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EASTERN AFRICA:

A STUDY OF THE REGIONAL MAIZE MARKET AND MARKETING COSTS

December 31, 2009

Agriculture and Rural Development Unit (AFTAR)
Sustainable Development Department
Country Department 1, Tanzania, Uganda and Burundi
Africa Region

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ABBREVIATIONS AND ACRONYMS

COMESA	Common Organization Market for Eastern and Southern Africa
EAC	East Africa Community
EAGC	Eastern Africa Grain Council
IDEAS	Investment for the Development of Export Agriculture
IFPRI	International Food and Policy Research Institute
MT	Metric Ton
NCPB	National Cereals and Producers Board in Kenya
PHL	Post-Harvest Losses
PT	Price Transmission
RATES	Regional Agricultural Trade Expansion Support
RATIN	Regional Agricultural Trade and Information Network
REC	Regional Economic Community
ReSAKSS ECA	Regional Strategic Analysis and Knowledge Support System for East and Central Africa
SAFEX	South African Futures Exchange
VOC	Vehicle Operating Costs
WFP	World Food Program
WTO	World Trade Organization

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Executive Summary

A. Relationship between Grain Marketing Costs, Agricultural Growth and Welfare

Maize is the most important staple food in the Eastern Africa region and the most widely traded agricultural commodity. Therefore, the performance of grain markets has a significant impact on people's welfare, particularly the poor, and is critical to inducing pro-poor growth in Kenya, Tanzania, and Uganda, i.e. the countries under review in this report. Given growing urbanization and the high rates of poverty that limit dietary upgrading, East Africa's market demand for food staples will grow dramatically in coming decades, from US$6.9 billion in 1997/99, to US$11.2 billion in 2015 and to US$16.7 billion in 2030 (Riddell *et al.*, 2006). As a result, production of maize and other food staples for growing urban markets and deficit rural areas (often across borders) would seem to represent the largest growth opportunity available to farmers in the region. The welfare benefits of linking food surplus zones with food deficit zones both within and between countries in Sub-Saharan Africa are well-documented in the recent analytical work of Haggblade *et al*. (2008) and Diao *et al*. (2008).

Reducing marketing costs would be a strong contributor to allowing farmers and traders to harness the opportunities of expanded markets. *Marketing costs at the borders* would need to be reduced but even more attention should be paid to *domestic marketing costs*. Policy makers in East Africa should not be misled that encouraging greater regional trade is solely a diplomatic matter. Instead, concerted public investments and policy actions at local, national, and regional levels are required. Reduced marketing costs would allow a reduction in input prices and thus production costs. At the same time, lower marketing costs are uniquely positioned to increase a ratio of farm output prices to agricultural input prices while lowering consumer prices. There exists the strong empirical proof that lower marketing costs and thus reduced travel distances to markets would increase the profitability of adopting the yield-rising technologies as shown in Dorosh *et al*. (2008). Diao *et al*. (2008) also show that with lower transaction costs agricultural growth in Africa would accelerate by 2 percent per year. Doubling staple food production, with improved trade, would lead to a substantial fall in consumer prices (25 percent) and a smaller decline in farm-gate prices (10 percent) compared to the 35-40 percent fall that would occur if market conditions stayed the same.

Thus, lower marketing costs would increase effective farm-gate prices without rising consumer prices. Higher effective prices for farmers do not necessarily mean higher output prices in absolute terms but rather an increased ratio of output prices to agricultural input prices. It is critical to avoid increasing farm prices at the expense of consumers (through minimum prices and other public interventions in the grain market), in particular because consumer prices in East Africa are already higher than world prices. Policy makers in East Africa and around the world are confronted with this classic "food price dilemma". The recent surge in regional and global food prices have renewed concerns that hunger and poverty could increase sharply across the world whenever poor and food-insecure households are forced to reduce their consumption levels. Since many small farmers are net consumers of food, they can also be adversely affected by rising

food prices, even as the returns from their growing activities may rise.

Affordable food prices for consumers are important beyond simply increasing consumption. It is counterproductive to set policies that create high prices for the main commodity consumed by laborers in a world where growth in the non-farm economy and diversification of agricultural income hold the key to poverty alleviation. Indeed, the pace at which East African countries are able to lower their food prices, and thereby enhance labor competitiveness, will have a crucial bearing on their capacity to expand into any internationally competitive, labor-intensive activity in any sector and to seize the opportunities that world trade expansion offers beyond several export crops. So, reduction in marketing costs can be an effective tool to improve agricultural incentives without hurting net buyers of food. Lower marketing costs are also critical to induce and sustain agricultural productivity through technical advances, the alternative way of reducing consumer prices without hurting producers.

Against this background, this report aims to examine, identify, and quantify the factors behind the marketing costs for maize in East African countries. While a number of studies have recognized major barriers to trade in the region, few have actually quantified their relative importance or the magnitudes of these constraints on grain trade. Since much past research has been inconclusive, a key focus of this report is to identify how different barriers contribute to marketing costs within countries and across borders. It also aims to analyze whether a reduction in cross-border trade costs without a simultaneous reduction in domestic costs would be sufficient for greater regional integration in East Africa.

B. Market Integration in East Africa

There is significant regional trade of maize in East Africa, both recorded and unrecorded. Kenya and Tanzania are the largest maize producers (and consumers), and Kenya is the largest importer in the region. Actually, deficit markets in Kenya provide the center of gravity for the region pulling in surplus maize from Kenya's own central highlands and from eastern Uganda and northern Tanzania. Formally and informally, these countries supplied about half of Kenya's 400,000 ton annual maize deficit during 2000/01-2004/05 and nearly the full import requirement of 200,000 tons during 2006/07-2007/08.[1] In 2008/09, about 220,000 tons of maize are projected to be exported to Kenya from Tanzania and Uganda, while the remaining 180,000 tons will be imported from South Africa (EAGC, 2009).

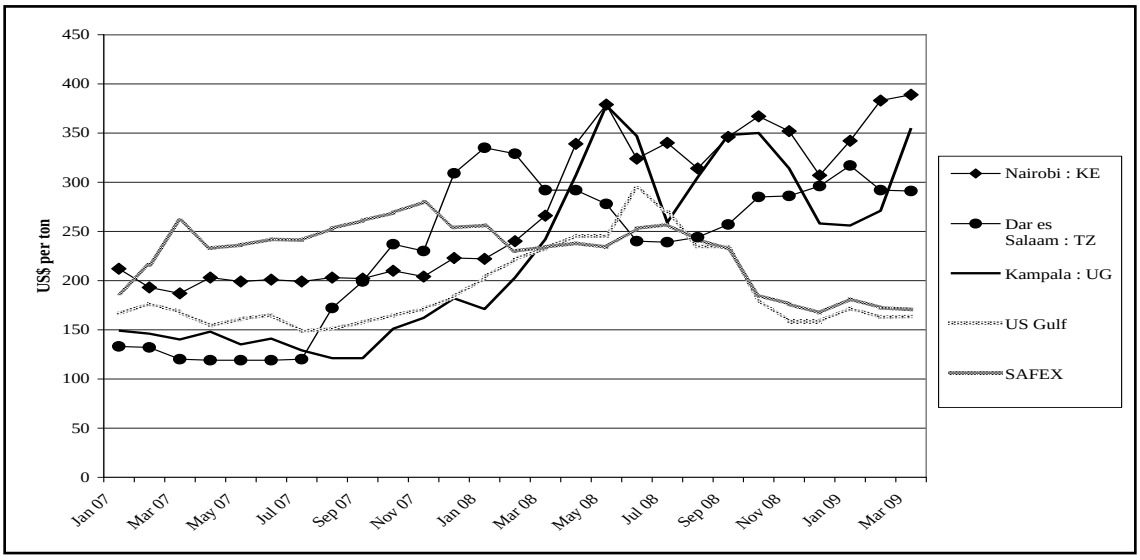
These realities suggest that strategies for accelerating growth in surplus agricultural areas will require a regional perspective. Political borders frequently separate surplus food production zones from the deficit markets they would normally serve in both large cities and rural areas. But the price incentives between surplus and deficit areas irrespective of borders and the integration initiatives of the East Africa Community (EAC) and the Common Organization Market for Eastern and Southern Africa

[1] Here and elsewhere in the report "ton" means "metric ton".

(COMESA) have been increasingly linking surplus and deficit areas within and between countries.[2] These integration processes should be further encouraged as a critical contribution to improved regional food security.

Developments in maize markets in the East African countries affect regional prices. The price transmission analysis carried out for this study shows that the major consumption centers, i.e. Dar es Salaam, Kampala, Mombasa and Nairobi, are well-integrated within the regional market. Major production areas are relatively well-integrated with consumption areas within the countries and across the borders. At the same time, the price transmission analysis shows that the East Africa market is only weakly integrated with the world market. The recent rise in regional maize prices, therefore, has been caused by regional factors such as the shortfalls in production in Kenya rather than the surge in international maize prices proxied by South African Futures Exchange (SAFEX) for white maize and US Gulf for yellow maize (Figure 1).[3]

Figure 1: Development of wholesale prices of white maize in Dar es Salaam, Kampala, Nairobi compared to world market prices (US Gulf and SAFEX), Jan. 2007-Mar. 2009 (US$ per ton)



Source: www.ratin.com, www.fao.org and www.safex.co.za.

The degree of market integration varies among countries. Kenya and Uganda, both individually and together, represent a relatively integrated market, with comparatively high long-run elasticities of price transmission and adjustment parameters correcting deviations from long-run equilibrium levels. While there is some evidence of integration

[2] The countries reviewed in this study are all committed to a policy of eventually having "maize without borders".

[3] The impact of rising international food prices on maize market in East Africa has been felt through indirect effects on regional prices of wheat and rice, which are likely to be better integrated with the world markets given the large imports to the region from overseas. When the international wheat and rice prices surged, the prices for these commodities in East Africa followed gearing many consumers to shift toward the consumption of maize and other staples. This might explain the increased consumption of maize in Kenya in 2008 (Table 47) and thus the additional pressure on maize prices in East Africa.

within Tanzania and between Tanzania and Kenya, price transmission involving Tanzania is for the most part considerably weaker and slower than in the rest of the region. Partially this is explained by the size of the country and the market linkages of Southern Highlands with southern neighbors (see Haggblade *et al.*, 2008); but it is also a result of the poorer infrastructure and distortive policy interventions, including export bans in Tanzania.[4]

C. Marketing Costs

Despite the recent advances in regional integration in East Africa, cross-border trade remains limited, and market integration is still far from its potential. *How to promote greater regional integration?* There is a critical role for regional bodies like the EAC and COMESA but only within limits. This report shows that reducing costs at borders is necessary but is insufficient to achieve a major impact. The main challenge is actually the reduction of the domestic costs to trade since they largely make trade unprofitable and continue to do so even if export prices go up and the costs of crossing the border are reduced. With the regional economic communities (REC) having only a limited impact on investments and policies at the national level at this stage, the main actions would need to be taken by national governments. But pro-active diagnostic and awareness creation from RECs would be highly desirable.

Based on the results of the survey carried out for this study,[5] total domestic marketing costs between farm-gate and capital wholesale markets averaged US$54 per ton in Uganda, US $80 per ton in Kenya, and US$91 per ton in Tanzania.[6] The structure of marketing cost varies by country and by the stage of the supply chain but what is common is the dominant role of *transport charges*. They average up to 76 percent of total marketing costs (Figure 2). Transport prices per ton-km are disproportionately high on rural roads compared to national/tarmac roads because of the poor quality of rural roads and the low levels of surplus production, which raise the per-trip fixed transport costs. Transport prices per ton-km from farm-gate to primary markets are 3-5 times larger than those from secondary to wholesale markets located in the countries' capitals. As a result, about 45 percent of average transport charges occur during the first 28 percent of the transport distance.

Transport prices are determined by transport costs and the degree of competition in the transport sector, including rail services. Competition on main roads appears to be high as many transporters obtain profits only by overloading. Transport prices are much

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[4] The spread of cell phones is also likely to be among the important reasons for improved price transmission in the region but is unlikely to explain differences in price transmission between countries given that the cell phone coverage seems to be uniform across East Africa.

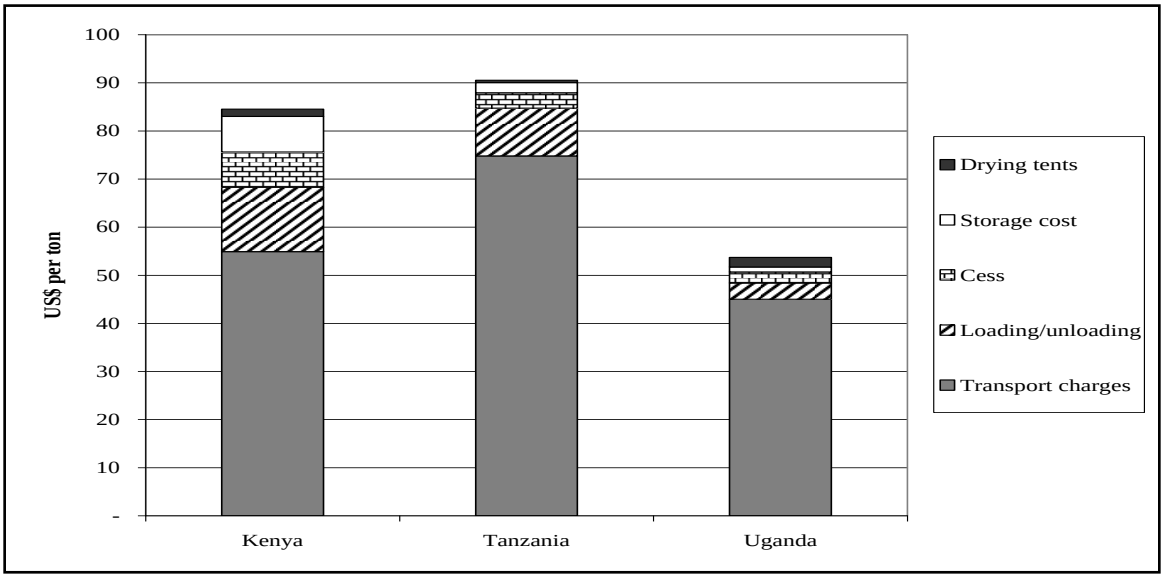
[5] See Chapter 4 for description of the survey and Annex 6 with the questionnaires.

[6] Note that these "average" marketing costs are not representative for all cases. Differences in various cost elements may vary by farms, markets and districts within the country, distances between markets, mode of transportation, number of roadblocks, quality of roads, and the months of storage before sales. It means that farmers farer from the wholesale market get smaller farm-gate price and farmers closer to the wholesale market get the larger farm-gate price assuming all the costs are the same but distance. In addition, there is also profit margins not estimated here, which add to the price wedge. But this average estimate is a good basis to understand the structure and nature of costs as well as make cross-country comparisons.

higher on rural routes, which might be a result of lower competition but also lower grain loads transported along those routes. Transport costs include fixed and variable costs. In East Africa, as in Africa in general, trucking companies' variable costs are high while fixed costs are low. The average variable costs to fixed costs ratio in Kenya and Tanzania (measured on tarmac roads) is 70/30, while in Uganda it is 77/23. On rural roads, the share of variable costs is likely to be even higher given their poor quality. In contrast, in a developed system such as France, the variable to fixed costs ratio is 45/55 (Teravaninthorn and Raballand, 2009). Low fixed costs in East Africa are attributed to the low costs of labor and the use of cheap secondhand trucks. In all countries, fuel and lubricants are the main variable costs, accounting for about 50 percent of vehicle operating costs (VOC). Tires and maintenance are other important cost factors.

High non-tariff measures also contribute to high variable costs and consequently higher-than-necessary transport prices. These include bribes and delays at roadblocks and weighbridges.[7] They average US$0.10 per ton-km and account for 10.2 percent of variable and 7.3 percent of total transport costs incurred on tarmac roads (from secondary to urban wholesale markets).[8] When considering the total distance from farm-gate to urban wholesale markets, these costs are estimated to be the largest in Kenya, at about US$7.2 per ton.

Figure 2: Structure of total marketing costs between farm-gate and urban wholesale markets by country (US$ per ton)[9]



Source: Authors' estimates based on the World Bank Survey, November-December 2008.

[7] The costs incurred by transporters and are not shown separately in Figure 2 as they are included in the transport costs.
[8] Note that this estimate of non-tariff measures is for 10 MT trucks. For the 5 MT truck, for example, a share of NTM in transport costs will double, and for the larger trucks, correspondingly, decrease.
[9] Note that non-tariff measures faced by transporters are included indirectly in Figure 2 as they are already reflected in the transport prices.

The cost of loading and unloading averages to a high 12 percent of total marketing costs. These costs are caused by small loads of maize at early stages of supply chains, and thus the need for multiple layers of traders and frequent loading and unloading of maize bags on the way from producers to final consumers. These costs are also inflated by weak enforcement of contractual agreements, weak standard/grade compliance, and thus, a lack of trust between sellers and buyers and unloading required for taxation purposes.

The local cess is additional costs to traders that increase the wedge between producer and consumer prices in East Africa. The cess rate ranges from 1 percent of maize value in Kenya to 5 percent in Tanzania but the effective tax rate often differs by district. Overall, the tax rate itself does not seem high but the effective rate of taxation is higher due to the non-uniform tax base and tax rates across districts and a multiple taxation of maize bags at various stages of the supply chain.

In addition to domestic marketing costs, this report also estimates the costs of crossing the borders. Crossing the Busia formal border between Uganda and Kenya is estimated to cost US$10 per ton. Most traders on that border are involved in formal transactions with about 36 percent of those interviewed reported to still trade informally. Interestingly, crossing the same border informally (by bicycle) results in similar costs as all the savings that informal traders generate from bypassing formal certification and customs procedures are offset by the additional costs of transporting grains in small quantities. For small-scale traders, the most important reasons for informal trade seem to be low incentives to comply with formal procedures on the one hand and the porous borders with high demand in Kenya on the other. Customs facilitation and harmonization of procedures through EAC and COMESA would encourage further formalization of cross-border trade and reduction in costs for cross-border trade but these improvements alone will not induce greater trade unless domestic costs are reduced.

Finally, along with the reduction in marketing costs, it is worthwhile addressing high post-harvest losses at various stages of the supply chain. The post-harvest losses only at farm-gate are found to average 10 percent, being the lowest in Kenya and the highest in Uganda. As expected, the post-harvest losses are largest among the small-scale farms, given their low incomes and assets, which make them less able to invest in high-quality storage facilities. The losses for small-scale farms are reported to range from 7 percent in Kenya to 15 percent in Uganda.[10]

The value of the post-harvest losses is large when using the farm-gate prices as a proxy of opportunity costs. In Kenya, losses are reported at US$5 per ton for large farms and US$18 for small farms. In Uganda, the post-harvest losses are estimated at an average of US$23 per ton and in Tanzania at US$20 per ton for small farms and US$11 per ton for medium farms. If Ugandan small farmers reduced their losses to the level in

[10] A word of caution should be said before interpreting the results of farmers' estimates. If maize is put into store with 18 percent moisture and it comes out 5 months later with 14 percent moisture, this is not a post-harvest loss but a normal loss in weight, for example. Often much grain is lost because of theft. Thus, not all losses are automatically 'post-harvest' losses. Notwithstanding possible subjective judgments, post-harvest losses remain a serious issue at farm-gate and along the whole supply chain in Africa.

Kenya, the savings would have equaled US$10 per ton. Overall, the average post-harvest losses in Kenya and Tanzania represent about one-half of transport charges between farm-gate and secondary markets.[11] In Uganda, these costs are almost identical. This implies that the investment in the post-harvest infrastructure and technologies would be a powerful tool to increase farm incomes and raise food supply in the region.

D. Policy Recommendations

Policy recommendations for reducing marketing and other costs need to distinguish between the roles of regional and national authorities. Although the greatest breakthrough in regional agricultural trade and regional integration would arise from actions at the national level, there is still an important role for RECs. They have a critical role in taking the lead in studying the barriers to trade beyond customs and cross-border areas, raising awareness, and helping the national governments to find remedies. Both EAC and COMESA need to be more proactive and more successful in promoting regional solutions to local problems.

At the regional level, improving infrastructure along cross-border trading routes for food staples would lower transport and transaction costs. Adopting a regional perspective, public investment in transport corridors could help link surplus farming zones with cross-border deficit markets, thus benefiting both the farmers in surplus farming zones and the consumers in the deficit markets. Transport corridors between eastern Uganda and Kenya and between northern Tanzania and Kenya offer a clear example of the potential food security benefits of regional infrastructure investment programs. To be effective, these "hardware" investments need to be accompanied by "software" measures, i.e. harmonized customs, sanitary and phytosanitary and other technical regulations, synchronized working hours at the border posts, mutual recognition of axle restrictions, and other facilitation measures to increase cross-border flows of food staples (see also World Bank, 2008b).

At national levels, recommendations for reducing marketing costs also distinguish between public investments ("hardware") and policy measures ("software"). On the investment side, *improving the quality of roads* is the priority (and fiscally largest) intervention to reduce transport costs and consequently transport prices for end users (see Table 37). Road investments should focus on rural areas since better feeder roads (and reduced travel time to markets) in Africa have a significant impact not only on transport costs but also on agricultural productivity/supply response (Dorosh *et al.*, 2008; Lall *et al.*, 2009). Investment in rural roads has a higher internal rate of return than comparable investments in secondary roads or main roads as long as these roads are at least in a fair condition (and more so if a low level of service is required). In Uganda, for example, improving quality of feeder roads was found to have made a significant contribution to agricultural growth and poverty reduction, while shortened distances to tarmac roads has not appeared to have statistically significant impacts (Fan *et al.*, 2004). In Malawi, not a country in this review but at comparable level of development with those under review, the quality of the trunk road network was not found to be a major constraint to trade but

[11] It should be noted, however, that this simplified comparison of post-harvest losses with marketing cost does not take into account all costs and benefits.

rather differences in the quality of feeder roads connecting villages to the main road network was found to have significant bearing on transport costs (Lall *et al.*, 2009).

Thus, investments in roads require *proper planning and implementation*. Connectivity of rural roads with national roads is especially critical. Providing inner roads closest to markets is a necessary pre-condition for the provision of outer roads, more distant from markets, to be effective. To enhance agriculture-led economic growth, public investment in transport infrastructure should be given priority to connect rural areas that offer a combination of rich natural and economic potential and high population densities, with major domestic and cross-border markets.[12]

Investments in rural roads should be accompanied by the measures to promote load consolidation. Investment in infrastructure is economically justifiable as long as consolidated production enables reasonable agglomeration to justify economically transportation per truck. A load consolidation may be promoted through (i) producer groups; (ii) on-farm and village storage; (iii) wholesale markets. Larger loads would not only reduce transport costs but reduce a frequency of loading/unloading at various stages of supply chain.

Improved feeder roads will reduce fuel and other variable costs but additional policy actions are yet necessary to *reduce fuel costs*. This is very critical as future oil prices are likely to be much higher, in spite of the temporary relief brought by the global financial crisis. In December 2008, fuel accounted for 47-58 percent of total transport costs, thus a reduction in fuel costs would significantly reduce transport cost and prices. Transporters should be encouraged to use trucks with lower operating costs, for example by changing truck import duties to encourage the import of newer trucks. This would lead to the modernization of the trucking fleet and higher fuel efficiency.[13] Reducing fuel taxes might also be an option, but review of these taxes should take into account that budget revenues from fuel taxes are usually used to maintain roads, thus adjusting fuel taxes downwards would need to be offset by other budget revenues to sustain road maintenance. Furthermore, taxing fuel supports carbon reduction efforts and thus contributes to slowing down the climate change.

Investments in *railroads* will also reduce transport prices by increasing competition with trucking companies. Increased competition from rail services would benefit transport users through comparable or lower transport costs. In the parts of Africa without rail services, transport prices are very high (Teravaninthorn and Raballand, 2009). Yet, where rail services exist, including East Africa, transport prices tend to be lower since rate-setting takes into account rail prices, especially for heavy and bulky commodities. With global fuel prices expected to rise again over time, such investments will become more profitable in the future, yet it goes beyond the scope of this study to determine a break-even point for fuel prices that would make rail investments attractive for connecting markets in East Africa.

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[12] Investments in rural roads will also need to be complemented by developing transport services. As large truckers are unlikely to find all rural routes profitable, it may be useful to consider options for promoting appropriate intermediate means of transport for connecting rural areas to at least primary markets.

[13] See detailed recommendations for addressing high transport prices in Africa in Teravaninthorn and Raballand (2009).

Reducing *delays and bribes* and streamlining *customs procedures* would also have significant positive effects on cost. Addressing these non-WTO-consistent measures requires immediate action. For example, the load-weighing processes at weighbridges should be streamlined to avoid delays. This could be done by commercializing the weighbridges with the strict monitoring of performance. Frequent calibration of the weighbridges equipment is required to ensure consistent reading. Corruption at weighbridges should also be dealt with, for example by introduction of weigh-in-motion systems, other mobile weighbridges, and by a strict enforcement of loading rules. Regarding corruption at roadblocks, it is recommended that the number of roadblocks be reduced (and more mobile police units are used to ensure sufficient security on the roads) and their mandate exclude controlling trading and licensing documents. On customs, export and import documentation, axle-load limits, and customs open hours are still required to be harmonized within the EAC Customs Union (see also World Bank, 2008b). The existence of these problems is accepted by most governments in the region, and many mitigation measures have already been put on the table at national and regional levels. Lack of public funds, for upgrading weighbridges and mobile police units for example, and lack of political will to enforce regulations at weighbridges and limit corruption at roadblocks have prevented these recommendations from being put into practice, however. The on-going technical assistance of the World Bank to the EAC Secretariat seeks to assist countries to prepare plans to reduce major non-tariff measures and equip the Secretariat with the tools to monitor their implementation (World Bank, 2008b).

In contrast to non-WTO-consistent measures, reducing the burden of *local cess* is a less straightforward task. On one hand, the effective rate of taxation by cess in the reviewed countries was found not to exceed 3 percent of maize value, though being regressive. The multiple taxation is often the case but it is likely to be a result of multiple aggregation of various loads at different markets (from primary to secondary and then to urban wholesale) rather than corruption at the roadblocks. On the other hand, the revenues from maize cess often accounts for a substantial share of locally-generated budget revenues. The budget incomes generated from maize cess in Kitale and Weregi towns in Kenya and in Njombe and Mbeya districts in Tanzania exceed 15 percent of locally-generated revenues and elimination of the cess would significantly erode the local taxation base in districts with few sources of income. In contrast, in more diversified areas such as Nakuru County in Kenya and Iringa District in Tanzania, a reduction or elimination of the maize cess could be a relatively small problem for their budgets. Before abolishing or suspending local taxes because they are perceived to be regressive and excessive, therefore, options should be explored to improve the equity of the tax instrument. Harmonization of cess tax base and rates and an improvement in administration of tax collection generally would be beneficial as it would reduce uncertainty and limit the opportunity for corruption.

Investing in wholesale markets might improve the administration of cess collection and also reduce an incidence of multiple cess taxation. The construction of Kibaigwa wholesale market in Tanzania, for example, has helped reduce the taxation burden by permitting traders, who come in with cess certificate on a smaller load and add tonnage to get a larger load, to obtain certificate just for the balance. Wholesale markets can also

help improve price formation and reduce search costs and as a result, reduce marketing costs.

Finally, trade restrictions and policy interventions would need to be removed. While the major focus of this report is to assess the ways to reduce marketing costs, it is important to stress that this should be done in parallel with improving the agricultural policy framework in East Africa. The recent food security crisis in the region and in the world has renewed the fear that hunger and food insecurity will return. As a result, the earlier achievements in trade liberalization have in some cases been reversed, at least temporarily, and the chances of a return to protectionist measures have risen. The maize export bans in Tanzania are an example of this. While the direct impact of the export bans is difficult to measure (and compare with marketing costs), its impact is seen in the form of lost opportunities for Tanzanian farmers and traders on the Kenyan and southern markets (Zambia, Malawi, and DRC). The export ban also explains why price transmission between Nairobi and relatively distant markets in Uganda is relatively strong (e.g. the combined rate of adjustment between Nairobi and Lira, which are located 730 km apart, is 59 percent – the regression predicts 57 percent) while price transmission between Nairobi and closer markets in Tanzania is comparatively weak (e.g. the combined rate of adjustment between Nairobi and Arusha, at a distance of only about 300 km, is 37 percent – the regression predicts 44 percent).

While the objectives of the ban, i.e. limited cross-border trade and lower maize prices in Tanzania, have been partially achieved, it has brought other negative social impacts. The export ban involves price control, which reduces potential output, causing losses to the economy as a whole. Lower output prices result in lower incentives for farmers to produce greater output, which hurts net buyers since maize output is kept below its potential. Tanzania is actually the country with the highest production potential in the region to feed the surrounding neighbors that have structural food deficits. But the export ban simply means lower exports, slower agricultural growth, and lost opportunities for farmers and consumers.

Export bans and other trade restrictions also negatively affect private sector development and investments. Survey evidence from private traders and potential investors in Africa during the 1990s showed that fear of policy reversal was a major impediment to investment (World Bank, 20005). Building private-public partnerships in increasing grain storage capacity is especially promising, but efforts to support the private-sector are unlikely to go far until incentives are provided for the private sector to operate.

Finally, with the increased food price volatility in East Africa and in world markets, a predictable and undistorted policy environment becomes increasingly critical. Several risk management instruments show considerable promise in managing food prices risks, including facilitation of private storage (warehouse receipt systems), futures and options markets, and weather-indexed insurance (World Bank, 2005). Yet transparent and predictable agricultural trading policy is a pre-condition for these alternatives to be utilized in East Africa.

1. Introduction

1. **Maize is the most important staple food in the Eastern Africa region and the most widely traded agricultural commodity**. The grains sub-sector accounts for a large share of agricultural GDP, rural employment, and consumption – both in terms of calorie intake and households' food budget. While the share of agriculture in total GDP varies from 24 percent in Kenya to 33 percent in Tanzania, the share of grains in agricultural GDP, and particularly rural employment, is large in all countries: calculations based on social accounting matrices from these countries show that grains account for around 40 percent of the crop GDP, and 50 percent of the agricultural employment.

2. **Therefore, the performance of grain markets has a significant impact on the well-being of the population, particularly the poor, in East Africa**. Indeed, improvement of the maize sub-sector is critical to induce pro-poor growth in the region. Overall, agricultural growth in Africa led by staple crops and livestock is found to be more pro-poor than growth led by the nonagricultural sector. The solid theoretical and empirical proof of this fact is summarized in the 2008 World Development Report (WDR, 2007).

3. **How is agricultural growth pro-poor?** *First*, growth in food staple production is broad-based as staples are grown by a majority of smallholder farmers. Poor farmers directly benefit from increasing their own food consumption, their land and labor productivity, and ultimately, their incomes. *Second*, the growth in staples production further benefits the poor through its effect on food prices. The poor spend more of their income on food, and lower food prices allow them to consume more without increasing spending. *Third*, growth of staples also has strong multiplier effects on non-farm rural enterprise, on the labor market, and on related sectors such as transport. The elasticity of poverty reduction with respect to agricultural GDP growth is usually greater than one, being estimated at -1.66 for Ethiopia, -1.78 for Ghana, -1.25 for Kenya, -1.58 for Uganda, and -1.83 for low income countries of Africa (Diao *et al.*, 2008).

4. **A key stimulant to agricultural growth is farmers' incentives, whether higher sale prices at the farm-gate level, reduced costs of production and transport, or just the spread between them**.[14] But how to increase farm-gate prices without hurting consumers? Policy makers in Africa and around the world are confronted with this classic "food price dilemma"; the recent surge in regional and global food prices has led to widespread concern that hunger and poverty will increase sharply across the world as poor and food-insecure households are forced to reduce their consumption levels. *The most powerful response to this challenge is to reduce marketing costs and improve access to consumption markets locally, nationally, and regionally*. Reduction in marketing costs allows both objectives to be achieved, i.e. increased farm-gate price and reduced purchasing price for consumers.

[14] Or lower input prices, which effectively imply higher real output prices with the other things constant.

5. **With lower transaction costs and greater trade, agricultural growth in Africa will accelerate**. A recent IFPRI study showed that while it is possible to double the production of food staples in Africa in the medium term, African agriculture would grow 2 percent more with improvements in market access and reduction in marketing costs (Diao *et al*., 2008). Dorosh *et al*. (2008) demonstrate the strong positive relationship between proximity to markets and travel time (indirectly, marketing costs) and the realization of agricultural potential in African countries (Table 1). Thus, lower marketing costs are highly likely to induce a supply response. The increased production would be absorbed by the growing urban population and deficit rural areas, within the countries and across the borders in East Africa (Table 2). With increased trade, doubling food staple production leads to a smaller fall in farm-gate prices (10 percent instead of 35-40 percent if market conditions stayed the same) but still substantial fall in consumer prices (25 percent).[15] The difference in farm revenues from major staple products between the two scenarios is estimated at US$40 billion or a 40 percent increase in five years. For maize alone, the farm revenues are expected to increase by a significant US$7.5 billion in total over the five years (Diao *et al*., 2008, p. 12).

