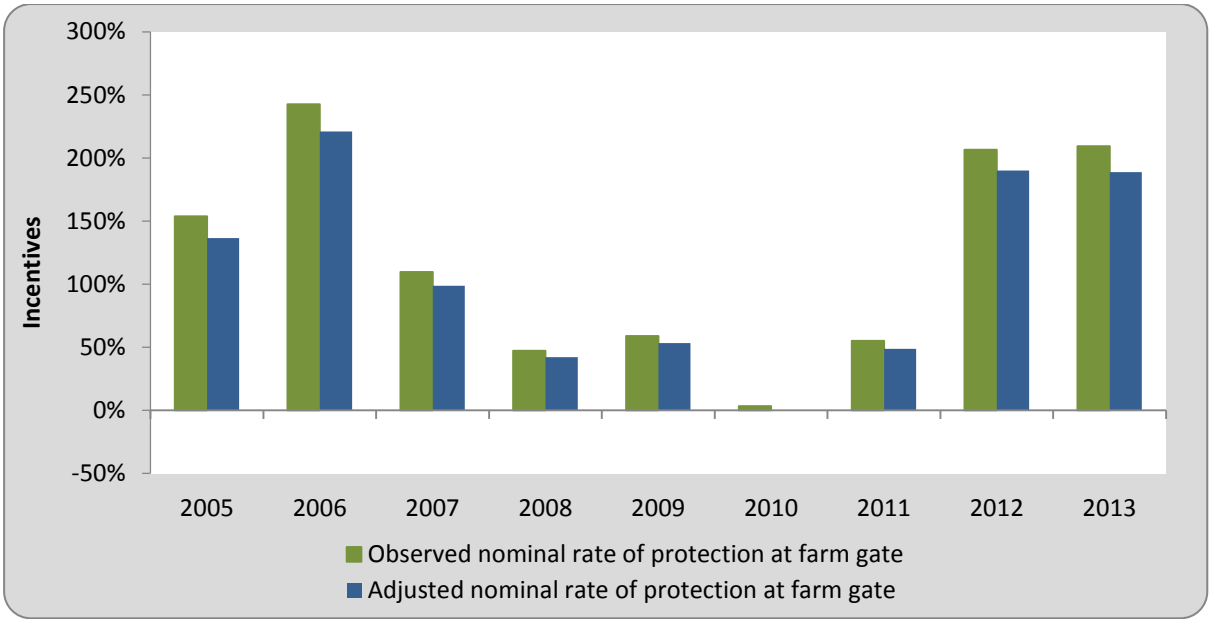
CONTENTS

SUMMARY OF THE NOTE

Product: Rice
Period analyzed: 2005-2013
Trade status: Net import from 2005-2009 and 2012-2013 / Net export from 2010-2011

COMMODITY CONTEXT

- Rice is the second most food and cash crop in Tanzania, accounting for 5 percent of the total value of production and 10 percent of total caloric intake;
- Rice production has generally increased since 2005, possibly due to a voucher-based input subsidy programme implemented from 2007/08 to 2013/14;
- Notwithstanding this increase in production, yields remained significantly lower than those in neighboring countries;
- Despite low yields, Tanzania became a net exporter of rice to regional markets in 2010 and 2011, but this trend was not sustained in the long term, as it reverted back to its net import status in 2012.



The observed Nominal Rate of Protection (NRP, green bar) in the graph above measures the impact of policy and market distortions on price incentives for rice producers. The graph shows that producers faced strong price incentives throughout much of decade analysed. However, these incentives were substantially lower in years affected by the global food price crisis (2007-2009). Price incentives remained low when the country became a net exporter in 2010, dropping to nearly zero percent, but increased again in 2012, when the country reverted back to its status as a net importer.

The adjusted NRP (blue bar) in the graph above is similar to the observed NRP, but captures the impact of any additional distortions from inefficiencies found along the rice value chain. As illustrated, the adjusted NRP remained slightly below the observed NRP. This indicates that value chain inefficiencies actually reduced the level of price incentives for producers throughout the study period.

DRIVING FACTORS

- the EAC common external tariff of 75% or 200 USD/tonne (whichever is higher) levied on rice imports from non-member countries, which led to higher prices for producers in years when Tanzania was a net importer;
- periodical export bans imposed in 2008, 2009 and 2011, which reduced price incentives in each respective year;
- value chain inefficiencies such as excessive transportation and marketing costs, which depressed producer prices by an average of 4 percent throughout the period analysed;
- scarcity of rice in Rwanda due to drought conditions, which led to favorable prices for Tanzanian rice producers and exporters in 2010 and 2011.

RECOMMENDATIONS

- Promote investments at the farm level to help increase yields and efficiency;
- Reduce the high costs associated with domestic transport and marketing;
- Increase investment in storage to reduce post harvest losses; and
- Establish and enforce coding and grading standards.

1. PURPOSE OF THE NOTE

This technical note is an attempt to measure, analyze and interpret price incentives for rice in the United Republic of Tanzania over the period 2005-2013.

For this purpose, yearly averages of domestic 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 reference prices and domestic prices along the commodity's value chain indicate the extent to which incentives (positive gaps) or disincentives (negative gaps) were present at the farm gate and wholesale level. The price gaps are expressed in relative terms as a percentage of the reference price, referred to as the Nominal Rate of Protection (NRP). These key indicators are used by MAFAP to assess the effects of policy and market performance on prices.

This technical note begins with a review of the commodity's production, consumption/utilization, marketing and trade, value chain and policy context (Chapter 2). It also provides a detailed description of how key data elements were obtained and indicators were calculated (Chapter 3). The indicators were then interpreted in light of existing policies and market characteristics (Chapter 4), and key policy recommendations were formulated on the basis of this interpretation (Chapter 5). Finally, the note concludes with a few main messages, limitations of the analysis and areas identified for further research to improve the analysis (Chapter 6).

The results and recommendations presented in this analysis of price incentives can be used by stakeholders involved in policy-making for the food and agriculture sector. They can also serve as input for evidence-based policy dialogue at the national, regional or international level.

This technical note should not be interpreted as an in-depth value chain analysis or detailed description of the commodity's production, consumption/utilization, marketing and trade or policy context. 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 in this technical note is subject to review and validation.

2. COMMODITY CONTEXT

Rice is the second most important food and cash crop in Tanzania after maize. It is a major source of employment and income for many farming households (NBS, 2007/08). Due to its strategic importance, rice is one of three commodities included in the Big Results Now (BRN) initiative, which aims to achieve big results that have a wider impact on poverty reduction and economic development. Under this initiative, rice production is expected to reach 290,000 tonnes by 2015 through Public Private Partnership (PPP) arrangements in large- and medium-scale rice production investment and smallholder aggregation schemes, which will be coordinated by the Southern Agricultural Growth Corridor of Tanzania (SAGCoT).

In Tanzania, rice is mainly produced by smallholder farmers, while marketing is dominated by middlemen and traders (Kilima, 2006). Rice productivity in Tanzania is about 1-1.5 tonnes/ha, which is lower than in most neighboring countries (Figure 3) and is among the lowest in the world[1]. In some areas, with intervention from the Kilimo Kwanza initiative under SAGCoT, productivity has increased from 2.5 tonnes/ha to 6.5 tonnes/ha.

The National Rice Sector Development Strategy (NRSDS) aims to transform the existing subsistence-dominated sector into a commercially viable production system (MAFC, 2009) by encouraging local and foreign investment to modernize rice production and marketing. This technical note monitors and analyses the impact of policy on the rice sector through prices to better understand whether it is generating the incentives required to achieve this objective.

PRODUCTION

According to the National Sample Agricultural Census of 2007/2008, the total area planted to paddy increased from 681,000 ha in 2002/03 to 906,708 ha in 2007/08 (33 percent). Nearly all rice (99 percent) is grown by smallholder farmers using traditional seed varieties.

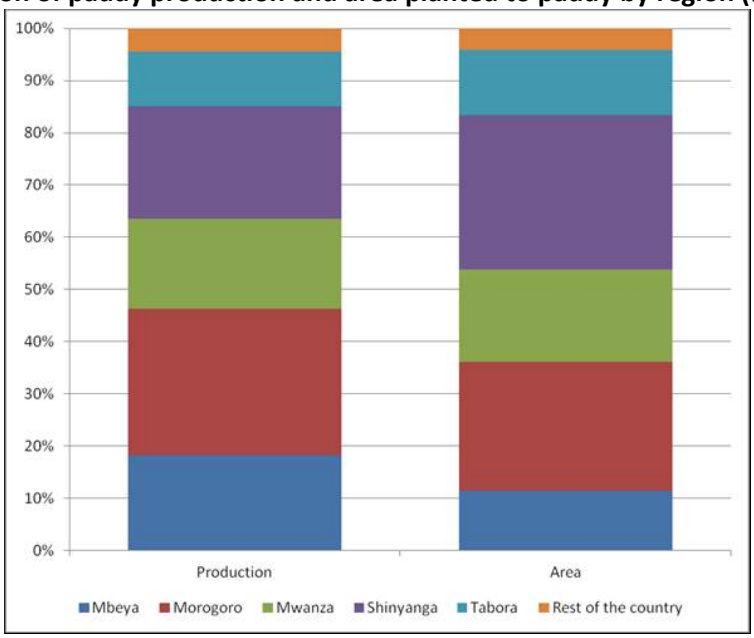
Rice is grown in three different areas or ecosystems in Tanzania (SAGCoT, 2010):

a) Rain-fed lowlands (68 percent): average productivity 3.5 tonnes/ha;
b) Rain-fed uplands (20 percent): average productivity 1.2 tonnes/ha; and
c) Irrigation schemes (12 percent): average productivity 3.8 tonnes/ha

Most irrigated plots are part of small, village-level schemes; however, some are part of large-scale schemes that were formerly state-managed farms (Minot, 2010). Nearly half of the country's rice production is concentrated in the regions of Morogoro, Shinyanga, Tabora, Mwanza and Mbeya (Figure 1). The first four rice-producing regions are located in the northern part of the country, while the fifth is located in the south.

[1] Tanzania ranks 95 out of 116 countries for which rice yield data is available in FAOSTAT (2004-2010 average).

Figure 1: Distribution of paddy production and area planted to paddy by region (%), 2005-2011

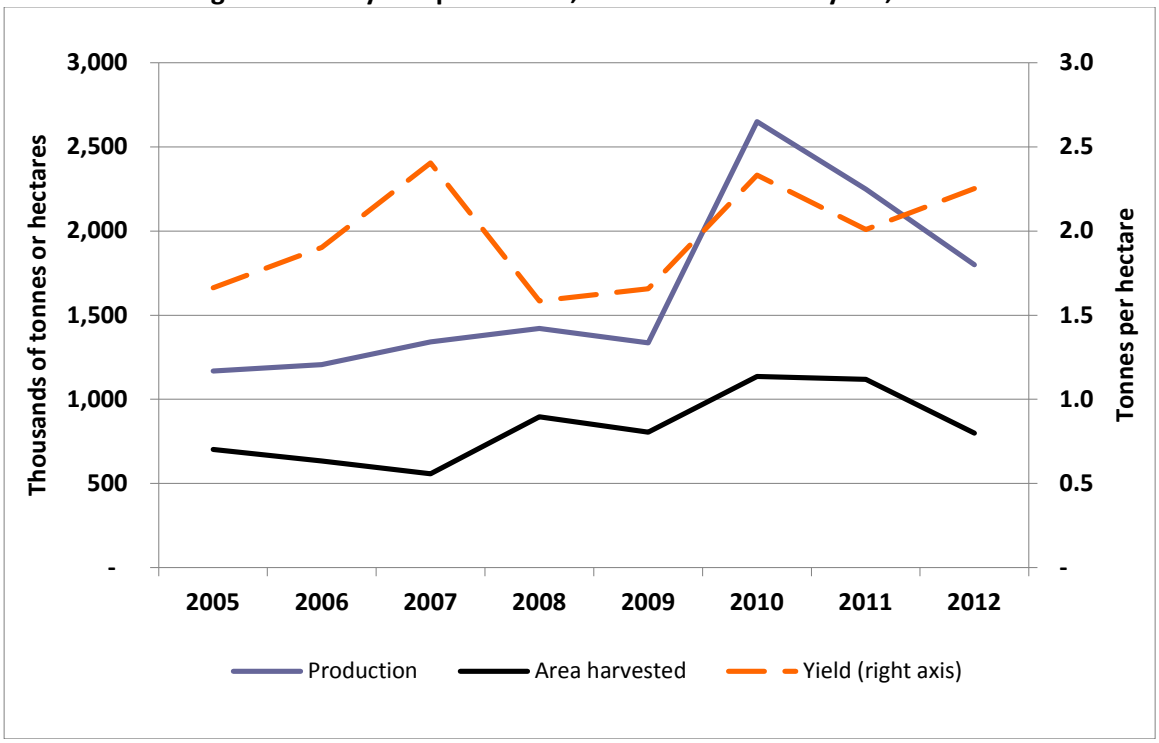


Source: MAFC, 2013

Paddy rice production increased at an average annual rate of 11 percent between 2005 and 2012 (Figure 2). From 2005 to 2007, the up-scaling of a fertilizer subsidy under the National Agricultural Input Voucher Scheme (NAIVS) raised yields and production significantly. In 2008, total land planted to rice increased as several cotton producers switched to rice production after experiencing significant losses in response to declining world prices (Ngailo et al., 2007). However, the lack of land suitable for rice production and the insufficient knowledge available to the new group of producers helps explain the substantial decline in yields and stagnant growth in rice production that occurred between 2007 and 2009, even while the fertilizer subsidy program was maintained.

In 2010, total rice production peaked as yields recovered and land allocated to rice production increased. Between 2010 and 2012, however, production declined with total area harvested, while yields remained volatile.

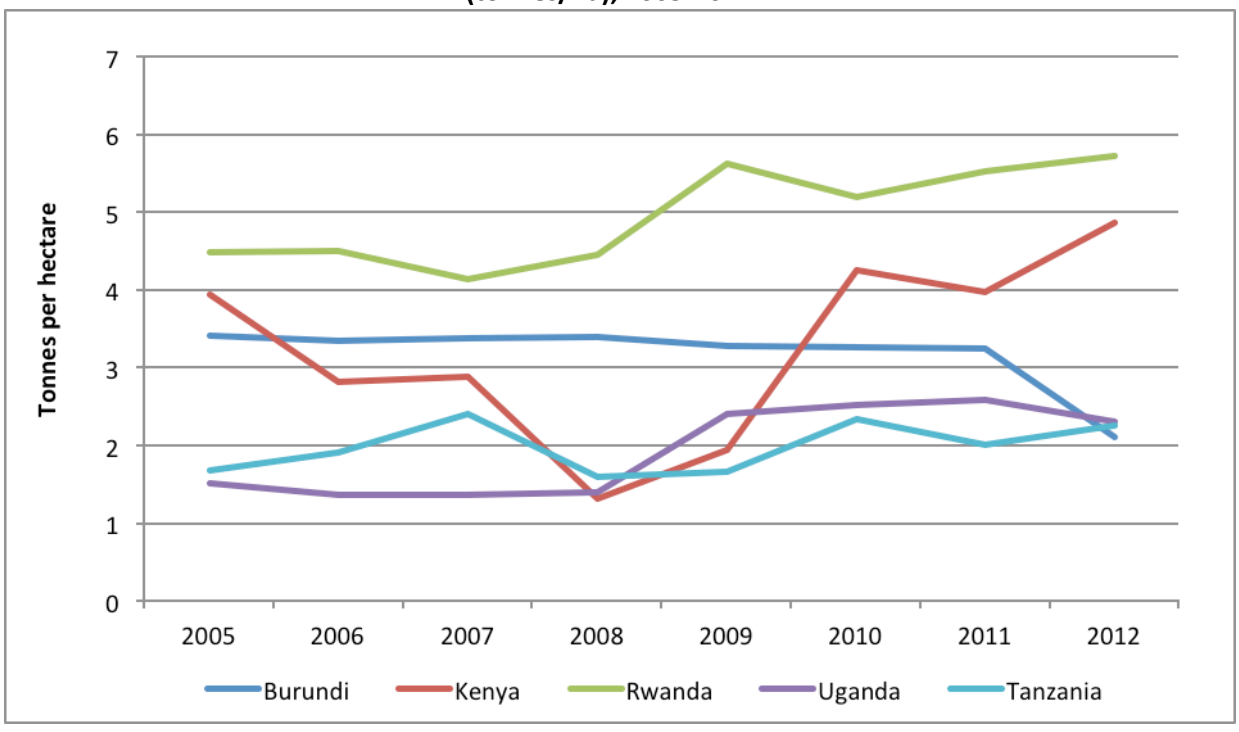
Figure 2: Paddy rice production, area harvested and yield, 2005-2012



Source: FOASTAT

As illustrated in Figure 3, the paddy rice yield in Tanzania is low relative to the yields in neighboring countries. Rwanda and Burundi had the highest yields, while Tanzania's yield averaged around 2 tonnes per hectare and remained one of the lowest throughout the period.