Table 1: Crop production and travel time in Africa

Travel time decile (no. pixels)	Travel time (Hrs)	Distance to ports, km	Total population, mill.	Total crop production, mill. US$	Total crop production relative to potential production
1 (14,762)	1.7	470.0	213.9	12,469	41.1%
2 (14,763)	3.0	527.7	69.3	10,168	45.6%
3 (14,762)	4.1	569.2	52.6	7,823	46.6%
4 (14,763)	5.1	607.5	46.5	6,959	33.2%
5 (14,763)	6.3	656.0	38.3	4,594	20.2%
6 (14,762)	7.6	696.0	30.8	3,479	16.3%
7 (14,763)	9.3	741.4	23.8	2,580	8.2%
8 (14,762)	11.7	762.6	18.3	2,031	5.9%
9 (14,763)	15.4	770.9	14.2	1,316	4.7%
10 (14,819)	24.8	716.1	8.4	1,405	2.9%

Source: Dorosh *et al.* (2008).

Table 2: Projected demand for agricultural and food products in East Africa in 2015 and 2030 (US$ million)

	1997/99	2015	2030
Cereals	2,667	4,340	6,628
Non-cereal food crops	6,843	11,641	17,479
Staple food crops	6,855	11,218	16,672
Non-food crops	270	575	958
Livestock	4,479	7,304	11,372
All food commodities	13,989	23,285	35,479
All agricultural commodities	14,259	23,860	36,437

Source: Riddell *et al*. (2006).

6. **Thus, trade is critical for growth**. The idea that reducing barriers to trade will stimulate growth and development is one of the main motivations for forming customs

[15] The model includes 17 Sub-Saharan African countries – Angola, Cameroon, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Uganda, and Zambia.

union such as the EAC and the free trade zone within COMESA. In the area of agricultural trade, the premise is that reducing barriers to trade will help countries better adjust to weather-related supply shocks and ensure greater food-security, using import and export to smooth consumption relative to production. It also helps stabilize prices and allows regions within countries to exploit their comparative advantage for the benefit of grain farmers, farmers who want to diversify from grains, and consumers.

7. **The countries under review (Kenya, Tanzania, and Uganda) committed to a "maize without borders" policy by establishing the EAC customs union in 2005**. Yet, cross-border trade remains limited. Non-tariff barriers at the border can partially explain this but even more important domestic costs of trade are so high that they make trade unprofitable even if cross-border costs are reduced. Finally, agricultural policy measures such as export bans continue to seriously limit cross-border trade in the region.

8. **How large are these barriers to trade and what is their nature? At which stage of the supply chain do they occur? What is the relative importance of costs of cross-border trade compared to the domestic costs? What is the difference among countries under review?** While a number of studies have recognized major barriers to trade, few have actually quantified the relative importance or magnitudes these constraints impose on grain marketing and trade in the East African region. Key questions to be addressed in this report, therefore, are how these barriers contribute to marketing and trade costs, and what is their magnitude and nature within countries and across the borders? A critical question for policy makers is which constraints are the most binding (at which stage of the supply chain) and need to be addressed first in order to achieve larger flows of grain trade?

9. **To provide the context**, the report begins with the presentation of maize sectors in each country under review and their trade linkages. How well individual countries are integrated with the regional and world markets is studied by a price transmission analysis. After the marketing costs are presented and analyzed, the report concludes with policy recommendations.

2. The Regional Maize Market in Eastern Africa

10. **This study covers three Eastern Africa countries, namely Kenya, Tanzania, and Uganda**. Table 3 illustrates that Kenya is a large country with the highest GDP per capita, with the lowest share of agriculture in the economy, and is the most open to trade (proxied by the proportion of exports and imports in its GDP). Uganda is the smallest country (in terms of land area and population), with the lowest GDP per capita, the highest population growth and the lowest trade shares of GDP, partly because it is land-locked. Tanzania is the largest country in terms of land area and population where agriculture accounts for a high percent of GDP (33 percent) and where the openness to trade ranges in between Uganda and Kenya.

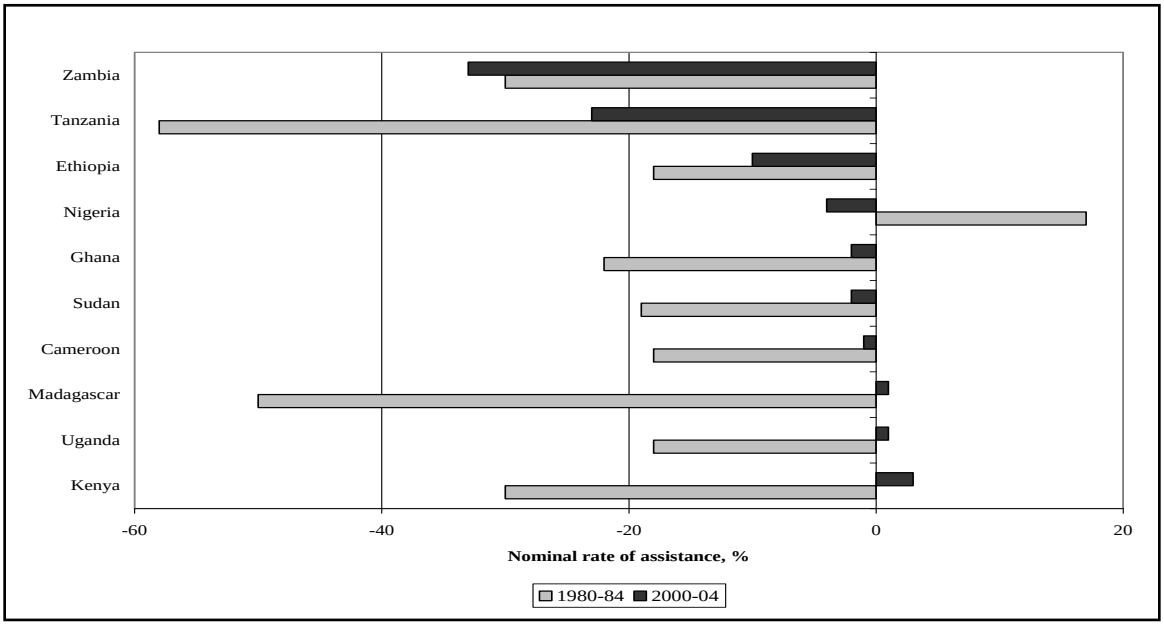
Table 3: Economic profile of the selected countries, 2000–2006 average

Economy and Trade	Kenya	Tanzania	Uganda	Average
GDP (US$ current million)	15,998	10,754	6,954	11,235
GDP growth (%)	3.5	6.2	5.6	5.1
GDP per capita (current US$)	460	306	256	341
GDP per capita (in $ PPP)	1,382	891	839	1,068
Composition of GDP (%)				
Agriculture	29	30	33	30.7
Industry	18	23	20	20.3
Services	53	46	46	48.3
Revenue/GDP (exc. grants, %)	19	11	12	14
Expenditure/GDP (%)	19	18	20	19
Fiscal balance/GDP (%)	1	-7	-8	-5
Exports GNFS/GDP (%)	25	20	13	19
Imports GNFS/GDP (%)	32	27	26	28
Current account balance/GDP (%)	-1	-4	-5	-3
Population (million)	36	40	27	32
Population growth (%)	2.6	2.6	3.2	2.8
Land size (000 sq km)	569	886	197	550

Source: World Development Indicators (WDI) and IMF database.

11. **While these countries are quite similar, they differ in their approach to the roles of the public and private sectors in agriculture**. Kenya and Uganda are largely liberalized economies with relatively undistorted prices and advanced private sectors. In Tanzania, however, the agriculture sector remains relatively more regulated with various interventions at local and national levels that distort price incentives. This is confirmed by Figure 3, which shows that although the agricultural distortions decreased in all three countries over the last two decades, Kenya and Uganda moved from taxation to support of farm-gate prices (mainly *via* import tariffs for importables such as rice, wheat and processed food), while in Tanzania the average farm-gate prices have remained below the border parity levels. The measures that depress prices in Tanzania range from local taxation and commodity boards to an export ban on maize.

Figure 3: Aggregate Nominal Rate of Assistance for agriculture in selected countries of Sub-Saharan Africa, 1980-2004



Source: World Bank's Agricultural Distortions Project, 2008.

12. **Maize is a major food staple and a source of calories in the region**. As illustrated in Table 4, maize has a particular importance in Kenya and Tanzania. In Uganda, the diet is more diversified, with cassava and plantains having a similar importance to maize.

Table 4: Composition of diet in Kenya, Tanzania, and Uganda (calories)

	Kenya		Tanzania		Uganda	
	Calories	**% of caloric intake**	**Calories**	**% of caloric intake**	**Calories**	**% of caloric intake**
Maize	768	36	655	34	266	11
Wheat	196	9	79	4	53	2
Rice	66	3	154	8	42	2
Sorghum	18	1	79	4	47	2
Other grains	12	1	31	2	126	5
Beans	103	5	57	3	148	6
Cassava	38	2	298	16	300	12
Sweet potatoes	46	2	66	3	221	9
Other root crops	60	3	11	1	29	1
Plantains	56	3	29	2	419	17
Other fruits and vegetables	112	5	62	3	435	17
Meat	77	4	49	3	62	2
Other food	601	28	347	18	377	15
Total	**2,154**	**100**	**1,917**	**100**	**2,524**	**100**

Source: FAOSTAT Food Balance Sheet.

13. **Maize is not only an important food staple but is also a tradable commodity in the region**.[16] In Tanzania and Uganda, it is among the top five commodities exported in the intra-regional market of the EAC. About 60 percent of all maize exported by Uganda and Tanzania lands in Kenya, with the rest going to other neighboring countries (Table 5).[17]

Table 5: Top commodities in official export value shares, 2000-2006 average

Kenya to	**Tanzania**	**Uganda**
Petroleum products*	16.68	65.23
Articles of apparel not elsewhere specified	38.31	54.79
Lime/cement /construction materials	5.93	92.50
Rolled plated manufactured steel	28.25	53.83
Soaps/cleansers/polishes	40.92	52.72
Tanzania to	**Kenya**	**Uganda**
Fish (live/fresh or chilled/frozen)	97.81	1.63
Tea and mate***	99.96	0.02
Cotton	93.93	1.52
Elements/oxides/halogen salt	0.00	16.72
Maize except sweet corn	**55.96**	**2.52**
Made-up textile articles	86.09	7.51
Uganda to	**Kenya**	**Tanzania**
Tea and mate***	99.98	0.00
Electric current**	78.08	20.77
Maize except sweet corn	**59.51**	**14.71**
Tobacco, raw and wastes*	79.43	11.90
Rolled plated manufactured steel	0.06	10.19
Vegetables (fresh or chilled/ frozen)	65.90	6.10

Note: * Also one of the top five export earners for the country overall; ** Electric current is an unusual commodity exported. *** Mombasa is the place for East Africa's tea auctions; therefore, tea exports from Uganda and Tanzania reported to Kenya are eventually for overseas export.

Source: COMTRADE database.

14. **Kenya and Tanzania are the largest maize producers (and consumers), and Kenya is the largest importer in the region** (Table 6). In fact, deficit markets in Kenya provide the center of gravity for the East Africa market, pulling in surplus maize from Kenya's own central highlands and from eastern Uganda and northern Tanzania (Haggblade *et al.*, 2008). Formally and informally, these countries have supplied roughly about half of Kenya's 400,000 ton annual maize deficit during 2000/01-2004/05, and nearly the full import requirement of 200,000 tons during 2006/07-2007/08 (Table 7). In 2008/09, about 220,000 tons of maize are projected to be exported to Kenya from Tanzania and Uganda, while the remaining 180,000 tons will be imported from South Africa (EAGC, 2009).

[16] Mainly white maize.

[17] This is the official data. The true export, together with unrecorded flows, is larger. In addition to Kenya, Uganda also exports to Rwanda, DRC and southern Sudan, while Tanzania exports to DRC, Burundi, Zambia and Malawi.

Table 6: Maize balance in Kenya, Tanzania, and Uganda, average 2006/07-2008/09 ('000 tons)[18]

Countries	Production		Consumption	Imports	Exports	Ending stocks
	Long rains	Short rains				
Kenya	2,343	312	2,978	263	13	267
Tanzania	3,331	93	2,926	19	103	343
Uganda[19]	383	250	400	0	165	71
Total Region	**6,058**	**655**	**6,304**	**281**	**281**	**682**

Source: EAGC (2009).

Table 7: Aggregate maize balance of East Africa region, ('000 tons)

	2006/07	2007/08	2008/09
Carry-over stocks, beginning	777.4	1,158.0	801.1
Imports	**268.7**	**160.6**	**414.0**
Uganda	0.0	0.0	0.0
Kenya	265.9	116.6	405.0
Tanzania	2.8	44.0	9.0
Maize production	6,970.0	6,685.0	6,483.7
Postharvest losses, seeds and other use	348.5	801.3	760.9
TOTAL AVAILABILITY	**7,667.7**	**7,202.4**	**6,937.9**
Domestic consumption	6,175.7	6,175.7	6,559.7
Exports	**333.4**	**225.6**	**284.0**
Uganda	187.3	149.0	159.0
Kenya	5.0	30.0	5.0
Tanzania	141.6	46.6	120.0
Carry-over stocks, end of the year	1,158.0	801.1	94.2

Source: EAGC (2009).

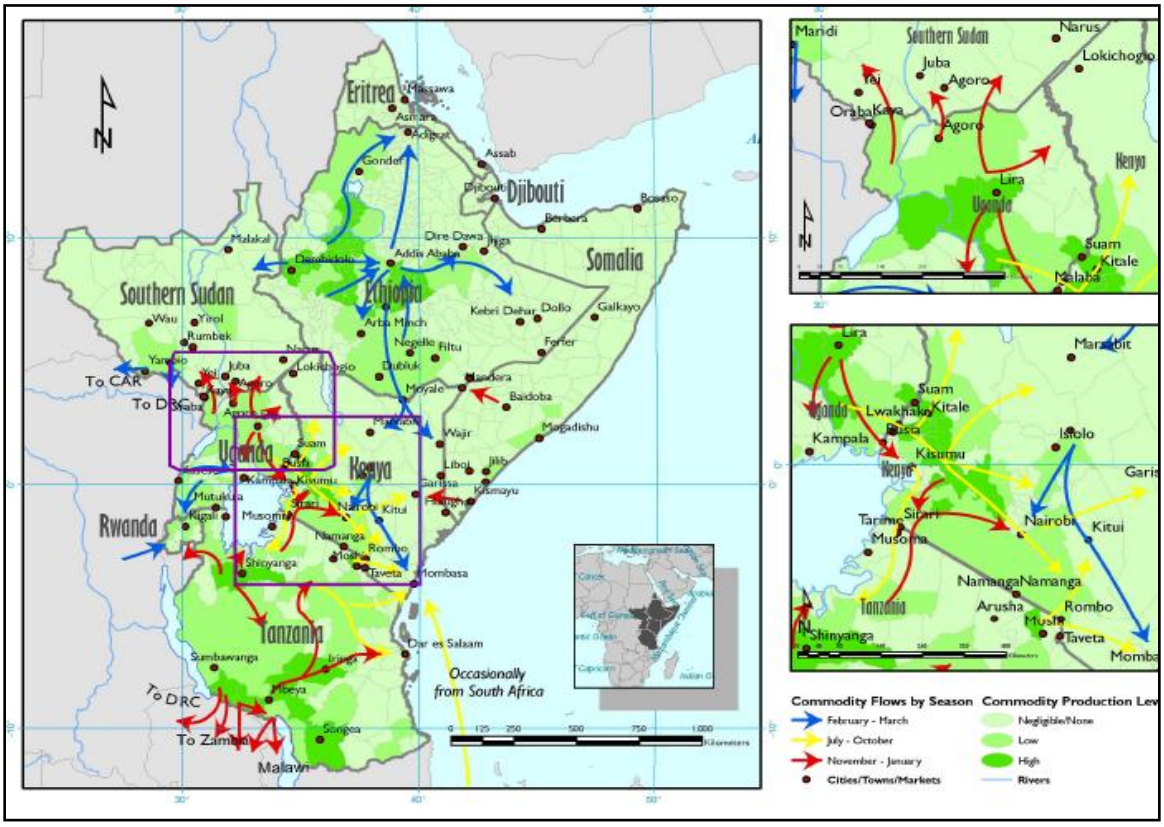
15. **Surplus maize producing areas in East Africa include eastern Uganda, northern Tanzania, and the western highlands of Kenya.** Southern Tanzania is another surplus area in the region but has limited impact on the Kenyan markets unless there is a large price differential allowing for covering the considerable costs of trade over 1,000 km (Haggblade *et al.*, 2008). At the current costs and prices, it is more profitable for Southern Highlands to trade with Zambia, Malawi and DRC but the overall export volumes going in the southern direction are reported smaller than those going in the northern direction. Major deficit zones emerge in the large urban areas of Nairobi and Mombasa, as well as in coastal Dar es Salaam. Though maize movements vary seasonally and involve movement in both directions at given times of the year in some areas, the most prevalent flows are depicted in Figure 4. As harvest months vary across regions and countries as depicted in Figure 5, trade flows change direction over the course of the year. Awuor (2007) reports that Nairobi is supplied by the eastern highlands[20] during February and March, by the western highlands during July to October, and by Uganda and Tanzania in December and January.

[18] See Annex 1 with maize balances for each country during 2006/07-2008/09.

[19] Only marketable production and consumption based on IDEA project are reported in Table 6. Total maize production and consumption in Uganda are about 400,000 tons larger than reported in that table, according to FAO.

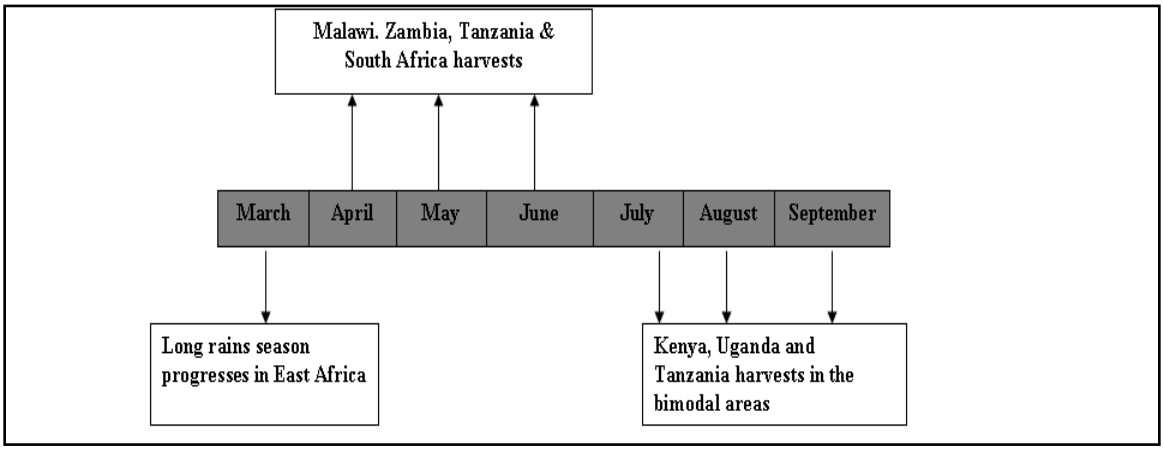
[20] This refers to the area surrounding Mt. Kenya to the northeast of Nairobi.

Figure 4: Maize production and market flows in East Africa



Source: FEWSNET (2009).

Figure 5: Eastern and Southern Africa timeline for long rains season

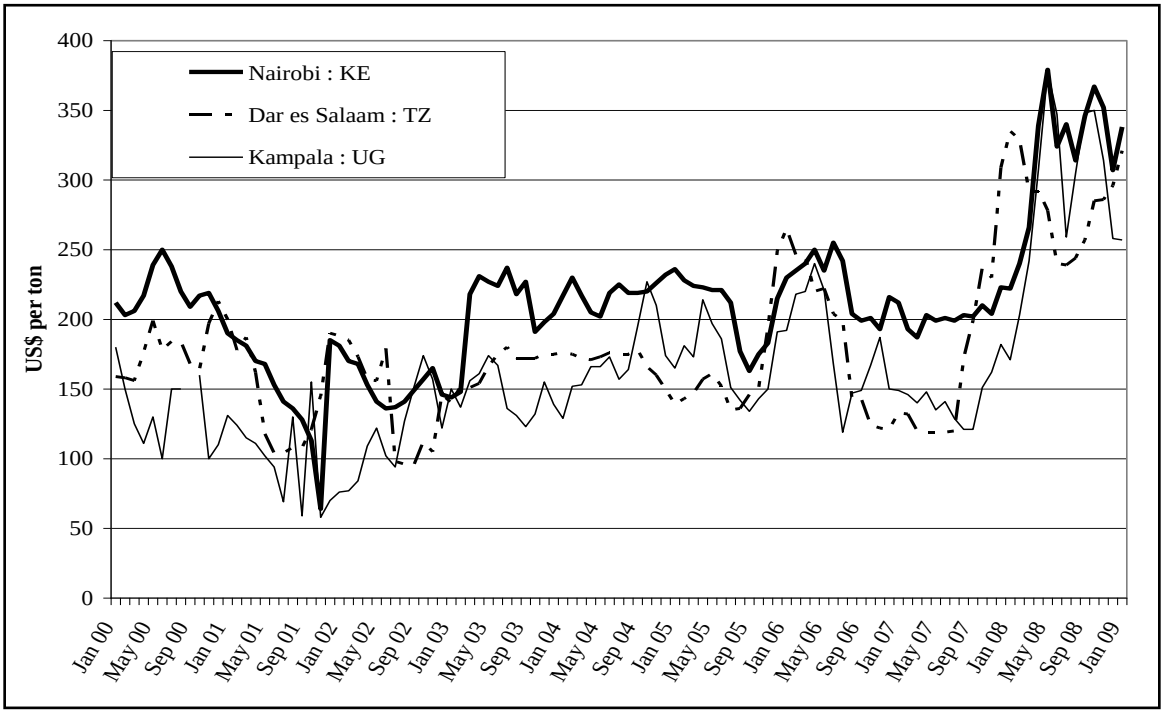


Source: www.ratin.net.

16. **The regional price trend has been steadily upwards, especially since 2007** (Figure 6). This accelerated rise in regional prices coincides with the recent surge in international maize prices but as the price transmission analysis shows (Chapter 3), the

reasons for the rise in regional maize prices lie largely within the region itself rather than on world markets (see also Figure 1).[21] Recently, harvest shortfalls in Kenya have resulted from a massive displacement of populations around producing zones due to violence triggered by the disputed presidential elections in late 2007 and early 2008, and subsequent food distribution programs for the displaced people. In addition, the significant reduction in use of fertilizer due to its high price at planting time in 2008, and therefore the widespread reduced production caused maize prices to surge. The price surge was further fueled by the insufficient short rains in October to December of 2008. Structurally, Eastern Africa has been moving towards a maize deficit for some time because of the rapid population growth and mostly static per capita maize production. Overall, the nominal price of maize is the highest in Nairobi; the prices are usually lower in Kampala and Dar es Salaam but in 2008 wholesale prices in Kampala were the same as prices in Nairobi on a number of occasions, while the maize export ban prevented the Dar es Salaam prices from rising more sharply. The following sections describe the maize sub-sectors in each country.

Figure 6: Wholesale monthly prices of maize in Nairobi, Kampala and Dar es Salaam, Jan. 2000-Jan. 2009 (US$ per ton)



Source: EAGC (2009).

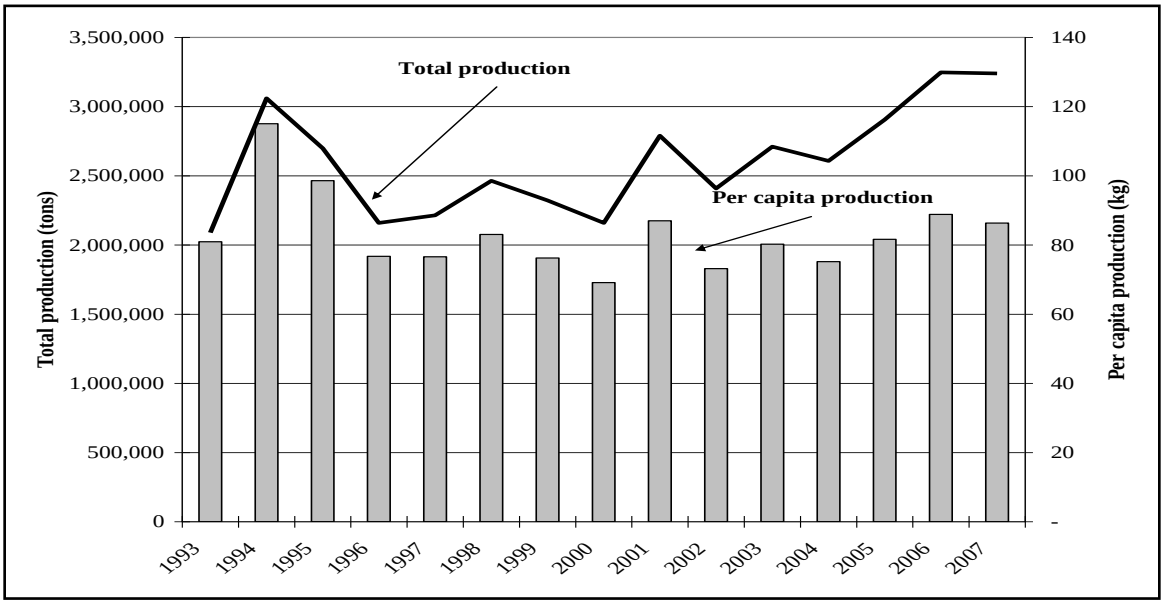
[21] The impact of rising international food prices on maize market in East Africa has been felt through indirect effects on regional prices of wheat and rice, which are likely to be well-integrated to the world markets given their imports to the region from overseas. When the international wheat and rice prices surged, the prices for these commodities in East Africa followed upwardly, gearing many consumers to shift toward the consumption of maize and other staples. This might explain the increased consumption of maize in Kenya in 2008 (Table 47) and thus the additional pressure on maize prices in East Africa.

2.1. Kenya

17. **Kenya produces roughly 2.4 million tons of maize per year, although production ranges between 2.1 million tons and 3.0 million tons depending on the rainfall** (Figure 7). Given the population of about 36 million people, this is equivalent to 70-90 kilograms of maize output per capita. Over the past decade, there has been essentially no growth on a per capita basis (FAOSTAT, 2009).[22]

18. **Inter-annual fluctuations in maize production in Kenya are high, but still less than in Tanzania**.[23] This is partly related to the fact that the western highlands of Kenya have more reliable rainfall than the main producing areas of Tanzania. It is also related to the fact that most of Kenya enjoys a bi-modal rainfall pattern, which allows Kenyan farmers to produce two maize harvests in parts of the country: one in June-July and the smaller one in January-February. If one harvest is smaller than usual, farmers respond by planting more maize the following season, thus reducing the annual shortfall.

Figure 7: Total and per capita production of maize in Kenya, 1993-2007



Source: FAOSTAT and World Development Indicators.

19. **The main surplus zone in Kenya is the "high-potential zone" in the western highlands,**[24] **centered on Kitale**. Although a large majority of farmers in Kenya grow maize, much of the marketed surplus is produced by medium- and large-scale farmers in these high-potential zones. It has been estimated that 10 percent of Kenyan farmers account for about 83 percent of the marketed surplus. Furthermore, 55 percent of the farm

[22] The FAO statistics differ somewhat from those of the Government of Kenya, but both show the same general trend of stagnation of total production and declining per capita production (Nyoro *et al*., (2004).

[23] The coefficient of variation (defined as the standard deviation divided by the mean) is 12 percent in Kenya, compared to 6 percent in Uganda and 14 percent in Tanzania during 2000/01-2008/09.

[24] This includes Trans-Nzoia, Uasin Gishu, Bomet, Nakuru, and the highland areas of Kakamega.

households in Kenya are actually overall net buyers of maize.[25] This percentage is highest in the western and eastern lowlands, where over two-thirds of farmers are net buyers of maize. In contrast, just 22 percent of the farmers in the high potential zone are net buyers of maize (Jayne *et al*., 2005).

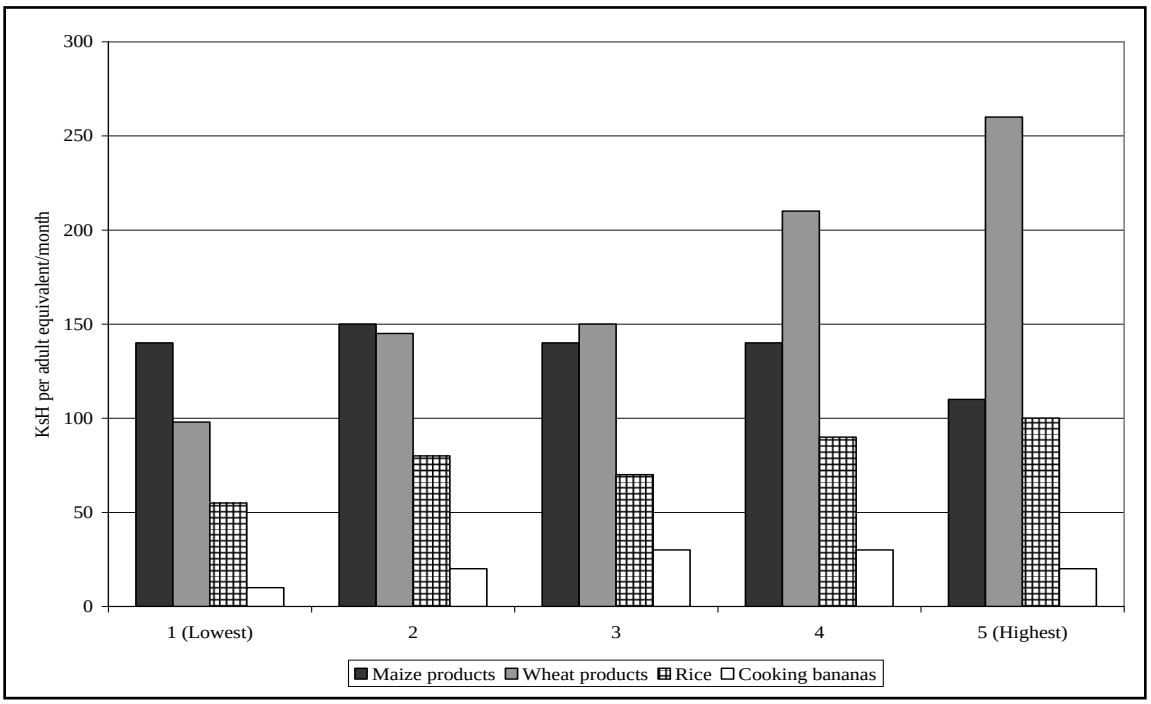
20. **Maize is by far the single most important food commodity in the Kenyan diet, accounting for 36 percent of total caloric intake** (FAOSTAT, 2009), though its importance in urban areas has been declining. Other staple foods in Kenya include wheat products (9 percent of caloric intake), beans (5 percent), and rice (3 percent). Maize still represents a larger share of the diet in Kenya than in the other East African countries. In spite of the decline in per capita consumption[26,] total maize consumption in Kenya has increased due to population growth (2.7 percent per year). Although meat consumption is rising in Kenya, the demand for maize for animal feed is estimated to be just 80 thousand tons, a relatively small share of the total (FAOSTAT, 2009).

21. **Spatially, the main centers of demand in Kenya are the two largest cities, Nairobi (with 2.5 million inhabitants) and Mombasa (with 770 thousand)**. However, it is important to note that many of the rural areas outside the western highlands are also net buyers of maize. Thus, there is significant flow of maize from rural areas to the cities, but also from the surplus zones (particularly in the west) to deficit zones (particularly in the east). In urban areas, per capita maize consumption has declined somewhat over this period, as consumers have diversified into other foods. Recent urban consumption surveys in Nairobi attest to the rising importance of wheat and rice products in food consumption patterns (Muyanga *et al*., 2005). In terms of expenditures, wheat has overtaken maize as the primary food staple in Nairobi. After disaggregating consumer expenditure patterns by income quintile, wheat dominates among the relatively wealthy urban consumers as well as the middle income quintile (the top 60 percent of Nairobi consumers), as shown in Figure 8. Maize still forms the single largest share of consumer staple expenditures among consumers in the bottom two income quintiles. Rice has also risen in importance, forming roughly 20 percent of overall staple food expenditures in Nairobi. The rising importance of a diversified set of staples that are widely traded on world markets and consistently available at import parity levels will increasingly contribute to more stable food expenditure patterns over time.