Figure 3: Paddy rice yield for Tanzania relative to rice yields for selected East African Countries (tonnes/ha), 2005-2012

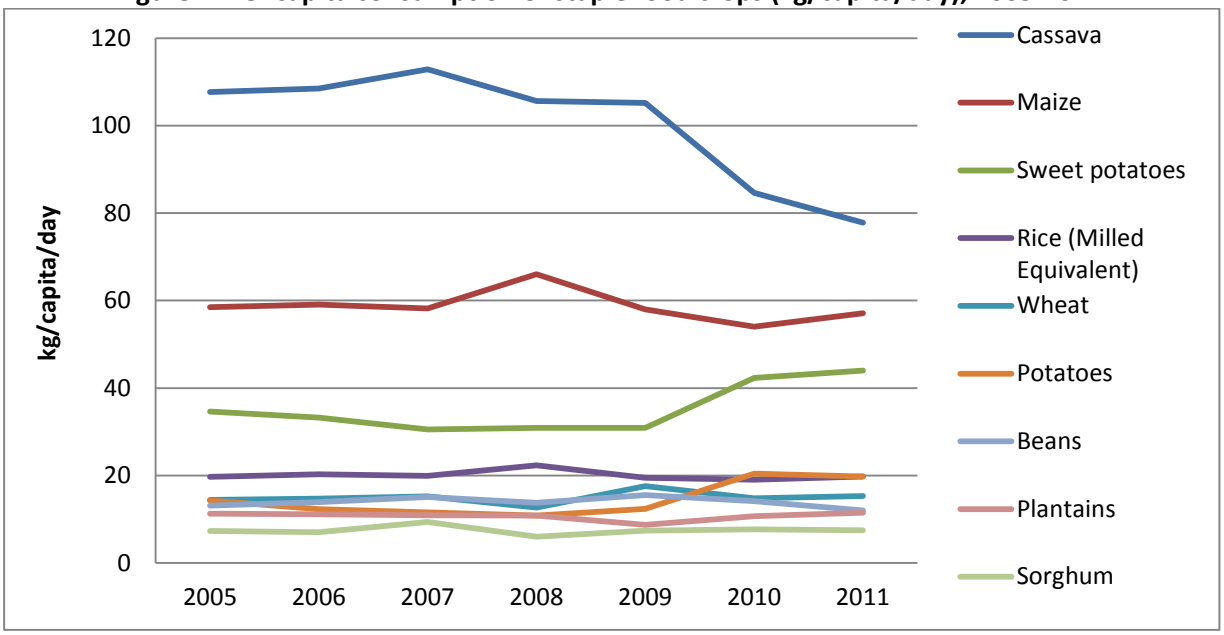


Source: FAOSTAT

CONSUMPTION/UTILIZATION

Rice generally ranks fourth among key food crops in terms of daily volume consumed per capita in Tanzania. Figure 4 shows that daily per capita consumption for rice remained stable between 2005 and 2011 at around 20 kg, while it decreased for cassava and increased for both potatoes and sweet potatoes since 2009. By 2010, the volume of potatoes consumed exceeded the volume of rice consumed per capita. This may be due to the fact that the price of potatoes is often lower than the price of rice in the local market.

Figure 4: Per capita consumption of staple food crops (kg/capita/day), 2005-2011



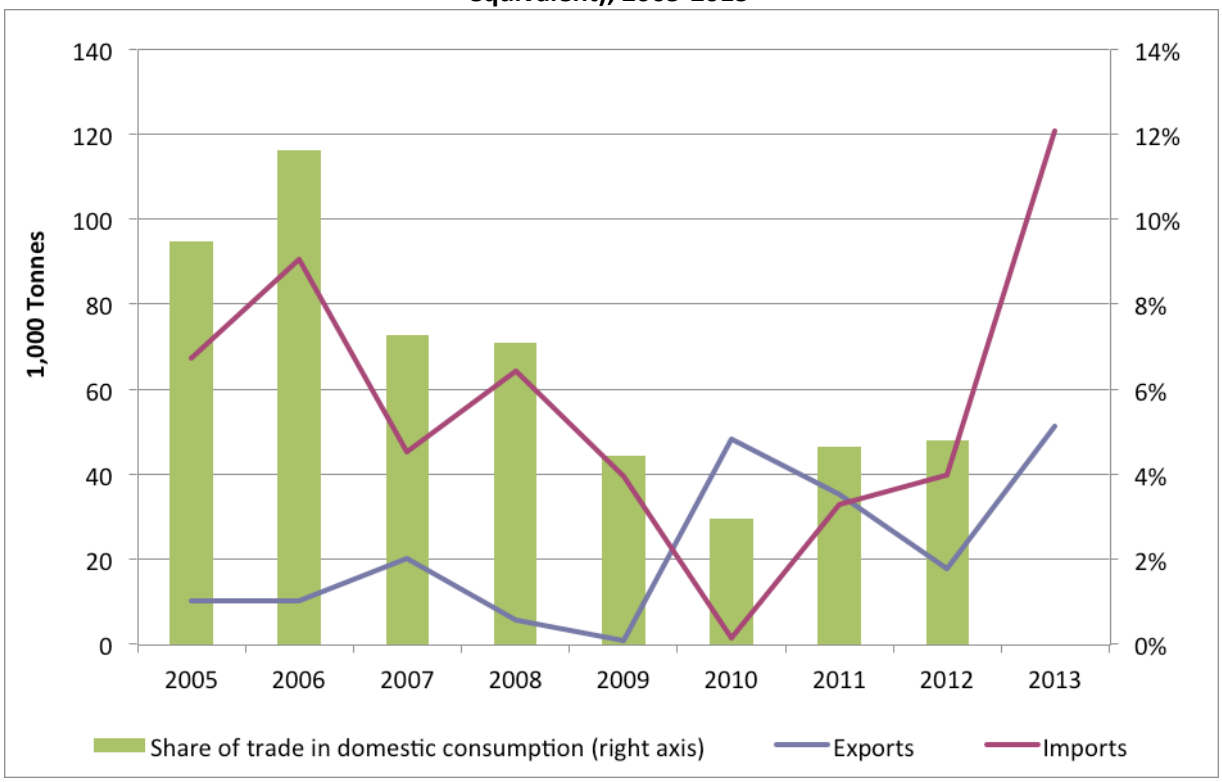
Source: FAOSTAT

Since rice is generally more expensive than maize and other staple foods, it tends to be more important in the diets of high- and middle-income households. Rice is also the preferred dish for many households during festival season or social functions. Furthermore, rice is often preferred by urban households because it is convenient to prepare.

MARKETING AND TRADE

The share of trade in domestic rice consumption (also referred to as trade intensity) steadily decreased between 2005 and 2012, reaching below 5 percent in 2012 from a maximum of nearly 12 percent in 2006. Total rice imports decreased steadily, reaching its lowest level in 2010, followed by a new cycle of steady increase (Figure 5). During interviews with local traders and farmers, trade policy was often mentioned as one of the major reasons for import and export fluctuations. Furthermore, the scarcity of rice in 2008 to 2009 provided incentive to local producers to invest more in rice production. As a result, Tanzania became a net exporter of rice in 2010 and 2011. However, exports dipped significantly between 2010 and 2012, but increased once again in 2013, along with imports, which nearly doubled in volume.

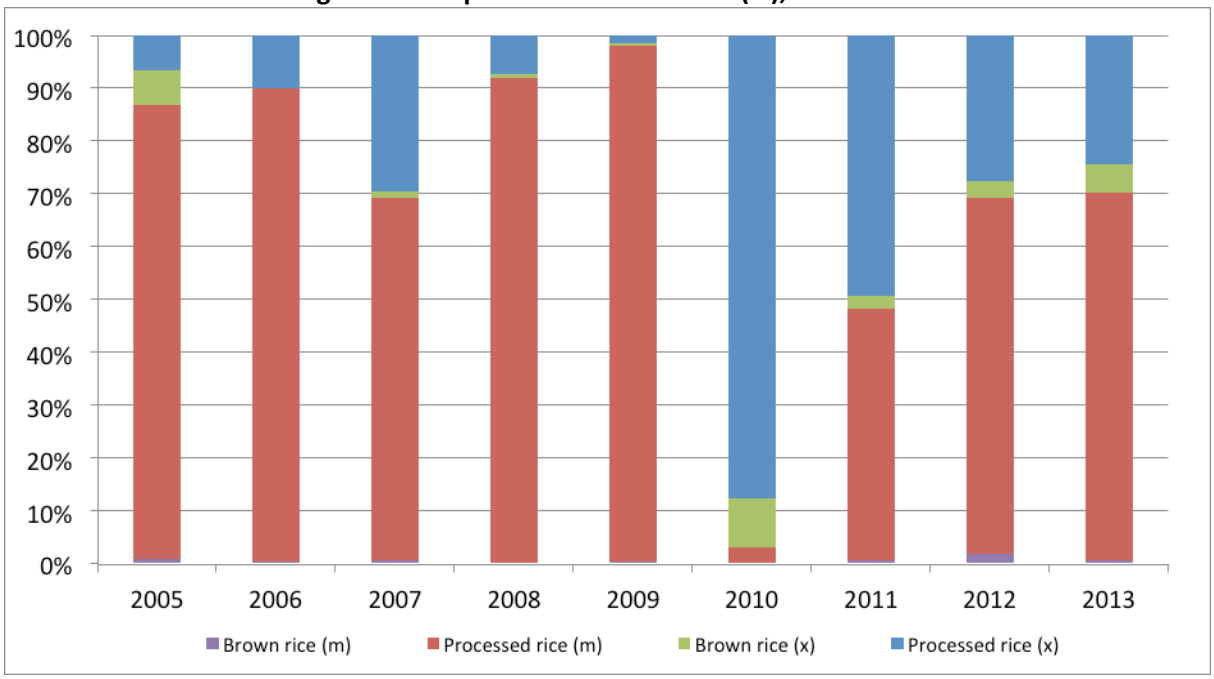
Figure 5: Total rice imports, exports and share of trade in domestic consumption (milled equivalent), 2005-2013



Note: The share of trade in domestic consumption could not be calculated for 2013 because production data is not yet available for this particular year. Paddy and husked rice were converted to their milled equivalents using conversion ratios of 0.65 and 0.80, respectively. Source: UN Comtrade and FAOSTAT

According to UN Comtrade data, most traded rice is milled and broken (processed). Paddy and husked (brown) rice types are traded in much lower quantities and are mainly exported (Figure 6).

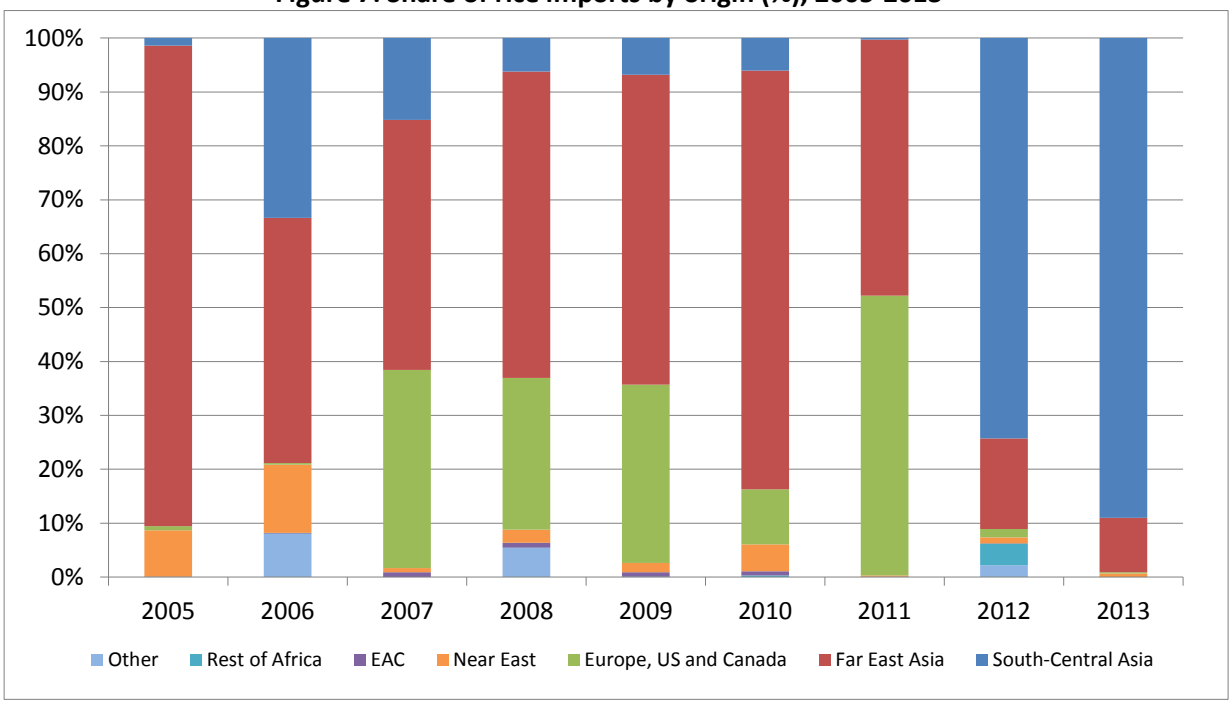
Figure 6: Composition of traded rice (%), 2005-2013



Note: Brown rice refers to paddy and husked rice [HS 100610 and 100620], while processed rice refers to milled and broken rice [HS 100630 and 100640]. Paddy and husked rice were converted to their milled equivalents using conversion ratios of 0.65 and 0.80, respectively. Source: UN Comtrade

Figure 7 shows that most of Tanzania's rice imports come from Far East Asia (mainly Vietnam, Japan, Singapore, China and Thailand) and, in more recent years, from South-Central Asia (mainly Pakistan and India). Imports from developed countries in the east and west played an important role during the food price crisis, with rice coming mainly from Japan and the USA, likely in the form of food aid.

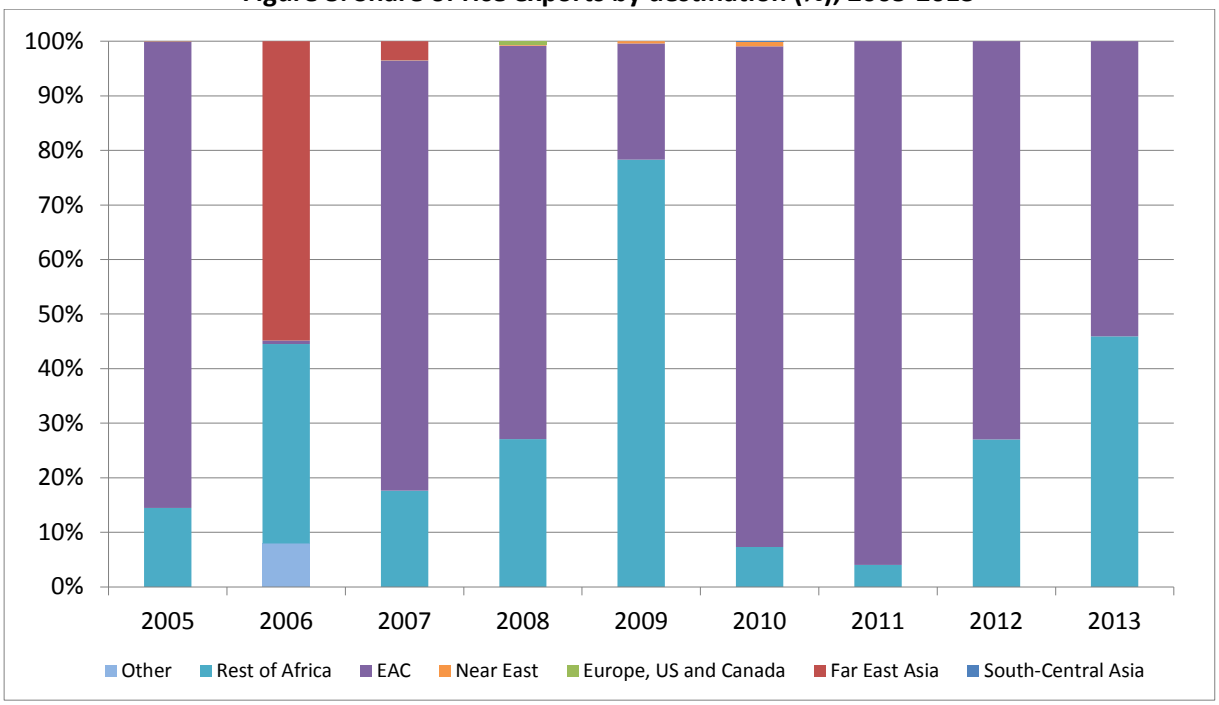
Figure 7: Share of rice imports by origin (%), 2005-2013



Note: Paddy and husked rice were converted to their milled equivalents using conversion ratios of 0.65 and 0.80, respectively. Source: UN Comtrade

As for exports, Tanzania is mainly a regional player (Figure 8). Between 2005 and 2013, 75 percent of Tanzania's rice exports went to East African Community (EAC) countries and 22 percent went to other neighboring countries in Africa (mainly Malawi, DRC and Zambia).

Figure 8: Share of rice exports by destination (%), 2005-2013



Note: Paddy and husked rice were converted to their milled equivalents using conversion ratios of 0.65 and 0.80, respectively. Source: UN Comtrade

DESCRIPTION OF THE VALUE CHAIN

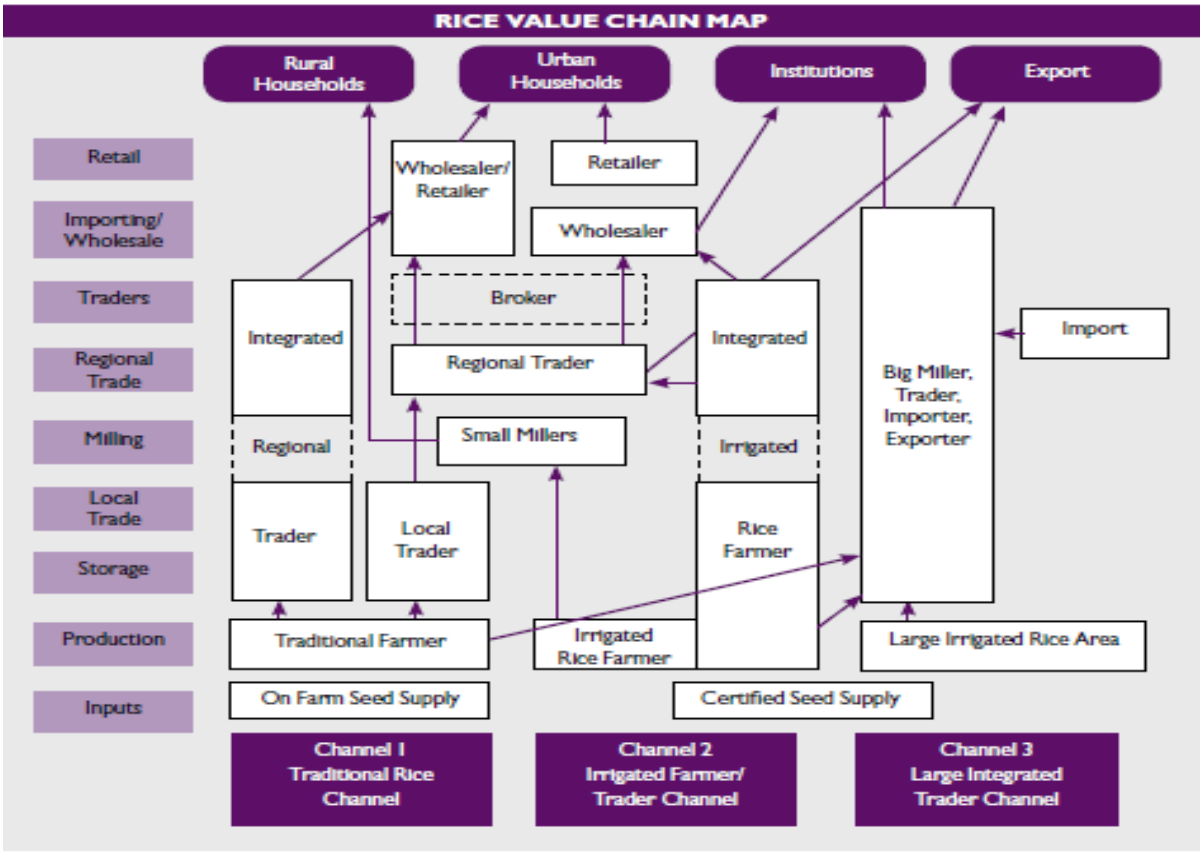
Rice is an important cash crop among farming households. According to the National Agricultural Sample Census of 2002-03, 42 percent of rice production is marketed, compared to 28 percent of maize production and just 18 percent of sorghum production. According to Minot (2010), about 13 percent of marketed rice is sold by small-scale farmers.

Figure 9 provides a simplified representation of the rice value chain in Tanzania. In general, rice is marketed through three different channels: (1) the traditional rice channel, (2) the irrigated farmer/trader channel and (3) the larger irrigated trader channel. The first and second marketing channels for rice are generally long, and many intermediaries are involved before the crop reaches final consumers. In fact, it is estimated that there are about 35 cash transactions by the time the crop reaches the final consumer (ECI, 2003). Long supply chains, combined with poor transportation networks, have contributed to large marketing margins (Eskola, 2005). However, more structured supply chains are emerging, and there is growing interest to invest in Tanzania's rice sector, particularly among large, foreign investors. (Matchmaker associates Ltd., 2010).

As shown in Figure 9, the first stage of the value chain is production, followed by storage, local trade, milling, regional trade, traders, wholesale/importing and finally retail. Normally, once paddy rice is harvested, it is sold to local traders, who either trade it at the regional market as paddy or send it to a small mill for processing. The milled rice is then sold at wholesale level to traders and/or to retail

shops. After harvest, it is also possible the paddy rice might be sold directly to large-scale millers, who export large quantities of processed rice.

Figure 9: Diagram of the rice value chain in Tanzania



Source: AgCLIR, 2010

In addition to taxes, marketing costs influence consumer prices and the profitability of rice production, processing, marketing/distribution and retail. However, it is important to note that imported and domestic rice follow different market pathways and therefore are subject to different marketing costs. For domestic rice, local and regional traders buy milled rice and/or paddy rice from producers and then sell to urban-based brokers/wholesalers. The brokers, in turn, sell rice to retailers, who then sell to consumers. On the other hand, for imported rice and rice under the food aid counterpart fund, 50 percent is distributed through wholesalers, 30 percent through traders' or importers' own distribution systems and 20 percent through retail shops (MAFC and FAO, 2008).

Based on the simplified gross margin (SGM) of rain-fed smallholder farmers (SHFs), the profitability varies from negative to modest returns of 27 percent, which suggests that profits are negligible, and most producers remain at a subsistence level. The irrigated farms are much more productive and profitable, with SGMs varying from 2 percent to 61 percent. Rice producers' main cost drivers are (own) labour (60-80 percent), inputs (10-30 percent) and local transport costs (5-10 percent). The other main actors in the value chain (traders, millers and retailers) realize positive gross margins varying from 9 to 25 percent. The main cost elements for traders/millers are raw material (paddy rice) for processing and trading (60-80 percent), transport costs (6-12 percent), milling (5-10 percent), loading and unloading (2-3 percent), taxes (2-3 percent) and, for the larger traders, storage rental (20-30 percent) (SAGCoT, 2010).

The rice value chain has attracted investment in production and value addition from SAGCoT and the Sokoine University of Agriculture Graduates Entrepreneur Cooperative (SUGECO). SAGCoT uses a hub and spike model to attract large-scale investments in rice production, processing and exports. Under this model, large-scale producers establish contracts with surrounding small-scale farmers to whom they provide inputs and extension services. The large-scale producers then pay farmers for the rice after deducting the costs of inputs and extension services provided.

SUGECO is a cooperative formed by graduates from Sokoine University of Agriculture, which aims to link students with viable agricultural projects to access capital from banks. SUGECO succeeded ion forming a partnership with CRDB Bank, which provides loans to SUGECO members for rice value addition activities by using their graduate certificates as collateral.

POLICY DECISIONS AND MEASURES

Tanzania's *National Development Vision 2025* emphasizes the need to streamline the country's development planning, implementation and monitoring mechanisms. This long-term plan has led to a series of Five Year Development Plans (FYDP). The first FYDP, which began in 2011/2012 and will end in 2015/2016, focuses on the theme "Unleashing Tanzania's Latent Growth Potential," with the objective of investing in strategic areas with high growth potential in order to fast track conditions for broad-based and pro-poor growth. In this spirit, the President Delivery Bureau (PDB) was established as a mechanism to monitor implementation of strategic investments in areas with high growth potential, dubbed as Big Results Now (BRN). Rice is among the three crops prioritized under BRN to ensure food availability, reduce poverty among rural households and gradually shift to a more commercialized and modernized production system.

The *National Rice Development Strategy (NRDS), 2009* is one of the crop-specific strategies prepared within the framework of Tanzania's *Agriculture Sector Development Programme (ASDP), 2006-2012/13*. The NRDS contributes to Tanzania's national policies and international commitment to improve the livelihoods of citizens in rural communities through enhancing household food security and incomes. The vision of NRDS is to transform the existing subsistence-dominated rice subsector into a commercially viable production system. The strategy underscores the existing potential for rice production in Tanzania and focuses on: i) development and availability of improved seeds resistant or tolerant to major biotic and abiotic stresses, ii) development and availability of improved post harvest processing technologies and value addition (grading and packaging) processes, iii) low use of labour saving technologies and inadequate technology transfer, and iv) construction of more irrigation infrastructure.

In particular the NRDS has defined intervention strategies, which are to be implemented in three-year periods. The timeframe was synchronized with the Government Medium Term Expenditure Framework (MTF) to ensure that the implementation of activities is financed and split into two groups, depending on the timeframe for implementation:

- Short-term (1-3 years) strategies:
    - increasing production and productivity of rice in selected irrigation schemes;
    - reducing production and post-harvest losses;

- increasing availability of and access to agricultural inputs (improved seeds, fertilizers, pesticides and appropriate farm machineries);
- rehabilitation and development of new irrigation schemes.

- Medium- (3-5 years) and long-term (5 years onward) strategies:
  - expansion of areas in lowland irrigation, rain-fed lowland and upland ecosystems;
  - increasing access to farm machinery and post-harvest technologies;
  - encouraging investment in medium- and large-scale processing industry.

Market and price support policies

In 2009, Tanzania passed the Cereals and Other Produce Act. This Act created a Cereal Board with the power to intervene in domestic rice and maize markets. The new Cereal Board has the authority to: (i) facilitate research on cereals, (ii) facilitate the offer of extension services to growers and dealers, (iii) facilitate the development of agricultural input services, (iv) disseminate information, including market information, (v) promote production, processing and storage, (vi) promote appropriate technologies and (vii) assist with the formation of farmers organizations. Perhaps most importantly, the board is further empowered to carry out commercial operations such as buying and selling, importing and exporting, processing, providing warehousing services and performing other commercial functions approved by the Minister of Agriculture, which aid the development of trade in cereals.

According to the Department of Food Security at the MAFC, the Cereal Board should act as a private commercial agent in the cereals market (mainly maize, sorghum and rice mainly), substituting individual traders. It has inherited the milling assets of the former National Milling Corporation in Arusha and Iringa.

Trade policies

Tanzania is a member of the East African Community (EAC) and the Southern Africa Development Community (SADC). This dual membership means different tariff structures are imposed. As shown in Table 1, rice trade between EAC member countries is free of regulation, so no restrictions or tariffs are applied. However, an EAC Common External Tariff (CET) of 75 percent or USD 200/tonne (whichever is higher) is applied to rice imports coming from countries outside the EAC, with the exception of those coming from members of Common Market for Eastern and Southern Africa (COMESA). However, between 2005 and 2007, a 5 percent tariff was applied to rice imports from South Africa.

Table 1: Import Tariff Regime for Rice

Product	Regime	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Rice	MFN (EAC CET)	75% or 200 USD/tonne [whichever is higher]									
	COMESA	-	-	-	-	-	-	-	-	-	-
	EAC	0									
	South Africa	5			-	-	-	-	-	-	-

Source: WITs (2012)

The EAC's import tariff regime is imposed to protect the regional rice industry and to reduce inflows of cheap, subsidized rice (Therkildsen, 2011). According to Vitale et al. (2013), the tariff has not fully

met its intended objectives due to increased rice smuggling, especially through Zanzibar, and weak enforcement of the tariff as a result of collusion between large importers and politicians. However, Minot (2010), in a discussion of the dynamics of staple food prices, notes that a higher tariff benefits Tanzanian rice farmers in two ways. "First, it creates increased demand for local rice among Tanzanian consumers by reducing rice imports. Second, it expands the market for Tanzanian rice in Kenya, since the rice production capacity of Kenya is much smaller than that of Tanzania." In other words, the rice tariff taxes Tanzanian and Kenyan rice consumers and primarily benefits Tanzanian rice growers (Vitale et al., 2013).

Since 2000, the government has used periodical export bans on staple food crops as a food security measure, in some cases violating EAC free trade commitments. Export bans were intermittently imposed on cereals for a few months in 2008, 2009 and 2011 and then lifted when food availability improved. In 2012, the government committed to discontinue implementing periodic export bans, as they introduce market distortions, which reduce price incentives for producers (All Africa, 2014).

Local taxes on levied on value chain actors

While farmers, traders, millers, transporters and importers/exporters are exempted from paying the Value Added Tax (VAT), they are subject to a district sales tax (cess) between 1-5 percent of the bag value if they transport grain bags from the district to any destination (Micro Ag CLIR, 2010).

These costs often make local rice more expensive than imported rice. For example, in January 2010, Thai A1 Super rice (a low-quality rice) could be imported at a CIF price of USD 445/tonne, compared to the domestic rice sold in Dar es Salaam at USD 750/tonne for low grade and USD 970/tonne for the best quality rice. In a price-sensitive market, local rice would not be able to compete with imported rice if the import duty were removed. This duty raises the price of Thai A1 Super to USD 779/tonne and allows the local product to remain on the market.

Public expenditure allocated to the rice sector

In response to the spike in global grain and fertilizer prices in 2007 and 2008, the Government of Tanzania implemented the National Agricultural Input Voucher Scheme (NAIVS) to boost maize and rice production, with the aim of preserving national food security. The scheme was piloted in two districts in 2007/08 and then expanded to 53 districts in 2008/09. Between 2008 and 2013, the government invested about USD 300 million to provide more than 2.5 million smallholder farmers with a 50 percent subsidy on a one acre package of maize or rice seed and chemical fertilizer. Beneficiaries of the scheme are expected to have graduated after three years of subsidy assistance with enough experience and income to continue purchasing seed and fertilizer on their own. Furthermore, it is expected that the redemption of vouchers through agro-dealers has fostered the development of sustainable input supply channels (World Bank, 2014).

An impact assessment of the NAIVS programme was carried out as part of a Public Expenditure Review of the programme, which was conducted this year. Results from this assessment indicate that the scheme increased maize and rice production by more 2.5 million tonnes and raised paddy rice yields by an average of 263 kg per acre. Additionally, more than 2,800 agro-dealers were trained and commercial input companies' investments in wholesale and retail distribution chains were expanded under the scheme (World Bank, 2014).

Despite these improvements, the NAIVS programme faced several logistical challenges. Many producers received their vouchers late, sometimes even after the planting season, which often delayed the delivery and application of inputs. Payments to agro-dealers and input suppliers were also often late, as the process of collection from the agro-dealer, confirmation by district officials and reconfirmation by a participating commercial bank was slow. There have also been claims that district officials were colluding with local agro-dealers to redeem vouchers for their own benefit. Some of these cases were actually confirmed and prosecuted (World Bank, 2014).

The NAIVS programme was discontinued after the 2013/14 cropping season, and the government is currently designing a credit-based input subsidy programme. The goal of this new scheme is similar to that of the NAIVS programme. However, it aims to avoid the same logistical challenges faced under the NAIVS programme in order to increase its overall impact and effectiveness.