[25] Due to the poor on-farm storage facilities and the need for cash, many of these net food buyers sell maize after the harvest at low prices and buy it in the lean period at high prices.

[26] "Consumption" refers to human consumption and is calculated as production plus formal imports minus formal exports minus the estimated amounts used for seed and feed.

Figure 8: Expenditures on primary staple foods, Nairobi Kenya, 2003



Source: Muyanga *et al*. (2005).

22. **The combination of stagnant production and rising consumption implies a growing structural deficit in maize for Kenya**. Kenya was a maize exporter during the mid- to late-1980s but became a net importer during the 1990s. Over the last eight years for which data are available (2000-2008), Kenya imported about 250 thousand tons per year through formal and informal channels (Haggblade *et al.*, 2008; EAGC, 2009). Overall, the share of imports in total consumption has been about 10-13 percent.

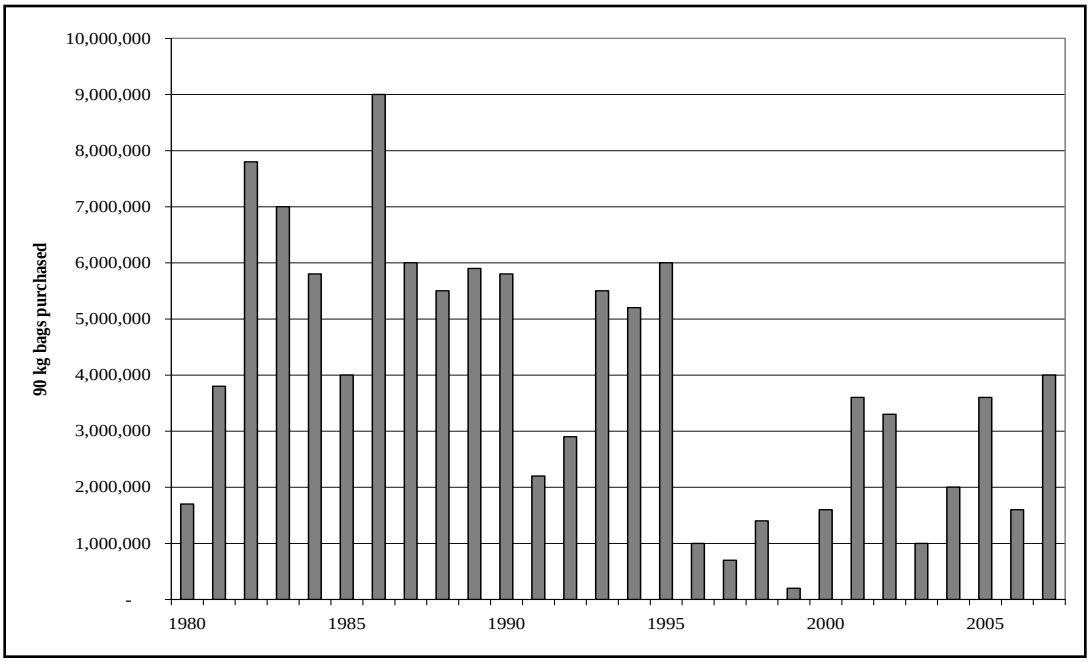
23. **Maize policy in Kenya is characterized by efforts to support and stabilize prices through the operations of the National Cereals and Produce Board (NCPB).** In the 1980s, the NCPB played a dominant role in maize markets, purchasing 600-800 thousand tons per year. Since then, maize markets have been liberalized and private trade plays a much larger role, but the NCPB continues to purchase maize to defend a floor price. Since 2000, the NCPB purchases have generally been in the range of 30-190 thousand tons. In 2006, however, the NCPB purchased 477 thousand tons of maize; while the government made additional in-country purchases in 2008 the shortfall in the marketable surplus meant that very limited amounts were delivered. The government actually imported from the world market (i.e. South Africa) and sold at subsidized rates.

24. **NCPB operations are estimated to have increased domestic maize prices by 20 percent during 1995-2004**. This result was derived from Jayne *at al*. (2008), who estimated both the separate and joint impacts of the NCPB's purchase and sale operations on wholesale prices in Kitale, a maize surplus region, and Nairobi. The periods where

NCPB prices were at a premium were longer and more pronounced than periods in which it was priced at a discount, which resulted in such a substantial price increase.[27]

25. **The NCPB's purchases had a large effect on prices because they normally exceeded 3 million bags, which is roughly 25-35 percent of the total maize sold by the small and large farm sector in Kenya** (Figure 9). Most of the maize purchased by the NCPB during 2000/01-2004/05 appears to have been directly from large-scale farmers in the Rift Valley (75.4 percent). To defend high maize prices, the government has impeded maize imports on occasion. In mid-2001, the Kenyan government imposed a temporary ban on cross-border imports because of low prices associated with a bumper harvest. Another temporary import ban was imposed in 2004 in response to a serious outbreak of aflatoxin poisoning said to be caused by imports from Uganda. And recently Kenya prevented Tanzanian trucks carrying maize from entering Kenya. Although this did not prevent the imports from occurring, it raised the cost of doing so by forcing transporters to off-load and reload the maize onto Kenyan trucks. Outside of the EAC customs union, the tariff rate of 25 percent is imposed, making imports from the world market, in particular South Africa, unprofitable, compared to those from Uganda and Tanzania (Figure 10).

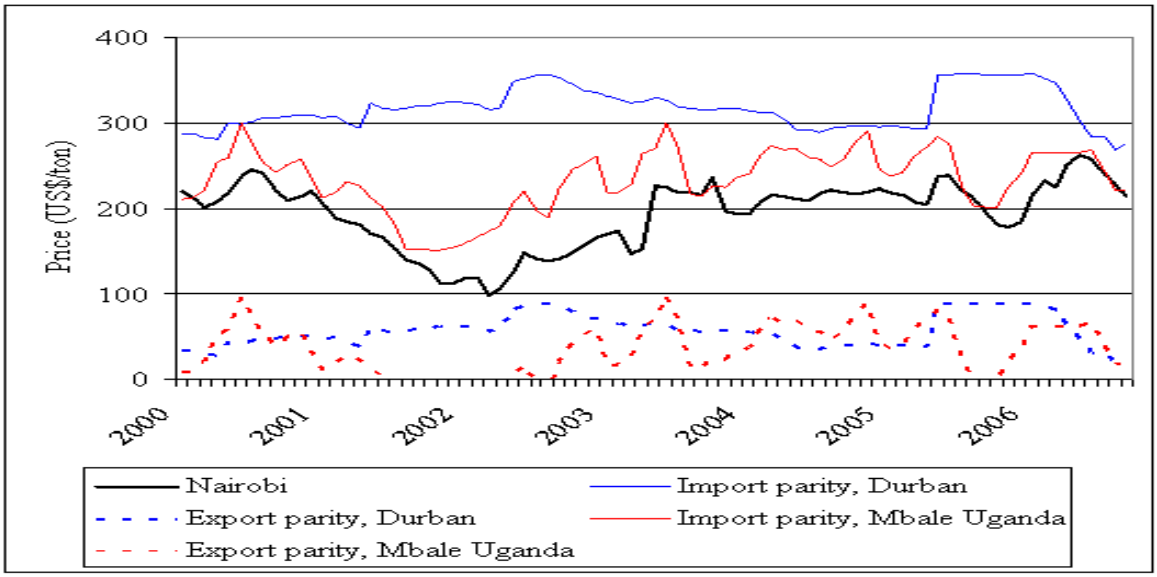
Figure 9: **Total NCPB maize purchases (90 kg bags), 1979/80-2006/07**



Source: NCPB (2007).

[27] The effects of the NCPB interventions in the recent 'crisis' period might have been different than reported for 1995-2004. The import of maize put downward pressure on domestic prices, while the in-country purchases pushed maize prices up. The net effect needs to be estimated, which goes beyond the scope of this Report.

Figure 10: Domestic and world prices for white maize, wholesale in Nairobi (US$ per ton)



Source: Haggblade *et al*. (2008, p. 22).

26. **Who has benefited from higher maize prices in Kenya?** Within the country, the biggest winners are the largest farms – net sellers of the maize and the largest losers are net buyers, i.e. urban consumers and maize-purchasing rural households (Table 8). Outside of the country, the big winners are farmers in eastern Uganda and northern Tanzania that export maize to Kenya. The distributive effect of potential reduction in maize prices in Kenya is presented in Table 9. For net buyers, who represent more than two-thirds of the sample, a 20 percent drop in maize prices is estimated to raise household income by 6 percent. For the poorest quintile, the corresponding figure is 18 percent of income. Net gain figures for net sellers are more variable across income quintile with losses steadily increasing from Ksh 111 for the poorest quintile to Ksh 581 for the richest within the small farm sector. The net welfare losses are likely to be substantially higher for large-scale maize farmers, data on which are unavailable in this analysis.

Table 8: Differences in household income and other characteristics according to position in the maize market

	Maize marketing position						
	Sell only (n=781)	**Buy only (n=2052)**	**Net seller (n=467)**	**Net buyer (n=242)**	**Net equal (n=18)**	**Neither buys nor sells (n=412)**	**Total (n=3972)**
Households in category as % of total sample	19.7	54.1	11.8	6.1	>0.01	10.3	100
Household income (2004 Ksh per HH)	334,188	175,409	275,006	184,375	243,950	213,775	223,176
Crop income (2004 Ksh per HH)	182,093	86,702	153,616	90,908	157,080	102,893	115,580
Animal income (2004 Ksh per HH)	53,384	17,291	33,040	22,852	16,490	30,947	27,991
Off-farm income (2004 Ksh per HH)	98,710	71,416	88,349	70,616	70,380	79,935	79,604
Maize share of gross crop income (%)	43.8	22.1	38.3	30.1	25.6	28.9	30.0
Female-headed households (%)	12%	49%	7%	16%	5%	11%	100%
Household wealth (2004 Ksh per HH)	273,390	58,662	118,840	61,862	31,590	110,435	113,401
Land cultivated (acres)	7.5	2.6	4.8	3.0	2.4	3.6	4.0
Household size (adult equivalents)	6.2	6.2	6.2	6.3	6.9	5.8	6.2

Source: Tegemeo Rural Household Surveys, 1997, 2000, 2004, from Jayne *et al*. (2008).

Table 9: Effect of twenty percent decrease in maize prices by income quintile and market position

	Net buyers			Net sellers			Full sample	
Income quintile	**Annual per capita income**	**Net gain**	**Relative net gain**	**Annual per capita income**	**Net gain**	**Relative net gain**	**Net gain**	**Relative net gain**
1	2,702	279	18.13	3,135	-111	-3.71	224	14.82
2	7,123	302	4.44	7,896	-141	-1.96	192	2.85
3	13,309	284	2.19	12,675	-235	-1.84	142	1.09
4	21,535	277	1.30	22,774	-282	-1.27	78	0.38
5	54,270	222	0.51	70,910	-581	-0.98	-129	-0.16
Full sample	16,573	277	6.35	34,350	-347	-1.54	101	3.80

Source: Mude and Kumar (2006).

27. **Of course, a general equilibrium approach, taking into account indirect effects on welfare through labor markets, would need to be undertaken before the welfare effects of mean-altering price policies could be fully understood**. Mghenyi (2006) accounts for these second-order effects by considering both adjustments in production and consumption, and the accompanying responses on the rural wage labor market, using dynamic stochastic dominance tests. Mghenyi finds that the second-order effects are relatively small, yielding results very similar to Mude and Kumar, i.e., that the most rural households, and especially the rural poor, are adversely affected by relatively high maize prices.

28. **Overall it seems that a reduction in maize prices associated with NCPB withdrawal from the maize market would have positive effects on income distribution and poverty reduction**. This is likely to hold true even after accounting for the second-order effects on wage labor. It is rather counterproductive to set policies that create high prices for the main commodity consumed by laborers in a world where growth in the non-farm economy and diversification of agricultural income hold the key to poverty alleviation, and where the nearby countries enjoy the competitive advantage of lower maize prices. Indeed, the pace at which Kenya is able to bring down its food prices, and thereby enhance the labor competitiveness, will have a crucial bearing on its capacity to expand into any internationally competitive, labor-intensive activity in any sector and to seize the opportunities that world trade expansion offers beyond several export crops.

2.2. Tanzania

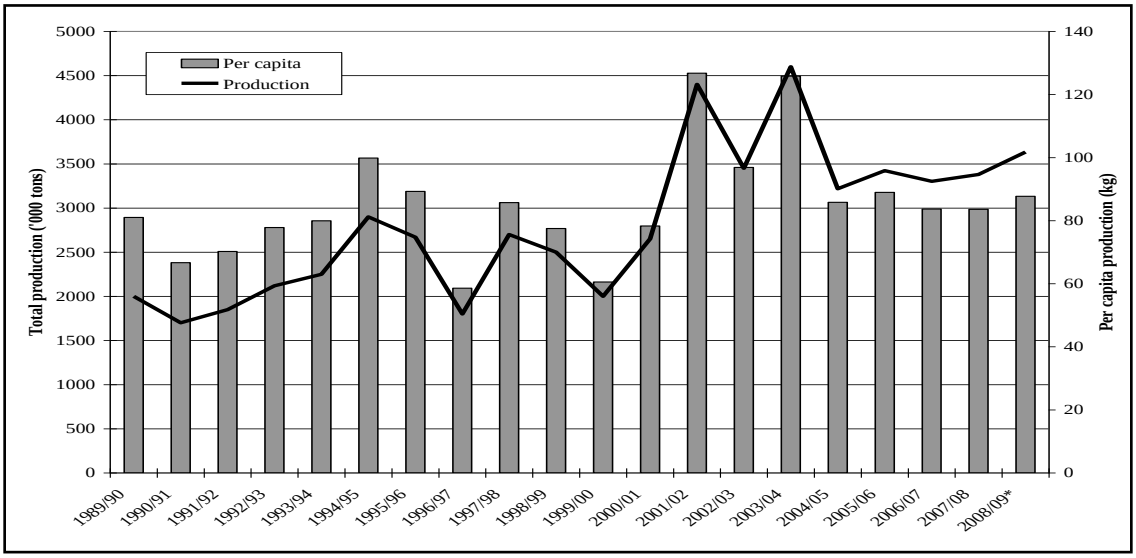
29. **On average, Tanzania produces more maize than Kenya, about 3.4 million tons during 2006/07-2008/09**. Although the area under cultivation in Tanzania is larger, maize yields are significantly lower due to the low use of fertilizers and improved varieties. Unlike Kenya, however, Tanzania has seen steady growth in maize production (Figure 11). Maize production has grown at about 2.7 percent per year, slightly outpacing population growth which is 2.6 percent per year.

30. **The annual fluctuation in maize production is higher than in Kenya or Uganda (the coefficient of variation is 14 percent)**. This is partly related to the fact that most of Tanzania has a unimodal rainfall, with rainfall concentrated in the March-June period and the maize harvest in July-August. The only area in Tanzania with bimodal rainfall is the northern border with Kenya. In this area, a short rainy season at the beginning of the year allows a harvest in February and March.

31. **The southern highlands are the largest maize surplus zone in Tanzania**. Out of the 21 regions in Tanzania, four of them in the southern highlands (Mbeya, Rukwa, Ruvuma, and Iringa) account for 35-40 percent of Tanzanian maize production. With unimodal rainfall, this area produces just one harvest per year. The northern highlands, including the regions of Arusha and Kilimanjaro, have bimodal rainfall and good conditions for growing maize, but the area is limited so they contribute just 10-15 percent of total maize production.

32. **As in Kenya, maize is by far the most important source of calories in Tanzania, accounting for 34 percent of total caloric intake** (see Table 4). In contrast to Kenya, however, cassava plays an important role in Tanzanian food consumption, contributing 16 percent of the caloric intake. Rice is more important in Tanzania than in Kenya (8 percent of caloric intake compared to 3 percent), while wheat products are less important (4 percent compared to 9 percent). Per capita maize consumption has remained roughly unchanged over the past decade, but population growth (2.6 percent per year) fuels a growing aggregate demand for maize. It is estimated that roughly 100 thousand tons of maize is used for animal feed each year in Tanzania.

Figure 11: Total and per capita maize production in Tanzania, 1989/90-2008/09



Note: *2008/09 is the forecast of EAGC.

Source: MAFC data from 1998/90 to 2005/06; EAGC data from 2006/07-2008/09; WDI data for population.

33. **Tanzania is largely self-sufficient in maize and is usually a net exporter**. Over 2000-2005, the formal export was 8,000 tons per year. However, these figures do not reflect substantial cross-border (informal) trade between Tanzania and its neighbors. EAGC reports that Tanzania has exported about 120,000 tons of maize annually to Kenya in recent years (see Table 7 and Table 48), which peaks in June and July because the Tanzania maize harvest in the north occurs earlier in the year than the Kenyan harvest and generally corresponds to the high Kenyan prices at that time. Maize is also exported from the southern highlands to northern Zambia, northern Malawi, and eastern DRC.[28] As a result, some surplus maize has been diverted (by better price margins across the borders) from Dar es Salaam and the central region markets, which are semi-arid and have chronic maize deficits. Overall, the share of exports (both formal and informal) in *total marketable production* was around 30 percent.[29]

34. **Tanzania is the only country in East Africa that formally restricts trade**.[30] Export bans have been imposed particularly following a poor harvest (or perceived poor harvest) or when consumer prices are unusually high. Since 2000, the export ban was made permanent, with only few months of formal lifting (Table 10).[31] Although there

[28] These exports can be fairly significant depending on the conditions across the border. Ruvuma region on the border with DRC normally has permission to export because the infrastructure between them and the rest of Tanzania is so poor that it makes sense to go to DRC. It is reported that sometimes the export ban does not include these western regions.

[29] According to the 2002/03 Agricultural Census, the average share of maize sold in Tanzania is estimated at 17 percent.

[30] Zambia and Malawi from Southern Africa are also known to impose export bans. Kenya has introduced the temporary ban in 2008/09 as a result of the recent surge in maize prices.

[31] See Chapter 3 for estimating the effect of export ban by using price margins between Kenya and Tanzania in the periods 'with' and 'without' export bans.

appears to be some uncertainty even among researchers who study maize markets when the ban is in effect and when it is not,[32] even the mere possibility of an export ban hampers investments in trucks and storage capacity. This in turn limits the facilitation of trade flow and reduces price incentives at the farm-gate level along with increased speculative buying (and competition to buy) at the harvest.

Table 10: Chronology of export bans for maize in Tanzania

Year	Events
1983/84	The GoT implemented partial import liberalization by allowing individuals with own sources of foreign exchange to import incentive goods and sell them at market clearing prices
1990	The GoT abolished import and export licenses for various goods
1999	The GoT abolished stamp duty on agricultural and livestock products
1999/2000	The export ban was lifted to allow export of maize to food deficit countries in Southern Africa
July 2003	The GoT passed a bill to prevent import of cheap/sub-standard products and dumping to protect the domestic industry
2004	The Minister of Agriculture and Food Security imposed the export ban by withdrawal of all maize export permits given to traders and suspending the issuance of new permits
January 2006	The ban was lifted for two months
March 2006	Export ban reintroduced
January 2007	Export ban lifted
March 2008	Export ban reintroduced

Source: Temu *et al*. (2007); www.fewsnet.net

35. **There is also a Strategic Grain Reserve that seeks to stabilize prices and to respond to food emergencies**. Unlike Kenya, where the NCPB plays a significant role in maize markets, the role of government purchases in Tanzania has been to address food emergencies rather than intervene in markets (Table 11). MAFC maintains 15 silos under the Food Security Department that are spread over the regions, with total storage capacity of 241 thousand tons. The Strategic Grain Reserve was utilizing about 50 percent of its storage space, with the total stock at the end of 2008/09 reported at 94,000 tons (or about 4 percent of total consumption). Purchases for the Strategic Grain Reserve were an important part of government maize policy in the 1980s and early 1990s, during which time the Strategic Grain Reserve was active in purchasing maize from the southern and northern highlands. Since the agricultural reforms of the late 1980s and early 1990s, the Strategic Grain Reserve (called now the National Food Reserve Agency) has focused on emergency and disaster relief, avoiding, so far, large intervention in markets.

[32] Cross-border trade takes place anyway through porous borders but at higher transaction costs and thus lower prices for farmers (see Table 7 and Annex 1).

Table 11: Strategic Grain Reserve Interventions in Tanzania, 1990-2006 (tons)

Year	Opening balance	Purchases	Sales	Ending balance
1989/90	107,000	-	-	107,000
1990/91	107,000	26,277	88,877	44,400
1991/92	44,400	69,482	67,418	60,787
1992/93	60,787	27,798	35,559	94,710
1993/94	94,710	24,275	81,262	41,246
1994/95	41,246	24,275	49,860	15,661
1995/96	15,661	73,197	65,841	23,017
1996/97	23,017	59,154	61,689	20,482
1997/98	20,482	43,882	23,532	40,832
1998/99	40,832	60,263	76,678	24,417
1999/00	24,417	90,270	39,978	74,709
2000/01	74,709	55,280	83,650	46,339
2001/02	46,339	19,706	18,998	47,047
2002/03	47,047	27,427	23,818	50,655
2003/04	50,655	55,915	77,309	29,262
2004/05	29,262	97,842	14,075	113,029
2005/06	113,029	43,774	150,233	6,570
2006/07	6,570	122,210	4,449	124,331
2007/08	124,331	19,451	74,770	68,976
2008/09	68,976	61,588	36,161	94,403

Source: Ashimogo (2008) and National Grain Reserve of Tanzania/MAFC.

2.3. Uganda

36. **The maize output in Uganda was about 1.2 million tons in 2006/07, which is less than half the production in Kenya or Tanzania**. For the same period the IDEAS[33] project estimated the production at 650,000 tons by assessing the marketable surplus. The "marketable surplus" approach is used by EAGC for Uganda for constructing regional food balances and thus is also used in this report (see Table 49). All sources suggest that Ugandan maize production is growing rapidly. Based on FAO estimates, maize production has been growing at 3.3 percent per year, more rapidly than in either of the other two countries. It has slightly outpaced population growth, which is 3.2 percent per year. Per capita maize production is 40 kg, about half the level in Kenya and Tanzania. In Uganda, maize is just one of four main staple food crops.

37. **The inter-annual volatility of maize production in Uganda is greater than in Kenya but less than in Tanzania**. Southern Uganda has a bimodal pattern of rainfall, with the main harvest in June-August and the short-season harvest in December-January. Northern Uganda is generally more arid and has a single rainy season producing a harvest from October to December. This means that there are three main times when crops come into the market easing supply both internally and regionally.

38. **The main maize surplus districts are Iganga, Mbale, and Kapchorwa in the east, Masindi in the central-west, and Kasese in the extreme southwest corner of the**

[33] IDEAS is the acronym for Investment for the Development of Export Agriculture, a project funded by the United States Agency for International Development.

country. There are substantial exports from Uganda (Mbale and Kapchorwa) and Kenya driven by Uganda's lower costs of labor and land rental (Nyoro *et al*., 2004).

39. **Maize plays a more moderate role in consumer diets in Uganda compared to Kenya and Tanzania**. Per capita consumption of maize is about 30 kg, less than one half of the corresponding figures in the other two countries. This is because plantains (cooking bananas) are the main staple in Uganda, accounting for 17 percent of the caloric intake of consumers. Maize, cassava, and sweet potatoes each account for 9-12 percent of the total (see Table 4 above). Per capita maize consumption has not changed significantly over the past decade; in contrast, consumption of rice and wheat products has grown rapidly, though they remain minor food items.

40. **As the principle orientation of Uganda's trade policy is to enable traders to offer products and services competitively, reliably, and on a sustainable basis**, Uganda is able to serve as a food basket for the region. There is no export duty on agricultural products, nor has the government instituted any bans or other restrictions on trade in food commodities.

41. **Estimates of trade suggest that the flow of maize from Uganda to Kenya is one of the larger and more consistent cross-border flows in the region**. Estimates of the volume vary widely. RATES (2003) estimated the annual volumes to range from 15 to 51 thousand tons over 1997-2002. Awuor (2007) suggests that informal exports in 2004 were around 70 thousand tons. More recent estimates of the EAGC suggest the annual export to Kenya was 120,000 tons during 2006-2008 (Table 49). There is also cross-border trade to Rwanda (at approximately 50,000 tons per year). The peace process in southern Sudan has also opened up new market opportunities for the Ugandan products. Unfortunately, there is little quantifiable data but the fact that Ugandan prices have matched Nairobi prices several times in the past year is attributed to Sudanese buying and shows that Sudanese traders often purchase from the farm gate, maize with high moisture levels competing with the Ugandan traders.

42. **The distinct feature of the Ugandan market is the presence of the World Food Program (WFP) and its local procurement program**. Maize procured in Uganda makes up the largest proportion of maize procured in Africa (excluding South Africa). The WFP purchases Ugandan maize and beans for distribution to Internally Displaced People camps in the country and shipment to southern Sudan, Ethiopia, DRC, and other places in the region that are experiencing food shortages. The volumes purchased were around 30,000 tons over 2000-2003, rising to over 100,000 tons in 2003 and 2004 and to 160,000 tons in 2006, which, using RATIN estimates, is about 25 percent of Ugandan maize surplus (WFP, 2007).

43. **On the one hand, the increasing purchases by the WFP have encouraged a supply response from farmers in producing more maize and from traders in establishing some facilities in Kampala to supply the WFP**. However on the other hand these increasing purchases put direct upward pressure on maize prices in Uganda

and also indirect pressure on maize prices in the whole East Africa region.[34] Maize prices in Uganda are likely to continue to be influenced by WFP procurements in the coming years, and care must be taken to handle the WFP's hypothetical exit from the market. The WFP purchases maize and beans primarily from large-scale traders, who are the only ones who can meet the quality and quantity requirements. It purchases commodity in Kampala and the traders' facilities have been placed in Kampala to serve the WFP. There has been (until recently) no investment in infrastructure up country, furthermore this movement of maize to Kampala to be then distributed back up country does, in some cases, duplicate transport costs. The WFP also has a program to purchase commodities from farmer organizations using relaxed standards, but this program accounts for less than 5 percent of WFP procurement (Wandschneider and Hodges, 2005) and has suffered many failures.

44. **The maize policy of the Uganda government has been to allow and even encourage cross-border trade and the WFP procurement program**. As part of the Plan for the Modernization of Agriculture, the government has been active in supporting the formation of farmer organizations, the development of mixed public and private agricultural advisory services, and institutional innovations such as a commodity exchange and warehouse receipts systems. Unlike in Kenya and Tanzania, the government has not attempted to impede cross-border trade or influence the price of maize through government purchases. One reason for this may be that maize prices are not as politically sensitive as in the other two countries, presumably because it is just one of four staple foods in the country.

[34] See Chapter 3 on the regional price integration in East Africa.

3. Regional Price Integration and Market Efficiency

45. **This chapter presents the analysis of maize market integration in East Africa**. The transmission of price signals plays an important role in guiding production and consumption decisions, and in stimulating inter- and intra-national trade flows. Hence, the analysis of price transmission can contribute to a better understanding of grain markets in the region. Maize price formation in each country is affected by price developments in other countries. The largest consumption center in the East Africa region is Nairobi, which attracts maize not only from Kenyan farmers but also from farmers in eastern Uganda and northern Tanzania. The price transmission (PT) analysis, therefore, will allow improved understanding of competitiveness of the markets and the extent to which domestic markets remain insulated from regional and world market developments. It will also provide the context for discussing the costs of trading maize presented in the next chapter.

46. **This section presents in sequence the analyses of five questions related to different aspects of PT on maize markets in Eastern Africa**. The five questions are:

i. What is the nature of PT between the world market and the major consumption centers in the region?

ii. What is the PT among the major consumption centers in the region?

iii. What is the nature of PT between production and consumption centers within the countries under review?

iv. What is the nature of PT between the production-export areas in Uganda and Tanzania and Nairobi?

v. Is the speed of PT between markets in the region related to the geographic distance between these markets, and is there any evidence that PT between two markets is significantly slower, all other things being equal, if these markets are separated by an international border?

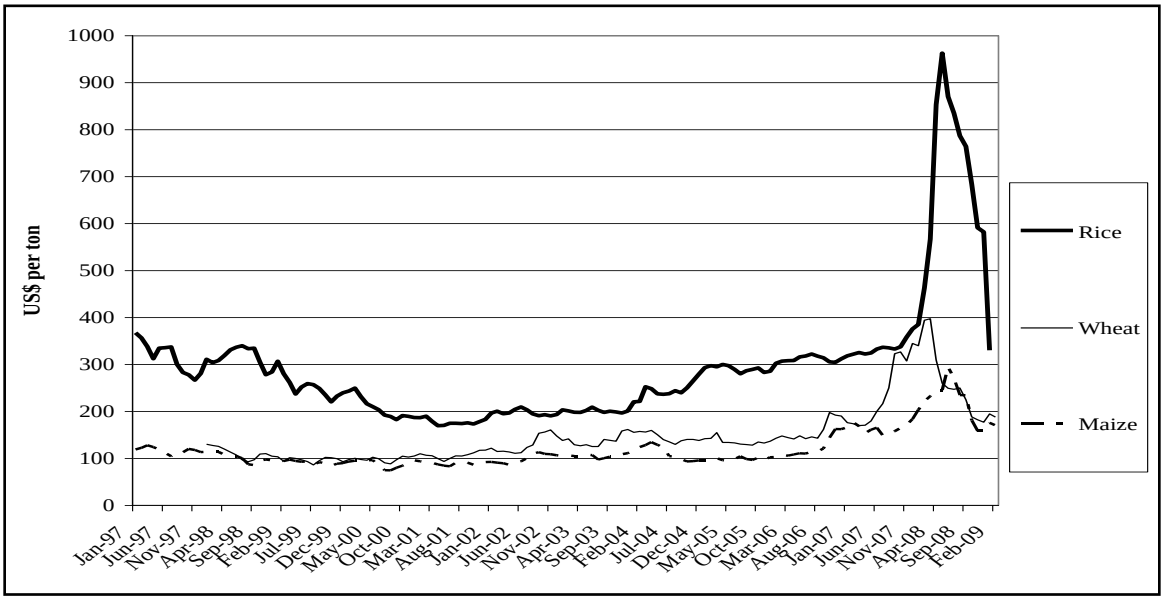
47. **The cointegration methodology is used to estimate the relationship between market pairs**. The estimated elasticities represent long-run elasticities of price transmission. The error-correction model is used to estimate a speed of disequilibrium's correction between prices. This is reflected in a "combined adjustment" indicator. Tables below also report the number of months required to restore a 50 percent of the long-run equilibrium between market pairs (prices). The detailed methodology of PT analysis is presented in Annex 4.

3.1. Integration with the international markets

48. **The 2008 surge in global food prices has led to widespread concern that hunger and poverty would increase sharply across the world as poor and food insecure households are forced to reduce their consumption levels**. From 2003 to early 2008, the world witnessed the most marked commodity price boom of the past century. The prices of oil, metals, food grains, and other commodities rose sharply and over a

sustained period, being exceptional in both the duration and the range of commodities affected. By mid-2008, energy prices were 320 percent higher in dollar terms than in January 2003 and international food grain prices 138 percent higher (Figure 12). Although in the second part of 2008 the international food prices started to decline, and World Bank projections are that food prices will fall a further 20 percent in 2009, food prices are likely to remain much higher over the next 20 years than during the 1990s (World Bank, 2008a).

Figure 12: World market nominal prices for wheat, maize and rice, Jan. 1997-Feb. 2009 (US$ per ton)



Note: Wheat price is the US No.2, Soft Red Winter Wheat, U.S. Gulf. Rice price is White Rice, Thai 100% B second grade, f.o.b. Bangkok. Maize price is US No.2, Yellow, U.S. Gulf.