1. METHODOLOGY

MAFAP methodology seeks to measure price incentives for producers and other marketing agents in key agricultural value chains. The analysis is based on the comparison between observed domestic prices and constructed reference prices. Reference prices are calculated from the international price of the product at the country's border, where the product enters the country (if imported) or exits the country (if exported). This price is considered the benchmark price free of influence from domestic policies and markets. MAFAP estimates two types of reference prices – observed and adjusted. *Observed reference prices* are those that producers and other marketing agents could receive if the effects of distortions from domestic market and trade policies, as well as overall market performance, were removed. *Adjusted reference prices* are the same as observed reference prices, but also exclude the effects of any additional distortions from domestic exchange rate policies, structural inefficiencies in the commodity's value chain, and imperfect functioning and non-competitive pricing in international markets.

MAFAP's price incentives analysis is based on the law of one price, which is the economic theory that there is only one prevailing price for each product in a perfectly competitive market. This law only applies in the case of homogeneous goods, if information is correct and free, and if transaction costs are zero. Thus, this analysis was conducted for goods that are either perfectly homogeneous or perfect substitutes in the local market in terms of quality, or, failing that, are simply comparable goods. Indicators calculated from reference and domestic prices will, therefore, reveal whether domestic prices represent support (incentives) or a tax (disincentives) to various agents in the value chain.

Domestic prices are compared to reference prices at two specific locations along commodity value chains – the farm gate (usually the main production area for the product) and the point of competition (usually the main wholesale market where the domestic product competes with the internationally traded product). The approach for comparing prices at each location is summarized below, using an imported commodity as an example. In this situation, the country is importing a commodity that arrives in the port at the benchmark price (usually the unit value CIF price at the port of entry). In the domestic market, we observe the price of the same commodity at the point of competition, which is in this case the wholesale market, and at the farm gate. We also have information on observed access costs, which are all the costs associated with bringing the commodity to market, such as costs for processing, storage, handling, transport and the different margins applied by marketing agents in the value chain. These include access costs between the border and wholesale, as well as between the farm gate and wholesale.

The benchmark price is made comparable to the domestic price at wholesale by adding the access costs between the border and wholesale, resulting in the observed reference price at wholesale. This takes into account all the costs incurred by importers and other agents to bring the commodity to market, which in effect, raises the price of the commodity. The reference price at wholesale is further made comparable to the domestic price at the farm gate by deducting the access costs between the farm gate and wholesale, resulting in the observed reference price at farm gate. This takes into account all the costs incurred by farmers and other agents to bring the commodity from the farm to the wholesale market. Mathematically, the equations for calculating the observed

reference prices at wholesale (RP_{owh}) and farm gate $\left(RP_{ofg}\right)$ for an imported commodity are as follows:

$$RP_{owh} = P_b + AC_{owh}$$

$$RP_{ofg} = RP_{owh} - AC_{ofg}$$

where AC_{owh} are the observed access costs from the border to wholesale, including handling costs at the border, transport costs from the border to the wholesale market, profit margins and all observed taxes and levies, except tariffs, and P_b is the benchmark price. AC_{ofg} are the observed access costs from the farm gate to wholesale, including handling costs at the farm, transport costs from farm to wholesale market, processing, profit margins and all observed taxes and levies.

The same steps described above can be taken a second time using benchmark prices and access costs that have been adjusted to eliminate market distortions due to exchange rate misalignments, structural inefficiencies in the commodity's value chain[2] and imperfect functioning and non-competitive pricing in international markets, where possible and relevant. The adjusted benchmark prices and access costs are then used to generate a second set of *adjusted* reference prices, in addition to the first set of *observed* reference prices calculated.

For exported commodities, a slightly different approach is used. In this case, the border is generally considered the point of competition (wholesale), and the unit value FOB price for the commodity is normally taken as the benchmark price. Furthermore, observed and adjusted reference prices at wholesale are obtained by subtracting, rather than adding, the access costs between the border and wholesale. Mathematically, the equations for calculating the observed reference prices at wholesale (RP_{owh}) and farm gate $\left(RP_{ofg}\right)$ for an exported commodity are as follows:

$$RP_{owh} = P_b - AC_{owh}$$

$$RP_{ofg} = RP_{owh} - AC_{ofg}$$

After observed and adjusted reference prices are calculated for the commodity, they are subtracted from the domestic prices at each point in the value chain to obtain the observed and adjusted price gaps at wholesale and farm gate. *Observed price gaps* capture the effect of distortions from trade and market policies directly influencing the price of the commodity in domestic markets (e.g. price ceilings and tariffs), as well as overall market performance. *Adjusted price gaps* capture the same as the observed, in addition to the effect of any distortions from domestic exchange rate policies, structural inefficiencies in the commodity's value chain, and imperfect functioning and non-competitive pricing in international markets. Mathematically, the equations for calculating the observed price gaps at wholesale (PG_{owh}) and farm gate $\left(PG_{ofg}\right)$ are as follows:

$$PG_{owh} = P_{wh} - RP_{owh}$$

$$PG_{ofg} = P_{fg} - RP_{ofg}$$

[2] Structural inefficiencies in commodity value chains may include government taxes and fees (excluding fees for services), high transportation and processing costs, high profit margins captured by various marketing agents, bribes and other non-tariff barriers.

where P_{fg} is the domestic price at farm gate, RP_{ofg} is the observed reference price at farm gate, P_{wh} is the domestic price at wholesale, and RP_{owh} is the observed reference price at wholesale.

A positive price gap, resulting when the domestic price exceeds the reference price, means that the policy environment and market functioning as a whole generate incentives (support) to producers or wholesalers. For an imported commodity this could be due to distortions such as the existence of an import tariff. On the other hand, if the reference price exceeds the domestic price, resulting in a negative price gap, this means that the policy environment and market functioning as a whole generate disincentives (taxes) to producers or wholesalers. For an imported commodity this could be due to distortions such as a price ceiling established by the government to keep domestic prices low.

In general, price gaps provide an absolute measure of the market price incentives (or disincentives) that producers and wholesalers face. Therefore, price gaps at wholesale and farm gate are divided by their corresponding reference price and expressed as a ratio, referred to as the ***Nominal Rate of Protection (NRP)***, which can be compared between years, commodities, and countries.

The *Observed Nominal Rates of Protection* at the farm gate (NRP_{ofg}) and wholesale (NRP_{owh}) are defined by the following equations:

$$NRP_{ofg} = \frac{PG_{ofg}}{RP_{ofg}} \; ; \; NRP_{owh} = \frac{PG_{owh}}{RP_{owh}}$$

where PG_{ofg} is the observed price gap at farm gate, RP_{ofg} is the observed reference price at the farm gate, $PG_{owh}$is the observed price gap at wholesale and RP_{owh} is the observed reference price at wholesale.

Similarly, the *Adjusted Nominal Rates of Protection* at the farm gate (NRP_{afg}) and wholesale (NRP_{awh}) are defined by the following equations:

$$NRP_{afg} = \frac{PG_{afg}}{RP_{afg}} \; ; \; NRP_{awh} = \frac{PG_{awh}}{RP_{awh}}$$

where PG_{afg} is the adjusted price gap at farm gate, RP_{afg} is the adjusted reference price at the farm gate, $PG_{awh}$is the adjusted price gap at wholesale and RP_{awh} is the adjusted reference price at wholesale.

If public expenditure allocated to the commodity is added to the price gap at farm gate when calculating the ratios, the ***Nominal Rate of Assistance (NRA)*** is generated. This indicator summarizes the incentives (or disincentives) due to policies, market performance and public expenditure.[3] Mathematically, the Nominal Rate of Assistance is defined by the following equation:

$$NRA = \frac{PG_{afg} + PE_{csp}}{RF_{afg}}$$

[3] The NRA indicator was not calculated for any of the commodities analyzed because of insufficient data on public expenditure. However, it will be developed in the forthcoming reports, as the public expenditure analysis is improved and better data are made available.

where PE_{csp} is commodity-specific public expenditure that has been identified and measured as monetary units per tonne.

Finally, MAFAP methodology estimates the ***Market Development Gap (MDG),*** which is the portion of the price gap that can be attributed to "excessive" or inefficient access costs within a given value chain, exchange rate misalignments, and imperfect functioning of international markets. "Excessive" access costs may result from factors such as poor infrastructure, high processing costs due to obsolete technology, government taxes and fees (excluding fees for services), high profit margins captured by various marketing agents, bribes and other non-tariff barriers. Therefore, the total MDG at farm gate is comprised of three components – gaps due to "excessive" access costs, the exchange rate policy gap and the international market gap. When added together, these components are equivalent to the difference between the observed and adjusted price gaps at farm gate.

Similar to the price gaps calculated, the MDG is an absolute measure, which is also expressed as a ratio to allow for comparison between years, commodities, and countries. This relative indicator of the total MDG affecting farmers is derived by calculating the ratio between the total MDG at farm gate and the adjusted reference price at farm gate as follows:

$$MDG_{fg} = \frac{(ACG_{wh}+ACG_{fg}+EXPG+IMG)}{RP_{afg}}$$

where ACG_{wh} is the access cost gap at wholesale defined as the difference between observed and adjusted access costs at wholesale, ACG_{fg} is the access cost gap at farm gate defined as the difference between observed and adjusted access costs at the farm gate, ERPG is the exchange rate policy gap, and IMG is the international market gap.

A more detailed description of the methodology applied in this analysis is available on MAFAP's website at www.fao.org/in-action/mafap.

2. DATA REQUIREMENTS AND CALCULATION OF INDICATORS

To calculate MAFAP's price incentives indicators, several types of data are needed. This section presents the data that was obtained and methodological decisions that were taken in this analysis.

TRADE STATUS OF THE PRODUCT

Tanzania was a net importer of rice in all years, except in 2010 and 2011, when it became a net exporter. As shown in Table 2, broken and milled rice were traded in larger quantities than other types of rice.

Table 2: Trade balance by type of rice (tonnes), 2005-2013

Type of rice	2005	2006	2007	2008	2009	2010	2011	2012	2013
Paddy (milled equivalent)	2,979	-46	613	307	-120	3,892	1,269	1,665	6,789
Husked (milled equivalent)	1,365	-231	-87	51	131	733	-42	-886	1,646
Broken	-46,735	-58,253	-37,115	-47,185	-26,140	12,541	8,519	-16,242	-33,677
Milled	-14,726	-21,744	11,629	-11,719	-12,638	29,528	-7,389	-6,602	-44,116
Trade Balance (X-M)	**-57,117**	**-80,275**	**-24,959**	**-58,546**	**-38,767**	**46,694**	**2,357**	**-22,065**	**-69,359**

Note: Paddy and husked rice were converted to their milled equivalents using conversion ratios of 0.65 and 0.80, respectively.

Source: UN Comtrade

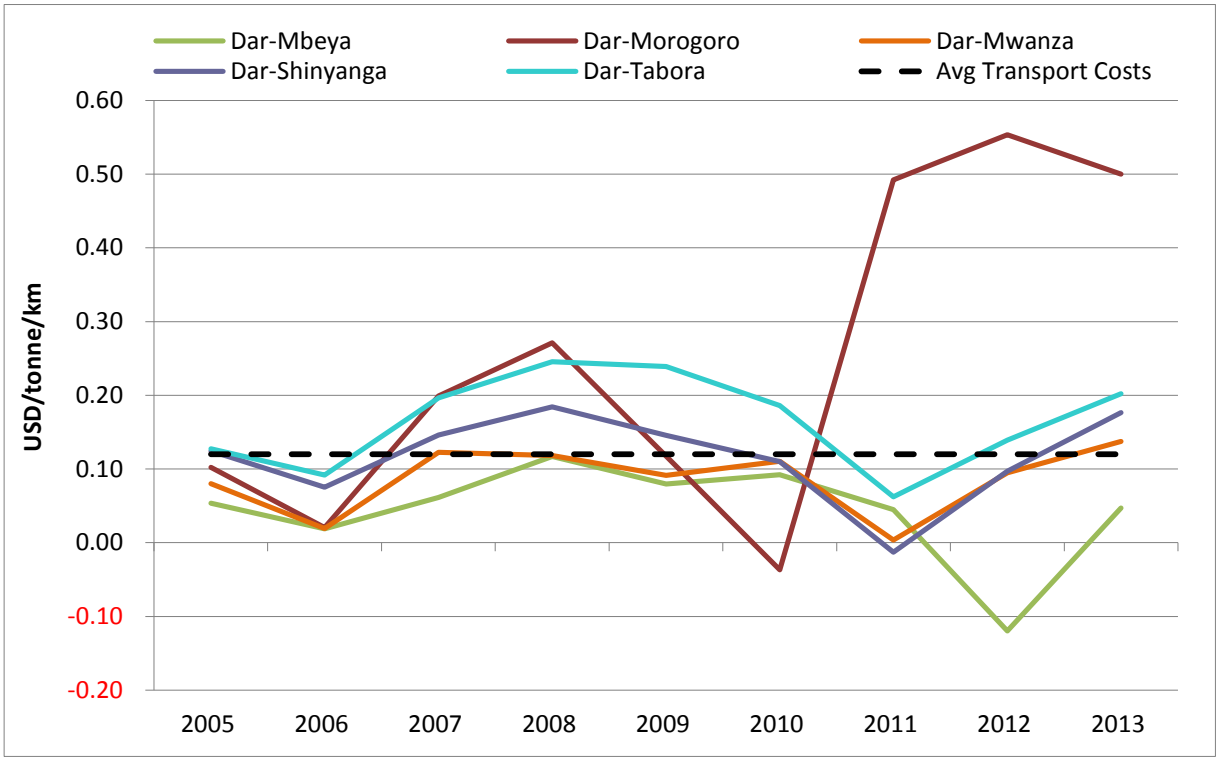
MARKET PATHWAY ANALYSED

For years when Tanzania was an importer of rice, Dar es Salaam is considered the main port of entry, since most rice imports come from the Far East. Dar es Salaam was also taken as the point of competition, as this is the largest wholesale market for rice in Tanzania and the location where domestic rice competes with rice imports.

During the two years that Tanzania was an exporter, most rice exports did not exit the country through Dar es Salaam, as they were directed to Rwanda. Therefore, Shinyanga, the main rice market close to the Rwanda border, was taken as the point of competition.

The typical market pathway would involve rice in surplus areas feeding Dar es Salaam when there is a production deficit, and surplus areas feeding neighboring countries when there is a production surplus (i.e. 2010 and 2011). To examine the viability of these different marketing routes, a price differential analysis was conducted. For import years, wholesale prices in Dar es Salaam were compared with wholesale prices in main production areas (Figure 10), and the difference between these prices was converted to unit costs per kilometer. Assuming that the market access costs of 0.12 USD per tonne reported by SAGCoT (2010) are accurate, it seems Tabora and Morogoro report wholesale prices low enough to compete in Dar es Salaam.