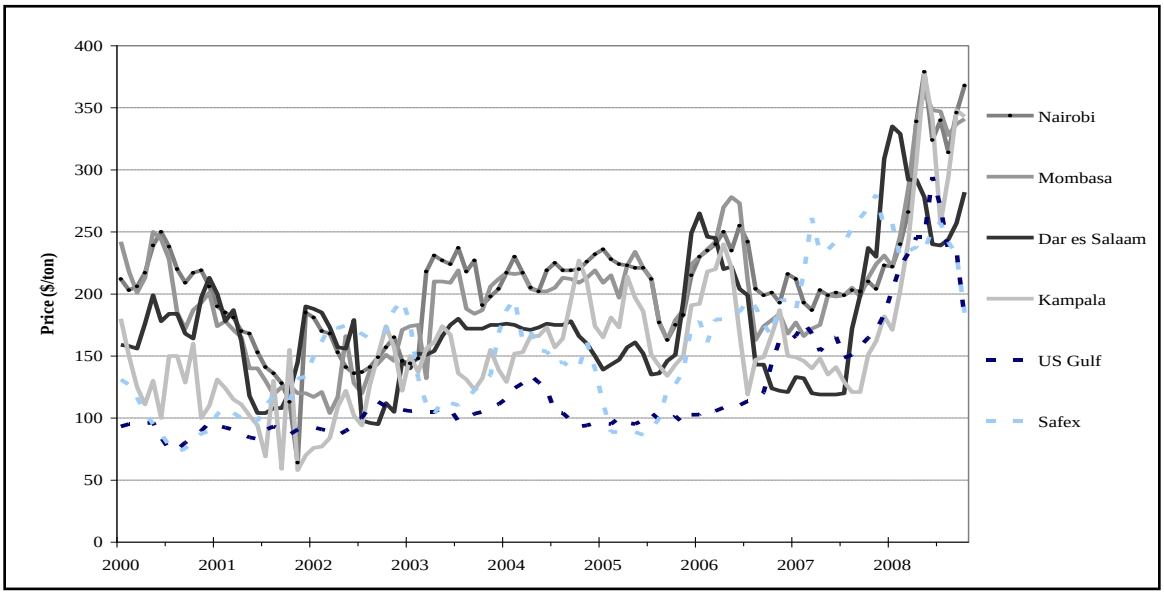
Source: FAOSTAT.

49. **In East Africa, food prices rose during the same period**; **was that rise caused by the increase in international prices?** The PT analysis shows that this was not the case because the major consumption centers in Eastern Africa appear to be only weakly integrated with the world markets. The visual impression of relatively weak PT between regional and the international prices illustrated in Figure 1 and Figure 13 is confirmed by the econometric results in Table 12. Statistical evidence for a long-run equilibrium is found in only two of the twelve possible combinations of the four regional and the four international prices. Nairobi and Dar es Salaam are linked to the U.S. Gulf price for yellow maize by long-run equilibrium relationships but the speed of PT is very slow. No regional consumption center appears to be connected to either of the South African maize prices (Safex and Durban), even though South Africa was a major source of Kenyan and Tanzanian maize imports from 2000 to 2005 (see Figure 27, Figure 28, and Figure 29).[35]

[35] This result seems to contradict the findings of other research. Sarris and Mantzou (2005), for example, found that the prices in Tanzania are more co-integrated with South African than with the US Gulf prices. The different results are

Even at the end of 2008 and early 2009, when Kenya began importing white maize from South Africa, the maize prices in Kenya and other East African countries appeared not to have been influenced by the world market prices proxied by SAFEX for white maize and US Gulf for yellow maize (recall Figure 1). The prices in East Africa have continued rising, while world market prices have followed the downward trend.

Figure 13: Wholesale maize prices in Eastern Africa and world market, nominal monthly prices, Jan. 2000 – Oct. 2008 (US$ per ton)



Note: U.S. FOB Gulf price (yellow maize) is the proxy of the world market price; SAFEX is the white maize spot price from South Africa Commodity Exchange; Durban price is the white maize export price.

Source: www.ratin.net; MAFC data for Tanzania; www.infortradeuganda.com for Uganda; http://www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en; www.safex.com.

50. **Only some regional prices react to international prices to correct deviations from their respective long-run equilibrium; the international prices themselves do not react**. This finding is plausible because the East African regional market is very small relative to international markets. The responses of the regional prices to deviations from their long-run equilibrium are of low magnitude and range between 11 percent and 24 percent per period. On average, the regional prices change by 17 percent.

51. **Table 13 presents the long-run PT elasticities for the market pairs characterized by cointegration between regional and international prices**. They differ from 1 considerably, indicating that price signals from international markets are not

explained by the econometric methods used, data frequency, and the length of time series. Including the rare periods of imports from South Africa changes the results of regression significantly, for example. But what is very similar among most reports is a fairly low 'long-term integration' of East Africa maize market with the world markets.

fully transmitted onto regional markets.[36] Table 13 also presents the combined adjustment parameters for each cointegrated market pair and the number of months required to correct a half of disequilibrium. Since only the regional price in each cointegrated market pair changes in response to deviations from the long-run equilibrium, these combined adjustment parameters are equal to the individual adjustment parameters for the corresponding regional markets in Table 12.

Table 12: Estimated adjustment parameters between the world market and the region[37]

		Kenya		Tan	Ugan da	World market			
		Nai-robi	Mom-basa	Dar es Salaam	Kam-pala	US Gulf	Safex	Durban	Mean[a]
Kenya	Nai-robi					-24%			24%
	Mom-basa								
Tan	Dar es Salaam					-11%			11%
Uganda	Kam-pala								
World market	US Gulf								
	Safex								
	Dur-ban								
	Mean[a]					17%			

[a] Calculated for the absolute values of adjustment parameters.

52. **In summary, only some consumption centers in Eastern Africa appear to be integrated with international maize markets and if so, then weakly**. This also holds for the periods of the large imports to the region from South Africa, the prices of which are very strongly linked to the US Gulf prices. The long-run PT elasticities are relatively

[36] The stationarity test of price data indicates that the prices are integrated of order 1 or I(1). The Johansen test is applied to test for long-term equilibrium relationships. Error-correction model is applied to estimate the adjustment parameters. See Annex 5 with the results of ADF stationarity, Johansen, and ECM tests.

[37] A light gray cell without number indicates that the pair was analyzed but that the cointegration test indicates no statistically significant long-run equilibrium relationship between prices in the markets in question. A dark grey cell indicates that prices in the markets in question are characterized by a statistically significant long-run equilibrium relationship.

small and the adjustment parameters indicate that regional markets respond slowly to international price signals. Actually with such adjustment parameters, the deviation from equilibrium between market pairs never gets fully restored.

Table 13: Long-run PT elasticities and combined adjustment parameters for cointegrated regional-international market pairs

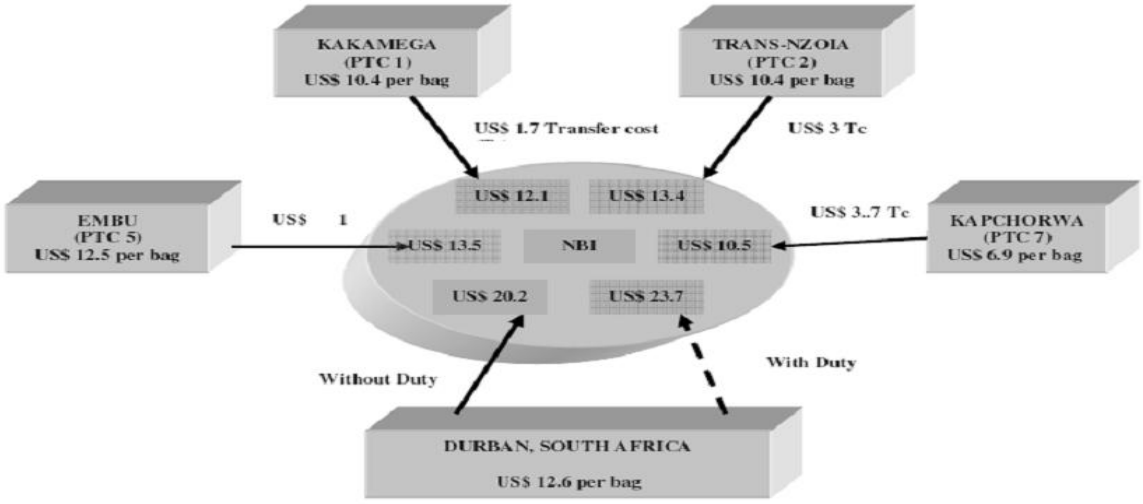
Market A	Nairobi	Dar es Salaam
Market B	US Gulf	US Gulf
PT elasticity	0.563	0.606
Combined adjustment[38]	24%	11%
Months required to correct 50% of price disequilibrium	4.5	7.2

Source: Authors' estimate.

53. **This weak integration is explained by three major reasons**. First, high costs of shipping maize to Mombasa from overseas and a 50 percent common import tariff in the EAC make import prices very high and thus uncompetitive as reported in Haggblade *et al*. (2008) in the years of normal harvest in the region. Figure 14 provides examples of import parity prices in Nairobi from different sources. The landed prices from South Africa are twice as high (both with and without import tariff) as the prices of maize originated from Uganda and Tanzania. Thus, *it is only in the years of very low production when East Africa imports from outside of the region that world market prices really matter*. Second, the region is usually self-sufficient in maize. Uganda and Tanzania produce surpluses to sell to their neighbors, mainly Kenya but also Zambia, Malawi, DRC, Burundi, Rwanda, and increasingly southern Sudan. But the volumes of these exports are small, making it unprofitable to trade overseas (and the qualities do not match international specifications). As a result, the regional price formation is not integrated with the world market. And third, the Eastern African countries produce and consume 'white' maize while 'yellow' maize of feed quality is largely traded on the international markets. The United States and South Africa are the largest exporters of white maize and also the largest suppliers to East Africa in the event of imports (see Annex 2). The difference in variety matters with East African claiming to eat yellow maize only "in the case of starvation". This can also partially explain the weak link to the world prices.

[38] The combined adjustment parameter measures the speed with which deviations from the long-run equilibrium between prices in two markets are corrected. This is shown in the following row (months required to correct 50 percent of price disequilibrium).

Figure 14: Import parity prices in Nairobi from various sources in 2006

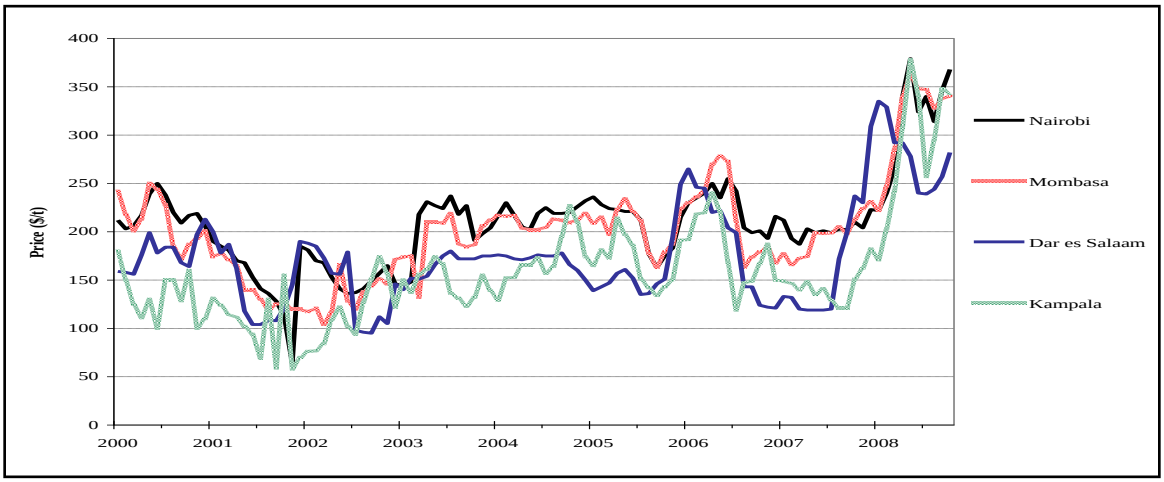


Source: Nyoro (2007).

3.2. Integration of the regional consumption centers

54. **In contrast, the major consumption centers, i.e. Nairobi, Mombasa, Kampala and Dar es Salaam, are well integrated within the East Africa regional market**. This means that the formation of maize prices in each individual country is affected by the price development in other countries. All prices share common characteristics such as a declining trend in 2000/01, increases in 2002/03, a sharp rise in late 2005 followed by a sharp fall in mid-2006, and significant increases beginning in late 2007 (Figure 15).

Figure 15: Wholesale maize monthly prices in Dar es Salaam, Kampala, Mombasa and Nairobi, nominal monthly data, Jan. 2000-Oct. 2008 (US$ per ton)



Source: www.ratin.net, MAFC data for Tanzania, www.infortradeuganda.com for Uganda.

55. **The period of price spikes in the last year has now translated into persistent price volatility around new, higher base levels**. This calls for the use of the risk management instruments. Several risk management instruments show considerable promise in managing food price risks, including facilitation of private storage (warehouse receipt systems), futures and options markets, and weather-indexed insurance (World Bank, 2005). Yet transparent and predictable agricultural trading policy is a pre-condition for these alternatives to be used.

56. **The results of the econometric analysis in Table 14 confirm the presence of a relatively high degree of integration among the major regional consumption markets**. Of the analyzed market pairs, only Mombasa and Dar es Salaam do not share a common long-run equilibrium price relationship. This is plausible since these seaports are the major points of entry for their respective countries but do not trade with one another; most maize trade between Tanzania and Kenya takes place via Arusha.

57. **Nairobi reacts strongly to deviations from its long-run price equilibrium with the other consumption centers**, displaying an average adjustment parameter of 36 percent. In contrast, the price in Dar es Salaam only reacts to deviations from a single long-run equilibrium (with Kampala). With an average price response of 18 percent, Dar es Salaam is the least responsive of all the regional consumption centers. Kampala takes an intermediate place, reacting to deviations in its equilibrium relationships with both Nairobi and Dar es Salaam. Kampala displays an average price response of 28 percent and is especially closely linked to Nairobi.

Table 14: Estimated adjustment parameters between major consumption centers in East Africa

		Tanzania	Kenya		Uganda	
		Dar es Salaam	Nairobi	Mom-basa	Kam-pala	Mean[a]
Tanzania	Dar es Salaam				-18%	18%
Kenya	Nairobi	23%		-52%	-34%	36%
	Mombasa		23%			23%
Uganda	Kampala	23%	34%			28%
	Mean[a]	23%	28%	52%	26%	

[a] Calculated for the absolute values of the percentage changes expressing the average magnitude of PT.

58. **With the exception of Dar es Salaam/Kampala, the long-run PT elasticities are relatively close to 1, which indicates that price signals are transmitted relatively**

completely in the long run (Table 15). Furthermore, with the exception of Dar es Salaam/Nairobi, the combined adjustment parameters are quite high, ranging from 41 to 75 percent. Hence PT between these markets is relatively rapid, especially in the case of Nairobi/Mombasa and Nairobi/Kampala.

Table 15: Long-run PT elasticities and total price changes between the major consumption centers

Market A	Dar es Salaam	Dar es Salaam	Nairobi	Nairobi
Market B	Nairobi	Kampala	Mombasa	Kampala
PT elasticity	1.225	0.521	0.884	0.743
Combined adjustment	23%	41%	75%	67%
Months required to correct 50% of price disequilibrium	3.5	2.7	1.3	1.5

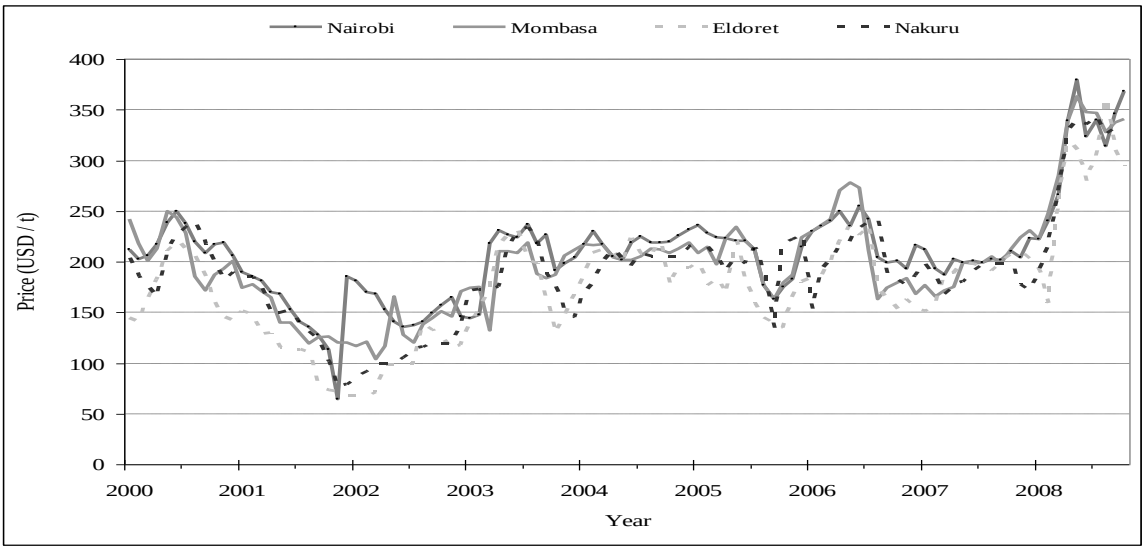
Source: Authors' estimate.

3.3. Integration between production and consumption centers

59. **What is the nature of price integration between production and consumption areas in the reviewed countries?** The results indicate that maize markets in Kenya, Tanzania and Uganda are integrated, although the degree of integration varies. Kenya and Uganda, both individually and together, represent a relatively integrated market, with comparatively high long-run elasticities of PT and adjustment parameters correcting deviations from long-run equilibrium levels. While there is some evidence of integration within Tanzania and between Tanzania and Kenya, PT involving Tanzania is for the most part found to be considerably weaker and slower than in the rest of the region. This is presented in detail below.

60. **Visually, the prices in the four Kenyan markets are well-cointegrated** (Figure 16). Production areas are represented by Nakuru and Eldoret. The strong price integration in Kenya is also supported by the econometric analysis in Table 16. The estimated long-run price elasticities are relatively close to 1, and the combined adjustment parameters for individual market pairs are large, reflecting a relatively high degree of PT and market integration in Kenya.

Figure 16: Maize prizes in major markets in Kenya, Jan. 2000-Oct. 2008 (US$ per ton)



Source: www.ratin.net

Table 16: Long-run PT elasticities and total price changes in Kenya

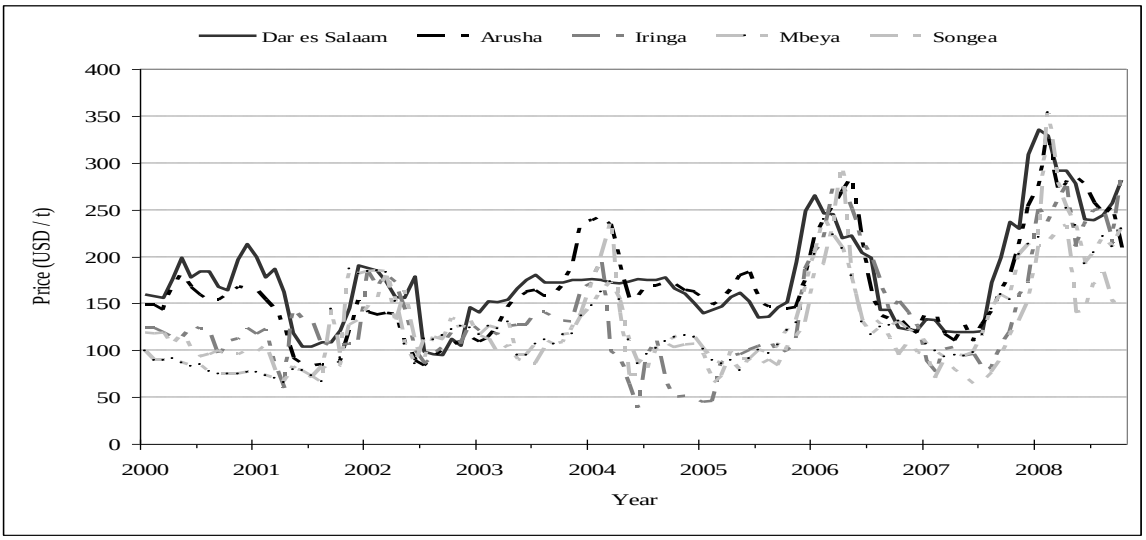
Market A	Nairobi	Nairobi	Nairobi	Mombasa	Mombasa	Eldoret
Market B	Mombasa	Eldoret	Nakuru	Eldoret	Nakuru	Nakuru
PT elasticity	0.884	0.652	0.715	0.743	0.820	1.116
Combined adjustment	75%	67%	65%	55%	40%	38%

Source: Authors' estimate.

61. **The market pairs in Tanzania are less integrated than in Kenya.** Based on price developments, there are two broad groups of maize markets there. Prices on the two markets in the upper half of the country, Dar es Salaam and Arusha, have similar levels and move together over most of the study periods (Figure 17). Prices in the three production regions in the South of the country (Mbeya, Songea and Iringa) are lower in most periods, and while they also move together, the relation between them appears to be looser. Furthermore these prices are more volatile than those in Dar es Salaam and Arusha. Prices in the four production regions peak every two years, and Dar es Salaam follows these peaks in most years (2004 is an exception). The average maize price level in Tanzania is roughly US$50 per ton lower than in Kenya (compare to Figure 16).

62. **While the combined adjustment parameters for market pairs that include Dar es Salaam are moderate (with the exception of Dar es Salaam/Mbeya they are all over 27 percent), the integration between the production centers in Tanzania is only moderate or weak**, ranging from 5 percent to 29 percent (Table 17). Hence, PT between the latter is generally very slow, and it takes many months for price signals on one market to be incorporated into prices on other markets. Overall, note that the strongest combined rate of adjustment in Tanzania (35 percent between Dar es Salaam and Arusha), is smaller than the weakest combined rate in Kenya (38 percent between Eldoret and Nakuru, see Table 16).

Figure 17: Maize prizes of major markets of Tanzania, Jan. 2000-Oct. 2008 (US$ per ton)



Source: MAFC and www.ratin.net

Table 17: Long-run PT elasticities and total price changes in Tanzania

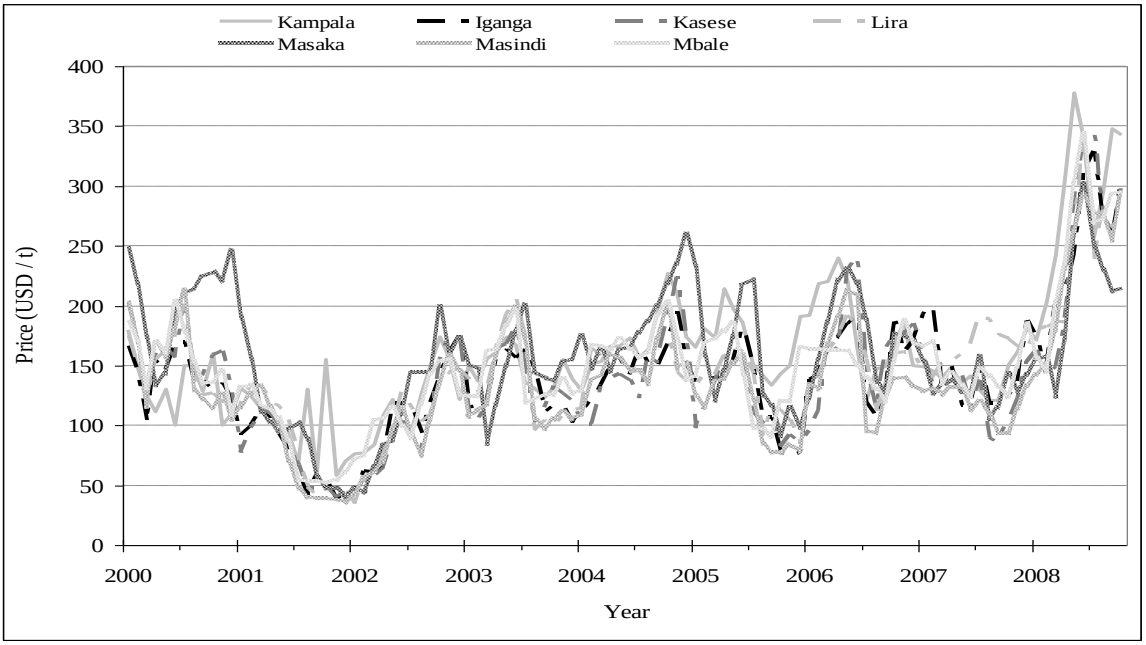
Market A	Dar es Salaam	Dar es Salaam	Dar es Salaam	Dar es Salaam	Arusha	Arusha	Iringa	Iringa
Market B	Arusha	Iringa	Mbeya	Songea	Iringa	Songea	Mbeya	Songea
PT elasticity	0.908	0.734	0.196	1.224	-0.73	4.991	1.05	1.37
Combined adjustment	35%	30%	17%	27%	5%	5%	27%	29%

Source: Authors' estimate.

63. **In Uganda, market integration is estimated to be somewhere between Kenya and Tanzania**. Figure 18 indicates that the seven Ugandan price series are similar in levels and display close co-movement over the entire observation period. Maize prices in Masaka tend to be the highest most of the time, but in 2008, the Kampala price began to increase first and attained the highest level. As is the case in Tanzania, prices in Uganda fluctuate round US$150 per ton level, but the average rate rose in 2008.

64. **PT between the three producing areas in the East of Uganda close to the Kenyan border (Lira and Mbale) is very strong**; the combined adjustment parameters between 57 and 64 percent are among the highest estimated in this report (Table 18). Furthermore, the long-run PT elasticities are all relatively close to 1. Hence price signals are transmitted both relatively quickly and completely on Ugandan markets.

Figure 18: Maize prizes of major markets of Uganda, Jan. 2000-Oct. 2008 (US$ per ton)



Source: www.ratin.net and www.infortradeuganda.com.

Table 18: Long-run PT elasticities and total price changes in Uganda

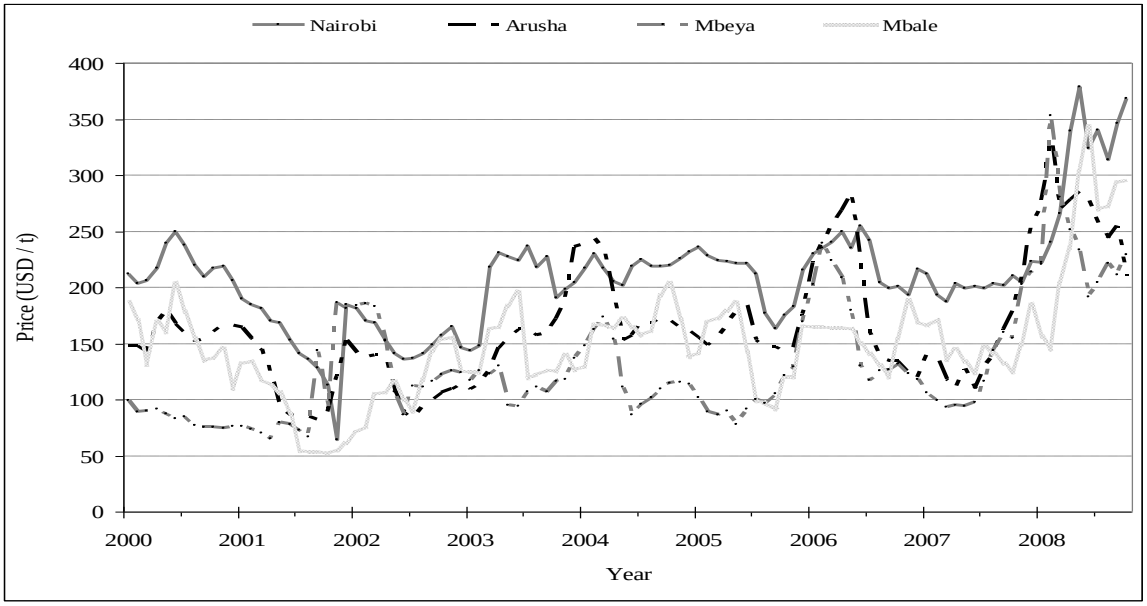
Market *A*	Kampala	Kampala	Kampala	Kampala	Iganga	Iganga	Mbale
Market *B*	Masaka	Mbale	Lira	Masindi	Mbale	Lira	Lira
PT elasticity	1.038	1.059	0.906	0.873	1.134	0.993	0.877
Combined adjustment	28%	35%	28%	33%	64%	61%	57%

Source: Authors' estimate.

3.4. Integration of production-export areas in Uganda and Tanzania with the consumption market in Nairobi

65. **Three production-export markets in Tanzania and Uganda were selected for the analysis of PT with Nairobi**. Mbale was selected because the results for Uganda presented above indicate that Mbale plays a key role among the maize production markets in Eastern Uganda that export large quantities of maize mainly to Nairobi. In Tanzania, the production markets Arusha in the North and Mbeya in the South were selected. Figure 19 presents some evidence of price co-movement on these markets. The price in Nairobi is generally highest, as expected for the importing market, and the margin between the highest and lowest of the four prices is greater than US$100 per ton over most of the study period.

Figure 19: Maize prices of Nairobi, Arusha, Mbeya and Mbale, Jan. 2000-Oct. 2008 (US$ per ton)



Source: www.ratin.net, MAFC data for Tanzania, www.infortradeuganda.com for Uganda.

66. **The econometric results indicate that prices in Nairobi have a long-run equilibrium relationship with prices in Arusha, Mbeya, and Mbale**. According to Table 19, the response to deviations from these long-run equilibrium is strongest in the case of Mbale (combined adjustment of 65 percent), intermediate in the case of Arusha (combined adjustment of 37 percent) and weakest in the case of Mbeya (adjustment of 16 percent by Nairobi alone). Altogether, the evidence presented in this section and above confirms that Nairobi plays a key role as a regional market hub that is integrated with other markets in Kenya and also with markets in neighboring Tanzania and Uganda.

Table 19: Long-run PT elasticities and total price changes from Uganda and Tanzania to Nairobi

Market A	Arusha	Mbeya	Nairobi
Market B	Nairobi	Nairobi	Mbale
PT elasticity	1.164	0.769	0.656
Combined adjustment	37%	16%	65%

Source: Authors' estimate.

3.5. Price transmission, country effects, border effects and geographic distances between market pairs

67. **As the geographic distance between two markets increases, PT between them can be expected to weaken, all other things being equal**. Transfer and transaction costs will generally increase with distance, making arbitrage more costly and increasing the average time required to complete a transaction. Of course, the quality of the infrastructure joining two markets can modify the effect of distance on PT; distant markets that are linked by good infrastructure (e.g. a paved highway) might display a

higher degree of PT than nearby markets that are linked by a dirt road.

68. ***Ceteris paribus*, international borders can also be expected to weaken PT**. Crossing a border usually involves formal (and sometimes informal) costs and delays. The effect of a border will depend on the nature of customs procedures, whether border stations are well staffed, whether procedures are transparent and automated, and, where informal trade is prevalent, whether there are high costs of evading border controls.

69. **Finally, along with general distance and border effects there may also be country effects that result when PT within or with a particular country is stronger or weaker than in its neighbors**. Country effects could be caused by differences in the quality of physical infrastructure or the institutions that govern or influence trade (e.g. the quality of roads, contract enforcement, etc.).

70. **The following results are based on all market pairs analyzed in the preceding sections of this report**. They demonstrate that *country, distance, and borders do have a significant impact on PT between Eastern African maize markets*. Table 20 shows that average long-run PT elasticities are highest for pairs of markets within a country (no border), intermediate for pairs of markets that are separated by a regional border (between Kenya and/or Tanzania and/or Uganda), and lowest for pairs of markets that are separated by a border to the rest of the world. It also shows that long-run PT elasticities are considerably higher inside Uganda and Kenya (roughly 0.9 and 0.8, respectively) than inside Tanzania (roughly 0.5).

Table 20: Average long-run PT elasticities and combined adjustment parameters for the 51 analyzed pairs of markets in Eastern Africa

PT parameter	No border				Regional border			Border to rest of world (n=)
	All pairs (n=26)	Pairs in Kenya (n=6)	Pairs in Tanzania (n=11)	Pairs in Uganda (n=9)	All pairs (n=13)	Border with Tanzania (n=6)	Border without Tanzania (n=7)	
Average long-run PT elasticity	0.705	0.785	0.498	0.905	0.667	0.741	0.603	0.581
Average combined adjustment	37%	61%	20%	42%	47%	26%	65%	16%

Source: Authors' estimate.

71. **More robust evidence of the link between distance and the speed of price transmission can be obtained by taking non-linearity, border effects involving Tanzania and Nairobi's role in regional market integration into account**. Table 21 presents the results of regressing the combined adjustment parameters for the 39 market pairs in the region on distance, distance squared, a dummy variable that equals 1 whenever the markets in the pair are separated by a border to Tanzania, and a dummy that equals 1 whenever Nairobi is a member of the market pair. The results in Table 21 demonstrate that the impact of distance on combined rates of adjustment is non-linear, with combined rates of adjustment falling at a declining rate as distance increases. While

the combined rate of adjustment for direct neighbors is estimated to equal 54.2 percent, it falls by 22.9 percent to 31.3 percent for markets that are separated by 500 km, and by an additional 5.4 percent to 25.9 percent for markets that are separated by 1,000 km. That combined rates of adjustment (i.e. the speed of PT) should fall at first rapidly but then progressively slower with increasing distance between markets is plausible since not all costs of trade will be variable with distance, and fixed cost components per unit of distance will fall as the distance increases.

Table 21: The impact of distance and border effects on combined rates of adjustment: regression results (dependent variable is the combined rate of adjustment)

Variable	Coefficient	Standard error	t-statistic	p-value
Constant	54.20	8.49	6.38	0.000
Distance (100km)	-6.33	2.75	-2.29	0.028
$(Distance)^2$	0.35	0.19	1.85	0.073
$D_{Nairobi}$	30.55	5.87	5.21	0.000
$D_{BorderToTanzania}$	-26.45	8.67	-3.05	0.004
n = 39	$R^2 = 0.500$		Adj.$R^2 = 0.441$	

Source: Authors' estimate.

72. **Table 21 also points to a significant positive 'Nairobi effect' on PT, and a significant negative effect of border crossings that involve Tanzania**. All other things being equal, the combined rate of adjustment is approximately 30.5 percent higher if Nairobi is a member of the market pair in question. Hence, the combined rate of adjustment between Nairobi and a market that is located 100 km away will equal almost 80 percent meaning that deviations from the long-run equilibrium relationship between prices on these markets will be almost completed corrected within two months.

73. **But if trade between the markets in question involves crossing a border with Tanzania, the combined rate of adjustment falls by roughly 26.5 percent**. This explains in particular why PT between Nairobi and relatively distant markets in Uganda is relatively strong (e.g. the combined rate of adjustment between Nairobi and Lira, which are located 730 km apart, is 59 percent - the regression predicts 57 percent), while PT between Nairobi and closer markets in Tanzania is comparatively weak (e.g. the combined rate of adjustment between Nairobi and Arusha, at a distance of only about 300 km, is 37 percent – the regression predicts 44 percent).

3.6. Effect of export ban in Tanzania on price transmission

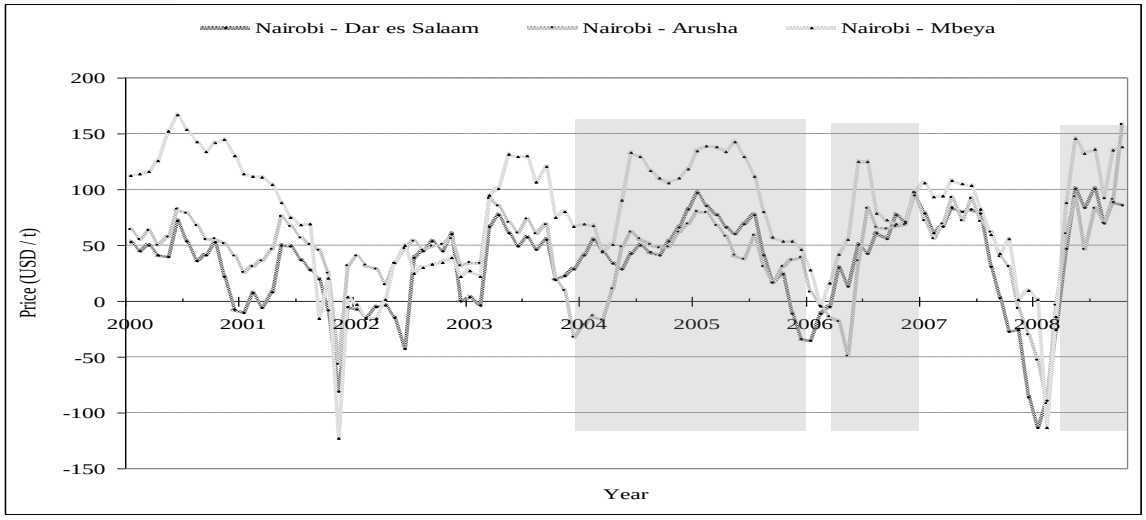
74. **Is the lower price integration of Tanzania partially explained by the bans imposed on maize export?** The exact magnitude of its impact on maize prices is difficult to quantify. First, the export ban is not the same as export tax that can be converted into *ad valorem* tariff with its impact estimated. Second, Tanzanian borders are porous and cross-border trade reportedly keeps flowing despite the ban, according to the Eastern Africa Grain Council, which regularly monitors cross-border grain trade in Eastern and Southern Africa. Despite these difficulties, one way of estimating the ban's impact is to analyze margins between the major export market (Kenya) and prices in Tanzania. If the

bans are effective, they should increase margins.

75. **The price margins are indeed found to have been affected**. Figure 20 presents the margins between Nairobi and three markets in Tanzania: Dar es Salaam, Arusha, and Mbeya (the periods with ban are shaded). The visual evidence suggests that periods with bans are often associated with higher margins. This is supported by the evidence in Table 22. Based on T-tests of differences in means there were statistically significant (at the 5 percent level) differences between average margins in phases with and without export bans for Nairobi-Dar es Salaam and Nairobi-Mbeya. As expected, *these differences were such that margins were higher in phases with export bans than in phases without. For Nairobi-Arusha, however, the increase in margins in phases with export bans was not large enough to be statistically significant*.

76. **Thus, the impact of the export ban differs across regions**. It has a significant effect on the prices of maize from the Southern Highlands but little effect on that from the Northern Highlands. The reasons are that the cross-border trade between the Northern region and Kenya is reported to take place whether the ban is in effect or not, and because of significant price incentives for Northern Highlands' farmers and traders to export to Kenya.[39] As illustrated in Figure 21, wholesale prices in Arusha are identical to those in Dar es Salaam, in spite of about 600 km distance between these two cities.[40] But Arusha prices are highly competitive in Nairobi with the price margin in the last two years averaging US$70 per ton.

Figure 20: Price margins and Tanzanian export bans (ban in effect in the shaded periods)



Source: www.ratin.net.

[39] The Eastern Africa Grain Council, www.ratin.net.

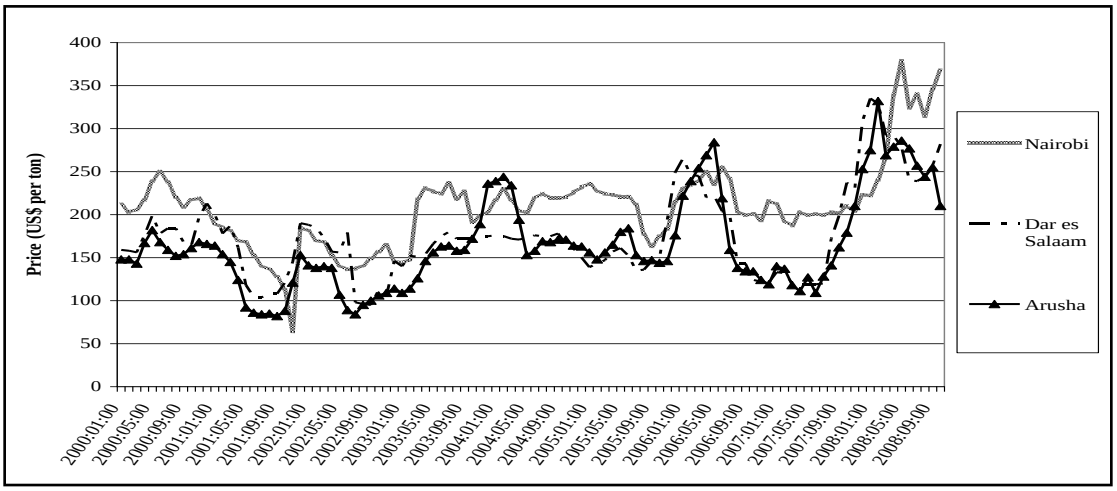
[40] Dar es Salaam is supplied from the Southern Highlands where the prices (proxied by Mbeya) were US$45 per ton lower than in Dar es Salaam during 2001-2008.

Table 22: Comparison of average margins in phases with and without Tanzanian export bans

Margin	Average margin		Value of the t-statistics	p-value	Conclusion
	No ban	Ban			
Nairobi - Dar es Salaam	46.5	59.8	-2.60	0.006	Increase
Nairobi – Arusha	52.1	60.5	-1.59	0.059	No increase*
Nairobi – Mbeya	81.5	97.2	-1.89	0.031	Increase

Note: * No significant increase at the 5% level, but significant at the 5.9% level.
Source: Authors' estimate.

Figure 21: Wholesale prices in Nairobi, Arusha and Dar es Salaam (US$ per ton)



Source: www.ratin.net and national statistics.

77. **Exports to Kenya originate mainly from the Northern Highlands and Lake Region** (see Figure 4). Total production in the Northern Highlands (Arusha and Kilimanjaro) and the Lake Region (Mara, Mwanza, Kagera and Shinyanga) was estimated at 834,000 tons in 2007/08, and about 17 percent of this output goes to Kenya. Potentially, more maize could have been exported to Nairobi but the weak transmission of price signals and high domestic costs make it unprofitable for maize coming from the Southern Highlands, the grain basket of the country.

78. **As shown above, the market integration of Tanzania with East African markets is the slowest and weakest**. The export ban is likely to have been among the reasons of this weak price integration, including within the country. While the slow market integration between Arusha and Mbeya (and Iringa) can be partially explained by the long distance and stronger linkages of the Southern Highlands with Zambia, Malawi and DRC, the low price transmission among Songea, Iringa, Mbeya, and Dar es Salaam is not possible to attribute solely to distances. While the objectives of the ban, i.e. limiting cross-border trade and lowering maize prices, were partially achieved, it has brought negative side-effects. An export ban is price control and the price control reduces potential output, causing losses to the economy. Lower output prices result in lower incentives for farmers to produce greater output; this hurts net buyers since maize output is kept below its potential. Having the export ban simply means lower agricultural growth and lower returns from public investments in roads and agricultural public goods.

79. **In addition, export bans make it impossible to use market-based risk management instruments**. With the increased food price volatility in East Africa and on the world markets, these instruments become critical to mitigate price risk. Yet, transparent and predictable agricultural trading policy is a pre-condition for these alternatives to be used in East Africa and in any other region of the world. This precondition is not met in East Africa, however.

4. Estimating Grain Marketing Costs

80. **This chapter presents a diagnostic analysis of marketing costs of maize in domestic and cross-border trade in East Africa**. The objective is to identify constraints and propose remedies for further strengthening market integration. The potential for lowering marketing costs is large and the stakes are high, given the rising food prices, their negative impact on food diet, and critical importance of lower marketing costs for pro-poor economic growth in East Africa.

81. **In spite of the recent improvements, cross-border trade remains limited**. Reducing cross-border costs would further improve market integration and thus enhance the efficiency of agricultural production in the region. But the analysis below clearly shows that reducing costs at the border would be insufficient to unleash the full potential. The key is to reduce domestic costs since they make trade unprofitable even if export prices go up and the costs of crossing the border are reduced.

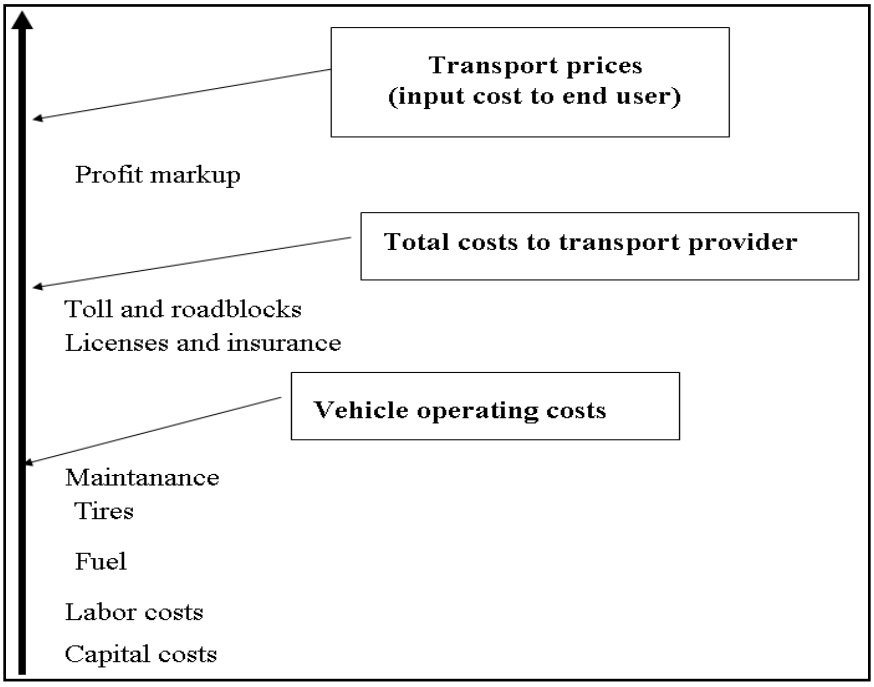
4.1. Methodology

82. **The supply chain analysis is utilized to estimate and analyze the costs of intra- and inter-country maize trade**.[41] All marketing/transaction costs are estimated across three major segments of the domestic supply chains: (i) from farm-gate to primary market (usually located in small rural towns); (ii) from primary to secondary markets (usually located in regional capital towns); and (iii) from secondary to wholesale market (located in large regional cities and countries' capitals). In addition, the costs of cross-border trade, both formal and informal, of eastern Uganda with Kenya are estimated.[42] Such an analysis helps effectively isolate the constraints at domestic and regional levels that affect maize trade in a systematic manner.

83. **The supply chain analysis is complemented by the analysis of transport prices and costs as outlined in Teraveninthorn and Raballand (2009)**. Transport prices paid by end users (farmers and traders) are analyzed for various modes of transportation and then compared with transport costs. Transport costs are disaggregated into vehicle operating costs (VOC) and indirect costs. VOC include various fixed and variable costs of operating vehicles. The fixed transport costs are comprised of labor costs, financing costs, depreciation, and administration costs. The variable transport costs include fuel, tires, maintenance, and batteries. Transport costs also include other indirect costs such as road toll, roadblock and weighbridge payments, licenses, and insurance expenses. The three tiers of cost factors are depicted in Figure 22.

[41] The supply chain approach is described in detail in Webber (2008), IFC (2007), and Tallec and Bockel (2005).
[42] The costs of cross-border trade between Kenya and Tanzania were not possible to collect because of the formal export ban and the refusal of traders to share the unbiased information.

Figure 22: Structure of transportation costs and prices



Source: Teraveninthorn and Raballand (2009).

84. **There are both domestic (internal) and cross-border non-tariff measures**. These are grouped into World Trade Organization (WTO)-consistent (i.e. regulations and taxes) and non-WTO consistent (nationals' discrimination, delays at weighbridges, bribes, etc.).[43] Local cess, which is often reported as major non-transport cost for grain trade, is studied in detail to assess the potential for reducing uncertainty in the tax base and tax collection (and thus increasing farm-gate prices) while maintaining (and eventually increasing) the budget revenue of local authorities from this tax.

85. **While a number of studies have identified aggregate costs and obstacles to trade in Eastern Africa, the estimates of the importance of these obstacles are rare**. Not all obstacles are equally constraining, and there has been no analytical work done that systematically quantifies the relative importance or magnitudes of these constraints on grain marketing and trade in the countries and the region under review.[44] A key focus here, therefore, is to fill this gap by presenting the magnitude and nature of different obstacles at various stages of the supply chains. This information will improve the understanding of the nature of the obstacles and assist in prioritizing policy interventions

[43] This approach follows the grouping of non-tariff measurers on goods trade in the EAC used in World Bank (2008b).

[44] In 2003-2004, RATES prepared maize baseline studies for the countries under review with some aggregated information on marketing and transaction costs. The recent World Bank (2008b) analytical work focused on estimating export and import parity prices and adjustment costs in these countries but not domestic and cross-border trade costs. The International Livestock Research Institute, a CGIAR center in Nairobi, has studied the costs of trading maize and cattle in Kenya, Tanzania and Uganda, but they are estimated at an aggregate level. Finally, there are many World Bank and non-World Bank studies (both project and non-project related) on the efficiency of grain supply chains in these countries (not all of which are known to the authors of this report), which are reported in Minot and Rashid (2008). The detail contained in this Report is rare or not available at all.

to achieve meaningful improvements in the grain trade.

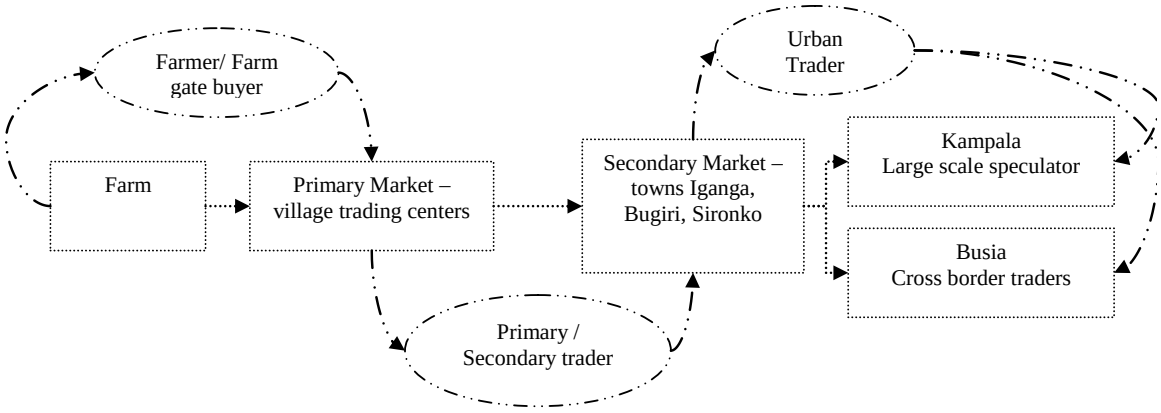
86. **The primary data for this report was collected from major producing and consuming zones in the Eastern African region during November-December 2008**.[45] As with the price transmission analyses in Chapter 3, the districts of Nakuru and Eldoret (North Rift) were selected to represent the producing zones of Kenya (with the primary market located in Moiben) while Nairobi is proxied as the urban area. The data for Tanzania was collected from Njombe in Iringa (Southern Highlands), the producing areas supplying Dar es Salaam; and the data for Uganda comes from Iganga and Bugiri (Busoga Region) of Uganda, producing zones supplying Kampala, and Sironko, as well as Mbale and Kapchorwa districts, which supply maize to Kenya through Busia. Overall, the information was received from about 400 respondents, including farmers, traders, transporters, and other market informants.

87. **There is no unified supply chain for maize**. In the typical maize trading set-up, for example in Uganda, the grain moves from farm-gate to primary markets, which are usually small rural town trading centers (Figure 23). Maize is usually brought to these centers either by primary traders or in rare cases by farmers themselves. Grain then moves into the secondary markets; these are usually maize collection points found in the big towns like Iganga, Jinja, Bugiri, Mbale, and Sironko. Maize is brought to these points either by primary traders or secondary traders who collect the maize from the rural towns. At higher levels of the supply chain, beginning from secondary markets, traders usually hire trucks/lorries with an average capacity of 10MT to deliver maize to wholesalers and millers found in the wholesale markets and larger urban areas like Kampala and Busia. In this case the buyers are referred to as large-scale speculators.[46] Thus, transporters are the facilitators of trade but not traders themselves.

88. **It does not mean that all intermediate steps are always involved in getting maize to urban markets**. In Kenya the large farms produce about 250 tons of maize, compared to 4 tons by small farms and 25 tons by medium farms. This allows some traders to purchase sufficient volumes of maize at one farm-gate to make it worthwhile to deliver it directly to urban areas, bypassing the intermediate stages of the supply chain (see Table 29 for an example). In the course of the month after harvest, some traders move about 389 tons of maize from farm-gate to millers in Kenya, and in a six month period the average sales on this route reach 2,250 tons per trader involved (Table 23). But most of the maize goes through various stages of the supply chains, and as expected, traders operating higher in the chain are dealing with large quantities of grain. Table 23 shows the magnitudes of maize sold per the interviewed trader at various stages of supply chain.

[45] The survey was undertaken by the team of the EAGC led by Bridget Okumu and Sophie Walker.
[46] In Kenya and Tanzania, 5 MT Lorries are usually rented at earlier stages of the supply chain. See the analysis below.

Figure 23: Typical supply chain for maize in Uganda



Source: World Bank survey carried out in November-December 2008.

Table 23: Tons of maize sold per trader along the domestic supply chains

Category Type	1 month	6 month	1 year
		Kenya	
Farm-gate to primary market trader	9	61	110
Primary to secondary market traders	97	578	1,200
Primary to wholesaler trader	163	858	1,156
Secondary to wholesaler	216	1,224	2,689
Primary to miller traders	105	351	743
Urban trader	224	746	892
		Uganda	
Farm-gate traders	4	13	27
Primary market trader	4	13	39
Secondary market trader	109	522	835
Urban trader	97	568	1,079
Large scale speculators	61	289	462
		Tanzania	
Farm-gate to primary market trader	5	32	108
Farm-gate to urban market	5	32	65
Primary to secondary market traders	2.8	15	21
Primary to wholesaler trader	63	378	756
Secondary to wholesaler	37	216	432
Urban trader	8	49	97

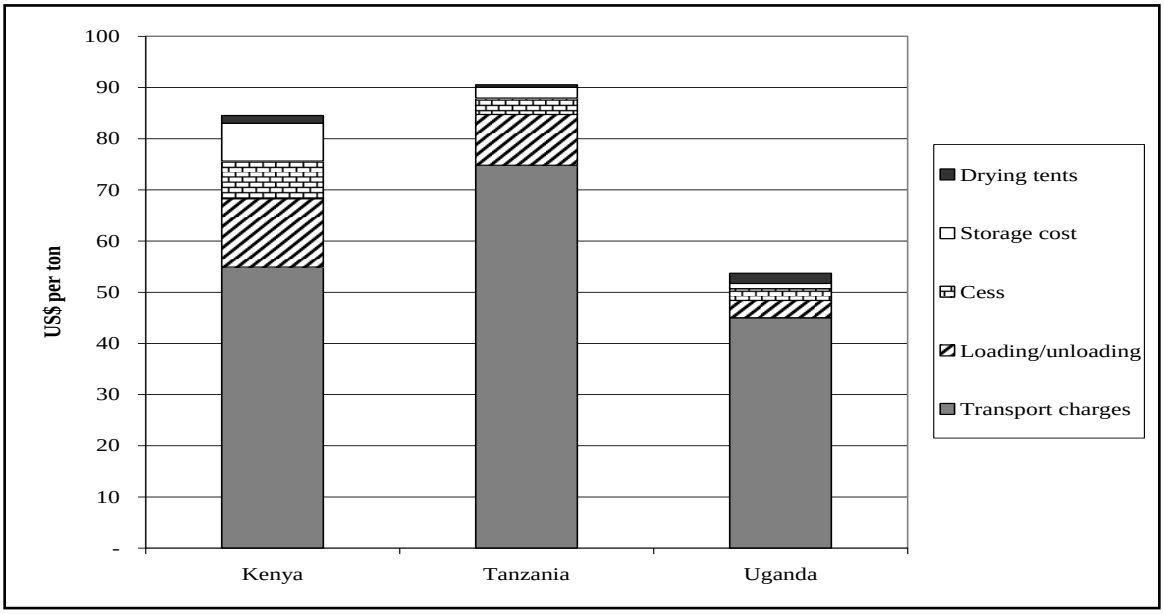
Source: World Bank survey carried out in November-December 2008.

4.2. Total marketing costs in domestic supply chains

89. **Based on the survey of farmers, traders and transporters carried out for this study, the total marketing costs along the domestic supply chains were found to**

average US$72 per ton.[47] As depicted in Figure 24 and Table 25, per ton marketing costs are estimated at US$53.7 in Uganda, US$85.5 in Kenya, and US$90.5 in Tanzania. When compared with the average derived margin between farm-gate and wholesale prices in the countries' capitals in Table 24 (column C), the estimated marketing costs (column D) are about 80 percent (column E). The remaining 20 percent are not only profit margins of traders as this may include (i) costs omitted in this report such as trader licenses and other permits; (ii) differences in distances between farm-gate and wholesale markets; (iii) difference in modes of transportation that imply variance in transport prices; and (v) errors, including those of in price estimates.

Figure 24: Total costs of trading maize from farm-gate to wholesale market/millers (US$ per ton)



Source: World Bank survey carried out in November-December 2008.

90. **The importance of marketing costs as a share of farm-gate prices is similar in Kenya and Uganda and larger in Tanzania**. As estimated in column F of Table 24, the share of marketing costs in farm-gate prices is 33.3 percent in Kenya and 28.6 percent in Uganda but 50.2 percent in Tanzania. Variance in shares is explained by differences in both marketing costs and farm-gate prices. Kenya has the highest farm-gate prices in East Africa because of its net-importing position and the NCPB activities (see Chapters 2) while Uganda has the lowest marketing costs with relatively low prices. Tanzania has the highest marketing costs and thus the lowest farm-gate prices due to the poor quality of rural roads, long distances, but also the export bans.

[47] The exchange rates used in this report are the following: 1US$ is equivalent to 78 Kenya shillings; 1,247 Tanzanian shillings; and 1,952 Ugandan shillings.

Table 24: Comparison of derived and estimated margins between farm-gate and wholesale markets (US$ per ton)

Countries	Farm-gate price	Wholesale prices	Derived margin	Estimated margin (marketing costs)	Ratio of margins	Share of estimated margin in farm-gate price, %
	A	***B***	***C***	***D***	***E***	***F***
Kenya	256.4	352.0	95.6	85.6	0.89	33.3%
Tanzania	180.4	286.0	105.6	90.5	0.86	50.2%
Uganda	187.5	258.0	70.5	53.7	0.76	28.6%

Note: Farm-gate prices were collected by EAGC and the wholesale prices are for Nairobi, Kampala, and Dar es Salaam in November 2008. Marketing costs are from Figure 24.

Source: Authors' estimate based on World Bank survey carried out in November-December 2008 and www.ratin.net

91. **Transport charges make up about 76 percent of total marketing costs**. The relative share of these costs varies from 64 percent of total costs in Kenya to 84 percent in Uganda and Tanzania (Table 25 and Figure 24). The second largest cost is hired labor for loading and unloading trucks. It amounts to 11.7 percent of total marketing costs, ranging per ton from US$3.4 in Uganda to US$13.3 in Kenya. These costs are quite high because a maize bag often goes through a number of markets before reaching the final consumer in large cities and thus requires loading and unloading at each intermediate stop. These costs are also inflated by weak enforcement of contractual agreements, weak standard/grade compliance, and thus, a lack of trust between sellers and buyers, as well as unloading required for taxation purposes. Other marketing costs include local cess, storage costs and drying tents.

Table 25: Marketing costs at various stage of the supply chain (US$ per ton)

Market segment	Cost element	Kenya	Tanzania	Uganda
Farm-gate-primary market	Storage/rental fee	2.10	0.80	0.30
	Transportation charges	1.80	6.40	4.50
	Hired labor loading/unloading	1.42	1.92	
	Council cess	3.13	1.60	
	Roadblocks and weighbridges	0.93		
	Drying tent/empty bags	n/a		
	TOTAL SEGMENT 1	**9.38**	**10.72**	**4.80**
Primary-secondary market	Storage/rental fee	2.50	1.20	0.33
	Transportation charges	20.10	27.00	16.50
	Hired labor loading/unloading	5.70	4.00	1.43
	Council cess	1.35	1.60	1.30
	Drying tent/empty bags	1.50	0.5	2.00
	TOTAL SEGMENT 2	**31.15**	**34.30**	**21.56**
Secondary-wholesale market/miller	Storage/rental fee	2.80	0.11	0.40
	Transportation charges	33.00	41.40	24.00
	Hired labor loading/unloading	6.27	4.00	1.96
	Council cess	2.85	0.0	0.98
	TOTAL SEGMENT 3	**44.92**	**45.51**	**27.34**
	TOTAL COSTS	**85.45**	**90.53**	**53.70**

Source: World Bank survey carried out in November-December 2008.

92. **In absolute terms, the most costs are incurred during the last two segments of the supply chain (primary-secondary markets and secondary-wholesale markets)**. According to Table 25, the costs incurred from farm-gate to primary markets (on rural roads) account for only 10-15 percent of total marketing costs. But in relative terms, per ton-km US$ costs are larger from farm-gate to secondary markets than from secondary to wholesale markets due to the poorer quality of rural roads (see Table 38) and the low volumes of trade at the first stages of the supply chain (see Table 23). How are these costs derived? Are the transport prices excessive, compared to transport costs? What is the share of non-tariff measures in transport prices? How to reduce the impact of non-tariff measures on traders' costs? Should the cess tax be decreased (or even abolished) and if so, what is the alternative for local budget revenues? These and other questions are answered in the analysis below.

4.3. Transport prices and costs

93. **As shown above, the payments for transportation services make up the major share of marketing costs**. The analysis of marketing costs, therefore, begins with an assessment of transport charges, staring from the first stage of the supply chain, i.e. from farmer to primary markets.

94. **For sales, maize is brought from farm to primary markets mainly by traders but sometimes by farmers themselves**. The common mode of transportation on this route is either bicycle (Uganda) or hired trucks (Kenya and Tanzania) (Table 26). Other methods include carts (used mainly in Tanzania and Uganda), public buses (Tanzania), and own transport (Kenya and Uganda). *For the purpose of the analysis, the commonly used mode of transportation in Kenya and Tanzania is assumed to be hired vehicles (5*

MT Lorry), while in Uganda bicycle.

Table 26: Major modes of transportation by farm size and countries from farm-gate to primary markets (in percent to total)

	Kenya			Uganda		Tanzania		
	Small scale	**Medium scale**	**Large scale**	**Small scale**	**Medium scale**	**Small scale**	**Medium scale**	**Large scale**
Cart	9			5	20	18		33
Bicycle	18			80	16			
Public vehicle					4	12		
Hired trucks	64	46	75	15	60	70	100	67
Own transport	9	54	25					
Overall	100	100	100	100	100	100	100	100

Source: World Bank survey carried out in November-December 2008.

95. **Transport prices at the first stage are the highest in Uganda, at US$1.5 per ton-km** (Table 27). This is mainly due to the high cost of using bicycles as the common mode of transportation.[48] The transport prices (paid by end users) in Kenya and Tanzania are lower and are estimated at US$0.3 and US$0.4 per ton-km, respectively.[49] However because of very short average distances between farm-gate and primary markets in Uganda (3-5 kilometers), total transport charges for end-users there are smaller than in Tanzania, which has the highest total transport price per ton among the reviewed countries. Overall, transport charges for the first stage of the supply chain are quite low relative to the farm-gate prices.

[48] The payment is made to hired labor carrying maize bags on their bicycles to primary markets.

[49] Transport prices for other (intermediate) modes of transportation in Kenya and Tanzania are much higher than for hired trucks. In Tanzania, for example, the transport price of public buses is estimated at US$0.9 and for carts US$1.0 per ton-km.

Table 27: Transport prices and distances between farm-gate and primary markets

	Maize price, US$ per ton	Transport price, US$ per ton-km	Distance to primary market, km	Transport price from farm-gate to primary market, US$ per ton
	Kenya			
Small scale	256.4	0.3	6	1.8
Medium scale	256.4	0.3	9	2.7
Large scale	256.4	0.3	10	3.0
	Tanzania			
Small scale	180.4	0.4	15	6.0
Large scale	180.4	0.4	17	6.8
	Uganda			
Small scale	187.5	1.5	3	4.5
Medium scale	187.5	1.5	5	7.5

Source: World Bank survey carried out in November-December 2008.

96. **The preferred modes of transportation after the primary markets are 5 and 10 metric ton trucks**. In Kenya for transport between the primary and secondary markets, traders prefer to rent a 5MT Lorry. Thereafter it seems more profitable to rent a 10MT Lorry due to the larger quantities of maize to be moved (Table 28). In both Tanzania and Uganda, a 10MT truck is the mostly common mode of transportation beginning already from the primary market, while some traders use trucks with a capacity of between 24 and 32 metric tons. Average distances between market pairs are shortest in Uganda and longest in Tanzania. The average distance between secondary and wholesale markets is about 80 km in Uganda (from Jinja to Kampala), 300 km in Kenya (from Eldoret to Nairobi), and 345 km in Tanzania (from Kibagwa market to Dar es Salaam). The longer the distance between the markets, the larger the transportation charges per trip (Table 28).

97. **It has been observed that transport prices go down along the supply chain, with improved access to better quality national roads and with larger volumes of maize traded.** Rural transport in East Africa is about four to six times more expensive per ton-km than transport in other areas. For the transportation segment between secondary and urban markets, the average transport price per ton-km is estimated at US$0.11 in Kenya, US$0.12 in Tanzania, and US$0.15 in Uganda (Table 29). In Kenya, transport prices in the last transportation segment are approximately one third of those in the second segment (from primary to secondary market) and in Tanzania and Uganda they are a half as much.