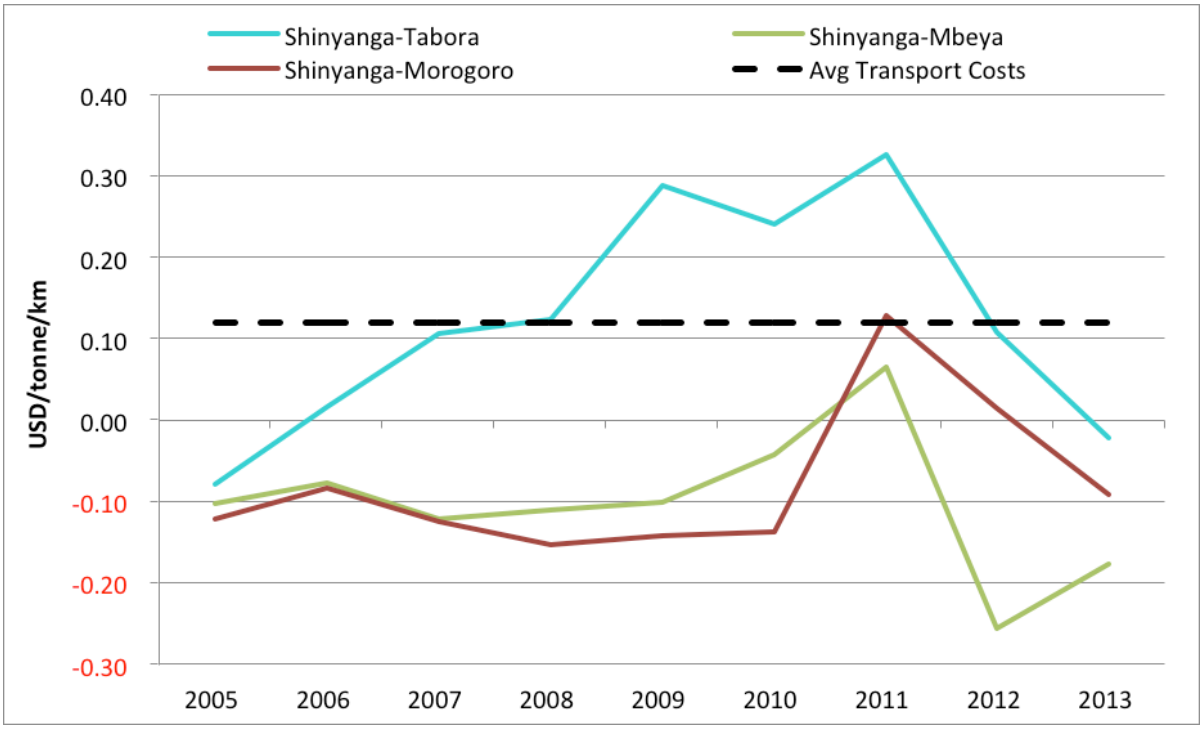
Figure 10: Wholesale price differentials between Dar es Salaam and main production areas for husked rice (USD/tonne/km), 2005-2013



Source: MIT and author's own calculations

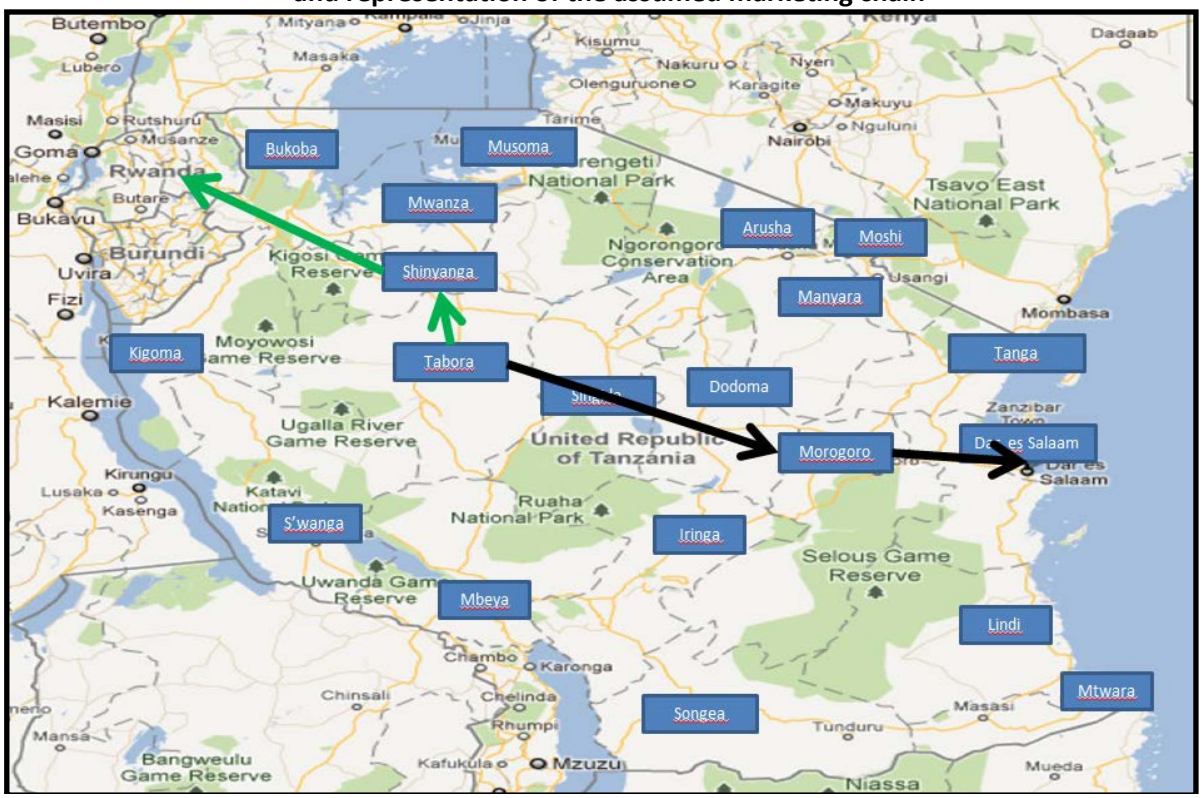
A similar analysis of export marketing routes via Shinyanga shows that only Tabora reports wholesale prices low enough to compete in Shinyanga/Rwanda in years 2010 and 2011, when Tanzania was an exporter of rice (Figure 11). Thus, Tabora was selected as the farm gate for this analysis. The market pathway for both import and export years is shown in Figure 12.

Figure 11: Wholesale price differentials between Shinyanga and main production areas for husked rice (USD/tonne/km), 2005-2013



Source: MIT and author's own calculations

Figure 12: Markets for which the Ministry of Industry and Trade records wholesale prices for rice and representation of the assumed marketing chain



Note: Black arrows represent marketing flows for import years and green arrows for export years.

Source: Author's own elaboration using Google Maps

BENCHMARK PRICES

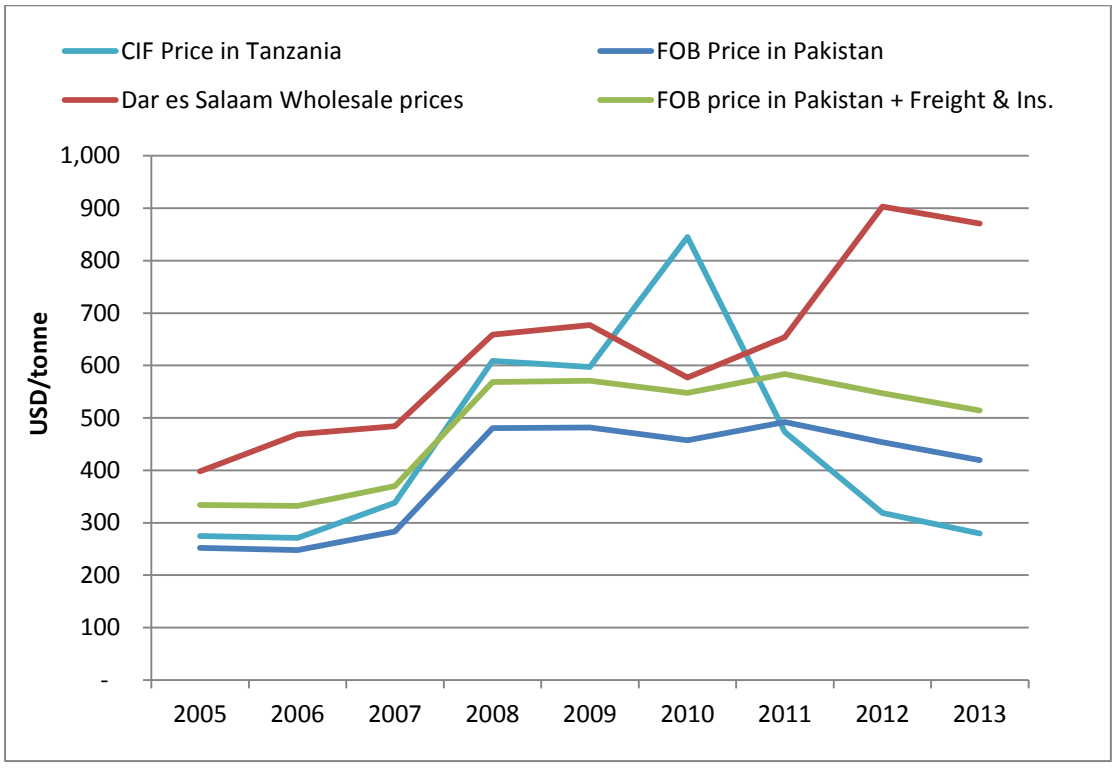
Observed

In order to calculate a reference price, a benchmark price must be established, which represents the distortion-free price of rice at the country's border. For years when Tanzania was a net importer of rice (2005-2009, 2012-2013), the unit value CIF price was taken as the benchmark price. This was calculated by dividing the total value of rice imports by the total quantity imported in each year using data obtained from UN Comtrade.

Although broken rice is the main type of rice traded in Tanzania, its quality and price is highly variable compared to milled rice. Therefore, unit value CIF prices for milled rice were used in this analysis because they follow a more consistent and coherent trend (Table 3).

As shown in Figure 13, CIF prices for years 2012 and 2013 diverged significantly from wholesale prices in Dar es Salaam and were well below FOB prices in Pakistan for milled rice exports to Tanzania, which is impossible when considering the cost of freight and insurance. As a result, CIF prices for these two years were estimated by adding freight and insurance costs between Pakistan's Karachi Port and the Port of Dar es Salaam (95 USD/tonne in 2013) to the unit value FOB price in Pakistan for milled rice exports to Tanzania (453 USD/tonne in 2012 and 419 USD/tonne in 2013). Estimated freight and insurance costs were obtained from World Freight Rates online database, while FOB prices in Pakistan were calculated using data from UN Comtrade.

Figure 13: CIF prices in Tanzania compared to wholesale prices in Dar es Salaam, FOB prices in Pakistan and FOB prices in Pakistan plus freight and insurance (USD/tonne/milled rice), 2005-2013



Source: Author's calculations using data from UN Comtrade, World Freight Rates, the IMF and MIT

Table 3: Unit value CIF prices by type of rice (USD/tonne), 2005-2009

Type of rice	2005	2006	2007	2008	2009	2012*	2013*
Paddy	157	671	213	727	397	-	-
Husked	84	214	175	1,385	505	-	-
Broken	170	228	91	135	128	-	-
Milled	**275**	**271**	**339**	**609**	**597**	**548**	**514**

** Calculated by adding the cost of freight and insurance to the FOB price in Pakistan for milled rice exports to Tanzania. Source: UN Comtrade*

For years when Tanzania was a net exporter of rice (i.e. 2010 and 2011), the FOB price was taken as the benchmark price. Since most rice was exported to Rwanda in these two years, the unit value FOB price was constructed by subtracting access costs between the Kigali wholesale market in Rwanda and the Rwanda/Tanzania border from the Kigali wholesale price. Kigali wholesale prices were obtained from FAO's GIEWS database. Access costs were calculated as the sum of transport costs and the exporter's margin, estimated as five percent of the wholesale price in Shinyanga plus access costs from Shinyanga to Rwanda/Tanzania border. Total transport costs were calculated by multiplying the average unit costs (.15 USD/tonne/km[4] equal to 238 TZS/tonne/km) in 2011, obtained from the National Food Reserve Agency (NFRA), by the total distance from Kigali to the Rwanda/Tanzania border. Transport costs in 2011 were deflated to estimate transport costs in 2010 using Tanzania's Consumer Price Index (CPI) obtained from the World Bank. Constructed FOB prices for 2010 and 2011 and the data used to calculate them are shown in Table 4.

Table 4: Constructed unit value FOB prices, 2010-2011

	2010	2011
a. Kigali wholesale price for milled rice (USD/tonne/husked rice equivalent)	731	712
b. Tanzania's Consumer Price Index (Base year = 2011)	.89	1.00
c. Average transport costs for milled rice (USD/tonne/km) [b*.15]	.13	.15
d. Distance from Kigali to Rwanda/Tanzania border (km)	142	142
e. Total transport costs from Kigali to the Rwanda/Tanzania border (USD/tonne/husked rice equivalent) [(c*142)*.80]	15	17
f. Exporter's margin estimated as 5% of wholesale price in Shinyanga + transport costs from Shinyanga to Rwanda/Tanzania border (USD/tonne/husked rice equivalent)	35	46
g. Constructed FOB price (USD/tonne/husked rice) [a-e-f]	**681**	**649**

Note: Milled rice was converted to its husked rice equivalent using a conversion ratio of 0.80.
Source: Author's calculations using data from GIEWS, the World Bank, NFRA and MIT

Adjusted

Benchmark prices were not adjusted in this analysis.

[4] These are the unit costs for transporting maize in northern Tanzania (i.e. Arusha). These costs were assumed to be equivalent to the unit costs for transporting milled rice.

DOMESTIC PRICES

Observed prices at point of competition

For years when Tanzania was a net importer, the average annual wholesale price for husked rice in Dar es Salaam was taken as the observed price at the point of competition. For years when Tanzania was a net exporter, the average annual wholesale price for husked rice in Shinyanga was taken as the observed price at the point of competition. These prices were calculated from monthly wholesale prices reported by the MIT and are shown in Table 5.

Table 5: Wholesale prices at the point of competition (TZS/tonne/husked rice), 2005-2013

Point of Competition	2005	2006	2007	2008	2009	2010*	2011*	2012	2013
Dar es Salaam	562,015	735,260	754,274	984,949	1,117,393	-	-	1,787,385	1,740,143
Shinyanga	-	-	-	-	-	858,793	1,306,993	-	-

* Years when Tanzania was a net exporter of rice

Source: MIT

Observed prices at farm gate

Due to a lack of reliable farm gate prices for rice, average annual wholesale prices in Tabora, the surplus production area, were taken as a proxy for farm gate prices. These prices were calculated from monthly wholesale prices reported by the MIT and are shown in Table 6.

Table 6: Wholesale prices taken as a proxy for farm gate prices (TZS/tonne/husked rice), 2005-2013

Farm Gate	2005	2006	2007	2008	2009	2010	2011	2012	2013
Tabora	441,838	639,195	537,823	739,508	853,818	792,325	1,205,546	1,603,370	1,470,410

Source: MIT

EXCHANGE RATES

Observed

Average nominal exchange rates between the Tanzanian Shilling (TZS) and the US Dollar (USD) were used in this analysis. These exchange rates were obtained from the Bank of Tanzania (BoT) and are shown in Table 7.

Table 7: Average Nominal Exchange Rates (TZS/USD), 2005-2013

2005	2006	2007	2008	2009	2010	2011	2012	2013
1,129	1,254	1,247	1,196	1,320	1,400	1,574	1,583	1,599

Source: BoT

Adjusted

Exchange rates were not adjusted in this analysis.

ACCESS COSTS

Observed

Border to point of competition / Point of competition to border

For years when Tanzania was an importer of rice, we considered the costs of landing at the Dar es Salaam Port. Access costs from the port (border) to wholesale (point of competition) in Dar es Salaam are reported by Temu et al. (2010), which identify up to 123 USD per tonne in non-tariff requirements for importation.[5] Although these costs refer to maize, we take them as a proxy for milled rice. These costs are summarized in Table 8 and supplemented with updated information from additional sources.

In order to check the validity of the Surface and Marine Transport Regulatory Authority's (SUMATRA's) declared fees for bulk imports, we have calculated the implicit unit value (USD) based on total revenues of SUMATRA related to total value of imports.[6] This generates a fee of 0.60 (2007), 0.46 (2008) and 0.88 (2009) TZS per USD of imports. When considering CIF unit value prices for those years, we see that the fee levied on rice would be between 0.16 and 0.4 USD per tonne, which is in the range of the declared fees. Therefore, we consider that the SUMATRA import fee of 0.3 USD per tonne is applied.

Table 8: Import costs at the Dar es Salaam Port

Item	Description	Charge	Update
Pre-inspection charges	Pre-inspection by TISCAN a private company mandated by TRA	Destination inspection processing fees (1.2% of FOB)	NIL
Phytosanitary charges	Post entry plant quarantine station inspection	15 USD per consignment	NIL
Port wharfage fees	Paid to Tanzania Harbours Authority for goods while docked or leaving port	1.5% of CIF	NIL
Tally fee	Payable to the shipping company	1 USD per tonne	NIL
Tanzania central freight bureau booking fees	TCFB fee for enforcing fair fright charges for exports and imports	2.5 % of CIF or FOB	Currently under SUMATRA (Surface and Marine Transports Authority) and set at 0.3 USD per tonne[7]. Included
Clearing agents fees	Documentation fees	78.43 USD per consignment (estimated)	Caps set by SUMATRA Bill of lading 45 USD Delivery order 45 USD
	Agent fees	% of value of goods	List of approved shipping agents includes over 30 companies.
Loading and unloading	Re-bagging, transport, silo charges etc.	USD 20 per tonne	
Health and food safety standards	Tanzania Food and Drugs Authority Permit	TZS 1,000 for testing fees	Assumed to be per tonne

Source: Temu et al. (2010) and author's own calculations

For those import costs reported per consignment, assumptions were made about the average size of a consignment to obtain costs in USD per tonne. Even when rice is normally imported in bulk, we can

[5] Although they do not specify the year, it seems the figures are for the early 2000's, as they reference a tariff structure that was in place from 2000 to 2003.
[6] Aggregated trade volume is not available, nor the disaggregation of SUMATRA revenue by type of goods.
[7] As reported for dry bulk http://www.sumatra.or.tz/index.php?option=content&task=view&id=37&Itemid=2

consider a minimum consignment size of 20 tonnes, which is equivalent to one container. Based on this assumption, import costs reported per consignment were converted to costs in USD per tonne, as shown in Table 9.

Table 9: Import costs at the Dar es Salaam Port as a percentage or unit value per tonne

Item	Percentage or unit value per tonne	Reference year	Notes
Pre-inspection charges	1.2% of FOB 0.9% of CIF	N.A.	Approximated for imports from original data (referred to FOB) using the FOB to CIF ratio of world exports to Tanzania and world imports declared by Tanzania for 2005 and 2006[8].
Phytosanitary charges	0.75 USD per tonne	2003	Assuming an average shipment of 20 tonnes
Port wharfage fees	1.5% of CIF	N.A.	For export years applied to FOB
Tally fee	1 USD per tonne	2003	
SUMATRA booking fees	0.3 USD per tonne	2010	
Documentation fees	2.25 USD per tonne	2010	Only bill of lading (imports) or Delivery order (exports) and assuming an average shipment of 20 tonnes
Clearing agent fees	2% of CIF	N.A.	Estimate of normal fees due to sufficient competition in Dar
Loading and unloading	20 USD per tonne	2003	
Health and food safety standards	1,000 TZS per tonne	2003	

Source: Temu et al. (2010) and author's own calculations

Costs not expressed as a percentage of the import (CIF) price were extrapolated for the study period using Tanzania's CPI. Costs expressed in USD per tonne were converted to TZS per tonne using the average, nominal exchange rate. In addition, an importer's profit margin equal to 5 percent of the purchase (CIF) price was included.

In 2010 and 2011, when Tanzania was an exporter, most rice was transported to Rwanda. For this two-year period, Shinyanga was taken as the point of competition. Therefore, access costs include transport from Shinyanga to the Rwanda/Tanzania border, in addition to documentation and phytosanitary inspection costs, as listed in Table 9. Costs reported by the NFRA for transporting maize in northern Tanzania (238 TZS/tonne/km in 2011) were taken as a proxy for milled rice. These unit value costs were multiplied by the distance between Shinyanga and the Rwanda/Tanzania border (403 km) to obtain the total transport costs for rice in 2011. Total transport costs, as well as documentation and phytosanitary inspection costs, were extrapolated for the two years using Tanzania's CPI. In addition, an exporter's profit margin equal to 5 percent of the purchase (wholesale) price in Shinyanga was included.

[8] For all other years, trade data is too inconsistent to be used (i.e. FOB price higher than CIF price or volumes differing by more than one order of magnitude).

Since import and export costs refer to milled rice[9], while domestic prices at the point of competition are for husked rice, total import and export costs[10] were multiplied by a quantity conversion ratio of .80 to obtain the total observed access costs from the border to the point of competition in husked rice. These costs are shown in Table 10 below, and the data used to calculate them are provided in Annex II.

Table 10: Observed access costs between the border and the point of competition (TZS/tonne/husked rice), 2005-2013

Trade direction/ flow	2005	2006	2007	2008	2009	2010	2011	2012	2013
Import via Dar es Salaam	47,147	52,802	59,612	82,668	89,968	-	-	104,623	102,416
Export via Shinyanga	-	-	-	-	-	114,546	146,159	-	-

Source: Temu et al. (2010), UN Comtrade, MIT, NFRA and author's own calculations

Farm gate to point of competition

Since prices at the point of competition and farm gate are for husked rice, costs for transport, handling and margins were taken into account, while processing costs were excluded. For the first two components, costs reported by the NFRA for transporting maize in northern Tanzania (238 TZS/tonne/km in 2011) were taken as a proxy for milled rice and extrapolated for the study period using Tanzania's CPI. For import years, these unit value costs were multiplied by the distance between Tabora and Dar es Salaam (886 km), while for export years, they were multiplied by the distance between Tabora and Shinyanga (198 km) to obtain total transport costs. Since transport costs refer to milled rice[11], while domestic prices at the point of competition and farm gate are for husked rice, they were multiplied by a quantity conversion ratio of .80 to obtain the total transport costs in husked rice. In addition, a trader's profit margin equal to 5 percent of the purchase (wholesale) price in Tabora was added to obtain the total observed access costs from the farm gate to the point of competition in husked rice. These costs are shown in Table 11 below, and the data used to calculate them are provided in Annex II.

Table 11: Observed access costs between the farm gate and the point of competition (TZS/tonne/husked rice), 2005-2013

Trade direction/ flow	2005	2006	2007	2008	2009	2010	2011	2012	2013
Tabora to Dar es Salaam	121,389	138,457	140,871	162,670	183,648	-	-	275,856	284,610
Tabora to Shinyanga	-	-	-	-	-	73,070	97,976	-	-

Source: MIT, NFRA and author's own calculations

Adjusted

Border to point of competition / Point of competition to border

[9] Costs used in this analysis are for maize grain, which is similar to milled rice in terms of density and bulk.
[10] Excluding the profit margin for exports, as this was already expressed in terms of husked rice.
[11] Costs used in this analysis are for maize grain, which is similar to milled rice in terms of density and bulk.

For years when Tanzania was an importer of rice, access costs were adjusted by reducing loading and unloading costs at the Dar es Salaam Port from 20 USD per tonne (2003), as reported by Temu et al. (2010), to 4.5 USD per tonne (2006), as reported by the World Bank (2011).

For years when Tanzania was an exporter of rice, access costs were adjusted by using NFRA transport costs for southern Tanzania (170 TZS/tonne/km in 2011). These costs were much lower than those reported for northern Tanzania (238 TZS/tonne/km in 2011), which were used in the observed domain. The total adjusted access costs between the border and point of competition are shown in Table 12 below, and the data used to calculate them are provided in Annex II.

Table 12: Adjusted access costs between the border and the point of competition (TZS/tonne/husked rice), 2005-2013

Trade direction/ flow	2005	2006	2007	2008	2009	2010	2011	2012	2013
Import via Dar es Salaam	31,905	35,330	41,746	64,864	70,390	-	-	79,499	76,666
Export via Shinyanga	-	-	-	-	-	95,378	124,558	-	-

Source: Temu et al. (2010), UN Comtrade, MIT, NFRA and author's own calculations

Farm gate to point of competition

Access costs from the farm gate to the point of competition were adjusted by using NFRA transport costs for southern Tanzania (171 TZS/tonne/km in 2011). As noted previously, these costs were much lower than those reported for northern Tanzania (238 TZS/tonne/km in 2011), which were used in the observed domain. The total adjusted access costs between the border and point of competition are shown in Table 13 below, and the data used to calculate them are provided in Annex II.

Table 13: Adjusted access costs between the farm gate and the point of competition (TZS/tonne/husked rice), 2005-2013

Trade direction/ flow	2005	2006	2007	2008	2009	2010	2011	2012	2013
Tabora to Dar es Salaam	93,436	108,477	108,784	127,285	143,967	-	-	220,767	225,186
Tabora to Shinyanga	-	-	-	-	-	63,652	87,364	-	-

Source: MIT, NFRA and author's own calculations

BUDGET AND OTHER TRANSFERS

Throughout the study period, voucher-based subsidies for variable inputs were provided to maize and rice producers under the NAIVS programme. These expenditures were captured in MAFAP's agricultural public expenditure analysis covering fiscal years 2006/07 to 2012/13 (taken as years 2007 to 2013 for the purpose of this analysis). However, since MAFAP's analysis only reports the total amount spent under NAIVS without differentiating between the amounts allocated to each commodity, further analysis was undertaken in order to estimate the amount allocated to rice producers per tonne of paddy rice outputs in each year.

According to Tanzania's 2014 Public Expenditure Review (PER) of the NAIVS programme, about 20 percent of the vouchers were allocated to rice producers, and each targeted producer received a total of three vouchers – one for seed, one for basal and one for top dress fertilizer. Additionally, the PER report provides the total number of vouchers distributed per year from 2008/09 to 2013/14 and the value of each type of voucher in 2011/12 and 2012/13.

Based on this information, the total number of vouchers distributed in 2011/12 and 2012/13 was multiplied by .20 to estimate the number of vouchers distributed to rice producers in both years. Assuming that each rice producer actually received one of each type of voucher, as the programme intended, the total number of vouchers distributed to rice producers was divided into equal thirds. Each third was then multiplied by the respective unit value of each voucher type, and the products were summed to obtain the total amount spent on voucher subsidies for rice producers in each year. This sum was then divided by the total public expenditure on rice and maize under NAIVS, as reported by MAFAP, to obtain the share allocated to rice. As shown in Table 14, the share in both years analysed was 12 and 9 percent, respectively, averaging around 10 percent.

Table 14: Data and calculations for estimated budgetary transfers to rice producers, 2011/12-2012/13 (TZS)

	2011/12	2012/13
a. Total number of vouchers distributed to rice and maize producers	1,779,867	940,783
b. Estimated number of vouchers distributed to rice producers [a*.20]	355,973	188,157
c. Unit value of subsidy voucher for paddy seed	12,000	12,000
d. Unit value of subsidy voucher for basel	28,000	50,000
e. Unit value of subsidy voucher for top dress fertilizer	20,000	40,000
f. Estimated total value of paddy seed vouchers to rice producers [(b*(1/3))*c]	1,423,893,600	752,626,400
g. Estimated total value of basel vouchers to rice producers [(b*(1/3))*d]	3,322,418,400	3,135,943,333
h. Estimated total value of top dress fertilizer vouchers to rice producers [(b*(1/3))*e]	2,373,156,000	2,508,754,667
i. Estimated budgetary transfers under NAIVS allocated to rice producers [f+g+h]	7,119,468,000	6,397,324,400
j. Total budgetary transfers under NAIVS allocated to rice and maize producers	57,895,519,475	68,799,709,390
K. Share of total budgetary transfers under NAIVS allocated to rice producers [i/j*100)	12%	9%

Source: MAFAP and 2014 Public Expenditure Review of the NAIVS

This average ratio of 10 percent was then used to estimate the total budgetary transfers to rice producers in all other years. Once this amount was derived, it was divided by total paddy production to obtain the amount of public expenditure allocated to rice producers per tonne in each year (Table 15).

Table 15: Budgetary transfers to rice producers per tonne, 2006/07-2012/13

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
a. Total budgetary transfers under NAIVS allocated to rice and maize producers (in millions of TZS)	25,310	28,674	72,075	80,357	63,656	57,896	68,800
b. Estimated budgetary transfers under NAIVS allocated to rice producers (in millions of TZS) [a*.10]	2,733	3,096	7,783	8,677	6,874	6,251	7,429
c. Production (in thousands of tonnes)	1,168	1,206	1,342	1,421	1,335	2,650	2,248
d. Total estimated public expenditure allocated to rice producers per tonne (TZS per tonne) [b/c]	2,037	2,179	5,830	3,274	3,057	3,472	3,385

Source: MAFAP and FAOSTAT

QUALITY AND QUANTITY ADJUSTMENTS

No quality adjustment was applied, since there is no evidence that the quality of local rice differs from that of imported rice.

Given that benchmark (CIF) prices are for milled rice and domestic prices are for husked rice, a quantity adjustment of 0.80 was applied between the border and the point of competition for years when Tanzania was an importer of rice. This conversion ratio was based on that fact that one tonne of husked rice produces about 0.80 tonnes of milled rice on average.

Table 16. Summary of data used in the analysis, 2005-2013

		Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
		trade status	*m*	*m*	*m*	*m*	*m*	*x*	*x*	*m*	*m*
DATA	*Unit*	*Symbol*									
Benchmark Price											
Observed	USD/Tonne	$P_{b(int\$)}$	275	271	339	609	597	681	649	548	514
Adjusted	USD/Tonne	P_{ba}	275	271	339	609	597	681	649	548	514
Exchange Rate											
Observed	TZS/USD	ER_o	1,129	1,254	1,247	1,196	1,320	1,400	1,574	1,583	1,599
Adjusted	TZS/USD	ER_a	1,129	1,254	1,247	1,196	1,320	1,400	1,574	1,583	1,599
Access costs border - wholesale											
Observed	TZS/Tonne	AC_{owh}	47,147	52,802	59,612	82,668	89,968	114,546	146,159	104,623	102,416
Adjusted	TZS/Tonne	AC_{awh}	31,905	35,330	41,746	64,864	70,390	95,378	124,558	79,499	76,666
Domestic price at wholesale	TZS/Tonne	P_{dwh}	562,015	735,260	742,239	984,949	1,117,393	858,793	1,306,993	1,787,385	1,740,143
Access costs wholesale - farm gate											
Observed	TZS/Tonne	AC_{ofg}	121,389	138,457	140,871	162,670	183,648	73,070	97,976	275,856	284,610
Adjusted	TZS/Tonne	AC_{afg}	93,436	108,477	108,784	127,285	143,967	63,652	87,364	220,767	225,186
Farm gate price	TZS/Tonne	P_{dfg}	441,838	639,195	537,823	739,508	853,818	792,325	1,205,546	1,603,370	1,470,410
Externalities associated with production		E									
Budget and other product related transfers		BOT			2,037	2,179	5,830	3,274	3,057	3,472	3,385
Quantity conversion factor (border - point of competition)	Fraction	QT_{wh}	0.80	0.80	0.80	0.80	0.80	1.00	1.00	0.80	0.80
Quality conversion factor (border - point of competition)	Fraction	QL_{wh}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Quantity conversion factor (point of competition – farm gate)	Fraction	QT_{fg}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Quality conversion factor (point of competition – farm gate)	Fraction	QL_{fg}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

SUMMARY OF INDICATORS

Table 17. Price gap for rice in Tanzania, 2005-2013

	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013
Trade status		*m*	*m*	*m*	*m*	*m*	*x*	*x*	*m*	*m*
Observed price gap at point of competition	TZS/Tonne/ Husked Rice	266,543	410,267	344,921	319,723	396,956	19,939	431,626	988,775	980,139
Adjusted price gap at point of competition	TZS/Tonne/ Husked Rice	281,785	427,739	362,787	337,528	416,534	771	410,025	1,013,899	1,005,889
Observed price gap at farm gate	TZS/Tonne/ Husked Rice	267,755	452,660	281,376	236,952	317,029	26,541	428,156	1,080,616	995,016
Adjusted price gap at farm gate	TZS/Tonne/ Husked Rice	255,044	440,150	267,155	219,372	296,925	-2,045	395,942	1,050,651	961,342

Source: MAFAP, 2014

Table 18: Nominal rate of protection and nominal rate of assistance for rice in Tanzania, 2005-2013

	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013
Trade status		*m*	*m*	*m*	*m*	*m*	*x*	*x*	*m*	*m*
Observed nominal rate of protection at point of competition	%	90	126	87	48	55	2	49	124	129
Adjusted nominal rate of protection at point of competition	%	101	139	96	52	59	0	46	131	137
Observed nominal rate of protection at farm gate	%	154	243	110	47	59	3	55	207	209
Adjusted nominal rate of protection at farm gate	%	137	221	99	42	53	0	49	190	189
Observed nominal rate of assistance at farm gate	%	n.a.	n.a.	111	48	60	4	55	207	210
Adjusted nominal rate of assistance at farm gate	%	n.a.	n.a.	99	43	54	0	49	191	190

n.a. = not available, Source: MAFAP, 2014

Table 19. Market development gap for rice in Tanzania, 2005-2013

	Unit	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
Exchange rate policy gap	TZS/Tonne/ Husked Rice	0	0	0	0	0	0	0	0	0
Access costs gap to point of competition	TZS/Tonne/ Husked Rice	15,242	17,471	17,866	17,804	19,578	-19,168	-21,601	25,124	25,750
Access costs gap to farm gate	TZS/Tonne/ Husked Rice	-27,953	-29,980	-32,087	-35,385	-39,681	-9,418	-10,613	-55,088	-59,424
Total market development gap	TZS/Tonne/ Husked Rice	-12,712	-12,509	-14,221	-17,580	-20,103	-28,586	-32,214	-29,965	-33,674
Market development gap as share of farm gate price	**%**	-3	-2	-3	-2	-2	-4	-3	-2	-2
Market development as share of adjusted reference price at farm gate	**%**	-7	-6	-5	-3	-4	-4	-4	-5	-7