Table 28: Major modes of transportation and average distances to various transaction points

Category of traders	Mode of transportation	% of traders using the mode	Average distance to transaction points, km
	Kenya		
Farm-gate to primary market	Lorry 5MT	60	6
Primary to secondary market	Lorry 5MT	77	67
Secondary to wholesale market/millers	Lorry 10MT	67	300
Farm-gate to wholesale market/millers	Lorry 10MT	65	400
	Tanzania		
Farm-gate to primary market	Lorry 5MT	60	16
Primary to secondary market	Lorry 10MT	45	100
Secondary to wholesale market/millers	Lorry 10MT	42	345
	Uganda		
Farm-gate to primary market	Bicycle	80	3
Primary to secondary market	Lorry 10MT	58	50
Secondary to wholesale market/millers	Lorry 10MT	55	80

Source: World Bank survey carried out in November-December 2008.

Table 29: Distances and transportation prices at various segments of the supply chains

Category of market	Mode of transportation	Average distance, km	Transport prices, US$/ton-km	Transport prices, US$/ton
	Kenya			
Farm-gate to first primary	Lorry 5MT	6	0.30	1.80
Primary to secondary market	Lorry 5MT	67	0.30	20.10
Secondary to wholesale/miller	Lorry 10MT	300	0.11	33.00
Farm-gate to wholesaler/miller	Lorry 10MT	400	0.11	44.00
	Tanzania			
Farm-gate to first primary	Lorry 5MT	16	0.40	6.40
Primary to secondary	Lorry 10MT	100	0.27	27.00
Secondary to wholesale/miller	Lorry 10MT	345	0.12	41.40
	Uganda			
Farm-gate to first primary	Bicycle	3	1.50	4.50
Primary to secondary	Lorry 5MT	50	0.33	16.50
Secondary to wholesaler /miller	Lorry 10MT	80	0.15	24.00*

Source: World Bank survey carried out in November-December 2008.

98. Overall, transport charges disproportionately add to total marketing costs in the first two segments of the supply chain (i.e. on rural roads). According to Table 30, about 44 percent of average transport charges occur during the first 28 percent of the distance between farmers and urban wholesalers (a ratio of costs to distance is 1.6). The rest 56 percent of the charges (55.5 percent) are accumulated during the remaining 72 percent of the route (a ratio of 0.8). Between farm-gate and secondary market, the ratio reaches 1.2 in Uganda, 1.8 in Tanzania, and 2.0 in Kenya.

99. **How different are these transport prices compared to other African regions?**

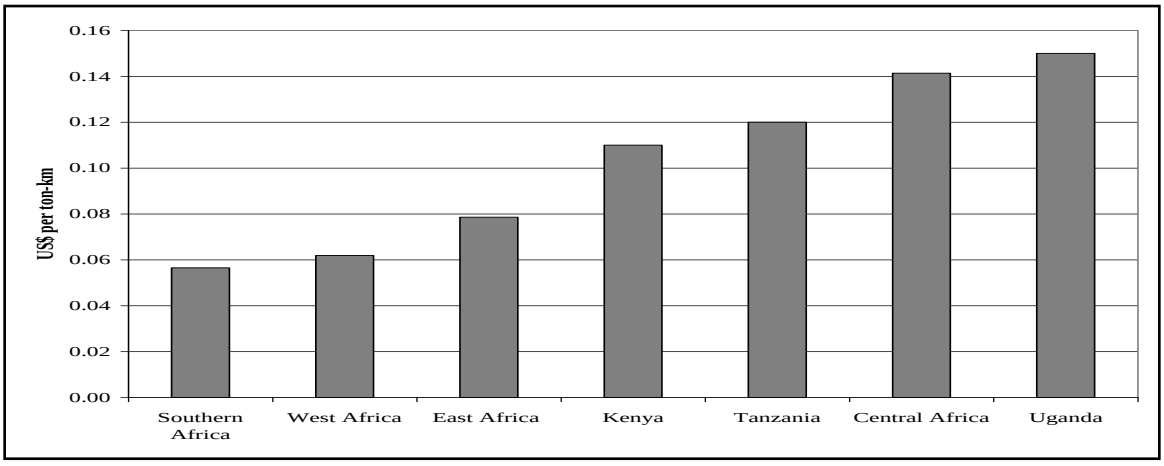
The transport prices for main international transport corridors in Africa from the recent study of Teraveninthorn and Raballand (2009) are used for comparison.[50] Figure 25 illustrates that transport prices for maize in Uganda are the highest but are not too much different from the prices in other parts of Africa across domestic routes and international corridors. The transport prices in Kenya and Tanzania are close to the average for the East African transport corridor from Mombasa to Kampala and are lower than for the Central Africa corridor from Douala to Bangui. The difference with Southern and West Africa corridors is substantial, however.

Table 30: Share of transport charges and distances in transportation segments

Market segments	Share of charges, %	Share of distance, %	Ratio of charges to distance
Kenya			
Farm-gate to secondary market (through primary)	39.9	19.6	2.0
Secondary to wholesale market	60.1	80.4	0.7
Tanzania			
Farm-gate to secondary market (through primary)	44.7	25.2	1.8
Secondary to wholesale market	55.3	74.8	0.7
Uganda			
Farm-gate to secondary market (through primary)	46.7	39.8	1.2
Secondary to wholesale market	53.3	60.2	0.9
Average			
Farm-gate to secondary market (through primary)	43.7	28.2	1.6
Secondary to wholesale market	56.3	71.8	0.8

Source: World Bank survey carried out in November-December 2008.

Figure 25: Comparison of transport prices in the countries under review with those along the main transport corridors in Africa (US$ per ton-km)



Source: World Bank survey carried out in November-December 2008 and Table 4.1 in Teraveninthorn and Raballand (2009).

[50] While the transport prices are not entirely comparable between domestic and transboundary corridors, between maize and other goods, and between the quality of national and cross-country roads, the information is still indicative.

100. **So, transport prices are the largest contributors to the wedge between farmers and consumers in all reviewed countries**. Much can be done to help reduce the burden of high transport prices but a clear diagnostic framework on the structure of transport costs and prices is needed, without which it is not possible to formulate appropriate policies and actions. As mentioned above, this report uses such a diagnostic framework outlined in Teravaninthorn and Raballand (2009) "*Transport Prices and Costs in Africa: A Review of the Main International Corridors*".

101. **Based on the trucking survey carried out for this study, the average transport costs are estimated at US$1.25 per km**. This is comparable to the transport costs estimated for the East Africa international corridor at US$1.33 per km (Table 31). On average, the ratio between variable to fixed costs is about 70/30 in the countries under review. This share of variable costs is comparable with those for the four main international corridors in Africa.

Table 31: Comparison of truck operating costs in Kenya, Tanzania, and Uganda with four international corridors in Africa

Country/Corridor	Route	Variable cost (US$/km)	Fixed costs (US$/km)	Share of variable costs in total, %	Average truck fleet age (years)
Kenya	Eldoret-Nairobi	0.89	0.38	70%	12
Tanzania	Kibaigwa-DAR	0.96	0.39	71%	9
Uganda	Jinja-Kampala	0.85	0.27	76%	13
West Africa (Burkina Faso and Ghana)	Tema/Accra-Ouagadogou	1.54	0.66	70%	13
Central Africa (Cameroon and Chad)	Doula-N'Djamena	1.31	0.57	70%	11
East Africa (Uganda and Kenya)	Mombasa-Kampala	0.98	0.35	74%	7
Southern Africa (Zambia and Tanzania)	Lusaka-Dar es Salaam	1.34	0.44	75%	10

Note: Costs for international corridors are reported for 30MT truck. Costs for Uganda, Kenya and Tanzania are reported for 10MT trucks.

Source: World Bank survey carried out in November-December 2008 and Table 4.2 in Teravaninthorn and Raballand (2009).

102. **Vehicle operating costs show a ratio of 23/77 between fixed and variable costs in Uganda and Tanzania and 30/70 in Kenya**. Overall, low fixed costs in East Africa can be attributed to the low costs of labor and the use of cheap, secondhand trucks (as old as 10-15 years and often run into the ground). Staff costs account for 34 percent of total fixed costs, being the smallest in Uganda and the highest in Tanzania (Table 32). Administration costs that include insurance, licenses, income taxes, and other overhead costs are likely to be underestimated in Uganda. The major variable costs are fuel and lubricants, which account for 58-85 percent of these costs (Table 33). Non-tariff measures amount to US$0.9 per ton-km and account for 10 percent of total variable costs, which is sometimes equal to or higher than tire and maintenance costs together.

Table 32: Fixed transport costs breakdown by country (US$ per km)

Country	Staff	Financing costs	Depreciation	Admin. Costs	Total costs
Kenya	0.110	0.100	0.092	0.081	**0.383**
Tanzania	0.170	0.090	0.100	0.034	**0.394**
Uganda	0.080	0.080	0.105	0.001	**0.266**
Average	**0.077**	**0.090**	**0.099**	**0.039**	**0.348**

Source: World Bank survey carried out in November-December 2008,

Table 33: Variable transport costs breakdown by country (US$ per km)

Country	Fuel/Lubricants[51]	Tires	Maintenance	Batteries	NTM	Total costs
Kenya	0.74	0.02	0.03	0.005	0.10	**0.894**
Tanzania	0.72	0.09	0.06	0.002	0.09	**0.962**
Uganda	0.58	0.16	0.07	0.01	0.09	**0.849**
Average	**0.66**	**0.09**	**0.05**	**0.006**	**0.09**	**0.901**

Source: World Bank survey carried out in November-December 2008.

103. **Total non-tariff measures are actually larger than shown in Table 33**. Non-tariff measures are faced by transporters not only during the last segment of the supply chain but also at the earlier stages (Table 34). Moreover, for smaller trucks (Table 33 presents the estimate for 10 MT truck), the non-tariff measures per ton are also larger. The major non-tariff measures are bribes and delays at roadblocks and weighbridges. These measures increase the costs of trade (by rising transport costs and thus transport prices) but do not bring additional budget revenues. They are called "non-WTO- consistent."[52] When adding all bribes and delays (i.e. the monetary value of delays) *at all* stages of the supply chain, per ton-km costs double in Uganda and increase by 40 percent in Kenya (Table 35). In Tanzania the costs remain unchanged as they almost all are incurred during the last stage of the supply chain. The costs per ton reach US$2.30 in Uganda, US$3.84 in Tanzania, and US$7.23 in Kenya.[53]

104. **Bribes on the domestic roads appear to be smaller than on EAC Northern and Central international corridors**. The recent report, based on a field survey carried out between July and November 2008, found that on the route from Mombasa to Kigali the bribery expenses averaged about US$900 per truck accounting for over 21 percent of total export costs (Rutagengwa, 2009). Total petty bribery (on one truck) equaled US$194 on the Ugandan side and US$704 on the Kenyan side, with 36 roadblocks counted on the export route alone. These bribery expenses in absolute and relative terms are much above those estimated for maize transportation in this study. Total payment per truck transporting maize is estimated to be US$23 in Uganda, US$38 in Tanzania, and US$51 in Kenya.

[51] The lower costs in Uganda contradict the fact that fuel prices are highest there. The explanation given by the interviewed transporters is that Ugandan routes have less hilly latitude compared to both Kenya and Tanzania. With this, the lower use of fuel in Uganda partially offsets the highest fuel prices. The fuel efficiency is estimated at 2.98 km per litre in Uganda, 2.02 km per litre in Kenya, and 2.36 km per litre in Tanzania.

[52] This approach follows the grouping of non-tariff measurers on goods trade in the EAC used in World Bank (2008b). This terminology is used here irrespective of the fact that it is applied for domestic trade.

[53] In recent months the frequency of roadblocks on national roads in Tanzania seems to have gone down. This positive trends need to be sustained to reduce transaction costs of trade.

105. **The comparison data is available from the recent study of the Regional Strategic Analysis and Knowledge Support System for East and Central Africa (ReSAKSS)**. The estimates of costs created by non-tariff barriers in that study is also larger than in our report (see Table 34 and Table 35). The survey of traders and transporters of maize and beef in Kenya, Tanzania, and Uganda, undertaken in the 2007, suggests the average non-tariff measures faced by maize transporters to be US$0.12 per km (Karugia *et al*., 2009). The costs are found to be the lowest in Kenya (US$0.9) and the highest in Uganda (US$0.15). The major reason of the difference between these estimates and those reported in Table 35 is that ReSAKSS study includes more costs to the list of non-tariff barriers than only costs caused by roadblocks and weighbridges. It covers road toll stations, customs procedures, immigration costs, transiting, standard and certification, security costs, licenses to be obtained by truckers, transporter allowances and also loading and unloading expenses. Some of these costs are not necessarily non-tariff measures, such as loading and unloading or transporter allowances, and other costs related to the cross-border trade costs and transiting on Kenya territory.

106. **Therefore, the results of different studies should be compared with a great care**. The absolute amount of payment depends on what is included in the costs but also on truck load, value of transported commodities/purchasing power of the driver, number of roadblocks and weighbridges, distance, and other factors. Regarding the roadblocks, for example, there are fewer roadblocks on rural than on tarmac roads. In relative terms, the share of bribery expenses in total costs is determined by types of costs included. Marketing costs of trading maize include loading and unloading at different markets, local taxes, and storage costs, which are unlikely to appear for export costs along international corridors. Therefore, the appropriate way to compare bribery expenses at various routes is to use the common denominator such as (i) US$ per ton-km for absolute comparisons and (ii) share of bribes in total transport costs. If this data is available, more plausible comparison can be made by interested parties.

107. **Bribes are given at roadblocks**. Often the bribes are paid to avoid delays, compensate for the lack of documents, and/or pay for overloading. Sometimes they are paid for the poor conditions of a truck (i.e. bald tires, broken mirrors, etc.). Per roadblock, the bribe ranges between US$2 and US$3 per truck. Table 34 provides details on the number of roadblocks and bribes per country and at each stage of the supply chain. In Kenya, there are eight roadblocks on average between farm-gate and wholesale market. In Tanzania, the number of roadblocks is ten, with seven of them being between secondary and wholesale markets. The smallest number of roadblocks is found in Uganda (four).

108. **Bribes are also paid at weighbridges**.[54] While the introduction of weighbridges to control axle load weight is beneficial, operational problems cause major delays. It is reported that the scales used are often outdated and operate in an uncoordinated fashion. For example, the weight recorded for a given load may differ from one weighbridge to

[54] According to Rutagengwa (2009), most bribes along the EAC northern and central corridor are actually paid at weighbridges.

another. In Kenya offenders of overloading are subjected to court procedures and hefty fines while trucks remain idle (Wanjala *et al.*, 2005). To avoid overloading fines and delays, traders and transporters often pay bribes.

Table 34: The estimate of costs from non-tariff measures by transporting maize from farm-gate to wholesale markets

	Farm-gate-Primary	Primary-Secondary	Secondary-Wholesale
	Kenya		
Average distance, km	6	67	300
Roadblocks:			
Number	2	2	4
Bribes paid per truck, US$	2.40	8.60	10.00
Value of wasted time per truck, US$	2.25	3.60	2.70
Weighbridges:			
Number	0	1	2
Bribes paid per truck, US$			12.80
Value of wasted time per truck, US$		4.50	4.05
	Tanzania		
Average distance, km	16	100	345
Roadblocks:			
Number	0	3	7
Bribes paid per truck, US$		4.00	16.84
Value of wasted time per truck, US$		0.70	1.96
Weighbridges:			
Number	0	1	3
Bribes paid per truck, US$		3.20	9.60
Value of wasted time per truck, US$		0.42	1.68
	Uganda		
Average distance, km	3	50	80
Roadblocks:			
Number	0	2	2
Bribes paid per truck, US$		5.00	10.40
Value of wasted time per truck, US$		3.89	2.59
Weighbridges:			
Number	0	0	1
Bribes paid per truck, US$			
Value of wasted time per truck, US$			1.08

Note: The monetary value of delays is estimated by using the labor costs per hour. It is assumed to be US$2.25 in Kenya, US$1.40 in Tanzania, and US$2.16 in Uganda.

Source: Authors' estimate based on the World Bank survey carried out in November-December 2008.

Table 35: Total non-tariff costs in US$ per km and US$ per ton[55]

	Kenya	Tanzania	Uganda
	Non-tariff measures, US$ per km		
Bribes paid at roadblocks and weighbridges	0.09	0.08	0.12
Monetary value of delays at roadblocks and weighbridges	0.05	0.01	0.06
Total costs	**0.14**	**0.09**	**0.18**
	Non-tariff measures, US$ per ton		
Bribes paid at roadblocks and weighbridges	4.48	3.36	1.54
Monetary value of delays at roadblocks and weighbridges	2.75	0.48	0.76
Total costs	**7.23**	**3.84**	**2.30**

Source: Authors' estimate based on World Bank survey carried out in November-December 2008.

109. **Paradoxically, the countries under review, despite being members of the EAC, have different axle-load restrictions**.[56] While Uganda and Kenya use the harmonized COMESA axle load specifications, Tanzania uses a higher legal limit, which also exceeds the load specifications under SADC. Further, the specified maximum Gross Vehicle Mass for commercial vehicles differs among the three EAC countries, which limits transit traffic within the region (World Bank, 2008b).

110. **Not all traders pay bribes during transportation, however**. In Kenya, about 60 percent of the interviewed traders indicated that they had to pay bribes. This share is smaller in Tanzania and Uganda, at 30 percent and 25 percent respectively.[57] However, whether a bribe is paid or not, there is always a risk of being forced to pay bribes. As a result, this risk is factored into total marketing costs, which reduces farm-gate prices and increases the consumer prices. If a trader/transporter is 'lucky' during a trip and does not have to pay, additional profit is a result. It is thus farmers that in the end always pay for the consequence of weak governance and corruption due to the lower farm-gate prices which they receive.

111. **In addition to bribes, long delays at roadblocks and weighbridges result in lost business opportunities and foregone income**. In Kenya, the opportunity cost of delays is estimated at US$2.75 per ton or about 61 percent of bribes paid (Table 35). The incurred costs due to delays are smaller in Uganda and Tanzania but they still raise the direct bribes paid by 13-15 percent. Furthermore these delays increase the time drivers have to spend on the road. For example at an average speed of 50 km per hour the journey from Eldoret to Nairobi should take around 6 hours, but with the additional

[55] Per ton estimates assume 5 MT trucks from farm-gate to primary markets and 10MT trucks for the remaining marketing segments.

[56] The EAC passed a specific 3 axle – 7 ton per axle load requirement for trucks. All member governments agree that the new restriction is good for protecting the road surface in the region, but this decision has been sporadically applied only in Uganda and Kenya, not in Tanzania. Kenya has a 3 axle weight limit with the maximum load of 48 tons, while Tanzania and Uganda have a 4 axle limit allowing about 56 tons. See also Rutagengwa (2009) who describes differences on axle rules between Kenya and Rwanda.

[57] According to the East Africa Bribery Index, police departments in all three countries under review are found to be most corrupt among public offices (Transparency International, 2009), with the bribery incidence averaging 45 percent in Kenya (first place), 35 percent in Uganda (second place), and 17 percent in Tanzania (third place).

delays for weighbridges and roadblock stops it takes over 12 hours. The result of these delays is reduced road safety as truck drivers spend long hours working and often end up driving in the dark, which significantly increases the risk of accidents.

112. **Taking into account all direct and indirect costs, the profitability of trucking companies transporting grains in East Africa is not very high**. With the high competition in the trucking sector and the given transport costs, profits in East African countries are often achievable by using secondhand trucks and overloading the trucks. Secondhand trucks reduce financing costs and depreciation. Overloading is known to be a critical factor in damage to road structure, but the transporters and traders often have a vested interest in operating with overloads, making this a difficult act to prevent. Without overloads, profit seems to be achievable only in Uganda at given transport costs and prices (Table 36). In Kenya and Tanzania, transporter can only turn profits with an overload of at least 1.5 tons. The profit margins from transporting grains seem to be small but the overloads and backloads during the trip makes it difficult to estimate actual profits derived from transporting maize solely.

Table 36: Profit margins at different loads

	Kenya	Tanzania	Uganda
Distance of costs to be covered, km	300	345	160
Transport costs per trip, US$	377.3	464.5	185.2
Transport charge per trip, US$	330.0	414.0	240.0
Profit per trip, US$	-47.3	-50.5	54.9
Profit per trip if the truck is overloaded, US$			
0.5 tons	-30.8	-29.8	66.9
1 ton	-14.3	-9.1	78.9
1.5 tons	2.3	11.7	90.9
2 tons	18.8	32.4	102.9

Note: Transport costs and prices are reported for 10MT trucks. Transport prices are estimated for the route from secondary to wholesale market. For Kenya, transport costs and prices per trip include only one-way due to the backloads. In Uganda, there is no backloads and thus transport costs need to cover both ways. In Tanzania, trucks are reported to pick up loads as they pass through.

Source: Authors' estimate based on World Bank survey carried out in November-December 2008.

113. **In East Africa, due to competition, measures that would reduce transport costs would also lower transport prices**.[58] According to the econometric estimates from Teraveninthorn and Raballand (2009), the most effective measures to be taken in the East Africa transport corridor would be improving the conditions of corridor road and lowering fuel prices (Table 37). Reducing the border crossing time would also have a positive although less significant effect.[59] Reducing informal payments was found to have a minimum impact on costs and no impact on transport prices for the international transport corridor, but this conclusion is likely to be different for internal routes. While

[58] Reducing transport costs in other regions would not necessarily result in reducing transport prices. In Western and Central Africa, for example, regulatory constraints limit competition in the trucking industry and thus limit the pass-through of lower transport costs (caused by lower fuel prices, for examples) to the end users of transportation services.

[59] The same conclusion also applies to reducing delays on domestic routes, which are found to be quite large in the countries under review (see Chapter 4.4.1).

these results cannot be blindly applied to the domestic routes for trading grains in Kenya, Tanzania, and Uganda, they are informative about approaches to reduce transport charges, which would benefit farmers and consumers in East Africa.

Table 37: Measures and outcomes for reducing transport prices along the main transport corridors in East Africa

Measures	Decrease in transport costs (%)	Increase in sales (%)	Decrease in transport price (%)
Rehabilitation of corridor from fair to good	-15	NS	-7/-10
20% reduction in border-crossing time	-1/-2	+2/+3	-2/-3
20% reduction of fuel price	-12	NS	-6/-8
20% reduction of informal payment	-0.3	NS	+/0

Source: Teravaninthorn and Raballand (2009).

114. **Policy recommendations for reducing transport costs need to distinguish between public investments ("hardware") and policy measures ("software")**. On the investment side, improving the quality of roads is a powerful intervention to reduce transport costs and consequently transport prices for end users. Roads in poor condition result in higher variable costs of operation because they (i) reduce fuel efficiency; (ii) damage vehicles, leading to high maintenance and higher operation costs; (iii) reduce the life of tires; (iv) reduce vehicle utilization because of lower speeds; and (v) reduce the life of the truck. Thus, improving road condition would have a significant impact on lowering transport costs, even if the roads are already in fair condition. The quality of roads is not very good in all the countries but the rural roads are in particular poor in Tanzania and Uganda, i.e. between farm-gate and secondary markets (Table 38). The most marketing costs per km are incurred on rural roads as shown above and it is also where the economic returns from road improvements will be the largest.[60]

115. **Strong evidence shows that physical isolation prevents large areas of East Africa from realizing their agricultural potential and easing market access constraints will induce supply response and subsequent growth in agricultural productivity**.[61] Dorosh *et al*. (2008) estimate that the African rural population with up to 4 hours travel time to the nearest city of 100,000 or more population realize about 47 percent of their crop production potential, while the rural households with about 10 hours of travel time realize only 6-10 percent of their crop production potential (see Table 1). The statistically significant correlation between the quality of feeder roads (distance to

[60] The definition of what constitutes rural roads is usually unclear: what is considered rural roads may be part of the secondary or tertiary road network. Rural roads are normally managed by local governments and communities and include urban secondary roads managed by municipalities. Quite commonly, these roads represent 80 percent of the total road network length, carry only 20 percent of the total motorized traffic, but provide access to the majority of population in Sub-Saharan African countries (SSATP). Traffic often consists of a majority of non-motorized or intermediate means of transport and pedestrians. Furthermore, they are often not classified and their extent and condition is usually unknown. In terms of semantic, "rural transport infrastructure" is used to ensure that tracks, paths and footbridges are included in discussions.

[61] In Tanzania and Uganda, IFPRI found the investments in rural roads to be among the strongest contributors to pro-poor agricultural growth after research and extension investments in Uganda and research and education investments in Tanzania (see Fan *et al*., (2006).

all-season roads) and agricultural productivity is also found in Malawi in the recent Country Economic Memorandum (Lall *et al.*, 2009). In Uganda, it is shown that investments in rural transport infrastructure have a higher internal rate of return than comparable investments in secondary roads or main roads as long these roads are at least in fair condition (Fan *et al.*, 2004; Fan *et al.*, 2006).

Table 38: Length and quality of road network in the countries under review

	Length	% of total	Good	Fair	Poor	Total
KENYA						
Paved Roads	8,937	14	29%	37%	34%	100%
Gravel Roads	27, 181	43	2%	70%	28%	100%
Earth Roads	27,172	43	1%	42%	57%	100%
Total	63,290	100				
UGANDA						
Paved Roads	2,800	5	19%	57%	24%	100%
Gravel Roads	16,740	25	10%	39%	51%	100%
Earth Roads	46,160	70	6%	9%	86%	100%
Total	65,700	100				
TANZANIA						
Primary (Trunk and Regional)	28,892	35	43%	35%	22%	100%
Secondary (District)	18,658	23	13%	13%	73%	100%
Tertiary (Feeder)	35,000	42	1%	3%	97%	100%
Total Classified Roads	82,550	100				

Source: National Biomass Study, Uganda Railways and Ministry of Works, Transport and Communication; Kenya Transport Memorandum, World Bank, 2005; Tanzania World Bank data.

116. **Investments in rural roads produce a variety of economic and social benefits**. Some of them are difficult to measure but should still be factored into economic analyses of investments to justify transport response. It is found in the literature that improved rural roads increase income and reduce spatial inequalities, all other things being equal. However, the impact on inequality is limited if only economic benefits are computed (Khandker, 2006; Jacoby and Minten, 2008). When other benefits of rural roads are computed such as health, education, and access to services, spatial inequality is dramatically reduced (Songco, 2002; Khandker, 2006; Van der Walle and Mu, 2007). Rural roads contribute to a shift in economic activities from farm to non-farm activities (Songco, 2002; Van der Walle and Mu, 2007) and from subsistence food crops to cash crops (Omamo, 1998). Finally, there is a delayed impact of rural roads, especially with regard to the non-economic benefits and shifts in economic activities. These effects may be most evident several years after the construction/rehabilitation of a road (Khandker, 2006; Van der Walle and Mu, 2007).

117. **Investments in roads require proper planning and implementation**. Connectivity of rural roads with national roads is especially critical. Providing inner roads closest to markets is a necessary pre-condition for the provision of outer roads, more distant from markets, to be effective. *To enhance agriculture-led economic growth, public investment in transport infrastructure should be prioritizing toward connecting*

rural areas that offer a combination of rich natural and economic potential and high population densities to major deficit markets, both domestic and across the borders.[62]

118. **Investments in rural roads will also need to be complemented by developing *transport services***. As large truckers are unlikely to find many rural routes profitable, alternate modes of transportation need to be identified. It may be useful to consider options for promoting appropriate intermediate means of transport for connecting rural areas to at least primary markets. Carts, bicycles, and other intermediate forms of transportation are very important in rural areas as illustrated in Table 26. Thus investments in rural roads should be adjusted to service the most cost-efficient transportation modes, which may not be trucks. In many rural areas, the size of agricultural surplus would not justify heavy truck traffic.

119. **Investments in rural roads should be accompanied by the measures to promote load consolidation**. Investment in infrastructure is economically justifiable as long as consolidated production enables reasonable agglomeration to justify economically transportation per truck. A load consolidation may be promoted through (i) producer groups; (ii) on-farm and village storage; (iii) wholesale markets.[63] Larger loads would also reduce the costs of loading and unloading along the supply chains.

120. **Improved feeder roads will reduce fuel and other variable costs but additional "software" actions are also necessary to reduce fuel costs**. This is very critical as future oil prices are likely to be much higher than the current one, in spite of the temporary relief brought by the global financial crisis. Fuel accounts for 47-58 percent of total transport costs, thus reducing fuel costs would significantly reduce transport cost and prices. Transporters should be encouraged to use trucks with lower operating costs, for example through changing truck import duties to encourage the import of newer trucks (as currently done in Tanzania). This would lead to the modernization of the trucking fleet and higher fuel efficiency.[64] Reducing fuel taxes might also be an option, but review of these taxes should take into account that budget revenues from fuel taxes are usually used to maintain roads thus adjusting fuel taxes downwards would need to be offset by other budget revenues to sustain road maintenance. Furthermore, taxing fuel supports carbon reduction efforts and thus contributes to slowing down climate change.

121. **Investments in railroads will also reduce transport prices through increased competition with trucking companies.** With the rising global fuel prices mentioned above, these investments will become more profitable in the future but it goes beyond the scope of this study to determine a break-even point for fuel prices to make rail investments attractive for connecting markets in East Africa. Increased competition from rail services benefits transport users through comparable or lower transport costs. In the parts of Africa without rail services, transport prices are very high (Teravaninthorn and

[62] The World Bank report "Increasing Roods Investment Efficiency in Rural Areas", draft from August 2009, sets up a framework for effective and efficient public expenditure in rural roads to enhance agricultural growth.
[63] See the World Bank report "Increasing Roods Investment Efficiency in Rural Areas", draft from August 2009, on the link between transport costs and loads.
[64] See detailed recommendations for addressing high transport prices in Africa in Teravaninthorn and Raballand (2009).

Raballand, 2009). But where rail services exist as in Eastern Africa, road prices are lower as they are established by taking into account rail prices, especially for heavy and bulky commodities.

4.4. Local taxes

122. **In addition to the above discussed costs, marketing costs can be reduced through improving the administration of local taxation of farmers and traders**. The abolishment of local taxes (in contrast to bribes and delays) is not a feasible solution since they often make up a substantial contribution to local budgets, especially locally generated revenues. The main local tax for maize (and other agricultural produce) is a council/local cess, with the tax rate ranging from 1 percent of maize value in Kenya to 5 percent in Tanzania. As depicted in Figure 24, cess makes up about 4.3 percent of total marketing costs. There are other local taxes that increase the costs of doing business and thus affect maize prices, namely market dues, permits and licenses for traders, processors and retailers, and other taxes.[65] This section, however, focuses only on cess since it was not possible to attribute the share of these taxes to maize business.[66]

123. **The rate of cess varies with the stage of the supply chain, the districts, and the country and there are generally four reasons for the variation**. As shown in Table 39, the *first reason* is because local governments have the right to set the tax rate at different levels, with central governments sometimes setting the cap as is the case in Tanzania. The *second reason* for inconsistency is that there is a multiple taxation of maize bags as they cross different districts. Sometimes it happens intentionally at roadblocks but often this is a result of multiple owners (and payers of cess) who handle a bag of maize to reach wholesale market from the farm-gate. Once the bag of maize is delivered to the primary market with a cess paid, it might be purchased by a secondary market trader who is then required to pay cess again charged per truck and so on.

124. **The *third reason* is a difference in measurement units used as a base for taxation**. Tanzania's district and municipal authorities are the most consistent in selecting a bag as their taxation base (Table 39). In Kenya, 73 percent of the interviewed traders reported having paid cess per bag and while 13 percent paid this tax per truck/size (providing another reason for overloading, in addition to additional profit). In Uganda, the frequency of use of truck size, number of bags and number of trips as a tax base is more evenly distributed than in Kenya and Tanzania.

[65] In Kenya, for example, traders pay between US$16 and US$ 80 per year for a single business permit. In Uganda, traders, wholesalers, retailers and processors need to pay about US$26 pee year to obtain business licenses. In some districts, traders also pay loading fees at US$1.5 per ton of maize.

[66] The study of the sub-national taxation of the agricultural sector has been recently initiated in Tanzania, the results of which will complement the findings of this report regarding the impact of other taxes and regulations on maize producers.

Table 39: Frequency of using various measurement units for collecting local cess (in percent to total)

Measurement units	Kenya	Tanzania	Uganda
Tonnage/truck size	13	11	33
Per bag	79	89	41
Per trip	8		25
Total respondents	**100**	**100**	**100**

Source: World Bank survey carried out in November-December 2008.

125. **The *fourth reason* for variation in cess per ton is often an arbitrary choice of farm-gate price (if the tax rate is based on maize value) and/or the imposition of a flat rate in shillings**. An example in Table 40 shows the tax base and tax rates in the selected districts of Tanzania. With the same tax base (100 kg bag of maize), the tax rate ranges from TSh 400 to TSh 1,000 per bag. Under the prevailing prices of maize in December 2008, the effective tax rate varied from 1.7 percent in Iringa, Njombe, and Mbeya to 3.3 percent in Mbozi despite the cess tax rate in Tanzania being set at 5 percent of maize value. A similar situation is found in Kenya and Uganda, but in Kenya the sellers of maize to NCPB have a more predictable tax rate than the sellers in the market.[67]

126. **Thus, overall the tax rates for cess do not seem to be a significant financial burden to farmers and traders**. The tax burden also seems insignificant in comparison with other marketing costs. However, the harmonization of the tax base and rates across regions in the reviewed countries would be necessary to reduce uncertainty, shorten delays, and limit the grounds for corruption. Moreover, a fresh look at other local taxes beyond food staples is necessary to estimate the extent of effective taxation of agricultural producers. The main reason for increasing transparency and predictability in charging cess rather than eliminating it is the additional revenues this tax brings to local budgets.