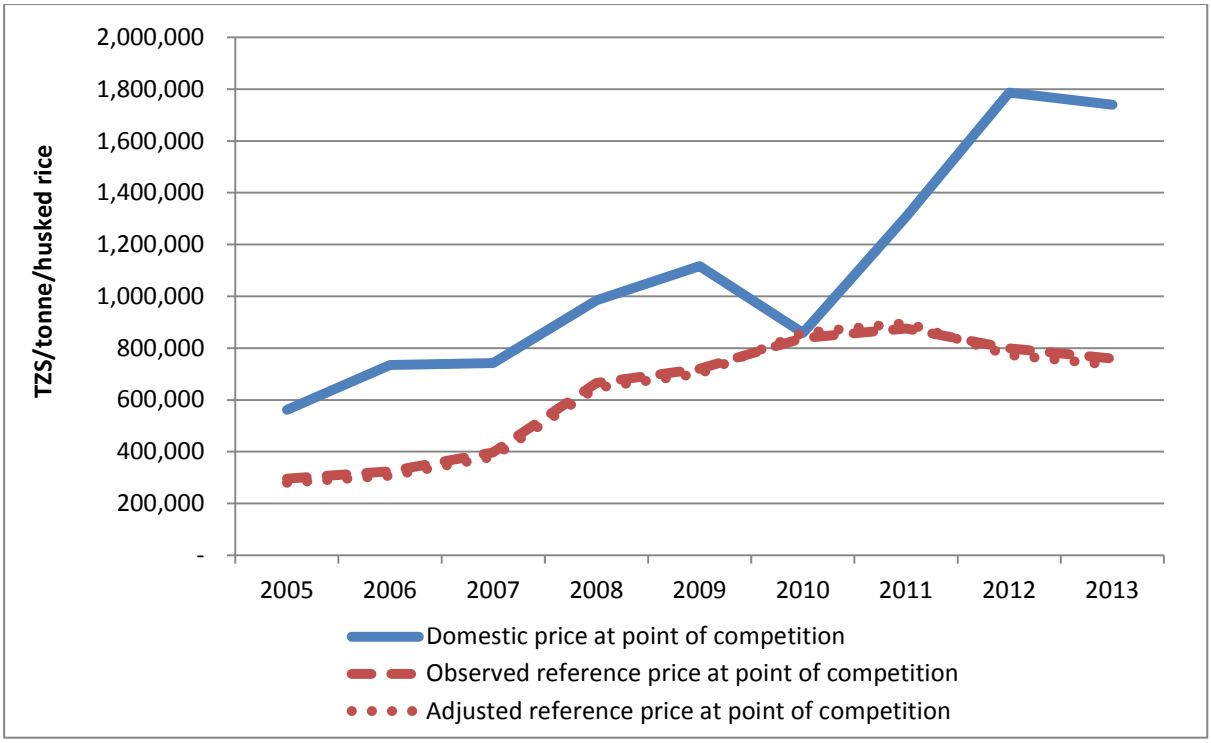
Source: MAFAP, 2014

3. RESULTS AND INTERPRETATION

Figures 14 and 15 compare domestic prices at the point of competition (i.e. wholesale) and farm gate, as observed in the market, to constructed reference prices. The observed reference price represents the price of husked rice that would have prevailed if distortions from explicit trade and market policies as well as overall market performance were removed. Adjusted reference prices are similar to the observed, but also exclude any distortions resulting from value chain inefficiencies.

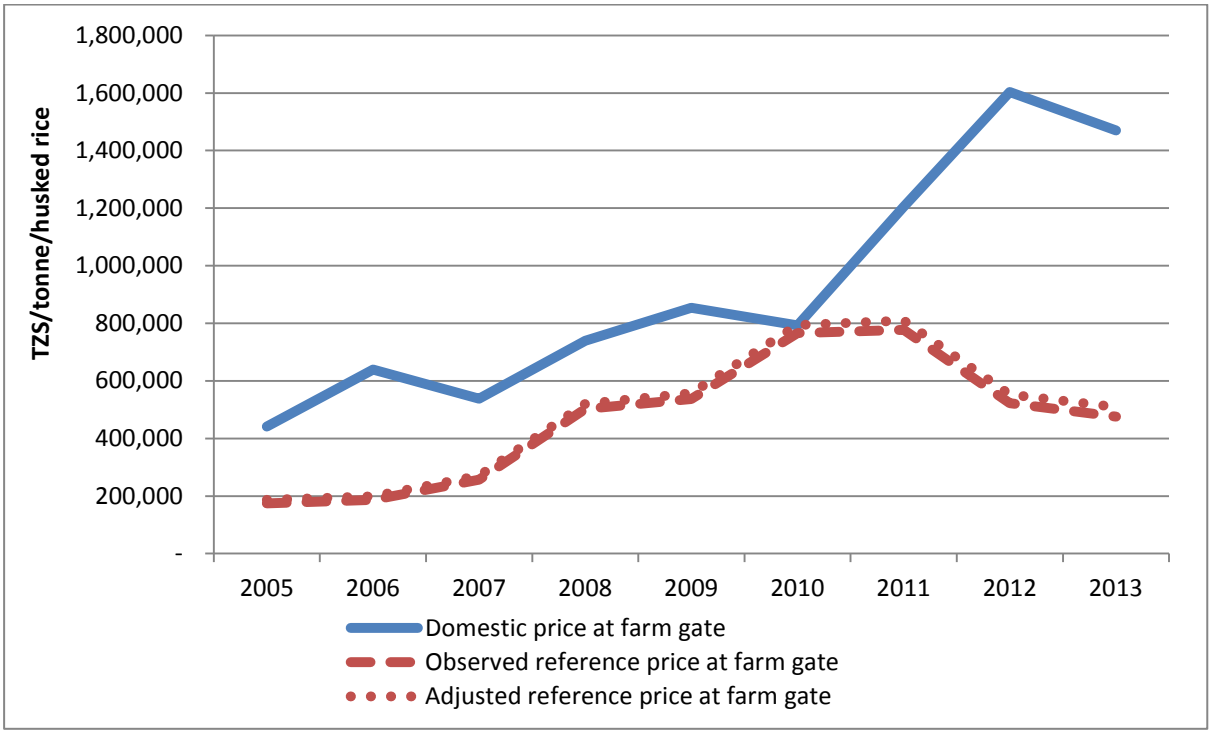
As shown in the graphs below, domestic prices exceeded both observed and adjusted reference prices in all years, except in 2010, when Tanzania became a net exporter of rice. The difference between domestic prices and their corresponding reference prices, referred to as the price gap, increased significantly from 2011 onward. This suggests that wholesalers and producers generally obtained progressively higher prices than what they would have if policy and market distortions were not present.

Figure 14: Domestic price vs. observed and adjusted reference prices at point of competition (wholesale) for rice in Tanzania (TZS/tonne/husked rice), 2005-2013



Source: MAFAP, 2014

Figure 15: Domestic price vs. observed and adjusted reference prices at farm gate for rice in Tanzania (TZS/tonne/husked rice), 2005-2013



Source: MAFAP, 2014

Figures 16 and 17 express the price gaps (reflected in the graphs above) in relative terms, as a percentage of the corresponding reference price in each year. This indicator, referred to as the Nominal Rate of Protection (NRP), measures the percent deviation of the price that wholesalers or producers actually received from the price they would have received if market distortions were not present. Thus, the observed NRP captures the impact of distortions from explicit trade and market policies as well as overall market performance, while the adjusted NRP captures the same, in addition to distortions from value chain inefficiencies.

The Nominal Rate of Assistance (NRA), also shown in Figures 16 and 17 below, is similar to the NRP, but takes into account any additional support to producers resulting from budgetary transfers such as production subsidies. NRA and NRP indicators measure the extent to which the overall policy environment and performance of the domestic rice market generate price incentives (support) or disincentives (taxes) to wholesalers or producers.

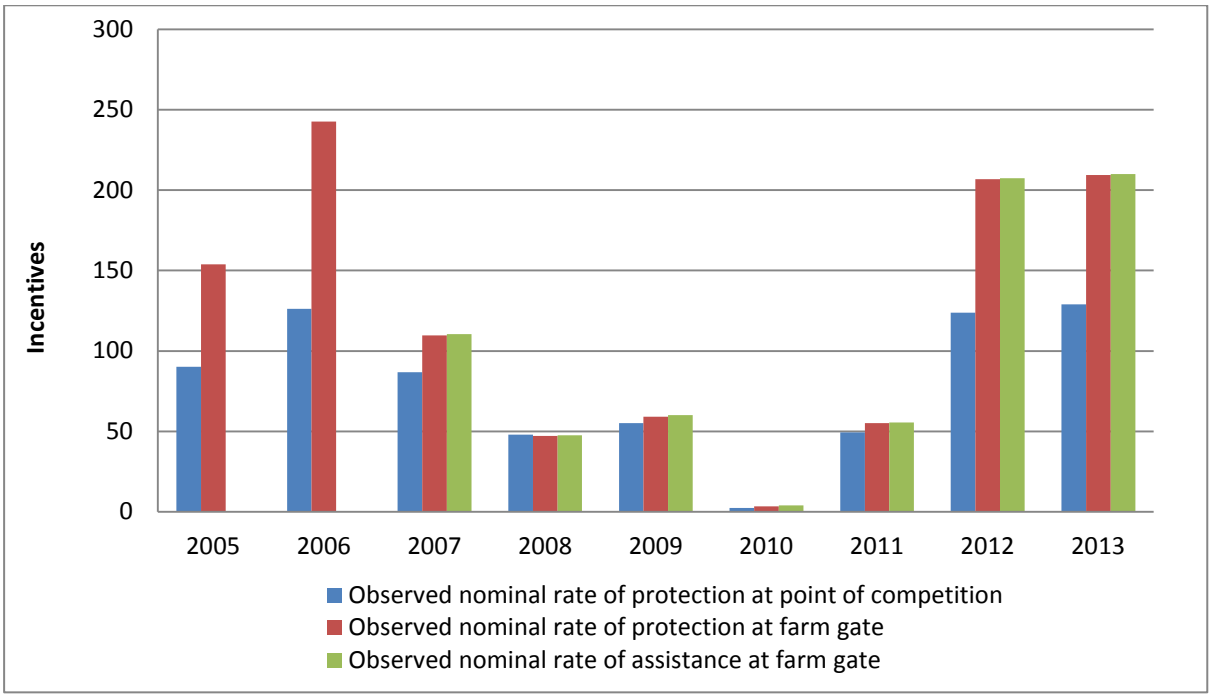
As shown in Figures 16 and 17, policy and market performance generated strong price incentives, which were higher for producers than for wholesalers in most years. However, the overall level of price incentives was lower and their distribution between agents was much more balanced during the period 2007-2011. This trend was largely due to the spike in global cereal prices in 2007/08, which led to higher benchmark prices and increased price transmission between agents. It can also be explained by the change in trade status in years 2010 and 2011, when rice was mainly exported to Rwanda via the Shinyanga wholesale market. In 2010, the NRP was close to zero percent, indicating that the market operated efficiently in that year, as wholesalers and producers both received a price that was almost equal to the distortion-free price of rice. However, in 2011, producers and wholesalers faced price incentives. This was likely due to drought conditions in Rwanda, which

resulted in a supply shortfall and favorable prices for Tanzanian producers as Rwanda resorted to importing rice from neighboring countries to address its deficit.

These results indicate that Tanzania's import tariff of 75 percent or 200 USD per tonne (whichever is higher) was effective in generating price incentives for both wholesalers and farmers. In all years, except 2007-2011, the level of protection was much higher than the tariff rate, indicating that the overall functioning of the market is also contributing to price incentives. This could be partly explained by the inefficiencies at the Dar es Salaam Port such as the cost of delays, which inflate the price of imported rice and allow local producers to sell domestic rice at a higher price. Furthermore, periodical export bans could have contributed to the lower NRPs observed at wholesale and farm gate in years 2008, 2009 and 2011.

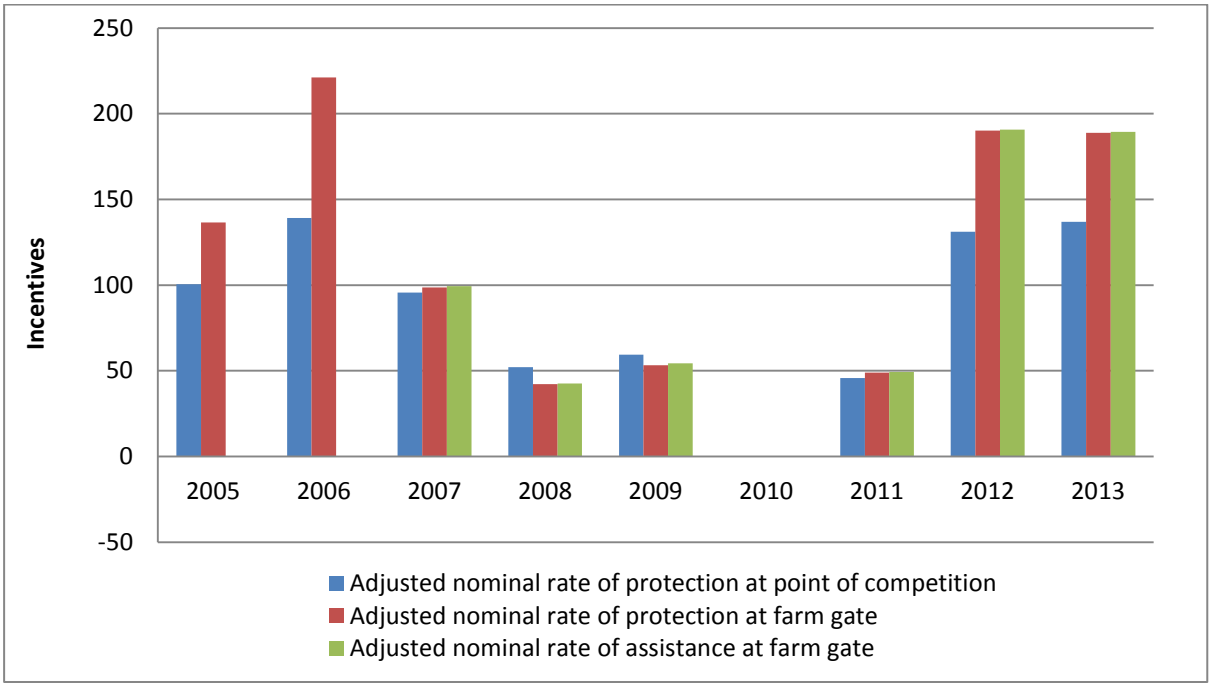
As shown in Figures 16 and 17, the NRA at farm gate was nearly equal to the NRP at farm gate in all years for which the NRA was calculated. This indicates that Tanzania's voucher-based input subsidy programme (NAIVS) did not provide enough support to producers to have a significant impact on price incentives they received.

Figure 16: Observed nominal rate of protection and nominal rate of assistance for rice in Tanzania (%), 2005-2013



Source: MAFAP, 2014

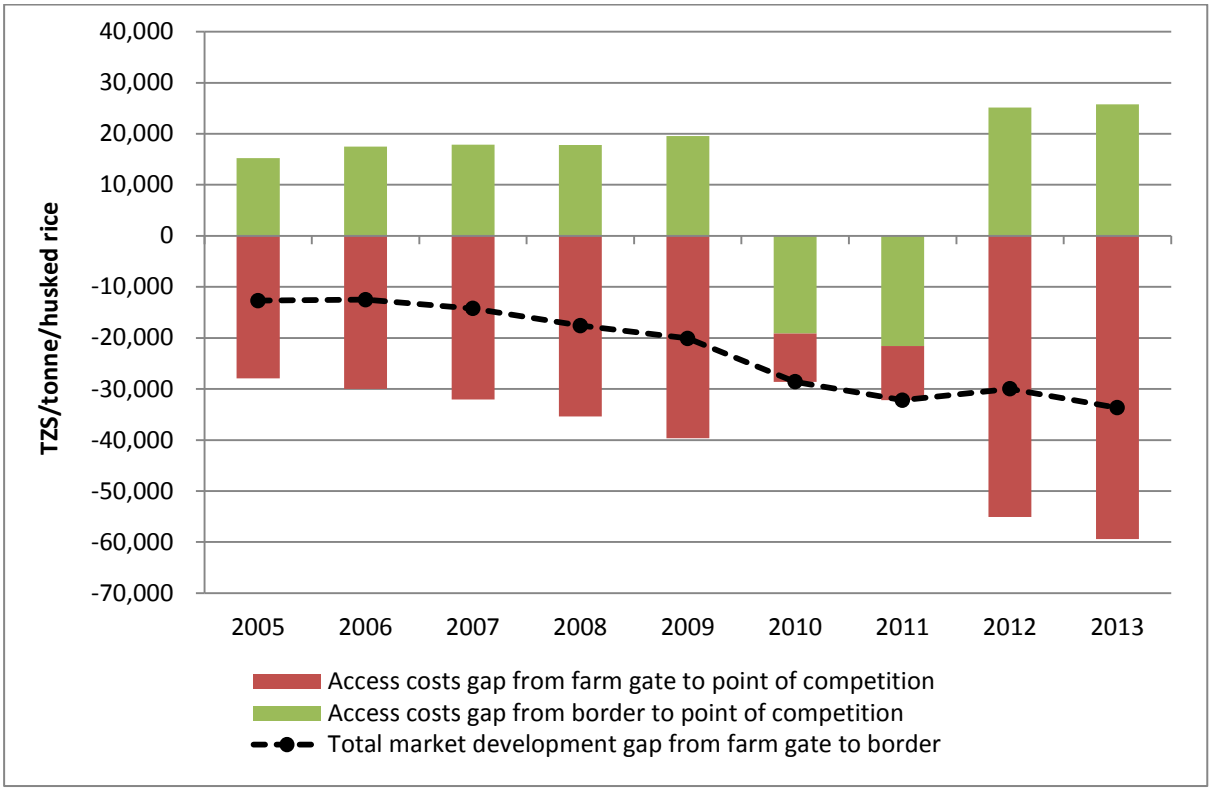
Figure 17: Adjusted nominal rate of protection and nominal rate of assistance for rice in Tanzania (%), 2005-2013



Source: MAFAP, 2014

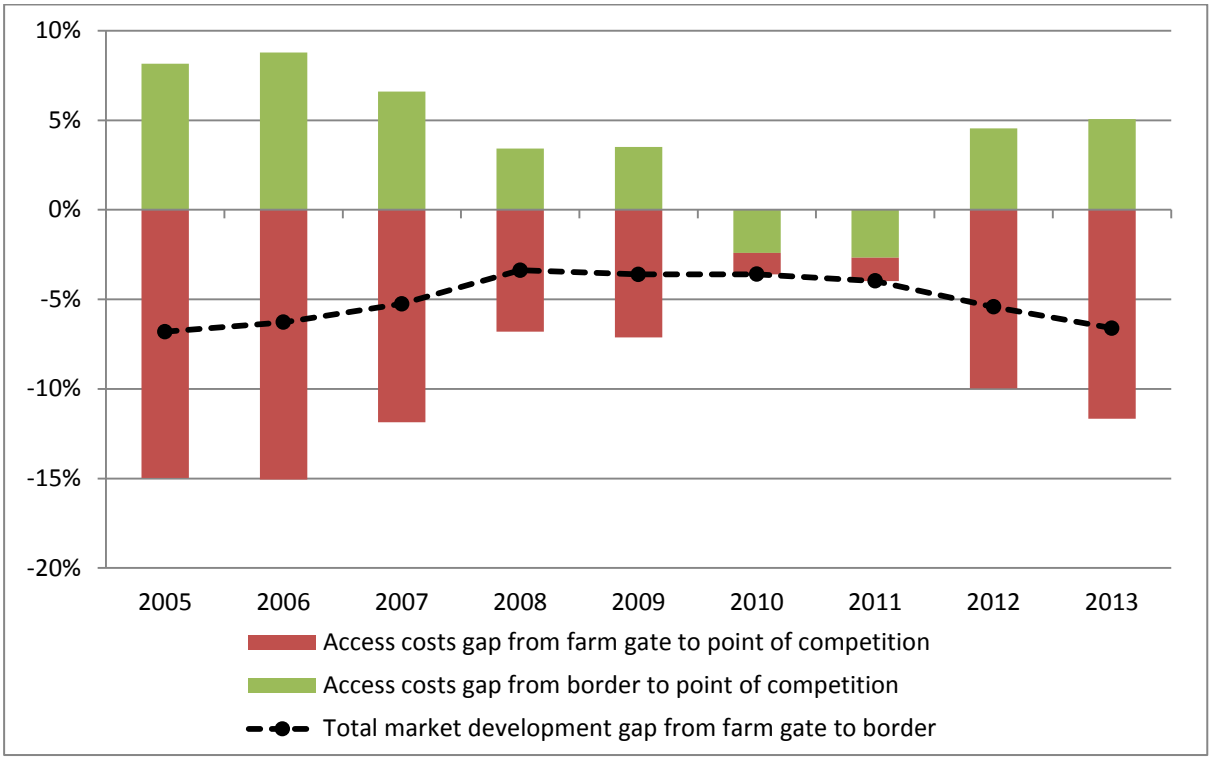
Figures 18 and 19 measure the effect of value chain inefficiencies on price incentives in both absolute and relative terms, respectively. The green bars capture the effect of excessive handling costs at the Dar es Salaam Port on price incentives at wholesale. In years when rice was considered an import, these inefficiencies resulted in additional protection for wholesalers, as they raised the price of imported rice. However, this additional protection was offset by excessive transportation costs between the farm gate and wholesale market in Dar es Salaam, which are represented by the red bars in the graphs below. The Market Development Gap (MDG), denoted by the black dashed line in the graphs, captures the net costs that total inefficiencies between the border and the farm gate represent to producers. These costs depressed producer prices by an average of 4 percent over the decade analysed.

Figure 18: Market development gap for rice in Tanzania in absolute terms (TZS/tonne/husked rice), 2005-2013



Source: MAFAP, 2014

Figure 19: Market development gap for rice in Tanzania in relative terms (%), 2005-2013



Source: MAFAP, 2014

4. RECOMMENDATIONS

The United Republic of Tanzania went from being a net importer of rice to a net exporter in 2010 and 2011 as a result of increased production and demand in neighboring countries. However, in 2012 and 2013, the country reverted back to importing more rice than it exported. This volatility in trade status raises questions about the sector's ability to sustain growth in production and compete with imports if government subsidies and protective trade measures were removed.

In addition, the import tariff has resulted in price incentives for wholesalers, which indicates that consumers are also paying higher prices for rice than they would in the absence of the tariff and other market distortions. This tax on consumers contradicts government objectives to increase national food security.

In order to achieve the NRDS's objectives of transforming the rice sector into a commercially viable production system, making rice more affordable for consumers and making the country's rice exports more competitive in regional markets, MAFAP analysis suggests:

- promoting investments at the farm level to help increase yields and efficiency;
- reducing the high costs associated with domestic transport and marketing;
- increasing investment in storage to reduce post harvest losses; and
- establishing and enforcing coding and grading standards.

5. CONCLUSION

MAIN MESSAGE

The results of this analysis show that the protective trade measures in place have been effective in generating price incentives for production. In most years, the level of incentives was higher for producers than for wholesalers. The results also show that the input subsidy programme did not provide enough support to significantly increase price incentives. Thus, while the tariff has been effective in protecting producers from cheap imports, the input subsidy programme has not delivered the expected outcomes. However, the cost of such a policy is borne by consumers who must pay a higher price for rice. The government could provide protection to producers and increase the sector's competitiveness without having effects on consumer prices if it focused on improving market access, storage and production systems.

LIMITATIONS

Firstly, the study currently uses wholesale prices in Tabora as a proxy for farm gate prices, since reliable farm gate prices for rice are not available. Secondly, access costs for maize grain were taken as a proxy for milled rice, which means that an assessment of costs associated with a specific rice value chain could not be undertaken. Furthermore, access costs between the farm gate and point of competition, which were obtained from the NFRA, do not provide a breakdown of itemized costs such as handling, trader margins and storage, making it impossible to identify specific inefficiencies or transaction costs in the value chain that could be reduced or eliminated through better targeted policies. Lastly, reliable benchmark (FOB) prices for rice exports to Rwanda in 2010 and 2011 were not available, so they were constructed using the wholesale price of milled rice in Kigali. The results of this analysis could be even stronger and more accurate if these key data constraints are addressed.

FURTHER INVESTIGATION AND RESEARCH

Local rice prices are still very high compared to international prices, which makes it difficult for producers to compete with imported rice, especially when the government issues import permits or removes import tariffs. Further research is needed to understand the cost structure within the supply chain in order to suggest ways of reducing or eliminating excessive transaction and production costs.

Since the Cereals Board has only been operational in recent years, it is too soon to adequately assess its impact on the rice market. However, it may eventually be useful to compare MAFAP's indicators in future years with those currently available or to construct a counterfactual in order to evaluate if interventions made by the Cereals Board are achieving the desired results.

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ANNEX I: Data and calculations used in the analysis

Name of product	Rice	Country	Tanzania	Point of Competition	Wholesale
International currency	USD	Local currency	TZS		

	DATA		Unit	Symbol	Year / trade status / food security	2005	2006	2007	2008	2009	2010	2011	2012	2013	Notes
						m	m	m	m	m	x	x	m	m	
	Benchmark price					y	y	y	y	y	y	y	y	y	
1		*Observed*	USD/TONNE	$P_{b(int\$)}$		275	271	339	609	597	681	649	547	514	CIF or FOB, depending on trade
1b		*Adjusted*	USD/TONNE	P_{ba}		275	271	339	609	597	681	649	547	514	
	Exchange rate														
2		*Observed*	TZS/USD	ER_o		1,129	1,254	1,247	1,196	1,320	1,400	1,574	1,583	1,599	
2b		*Adjusted*	TZS/USD	ER_a		1,129	1,254	1,247	1,196	1,320	1,400	1,574	1,583	1,599	
	Access costs border - point of competition														
3		*Observed*	TZS/TONNE	ACo_{wh}		47,147	52,802	59,612	82,668	89,968	114,546	146,159	104,623	102,416	Linked to Sheet 3
3b		*Adjusted*	TZS/TONNE	ACa_{wh}		31,905	35,330	41,746	64,864	70,390	95,378	124,558	79,499	76,666	Linked to Sheet 3
4	**Domestic price at point of competition**		TZS/TONNE	P_{dwh}		562,015	735,260	742,239	984,949	1,117,393	858,793	1,306,993	1,787,385	1,740,143	
	Access costs point of competition - farm gate														
5		*Observed*	TZS/TONNE	ACo_{fg}		121,389	138,457	140,871	162,670	183,648	73,070	97,976	275,856	284,610	Linked to Sheet 3
5b		*Adjusted*	TZS/TONNE	ACa_{fg}		93,436	108,477	108,784	127,285	143,967	63,652	87,364	220,767	225,186	Linked to Sheet 3
6	**Domestic price at farm gate**		TZS/TONNE	P_{dfg}		441,838	639,195	537,823	739,508	853,818	792,325	1,205,546	1,603,370	1,470,410	
7	Externalities associated with production		TZS/TONNE	E											
8	Budget and other product related transfers		TZS/TONNE	BOT				2,037	2,179	5,830	3,274	3,057	3,472	3,385	From public expenditure analysis
	Quantity conversion factor (border - point of competition)		Fraction	QT_{wh}		0.80	0.80	0.80	0.80	0.80	1.00	1.00	0.80	0.80	
	Quality conversion factor (border - point of competition)		Fraction	QL_{wh}		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Quantity conversion factor (point of competition - farm gate)		Fraction	QT_{fg}		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Quality conversion factor (point of competition - farm gate)		Fraction	QL_{fg}		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

	CALCULATED PRICES		Unit	Symbol	2005	2006	2007	2008	2009	2010	2011	2012	2013	
	Benchmark price in local currency													
9		*Observed*	TZS/TONNE	$P_{b(loc\$)}$	310,406	340,239	422,132	728,197	788,086	953,400	1,021,391	865,687	821,985	[1]*[2]
10		*Adjusted*	TZS/TONNE	$P_{b(loc\$)a}$	310,406	340,239	422,132	728,197	788,086	953,400	1,021,391	865,687	821,985	[1b]*[2b]
	Reference price at point of competition													
11		*Observed*	TZS/TONNE	RPo_{wh}	295,472	324,993	397,318	665,226	720,437	838,854	875,232	797,172	760,004	([9]*[QTwh]*[QLwh])+[3]
12		*Adjusted*	TZS/TONNE	RPa_{wh}	280,230	307,521	379,452	647,421	700,859	858,022	896,833	772,049	734,254	([10]*[QTwh]*[QLwh])+[3b]
	Reference price at farm gate													
13		*Observed*	TZS/TONNE	RPo_{fg}	174,083	186,535	256,447	502,556	536,789	765,784	777,256	521,316	475,394	(([11]*[QLfg])*[QTfg])-[5]
14		*Adjusted*	TZS/TONNE	RPa_{fg}	186,794	199,045	270,668	520,136	556,893	794,370	809,469	551,281	509,068	(([12]*[QLfg])*[QTfg])-[5b]

	INDICATORS		Unit	Symbol	2005	2006	2007	2008	2009	2010	2011	2012	2013	
	Price gap at point of competition													
15		*Observed*	TZS/TONNE	PGo_{wh}	266,543	410,267	344,921	319,723	396,956	19,939	431,761	990,213	980,139	[4]-[11]
16		*Adjusted*	TZS/TONNE	PGa_{wh}	281,785	427,739	362,787	337,528	416,534	771	410,160	1,015,336	1,005,889	[4]-[12]
	Price gap at farm gate													
17		*Observed*	TZS/TONNE	PGo_{fg}	267,755	452,660	281,376	236,952	317,029	26,541	428,290	1,082,054	995,016	[6]-[13]
18		*Adjusted*	TZS/TONNE	PGa_{fg}	255,044	440,150	267,155	219,372	296,925	-2,045	396,077	1,052,089	961,342	[6]-[14]
	Nominal rate of protection at point of competition													
19		*Observed*	%	$NRPo_{wh}$	90%	126%	87%	48%	55%	2%	49%	124%	129%	[15]/[11]
20		*Adjusted*	%	$NRPa_{wh}$	101%	139%	96%	52%	59%	0%	46%	132%	137%	[16]/[12]
	Nominal rate of protection at farm gate													
21		*Observed*	%	$NRPo_{fg}$	154%	243%	110%	47%	59%	3%	55%	208%	209%	[17]/[13]
22		*Adjusted*	%	$NRPa_{fg}$	137%	221%	99%	42%	53%	0%	49%	191%	189%	[18]/[14]
	Nominal rate of assistance													
23		*Observed*	%	NRAo	154%	243%	111%	48%	60%	4%	55%	208%	210%	([17]+[8])/[13]
24		*Adjusted*	%	NRAa	137%	221%	99%	43%	54%	0%	49%	191%	190%	([18]+[8])/[14]

	DECOMPOSITION OF MDG	Unit	Symbol	2005	2006	2007	2008	2009	2010	2011	2012	2013	
25	International markets gap	TZS/TONNE	IMG	0	0	0	0	0	0	0	0	0	([1]-[1b])*([2]+[2b]/2)*QTwh*QLw
26	Exchange rate policy gap	TZS/TONNE	ERPG	0	0	0	0	0	0	0	0	0	([2]-[2b])*(([1]+[1b])/2)*QTwh*QL
27	Access costs gap to point of competition	TZS/TONNE	ACG_{wh}	15,242	17,471	17,866	17,804	19,578	-19,168	-21,601	25,124	25,750	[3b]-[3]
28	Access costs gap to farm gate	TZS/TONNE	ACG_{fg}	-27,953	-29,980	-32,087	-35,385	-39,681	-9,418	-10,613	-55,088	-59,424	[5b]-[5]
29	Externality gap	TZS/TONNE	EG	0	0	0	0	0	0	0	0	0	
30	Total market development gap	TZS/TONNE	MDG	-12,712	-12,509	-14,221	-17,580	-20,103	-28,586	-32,214	-29,965	-33,674	[25]+[26]+[27]+[28]+[29]
31	Market development gap as share of farm gate price	%	MDG	-3%	-2%	-3%	-2%	-2%	-4%	-3%	-2%	-2%	[30]/[6]
32	Market development gap as share of adjusted reference price at farm gate	%	MDG	-7%	-6%	-5%	-3%	-4%	-4%	-4%	-5%	-7%	[30]/[14]

ANNEX II: Access costs data and calculations

Corridor	Distance	Mode of transport	Cost (TZS)	Cost per tonne and km (TZS - USD)
Songea - Mbeya – Dar	927 828	Truck Train	158,500 per tonne 119,918 per tonne	170.10 – 0.11 144.83 – 0.09
S'wanga – Dar	1,399	Train	2,442,600 per 40 tonne container	43.65 – 0.03
Arusha – Dar	N.a.	Train + truck	230 per tonne per KM	238.00 – 0.15

Source:

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