[67] The tax rate in Kenya for sales to NCPB averages 1 percent of the value of the maize price. Otherwise, the tax rate ranges between Ksh 10 and Ksh 40 per 90 kg bag.

Table 40: Tax base and tax rate for the selected districts in Tanzania

District	Tax base	Tax rate	Remarks
Iringa	Weight of the maize bag (100 kg)	TSh 500 per bag of 100 kg	With the price per bag at TSh 30,000 and if 5% tax rate were used, the tax per bag would have been TSh 1,500. However by charging TSh 500 per bag, effective tax rate is around 1.7%
Njombe	Weight of the maize bag (100 kg)	TSh 500 per bag of 100 kg	With the price per bag at TSh 30,000 and if 5% tax rate were used, the tax per bag would have been TSh 1,500. However by charging TSh 500 per bag, effective tax rate is around 1.7%
Mbeya	Weight of the maize bag (100 kg)	TSh 500 per bag of 100 kg even though sometimes it can go down to TSh 400 per bag	With the price per bag at TSh 25,000 and if 5% tax rate were used, the tax per bag would have been TSh 1,250. However by charging TSh 500 per bag, effective tax rate is around 2%
Mbozi	Weight of the maize bag (100 kg)	TSh 1,000 per bag of 100 kg	With the price per bag at TSh 25,000 and if 5% tax rate were used, the tax per bag would have been TSh 1,250. However by charging TSh 1,000 per bag, effective tax rate is around 3.33%

Source: Survey of local districts in Tanzania carried for the World Bank, December 2008.

127. **In some instances, the maize cess accounts for quite a large share of budget revenues, especially that which is generated locally**. The importance of maize cess depends on the width and depth of the local taxation base per district (township) and the sixe of transfers from the central governments. In Kitale and Weregi (Kenya) major maize producing areas, the maize cess made up 40-95 percent of local food cess revenues and 16-51 percent of budget revenues generated locally during 2005/06-2007/08 (Table 41). With central transfers accounting for 58-71 percent of the total local budgets, the share of maize cess is estimated to be 7-17 percent of the total local budgets. In contrast, the importance of maize cess in Nakuru country (Kenya) is very small, accounting for 5 percent of total cess and 1 percent of local tax revenues. This is explained by the diversified tax base in Nakuru compared to Kitale and Weregi. In Tanzania, the importance of maize cess is similarly large in Njombe and Mbeya, averaging 43 percent of total local cess and 12 percent in local taxes. Maize cess plays a less pronounced role in the budget of Iringa, however. Overall, given the very large share of central transfers in total local budgets in Tanzania (about 97 percent), the maize cess accounts for only 0.1 percent of total local budgets.

Table 41: Share of maize cess in the selected local budgets in Kenya and Tanzania, average of 2005/06-2007/08 (in percent)[68]

	Kenya			Tanzania		
	Kitale town	**Weregi town**	**Nakuru county**	**Iringa district**	**Njombe district**	**Mbeya district**
Share of maize cess in total local cess	95.0	40.0	5.0	12.0	42.0	45.3
Share of maize cess in total locally-generated revenues	51.2	15.6	0.9	5.9	15.1	10.3
Share of central transfers in local budget	70.5	57.8	51.7	97.5	97.0	96.4
Share of maize cess in total local budget	15.6	6.6	0.5	0.1	0.1	0.2

Source: Survey of local districts in Kenya and Tanzania carried for the World Bank, December 2008.

128. **Thus, the abolishment of market cess, in contrast to non-WTO-consistent non-tariff measures, is not a straightforward solution**. A reduction/elimination in maize cess could be a relatively small problem for the budgets in Nakuru in Kenya and even Iringa district in Tanzania. But it would result in a significant erosion of the local taxation base in Kitale, Weregi, Njombe, and Mbeya districts. Before abolishing or suspending local taxes because they are perceived to be regressive and excessive, therefore, options should be explored to improve the equity of the tax instrument. Harmonization of cess tax base and rates as well as an improvement in administration of tax collection generally would be beneficial as it would reduce uncertainty and limit the opportunity for corruption. Regarding the latter, the example for treating an additional load in Kibaigwa market in Tanzania for the purpose of taxation might be followed. It is reported that at that market, when a small trader, who come in with cess certificate on a smaller load, adds tonnage to get a larger load, he can get a certificate just for the balance.

4.5. Costs of the cross-border trade

129. **So far, this report has dealt with domestic marketing costs**. This sub-chapter estimates the cross-border costs and discusses the main barriers to regional grain trade. Trade within East Africa has traditionally been small-scale, localized, and informal. However recently the cross-border trade flows have increased (Chapter 2), with the markets in individual countries becoming more regionally integrated and interdependent (Chapter 3). The elimination of import tariffs within the EAC Customs Union is one of the reasons for the increased cross-border trade. Another reason is the static production in Kenya, which has increased the deficit, creating upward price pressure and allowing regional trade to grow. Trade is becoming more formal between Uganda and Kenya but less so between Kenya and Tanzania due to the export ban imposed in Tanzania. Based on the survey of the Busia border crossing (on the major agricultural trade corridor between Uganda and Kenya) carried out for this study, 36 percent of traders still use informal routes for crossing the border (transshipment by bicycle).[69]

[68] Similar data for districts in Uganda are not available. The share of maize in local food cess in Tanzania was derived from the share of maize production in a correspondent district.

[69] Data on the border between Tanzania and Kenya was not possible to collect due to the resistance of traders to share information.

130. **The formal costs of crossing the border are estimated at US$11 per ton**. *The estimated costs of crossing the border are relatively low compared to the domestic marketing costs discussed above, highlighting the critical importance of reducing domestic costs for a greater regional integration in East Africa*. The difference in costs between formal and informal cross-border trade is insignificant. The costs of formal crossing of the Busia border are estimated to be US$11 per ton for 10MT truck and US$9.7 per ton for 32MT truck, while the cost of informal crossing with bicycle is about US$10 per ton (Table 42). All the savings that informal traders generate from bypassing the formal certification and customs procedures are offset by additional costs of transporting grains in small quantities (by bicycle) through the border.

131. **What encourages the informal cross-border trade?** The most important reason for informal trade is likely to be low incentives to comply with formal procedures. On the Ugandan-Kenyan border, many formal procedures can be processed at the border post itself, including certification from the Kenyan sanitary and phytosanitary authorities. So, if a trader is officially registered and has the certificate of origin for maize, he/she should have no problems with exporting maize to Kenya. But since the costs of informal trade are not much different from the costs of formal trade, some traders keep using informal routes. This is especially the case when a trader has only a few tons of maize, maize is not properly dried and cleaned,[70] business license and certificate of origin are not available, and working hours at the border posts differ. Therefore, as long as there is effective demand for small volumes of maize on the Kenyan side and loose enforcement of the border crossing rules, informal trade by small traders will continue.

[70] The moisture content is set at 13 percent in Tanzania, 13.5 percent in Kenya and 14 percent in Uganda. The rate of insect damaged grain is tolerable at 1 percent in Uganda, 2 percent in Kenya, and 3 percent in Tanzania.

Table 42: Costs of crossing the Busia border through formal and informal routes (US$ per ton)

Cost elements	Informal trade (Bicycle)	Formal (10MT truck)	Formal (32MT tuck)
Parking fee for lorry on the Ugandan side	0.25	0.25	0.16
Transport costs to cross the border	3.56		
Ugandan council fee	2.85	2.85	2.85
Re-bagging and loading *	3.56	3.56	3.56
Ugandan clearing agent fee		0.64	0.80
PATA clearing agent fee**		1.22	0.88
Fees paid by PATA agent to facilitate clearing process in Kenya		1.61	1.16
KEPHIS		0.45	0.36
KEBS		0.45	0.36
Health Department		0.45	0.36
Bribe		0.26	0.08
Road use fee		0.90	0.28
Total costs	**10.22**	**11.03**	**9.69**

Note: * All the cargo needs to be re-bagged from 100 kg bags to 90 kg bags. PATA agents handle all official business that crosses the Busia border. ** Ugandan traders cannot hire Ugandan clearing agents to clear goods in Kenya. Although KEPHIS, KEBS and Health Department Services are meant to be free, 'facilitation' payments are usually made.

Source: World Bank survey carried out in November-December 2008.

4.6. Off-farm storage

132. **Storage costs are added to marketing costs**. Storage costs account for about 3.5 percent of total marketing costs (Figure 24). The estimated costs are those incurred off-farm and include only the storage fee payments of traders at various stages of the supply chain (on-farm storage is described in section 4.7). In Kenya, 71 percent of interviewed traders did not have their own storage facilities, of which 60 percent rent them. In Uganda, about 57 percent of traders did not own storage spaces and 86 percent of them rented. In Tanzania, 79 percent of traders did not have their own storage facilities but only 36 percent of them rented them.

133. **Storage costs are the highest in Kenya, where they average US$2.5 per ton per month as shown in Table 43**. Storage costs are lowest in Uganda and in Tanzania, where they are a half as costly as in Kenya. In the estimates of the marketing costs given above, it is assumed that maize is stored at each stage of the supply chain for one month. For traders storing longer, storage costs are certainly larger but they often offset this increase by higher sale prices.

134. **Private storage capacity remains limited in the region**. As a result, private storage does not play an effective stabilizing role in food systems yet. Private investments in storage are often discouraged by policy and trade interventions such as export bans in Tanzania and NCPB interventions in Kenya. These interventions increase the risk of storage by making it difficult to predict future prices and thus the decision to store *vs.* sell at certain point of time. The impact of better price predictability on storage investments is evident in Uganda, where private storage capacity has grown in response to liberal trade

policy and the increasing demands from WFP. Thus, it is critical for the governments to improve the policy environment and also support the expansion of private storage capacity through private-public partnership schemes, which provide technology, materials and sometimes credit to private storage investors. A greater off-farm storage capacity would also reduce post-harvest losses at farm-gate level described below as farmers would be able to access more affordable off-farm storage facilities.

Table 43: Storage costs at various stages of the supply chain (US$ per ton)

District	Category of trader	Storage costs, US$ per ton per month
Uasin Gishu, Kenya	Farm-gate to first primary	2.1
	Primary to secondary market	2.5
	Secondary to wholesale/miller	2.8
Sironko, Uganda	Farm-gate to first primary	0.3
	Primary to secondary market	0.4
	Secondary to wholesale/miller	0.4
Njombe, Tanzania	Farm-gate to first primary	0.8
	Primary to secondary market	1.2
Mbeya, Tanzania	Primary to secondary market	1.2

Source: World Bank survey carried out in November-December 2008.

4.7. Post-harvest losses at farm level

135. **Finally, the post-harvest losses at farm-gate level are also estimated**. These losses are not included in the above analysis of marketing costs because they are foregone income rather than cost. Losses occur at various stages of the supply chain but here the estimates are made only at farm level. Reducing post-harvest losses can be a powerful tool to increase farm income no only directly from sales but also indirectly through reduced transport prices in rural areas.

136. **Based on the interviews carried out for this study, most farmers indicated high post-harvest losses**. For the analysis, the farms are divided into three categories based on area: (i) small-scale farmers (less than 2 ha), (ii) medium-scale farmers (2-25 ha), and (iii) large-scale farmers (above 25 ha). The majority of farms in all countries report substantial post-harvest losses; they also report using their own facilities to store the harvest (Table 44). Other characteristics of the farmers are described in Box 1.

Table 44: Selected characteristic of different types of farms in Kenya, Tanzania and Uganda

	Share of farms reported significant post-harvest losses, %	Share of farms using own storage facilities, %
KENYA		
Small-scale farms	73	100
Medium-scale farms	85	77
Large-scale farms	75	100
TANZANIA		
Small-scale farms	67	50
Large-scale farms	83	100
UGANDA		
Small-scale farms	95	86
Medium-scale farms	92	92

Source: World Bank survey carried out in November-December 2008.

Box 1: Other characteristics of the surveyed farms in Kenya, Tanzania, and Uganda

A total of 29 farmers, and this includes small-, medium- and large-scale farmers, were interviewed in Kenya's three districts. Among the small-scale farmers, 92 percent were male with an average age of 36 years and an average of 12 years of schooling, while the average age of females was 40 years with an average of 8 years of schooling. Among the medium-scale farmers, 62 percent were male with an average age of 39 years and 11 years of schooling while the female average age was 46 with an average of 12 years of schooling. Among the large-scale farmers, all were male with an average age of 56 years and 17 years of schooling.

In Uganda, a total of 46 farmers were interviewed. The sample included small- and medium-scale farmers. Among the small-scale farmers, 67 percent were male with an average age of 39 years and an average of 10 years of schooling while the average female age was 43 with 9 years of schooling. Among the medium-scale farmers 96 percent were male with an average age of 41 and 12 years of schooling and the female average age was 43 with 10 years of schooling.

In Tanzania, a total of 27 farmers were interviewed in six districts. Among the small-scale farmers, 89 percent were male with an average age of 34 years and 11 years of schooling while the average age of the female was 38 years with 8 years of schooling. All the large-scale farmers interviewed were male with an average age of 42 years and 13 years of schooling.

137. **How large are the post-harvest losses and where are they the highest?** The post-harvest losses are reported to average 10 percent, being the lowest in Kenya and the highest in Uganda (Table 45). As expected, the post-harvest losses are largest among the small-scale farms, given their low incomes and assets, which make them less able to invest in good quality storage facilities. The losses for small-scale farms are reported to range from 7 percent in Kenya to 15 percent in Uganda.[71]

[71] These post-harvest losses estimates are higher than the ones used by EAGC for maize balance in East Africa. It is estimated there at 10 percent of total output along the whole supply chain, not only at farm-gate.

Table 45: Post-harvest losses

	Kenya			Tanzania		Uganda	
	Small	**Medium**	**Large**	**Small**	**Large**	**Small**	**Medium**
PHL, in % of harvest	7.0	3.0	2.0	11.0	6.0	15.0	9.0
Total PHL, tons per acre	0.084	0.042	0.036	0.088	0.060	0.150	0.144
Farm-gate price of maize, US$/ton	256.4	256.4	256.4	180.4	180.4	187.5	187.5
Value of PHL per ton, US$	**18.0**	**7.7**	**5.1**	**19.9**	**10.8**	**28.1**	**16.7**

Source: World Bank survey carried out in November-December 2008.

138. **The value of the post-harvest losses is large when using the farm-gate prices as opportunity costs**. In Kenya, they are reported at US$5 per ton for large farms and US$18 for small farms. In Uganda, the post-harvest losses are estimated at an average of US$23 per ton and in Tanzania at US$20 per ton for small farms and US$11 per ton for medium farms. If Ugandan small farmers reduced their losses to the level in Kenya, the savings would have equaled about US$10 per ton. Overall, the average post-harvest losses in Kenya and Tanzania are about one half of transport charges between farm-gate and secondary markets (see Table 25). In Uganda, these costs are almost identical. This implies that investment in post-harvest infrastructure and technologies would be a powerful tool to increase farm incomes and raise food supply in the region.

139. **A word of caution should be said before interpreting the results of farmers' estimates, however**. If maize is put into store with 18 percent moisture and it comes out five months later with 14 percent moisture, this is not a post-harvest loss but a normal loss in weight, for example. Often much grain is lost because of theft. So not all losses are automatically 'post-harvest' losses. Notwithstanding possible subjective judgments, post-harvest losses remain a serious issue at farm-gate and along the whole supply chain in Africa.

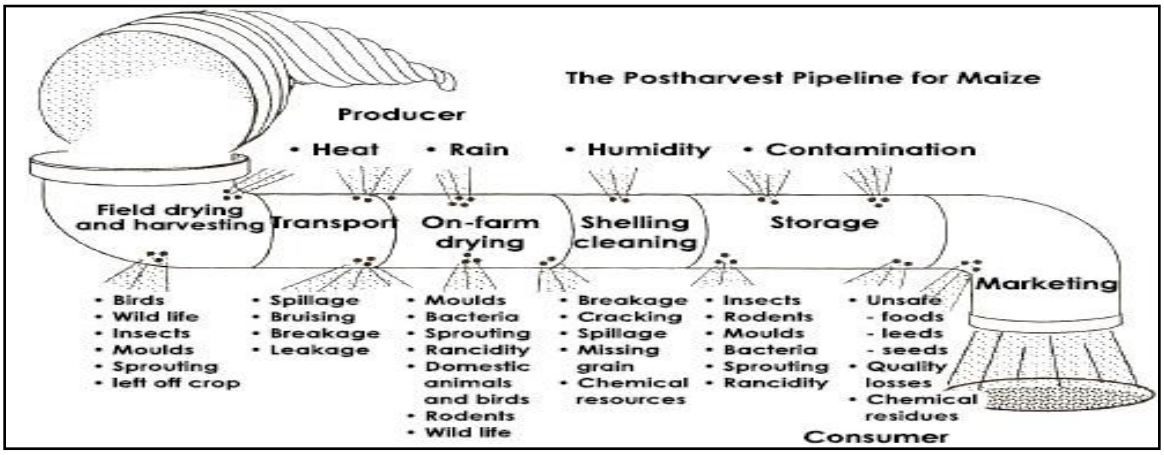
140. **Overall, high post-harvest losses provide a strong rationale for governments and the donor community to identify and invest in promising technologies for storage and best management practices for community/village storage facilities**. After the last food crisis in the mid-1970s considerable development investment went into post-harvest loss reduction for staple crops. Centers of excellence were formed and supported, both in the developed and the developing world. For example, in the 1970s and 1980s, the Tropical Products Institute (now Natural Resource Institute) in the United Kingdom led the field in terms of appropriate technology for smallholders (at the farm and village level), in developing countries. Unfortunately, once real commodity prices resumed their historical forty-year downward trend much of this research was not widely applied.

141. **The renewed focus on investment in agriculture that began last year is prompting new interest in effective interventions in this aspect of the agro-food system**. The investment required to reduce post-harvest losses appears to be relatively modest and the return on that investment rises rapidly as the price of the commodity increases. For those reasons, post-harvest loss reduction should arguably now serve as one of the medium-term pillars of the agricultural development programs as it will

significantly assist with poverty reduction.[72]

142. **Post-harvest losses can be caused by many factors**. As illustrated in Figure 26, the main factors responsible for the losses are (i) physical (temperature and moisture), (ii) biological (insects and mites, birds, microorganisms and people), (iii) mechanical (on-farm transport, speed and ground conditions of use), (iv) engineering (harvesting tools, processing equipment, drying and storage equipment), and (v) socio-economic (financial status of farm, farming system, storage system).

Figure 26: The post-harvest pipeline of maize



Source: Mejia (2005).

143. **In the countries under review, engineering and biological factors have been causing the largest losses**. In Kenya and Uganda, unfavorable weather conditions are responsible for the largest losses of the harvest, with the poor quality of storage facilities and pest infestation playing the second largest role (Table 46). In Tanzania, pest infestation was the major contributor to the post-harvest losses and can be directly linked to the poor quality of storage facilities. The lack of storage facilities, both owned and rented, is reported to be a problem in Tanzania and Uganda but not in Kenya. Finally, some losses also occurred during transportation from the field due to spillage.

[72] ARD together with AFTAR submitted the request to TFESSD for funding the stock-taking review of the promising technologies and management practices to reduce the post-harvest losses incurred by smallholders.

Table 46: Reasons for post-harvest losses (in percent to total losses)

Causes of loses	Kenya			Uganda		Tanzania	
	Small	Medium	Large	Small	Medium	Small	Large
Losses by transporting on poor road	0	5		11	6	13	
Lack of storage	6	0		18	13	13	13
Pest infestation	17	18	**37**	**25**	**32**	**40**	**50**
Poor quality of storage facility	**28**	14		**20**	16	**23**	**25**
Impact of weather	**33**	**58**	**50**	**29**	**28**	10	13
Spillage	17	5	13	4	6		
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Note: Factors equal and exceed 20 percent are highlighted in bold.

Source: World Bank survey carried out in November-December 2008.

5. Policy Recommendations

144. **Policy recommendations for reducing marketing and other costs need to distinguish between the roles of regional and national authorities.** Although the greatest breakthrough in regional agricultural trade and regional integration would arise from actions at the national level, there is still an important role for RECs. They have a critical role in taking the lead in studying the barriers to trade beyond customs and cross-border areas, raising awareness, and helping the national governments to find remedies. Both EAC and COMESA need to be more proactive and more successful in promoting regional solutions to local problems.

145. **At the regional level, improving infrastructure along cross-border trading routes for food staples would lower transport and transaction costs**. Adopting a regional perspective, public investment in transport corridors could help link surplus farming zones with cross-border deficit markets, thus benefiting both the farmers in surplus farming zones and the consumers in the deficit markets. Transport corridors between eastern Uganda and Kenya and between northern Tanzania and Kenya offer a clear example of the potential food security benefits of regional infrastructure investment programs. To be effective, these "hardware" investments need to be accompanied by "software" measures, i.e. harmonized customs, sanitary and phytosanitary and other technical regulations, synchronized working hours at the border posts, mutual recognition of axle restrictions, and other facilitation measures to increase cross-border flows of food staples (see also World Bank, 2008b).

146. **At national levels, recommendations for reducing marketing costs also distinguish between public investments ("hardware") and policy measures ("software")**. On the investment side, improving the quality of roads is the priority (and fiscally largest) intervention to reduce transport costs and consequently transport prices for end users (see Table 37). Road investments should focus on rural areas since better feeder roads (and reduced travel time to markets) in Africa have a significant impact not only on transport costs but also on agricultural productivity/supply response (Dorosh *et al*., 2008; Lall *et al*., 2009). Investment in rural roads has a higher internal rate of return than comparable investments in secondary roads or main roads as long as these roads are at least in a fair condition (and more so if a low level of service is required). In Uganda, for example, improving quality of feeder roads was found to have made a significant contribution to agricultural growth and poverty reduction, while shortened distances to tarmac roads has not appeared to have statistically significant impacts (Fan *et al*., 2004). In Malawi, not a country in this review but at comparable level of development with those under review, the quality of the trunk road network was not found to be a major constraint to trade but rather differences in the quality of feeder roads connecting villages to the main road network was found to have significant bearing on transport costs (Lall *et al*., 2009).

147. **Thus, investments in roads require proper planning and implementation**. Connectivity of rural roads with national roads is especially critical. Providing inner roads closest to markets is a necessary pre-condition for the provision of outer roads,

more distant from markets, to be effective. To enhance agriculture-led economic growth, public investment in transport infrastructure should be given priority to connect rural areas that offer a combination of rich natural and economic potential and high population densities, with major domestic and cross-border markets.[73]

148. **Investments in rural roads should be accompanied by measures to promote load consolidation**. Investment in infrastructure is economically justifiable as long as consolidated production enables reasonable agglomeration to justify economically transportation per truck. A load consolidation may be promoted through (i) producer groups; (ii) on-farm and village storage; (iii) wholesale markets. Larger loads would not only reduce transport costs but reduce a frequency of loading/unloading at various stages of supply chain.

149. **Improved feeder roads will reduce fuel and other variable costs but additional policy actions are yet necessary to reduce fuel costs**. This is very critical as future oil prices are likely to be much higher, in spite of the temporary relief brought by the global financial crisis. In December 2008, fuel accounted for 47-58 percent of total transport costs, thus a reduction in fuel costs would significantly reduce transport cost and prices. Transporters should be encouraged to use trucks with lower operating costs, for example by changing truck import duties to encourage the import of newer trucks. This would lead to the modernization of the trucking fleet and higher fuel efficiency.[74] Reducing fuel taxes might also be an option, but review of these taxes should take into account that budget revenues from fuel taxes are usually used to maintain roads, thus adjusting fuel taxes downwards would need to be offset by other budget revenues to sustain road maintenance. Furthermore, taxing fuel supports carbon reduction efforts and thus contributes to slowing down climate change.

150. **Investments in railroads will also reduce transport prices by increasing competition with trucking companies**. Increased competition from rail services would benefit transport users through comparable or lower transport costs. In the parts of Africa without rail services such as in West Africa, transport prices are very high (Teravaninthorn and Raballand, 2009). Yet, where rail services exist, as in Central and Eastern Africa, transport prices tend to be lower since rate-setting takes into account rail prices, especially for heavy and bulky commodities. With global fuel prices expected to rise again over time, such investments will become more profitable in the future, yet it goes beyond the scope of this study to determine a break-even point for fuel prices that would make rail investments attractive for connecting markets in East Africa.

151. **Reducing delays and bribes and streamlining customs procedures would also have significant positive effects on cost.** Addressing these non-WTO-consistent

[73] Investments in rural roads will also need to be complemented by developing transport services. As large truckers are unlikely to find all rural routes profitable, it may be useful to consider options for promoting appropriate intermediate means of transport for connecting rural areas to at least primary markets. See the World Bank report "Increasing Roods Investment Efficiency in Rural Areas", draft from August 2009.

[74] See detailed recommendations for addressing high transport prices in Africa in Teravaninthorn and Raballand (2009).

measures requires immediate action. For example, the load-weighing processes at weighbridges should be streamlined to avoid delays. This could be done by commercializing the weighbridges with the strict monitoring of performance. Frequent calibration of the weighbridges equipment is required to ensure consistent reading. Corruption at weighbridges should also be dealt with, for example by introduction of weigh-in-motion systems, other mobile weighbridges, and by a strict enforcement of loading rules. Regarding corruption at roadblocks, it is recommended that the number of roadblocks be reduced (and more mobile police units are used to ensure sufficient security on the roads) and their mandate exclude controlling trading and licensing documents. On customs, export and import documentation, axle-load limits, and customs open hours are still required to be harmonized within the EAC Customs Union (see also World Bank, 2008b). The existence of these problems is accepted by most governments in the region, and many mitigation measures have already been put on the table at national and regional levels. Lack of public funds, for upgrading weighbridges and mobile police units for example, and lack of political will to enforce regulations at weighbridges and limit corruption at roadblocks have prevented these recommendations from being put into practice, however. The on-going technical assistance of the World Bank to the EAC Secretariat seeks to assist countries to prepare plans to reduce major non-tariff measures and equip the Secretariat with the tools to monitor their implementation (World Bank, 2008b).

152. **In contrast to non-WTO-consistent measures, reducing the burden of local cess is a less straightforward task**. On one hand, the effective rate of taxation by cess in the reviewed countries was found not to exceed 3 percent of maize value, though being regressive. The multiple taxation is often the case but it is a result of multiple aggregation of various loads at different markets (from primary to secondary and then to urban wholesale) rather than corruption at the roadblocks. On the other hand, the revenues from maize cess often accounts for a substantial share of locally-generated budget revenues. The budget incomes generated from maize cess in Kitale and Weregi towns in Kenya and in Njombe and Mbeya districts in Tanzania exceed 15 percent of locally-generated revenues and elimination of the cess would significantly erode the local taxation base in districts with few sources of income. In contrast, in more diversified areas such as Nakuru County in Kenya and Iringa District in Tanzania, a reduction or elimination of the maize cess could be a relatively small problem for their budgets. Before abolishing or suspending local taxes because they are perceived to be regressive and excessive, therefore, options should be explored to improve the equity of the tax instrument. Harmonization of cess tax base and rates and an improvement in administration of tax collection generally would be beneficial as it would reduce uncertainty and limit the opportunity for corruption.

153. **Investing in wholesale markets might improve the administration of cess collection and also reduce an incidence of multiple cess taxation**. The construction of Kibaigwa wholesale market in Tanzania, for example, has helped reduce the taxation burden by permitting traders, who come in with cess certificate on a smaller load and add tonnage to get a larger load, to obtain certificate just for the balance. Wholesale markets can also help improve price formation and reduce search costs and as a result, reduce marketing costs.

154. **Finally, trade restrictions and policy interventions would need to be removed**. While the major focus of this report is to assess ways to reduce marketing costs, it is important to stress that this should be done in parallel with improving the agricultural policy framework in East Africa. The recent food security crisis in the region and in the world has renewed the fear that hunger and food insecurity will return. As a result, the earlier achievements in trade liberalization have in some cases been reversed, at least temporarily, and the chances of a return to protectionist measures have risen. The maize export bans in Tanzania are an example of this. While the direct impact of the export bans is difficult to measure (and compare with marketing costs), its impact is seen in the form of lost opportunities for Tanzanian farmers and traders on the Kenyan and southern markets (Zambia, Malawi, and DRC). The export ban also explains why price transmission between Nairobi and relatively distant markets in Uganda is relatively strong (e.g. the combined rate of adjustment between Nairobi and Lira, which are located 730 km apart, is 59 percent – the regression predicts 57 percent) while price transmission between Nairobi and closer markets in Tanzania is comparatively weak (e.g. the combined rate of adjustment between Nairobi and Arusha, at a distance of only about 300 km, is 37 percent – the regression predicts 44 percent).

155. **While the objectives of the ban, i.e. limited cross-border trade and lower maize prices in Tanzania, have been partially achieved, it has brought other negative social impacts**. The export ban involves price control, which reduces potential output, causing losses to the economy as a whole. Lower output prices result in lower incentives for farmers to produce greater output, which hurts net buyers since maize output is kept below its potential. Tanzania is actually the country with the highest production potential in the region to feed the surrounding neighbors that have structural food deficits. But the export ban simply means lower exports, slower agricultural growth, and lost opportunities for farmers and consumers.

156. **Export bans and other trade restrictions also negatively affect the private sector development and investments**. Survey evidence from private traders and potential investors in Africa during the 1990s showed that fear of policy reversal was a major impediment to investment (World Bank, 20005). Building private-public partnerships in increasing grain storage capacity is especially promising but efforts to support the private-sector are unlikely to go far until incentives are provided for the private sector to operate.

157. **Finally, with the increased food price volatility in East Africa and in world markets, a predictable and undistorted policy environment becomes increasingly critical**. Several risk management instruments show considerable promise in managing food price risks, including facilitation of private storage (warehouse receipt systems), futures and options markets, and weather-indexed insurance (World Bank, 2005). Yet transparent and predictable agricultural trading policy is a pre-condition for these alternatives to be used in East Africa.

6. References

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Annex 1: Maize Food Balances in East Africa

Table 47: Maize balance in Kenya, 2006/07-2008/09 (tons)

	2006/07	2007/08	2008/09
Carry-over stocks, beginning	**597,000**	**914,959**	**400,000**
Imports	265,959	116,631	405,000
Uganda	132,971	80,000	110,000
Tanzania	132,988	36,631	110,000
Import outside EA			185,000
Maize production	**3,060,000**	**2,655,000**	**2,250,000**
Long rains	2,520,000	2,385,000	2,124,000
Short rains	540,000	270,000	126,000
Post-harvest losses and seeds	153,000	398,250	337,500
Total Availability	**3,769,959**	**3,288,340**	**2,717,500**
Domestic consumption	2,850,000	2,850,000	3,234,000
Exports	5,000	30,000	5,000
Uganda			
Tanzania		20,000	
Outside of EA	5,000	10,000	5,000
Carry-over stocks, end	**914,959**	**408,340**	**-521,500**

Source: EAGC (2009).

Table 48: Maize balance in Tanzania, 2006/07-2008/09 (tons)

	2006/07	2007/08	2008/09
Carry-over stocks, beginning	**157,056**	**189,463**	**303,112**
Imports	2,780	44,000	9,000
Uganda	2,131	4,000	4,000
Kenya		20,000	
Import outside EA	649	20,000	5,000
Maize production	**3,260,000**	**3,380,000**	**3,633,652**
Long rains	3,100,000	3,300,000	3,593,658
Short rains	160,000	80,000	40,000
Post-harvest losses and seeds	163,000	338,000	363,366
Total Availability	**3,256,836**	**3,2754,463**	**3,582,404**
Domestic consumption	2,925,720	2,925,720	2,925,720
Exports	141,653	46,631	120,000
Uganda			
Kenya	132,988	36,631	110,000
Outside of EA	8,665	10,000	10,000
Carry-over stocks, end	**189,463**	**303,112**	**536,684**

Source: EAGC (2009).

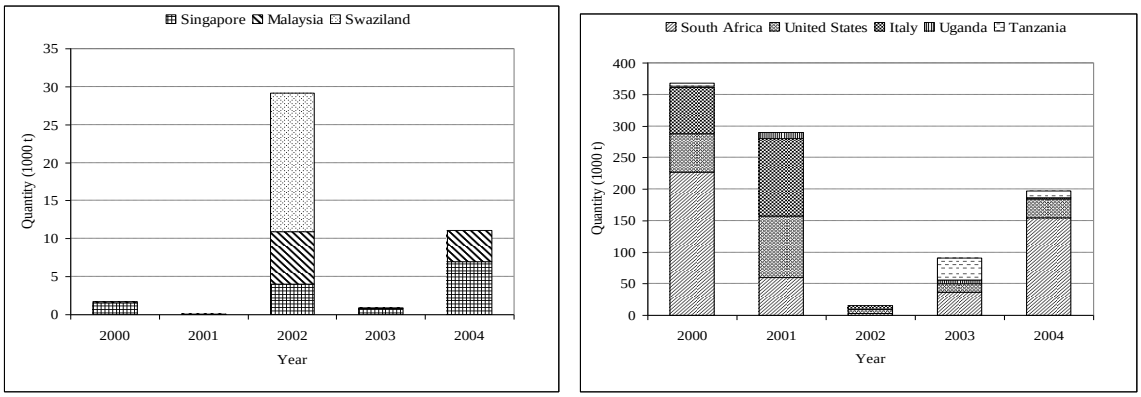
Table 49: Maize balance in Uganda, 2006/07-2008/09 (tons)

	2006/07	2007/08	2008/09
Carry-over stocks, beginning	**23,405**	**53,627**	**89,627**
Imports			
Kenya			
Tanzania			
Import outside EA			
Maize production	**650,000**	**650,000**	**600,000**
Long rains	400,000	400,000	350,000
Short rains	250,000	250,000	250,000
Post-harvest losses and seeds	32,500	65,000	60,000
Total Availability	**640,905**	**638,627**	**629,627**
Domestic consumption	400,000	400,000	400,000
Exports	187,278	149,000	159,000
Rwanda	47,176	60,000	40,000
Kenya	132,971	80,000	110,000
Tanzania	2,131	4,000	4,000
Outside of EA	5,000	5,000	5,000
Carry-over stocks, end	**53,627**	**89,627**	**70,627**

Source: EAGC (2009).

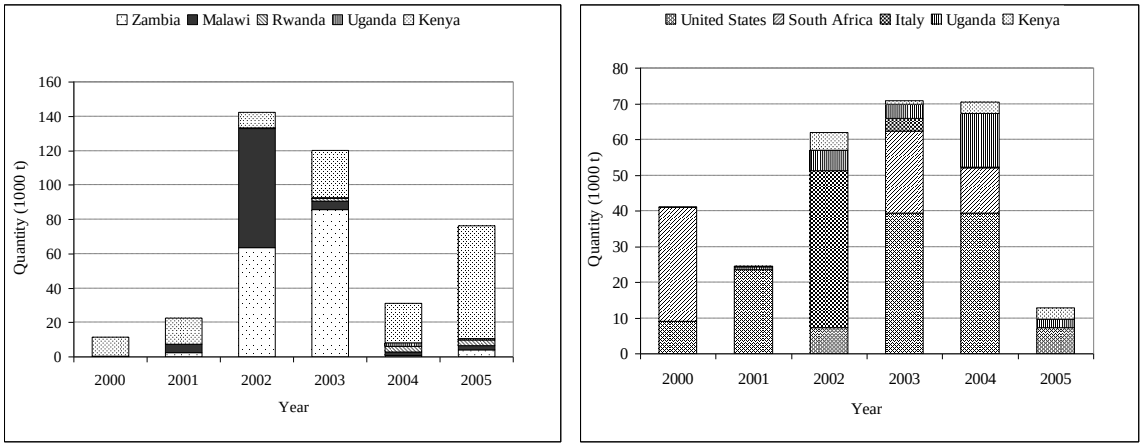
Annex 2: International Maize Trade of Selected Countries

Figure 27: Maize trade of Kenya 2000-2004[75]



Source: FAO (2008).

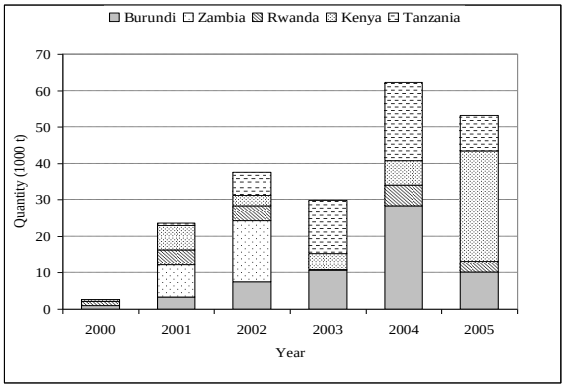
Figure 28: Maize trade of Tanzania 2000-2005[75]

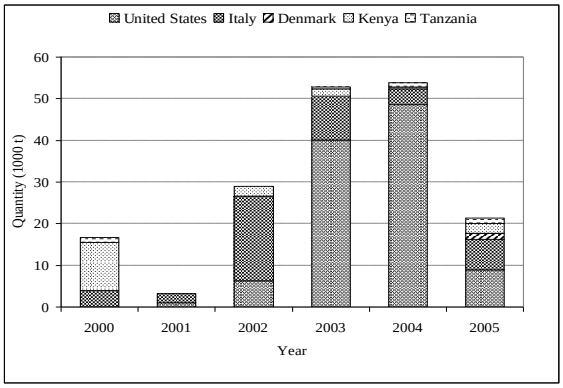


Source: FAO (2008).

Figure 29: Maize trade of Uganda 2000-2005[75]

[75] The left panel displays the country's exports and the right panel its imports.

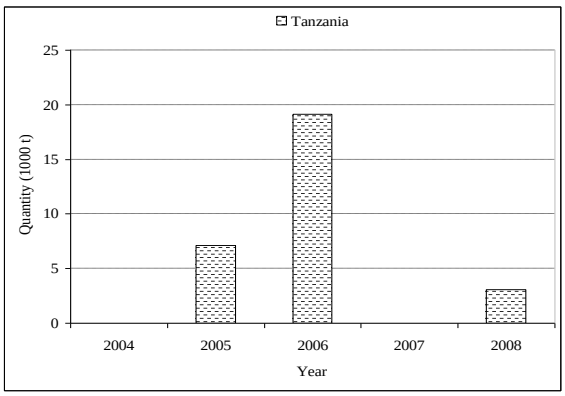


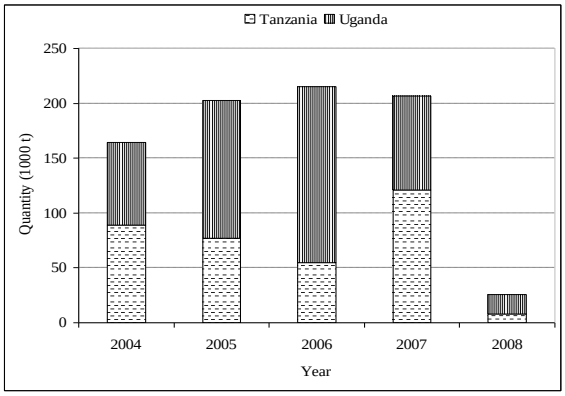


Source: FAO (2008).

Annex 3: Regional Maize Trade of Selected Countries

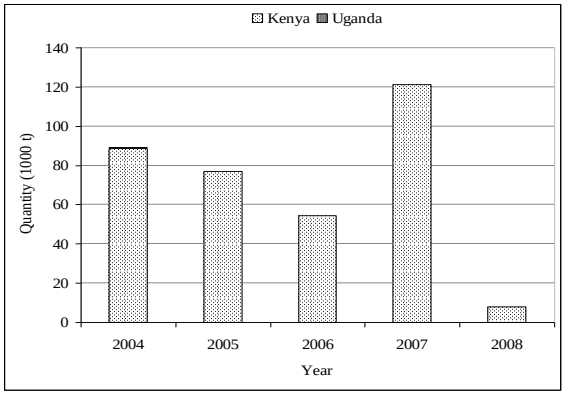
Figure 30: Regional maize trade of Kenya 2004-2008[75]

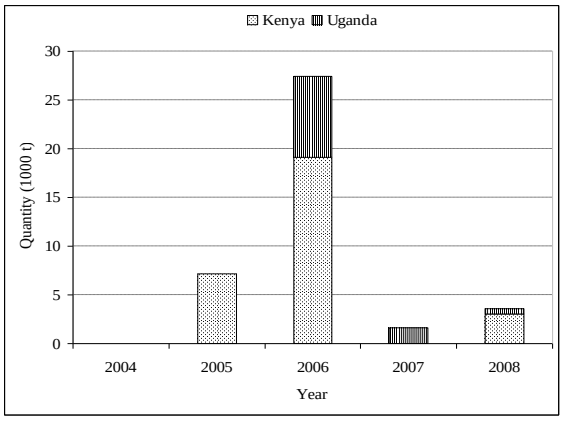




Source: RATIN (2008).

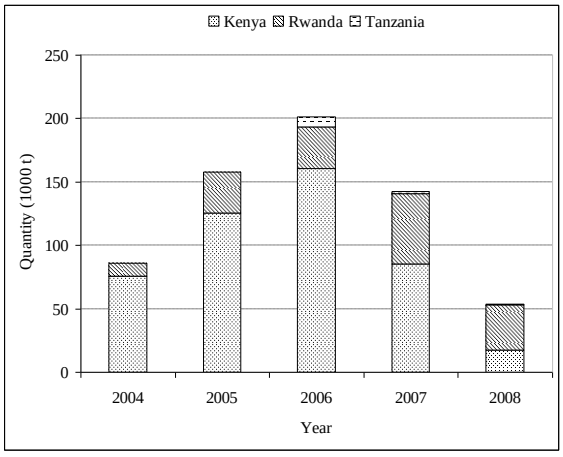
Figure 31: Regional maize trade of Tanzania 2004-2008[75]

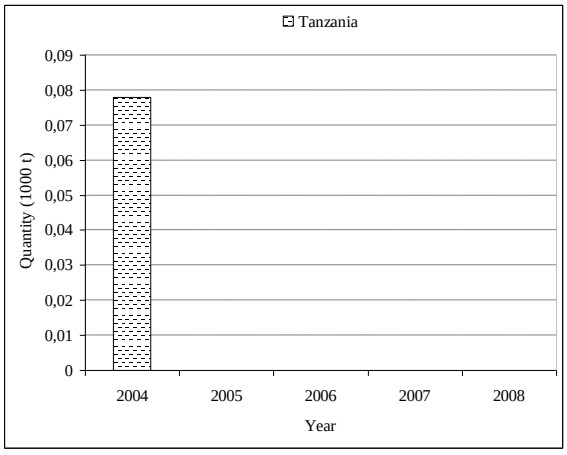




Source: RATIN (2008).

Figure 32: Regional maize trade of Uganda 2004-2008[75]





Source: RATIN (2008).

Annex 4: Methodology of the Price Integration Analysis

A. An overview of the methods used to study price transmission

There have been rapid advances in price transmission (PT) analysis in recent years. Economists have developed a variety of empirical methods for studying PT and market integration (Fackler and Goodwin, 2001 is a recent review). In the course of this development, the analysis of simple correlations between price series has been supplanted by increasingly sophisticated econometric techniques.

The introduction of co-integration methods in the mid- to late-1980s provided impetus to the PT literature by enabling practitioners to distinguish non-spurious from spurious relationships between (often non-stationary) prices, and by providing deeper insights into the equilibrating dynamics – generally attributed to arbitrage – that underlie PT (Varva and Goodwin, 2005). Cointegration analysis is based on the insight that if a linear combination of two non-stationary variables is itself stationary, then these two (so-called 'integrated') variables must be co-moving and linked to one another by a long-run equilibrium relationship (and can therefore be referred to as 'cointegrated'). Hence, cointegration analysis begins with stationarity tests to determine whether the variables in question (prices in the case of PT analysis) are non-stationary. The augmented Dickey-Fuller (ADF) and KPSS (Kwiatkowski *et al.*, 1992) tests are commonly used for this purpose. If the prices are found to be non-stationary, the analysis proceeds with tests to determine whether there is a stationary linear relationship between them. One possibility is to test whether the residual of a simple regression between these prices is stationary using, again, the ADF and KPSS tests. Alternatively Johansen has developed tests for cointegration based on maximum-likelihood estimation techniques.

If the prices on markets *A* and *B* are cointegrated, the long-run equilibrium or 'cointegrating' relationship between them takes the following form:

$$p_t^A = \beta_0 + \beta_1 p_t^B + ect_t \qquad (1)$$

In this equation, β_0 measures the long-run margin between the prices (which measures transfer costs from B to A), and β_1 is the long-run PT coefficient. If logarithms of prices are employed in the estimation then β_1 can be interpreted as the long-run PT elasticity. This elasticity measures the percentage change in the price on market *A* that occurs in the long run in response to a 1% change in the price on market *B*.

The residual ect_t of this equation measures deviations from the long-run equilibrium relation. While such deviations are expected to average out to zero in the long run, non-zero deviations can occur in the short run if the price on one or both markets is shocked, for example by a sudden shift in demand or unexpected fluctuations in supply. A positive deviation from the long-run equilibrium relationship ($ect_t > 0$) indicates that the price on market *A* is 'too high' vis-à-vis the price on market *B*. The resulting excess returns will trigger increased trade from *B* to *A*, increasing (decreasing) the price in the former (latter) and realigning the prices with their long-run equilibrium. A negative deviation ($ect_t < 0$) indicates that the price on market A is 'too low' vis-à-vis the price on market B, and this will trigger reduced trade and an opposite set of reactions that realign the prices with their

long run equilibrium relationship.

The speed with which such realignments or 'corrections' of deviations from the long-run equilibrium take place is a measure of the strength of PT (i.e. the transmission of price signals) between two markets, and it is measured by estimating the so-called 'error correction model' (ECM). The ECM describes the short-run dynamics that ensure that cointegrated prices are always attracted back towards their long-run equilibrium relationship. The ECM for two prices takes the following basic form:

$$\begin{pmatrix} \Delta p_t^A \\ \Delta p_t^B \end{pmatrix} = \begin{pmatrix} \alpha^A \\ \alpha^B \end{pmatrix} ect_{t-1} + \sum_{i=1}^{k} \mathbf{\Gamma}_i \begin{pmatrix} \Delta p_{t-i}^A \\ \Delta p_{t-i}^B \end{pmatrix} + \begin{pmatrix} \varepsilon_t^A \\ \varepsilon_t^B \end{pmatrix}. \qquad (2)$$

In this equation, α^i and $\mathbf{\Gamma}$ are coefficients to be estimated, and the ε^i are random errors. The ECM can be estimated in one step using the above-mentioned methods developed by Johansen. Alternatively the Engle-Granger two-step method can be employed. According to this method, first the long-run relationship in equation (1) is estimated, and then the residuals of this equation are used as estimates of the *ect*-term in the ECM in equation (2). Both steps of this method can be estimated using simple OLS.

The so-called 'adjustment parameters' in the ECM, α^A and α^B, measure how quickly p^A and p^B react to deviations from their long-run cointegrating relationship, in other words how quickly such deviations are 'corrected'. Consider a stylized example with the long-run equilibrium relationship $p^A = 5 + p^B$, i.e. the price in *A* equals the price in *B* plus an equilibrium margin of 5. Assume, for example, that p^A and p^B are initially equal to 105 and 100, respectively. A poor harvest in *A* will lead to price increases on this market, say to 110. As a result, the price in *A* will be 'too high' by the amount of 5. Trade from *B* to *A* will generate profits in excess of the equilibrium margin, and trade volumes will increase as a result, exerting downward (upward) pressure on the price in *A* (*B*). α^A and α^B will reflect the magnitudes of these pressures. If, for example, α^A = -0.5, then p^A will fall to correct 50% of any deviation from the long-run equilibrium relationship in each period. In the stylized numerical example just provided, p^A would fall by 2.5 (=-0.5*5) in the first period after the poor harvest, resulting in a new p^A of 107.5. 50% of the remaining deviation of 2.5 (-0.5*2.5=-1.25) would be corrected in the next period, resulting in a p^A of 106.25, and so on until the long-run equilibrium is restored. Of course, this simple example has implicitly assumed that α^B equals zero, so that only p^A adjusts to restore equilibrium. This is possible, but certainly not necessary. It is also possible that only p^B adjusts to restore equilibrium, or that both prices adjust.[76] Note that α^A must be negative and α^B must be positive so that price reactions correct deviations and restore the long-run equilibrium (by reducing p^A and increasing p^B if the deviation is positive, and *vice versa*). The combined magnitude of α^A and α^B reflects the overall speed of adjustment, and the relative magnitude indicates how the 'burden' of adjustment is distributed between the two markets.

[76] In practical applications, it is highly unlikely that an estimated adjustment parameter will ever exactly equal zero. What matters is whether it differs from zero significantly based on statistical tests.

In this report, the cointegration methodology described above was applied in the following manner:

a. ADF tests were first applied to the maize price series in Kenya, Tanzania and Uganda (see below for a description of this data). The preponderance of evidence indicates that the prices are integrated of order 1 or I(1).

b. We next applied the Johansen cointegration test to pairs of prices to test for the existence of a long-run equilibrium between these prices.

c. If a pair of prices is cointegrated, then the Johansen procedure (Johansen, 1995) is applied to generate estimates of the long-run equilibrium relationship in equation (1) and the ECM in (2). These estimates are analyzed to provide answers to questions i through vi above.

d. To analyze the impact of the recent increase in international food prices on maize PT in East Africa (question vii), a test procedure proposed by Hansen and Johansen (1999) and Juselius (2008) is applied. This procedure tests for the existence of a structural break in the long-run equilibrium relationship between two prices. We implement the test using August 2007 as the possible break point.

e. To analyze the impact of Tanzanian export bans on PT in the region (question viii) we test for differences in average margins between Nairobi and key markets in Tanzania in phases with and without export bans.

f. To analyze the relationship between geographic distance and borders and the strength of PT between two markets (question ix), simple graphical analysis and regressions are employed.

B. Data

Monthly price data in US$ per ton for 20 markets in the region from January 2000 to October 2008 (106 observations) are employed in this analysis. The following prices are considered:

g. Three international maize prices: fob US Gulf (yellow maize), Safex (white maize) and South African export parity price fob Durban. The last two prices are not typical world market notations, but South Africa is – along with the US – the only relevant international sources of maize for countries in the region.

h. Four Kenyan maize prices: Nairobi and Mombasa (net consumption), Eldoret (net production) and Nakuru (net production).

i. Five Tanzanian maize prices: Dar es Salaam (net consumption), Iringa, Mbeya and Songea (net production), and Arusha (net production, trading center for maize exports from Tanzania to Kenya).

j. Seven Ugandan maize prices: Kampala (net consumption), Iganga, Kasese, Lira, Masaka and Masindi (net production), and Mbale (net production, trading center for maize exports from Uganda to Kenya).

Most of the price data were obtained from the webpage of the Regional Agricultural Trade Intelligence Network of the Eastern Africa Grain council (RATIN, 2008). Weekly data in local currency published by the Ministry of Industry and Trade of Tanzania and InfoTradeUganda (2008) was used in some cases (see below). Some monthly data in local currency were taken from Michigan State University (2008). The international US Gulf prices were obtained from RATIN (2008), and the Safex and Durban prices were downloaded from Safex (2008).

Where data were missing, averages of weekly data or monthly data in local currency were transformed into US$ per ton and used to fill the gaps:

- Iringa contains observations based on average weekly data in local currency;
- Mbeya contains observations from monthly data in local currency;
- Songea contains 25 observations based on average weekly data;
- Nakuru is largely based on monthly data in local currency;
- Eldoret contains a few averages of weekly data and monthly data in local currency;
- Iganga, Kasese, Masaka, Lira and Masindi prices are mostly computed from monthly data in local currency and 10-15 weeks of weekly averages.

Fifty-nine missing observations (exclusively in the Tanzanian and Ugandan series) could not be filled using weekly or monthly data in local currency. These gaps were filled using an imputation algorithm proposed by King *et al*. (2001) and the corresponding R-package Amelia. We performed 1000 imputations for each missing value and estimated its most likely value using Parzen (1962) nonparametric mode estimator. Since only 59 of a total of 2120 observations are affected, we are confident that this imputation does not have a notable impact on the results reported below.

If available, weekly data has several advantages for PT analysis. First, higher frequency data often provide more observations and therefore degrees of freedom for econometric estimation. Second, some PT processes might unfold in the course of weeks rather than months. In such cases, weekly data will provide a better record of the disequilibria and adjustments that characterize PT processes than monthly data, which will average out potentially useful information. Third, and related to the previous two points, weekly data would make it possible to estimate more complex models of PT, for example models that allow for threshold effects in PT, or regime-dependent PT behavior. These advantages of weekly data could be of great value for attempts to address questions vii and viii in particular, because they involve looking for evidence of differences in PT behavior between subsets of the data (i.e. subsets before and during the recent rise in global food prices; subsets with and without Tanzanian export bans). There are only 106 observations in the monthly dataset, and subsets of this data will have even fewer observations, making it very difficult to obtain reliable estimates of dynamic PT processes.

Unfortunately, most of the available weekly price series contain long phases of missing values. Furthermore where weekly data from multiple sources are available, significant discrepancies are apparent. These factors negate the potential advantages of working with weekly data for the time being. Efforts to collect consistent and sustained weekly data on maize and other staple food prices in the region should be given high priority.

Annex 5: Econometric Results of Price Transmission Analysis

Table 50: Results of the ADF unit root tests of the logged price series

	Levels			First differences		
Price series	**ADF test statistic (constant)**	**Crit. value 5%**	**Lag length (AIC)**	**ADF test statistic (no constant)**	**Crit. value 5%**	**Lag length (AIC)**
Dar es Salaam	-1.8257	-2.86	5	-5.3526	-1.94	4
Arusha	-2.1169	-2.86	10	-6.4206	-1.94	9
Iringa	-2.576	-2.86	0	-10.299	-1.94	0
Mbeya	-2.5564	-2.86	2	-6.1504	-1.94	1
Songea	-3.004	-2.86	0	-7.2311	-1.94	0
Nairobi	-2.5557	-2.86	0	-12.41	-1.94	0
Mombasa	-1.6324	-2.86	0	-10.516	-1.94	0
Eldoret	-1.5083	-2.86	0	-8.9818	-1.94	0
Nakuru	-1.4589	-2.86	0	-9.4614	-1.94	0
Kampala	-1.3179	-2.86	1	-6.9918	-1.94	3
Iganga	-2.1677	-2.86	0	-10.407	-1.94	0
Kasese	-2.5801	-2.86	7	-3.5807	-1.94	5
Masaka	-2.909	-2.86	1	-8.8612	-1.94	0
Mbale	-2.1821	-2.86	1	-9.3665	-1.94	0
Lira	-2.2787	-2.86	1	-9.2838	-1.94	0
Masindi	-2.5892	-2.86	1	-7.2539	-1.94	1
US Gulf	-1.9468	-2.86	3	-4.5348	-1.94	5
Safex	-2.0506	-2.86	1	-6.742	-1.94	0
Durban	-1.1819	-2.86	0	-10.555	-1.94	0

Note: All prices except Songea and Masaka are clearly integrated of order 1 (I(1)) at the 5% level of significance. All series (including Songea and Masaka) are clearly I(1) at the 10% level of significance (the respective critical values are not shown here).

Table 51: Results of Johansen cointegration test and long-run equilibrium estimations

Pair	Market *A*	Market *B*	Cointegration at 10%	Long-run relationship Intercept	Elasticity
1	Dar es Salaam	Arusha	yes	0.541	0.908
2	Dar es Salaam	Iringa	mixed	1.578	0.734
3	Dar es Salaam	Mbeya	mixed	4.203	0.196
4	Dar es Salaam	Songea	yes	-0.662	1.224
5	Dar es Salaam	Nairobi	mixed	-1.4	1.225
6	Dar es Salaam	Mombasa	no		
7	Dar es Salaam	Kampala	mixed	2.505	0.521
8	Dar es Salaam	US Gulf	mixed	2.28	0.606
9	Dar es Salaam	Safex	no		
10	Arusha	Iringa	yes	8.594	-0.73
11	Arusha	Mbeya	no		
12	Arusha	Songea	yes	-18.525	4.991
13	Arusha	Nairobi	yes	-1.135	1.164
14	Iringa	Mbeya	yes	0	1.055
15	Iringa	Songea	yes	-1.657	1.37
16	Iringa	Nairobi	no		
17	Mbeya	Songea	yes	-2.665	1.577
18	Mbeya	Nairobi	yes	0.688	0.769
19	Songea	Nairobi	yes	-0.609	1
20	Nairobi	Mombasa	yes	0.66	0.884
21	Nairobi	Eldoret	yes	1.979	0.652
22	Nairobi	Nakuru	yes	1.592	0.715
23	Nairobi	Kampala	yes	1.593	0.743
24	Nairobi	Iganga	yes	2.567	0.565
25	Nairobi	Kasese	yes	2.708	0.538
26	Nairobi	Masaka	yes	2.444	0.577
27	Nairobi	Mbale	yes	2.077	0.656
28	Nairobi	Lira	yes	2.532	0.568
29	Nairobi	Masindi	yes	2.542	0.577
30	Nairobi	US Gulf	yes	2.674	0.563
31	Nairobi	Safex	no		
32	Mombasa	Eldoret	yes	1.46	0.743
33	Mombasa	Nakuru	yes	0.995	0.82
34	Mombasa	US Gulf	no		
35	Mombasa	Safex	no		
36	Eldoret	Nakuru	yes	-0.694	1.116
37	Kampala	Iganga	no		
38	Kampala	Kasese	no		
39	Kampala	Masaka	yes	-0.162	1.038
40	Kampala	Mbale	yes	-0.213	1.059
41	Kampala	Lira	mixed	0.568	0.906
42	Kampala	Masindi	yes	0.815	0.873
43	Kampala	US Gulf	no		
44	Kampala	Safex	no		
45	Iganga	Mbale	yes	-0.735	1.134
46	Iganga	Lira	yes	-0.004	0.993
47	Mbale	Lira	yes	0.638	0.877
48	Dar es Salaam	Durban	no		

49	Nairobi	Durban	no		
50	Mombasa	Durban	no		
51	Kampala	Durban	no		

Note: A long-run relationship is only estimated if there is at least mixed evidence in favor of cointegration. "Mixed" means that the three model selection criteria used to determine the appropriate lag length resulted in different test conclusions so that no definitive conclusion could be reached.

Table 52: Results of ECM estimations

Pair	α Market *A*	P-value	Half-life	α Market *B*	P-value	Half-life
1	-0.161	0.046	3.9	0.194	0.007	3.2
2	-0.051	0.233		0.299	0.000	2.0
3	-0.169	0.001	3.7	-0.090	0.205	
4	-0.008	0.843		0.265	0.000	2.3
5	-0.009	0.851		0.228	0.000	2.7
6						
7	-0.181	0.000	3.5	0.230	0.007	2.7
8	-0.112	0.011	5.8	0.011	0.640	
9						
10						
11	-0.052	0.005	13.0	-0.074	0.079	9.0
12						
13	0.016	0.024	43.0	0.049	0.000	13.8
14	-0.123	0.025	5.3	0.251	0.000	2.4
15	-0.213	0.001	2.9	0.059	0.213	
16	-0.066	0.357		0.217	0.000	2.8
17						
18	0.156	0.003	4.1	0.316	0.000	1.8
19	-0.080	0.119		0.157	0.000	4.1
20	-0.107	0.043	6.1	0.136	0.000	4.7
21	-0.528	0.000	0.9	0.229	0.002	2.7
22	-0.478	0.000	1.1	0.194	0.024	3.2
23	-0.337	0.001	1.7	0.320	0.000	1.8
24	-0.339	0.000	1.7	0.339	0.018	1.7
25	-0.220	0.007	2.8	0.411	0.000	1.3
26	-0.225	0.004	2.7	0.463	0.000	1.1
27	-0.139	0.036	4.6	0.437	0.000	1.2
28	-0.424	0.000	1.3	0.231	0.024	2.6
29	-0.275	0.000	2.2	0.310	0.001	1.9
30	-0.238	0.008	2.6	0.487	0.000	1.0
31	-0.238	0.000	2.6	-0.032	0.256	
32						
33						
34	-0.250	0.002	2.4	0.301	0.001	1.9
35	-0.124	0.102		0.399	0.000	1.4
36						
37						
38	-0.162	0.001	3.9	0.008	0.792	
39	-0.119	0.136		0.383	0.000	1.4
40						
41						
42	0.057	0.394		0.285	0.000	2.1
43	-0.177	0.075	3.6	0.179	0.026	3.5
44	-0.065	0.463		0.280	0.000	2.1

45	0.024	0.795		0.328	0.000	1.7
46						
47						
48	-0.278	0.000	2.1	0.004	0.868	
49	-0.643	0.000	0.7	-0.004	0.956	
50	-0.328	0.003	1.7	0.281	0.003	2.1
51	-0.010	0.910		0.574	0.000	0.8

Note: Half-lives are only calculated if the corresponding adjustment parameter is significant at the 10% level at least. The half-life measures the number of periods (months in this case) required to correct one-half of deviation from the long-run equilibrium relationship.

Annex 6: Questionnaire for Collection of Primary Data on Marketing Costs

A: Identifying Variables

Date of Interview :(ddmmyy)

SURDATE_____

Respondent ID No.

RESID_____

Respondent Name_____

Supervisor: _____ **SNUM**

_____

Enumerator: _____ **ENUM**

_____

Province: _____ **PROV**

_____

District: _____ **DIST**

_____

Market : _____ **MKT** _____

We are part of a team at Eastern Africa Grain Council(EAGC), who are studying Domestic and Cross Border Trade on Maize with the aim of Estimating Marketing Costs of the Eastern Africa Regional Grain Trade. Your participation in answering these questions is very much appreciated. Your participation is completely voluntary, and you do not need to answer any questions you do not want to. Your responses will be

COMPLETELY CONFIDENTIAL. If you choose to participate you may refuse to answer certain questions or you may stop participating at any time. Your responses will be added to those of other households, traders and transporters in Kenya and analysed together. The results will be used by the world bank to guide future policy dialogue at country and regional level to promote functioning markets and trade. If you have any questions or comments about this survey, you may contact the CEO, Eastern Africa Grain Council (EAGC) P.O. Box 218 00600 Sarit Center Nairobi **THANK YOU.**

A : **General Information**

1. What is the age of the respondent **AGE _____**

2. Sex of the Respondent *(1=Male 2=Female)* **SEX _____**

3. Years of education of the respondent **EDUCYRS** _____

(0=None 1.....14 years completed 20=Some college 21=Some university 22=Completed college 23=Completed university)

4. What type of activity are you involved in **ACTIVITY** _____

(1=Buying maize grain 2=Selling maize grain 3=Both 1 and 2 4=Farming 5=Transporter (maize grain) 6=Others (Specify))

Instructions
*If **Qn 4=4 go to Section B Information on Farming***
*If **Qn 4=5 go to Section C Information on Transporters***
*If **Qn 4=1,2 or 3 go to Section F Information on Domestic and Cross Border Traders***

B: Information on Farmers

5. During the last season (Year 2007 harvest Nov-Dec) how many bags of maize did you harvest

07BAGS _____

6. What was the price of maize at the time of harvest in Ksh **07PRICE _____**
Unit of harvest **07UNIT_____**
(1=Kgs 2=90 Kg bag 3=Ton 4=Others (Specify))

7. Out of the bags you harvested were there any loses **LOSE _____**
(1=Yes 2= No) ***If No go to Qn 9***

8. If Yes how many bags did you loose **07LOSEBGS _____**

9. In a **good season** how many bags do you harvest **GDSEABG _____**
How many bags are lost **GDSLOBG _____**
Price per bag at harvest **GDPRICE _____**

10. In a **bad season** how many bags do you harvest **BDSEABG _____**
How many bags are lost **BDSLOBG _____**
Price per bag at harvest **BDPRICE _____**

11. What are the **main** reasons for post-harvest loses **POSTHLSE1** _____

POSTHLSE2 _____

(*1=Lack of storage 2=Bad roads 3=Pest infestation 4=Poor storage 5=Poor weather 6=Others (Specify)*

12. Do you own a store for maize storage *(1=Yes 2=No)* **STOREMZ** _____
If No go to Qn 15

13. If yes for how long do you store your maize before selling (storage time in months)
STOREMTH _____

14. If yes what would be the opportunity cost per bag in Ksh of hiring a store and duration
Cost per bag **STPRIC** _____
Duration in months **STDUR** _____

15. Do you hire storage facilities to store your maize *(1=Yes 2=No)* **STHIRE** _____

16. If Yes what is the cost per bag and the duration that you store your maize in the facility
Cost per bag **STHRCOST** _____
Duration in months **HIREDUR** _____

17. What is the mode of transportation used to the first primary market for maize
MODETRANS ____
(1=On foot 2=Cart 3=Bicycle 4=Public vehicle 5=hired transport 6=Others (Specify))

18. What is the average distance to the market in kilometres **DISTMKT** _____

19. What is the cost of transportation of the maize to the market and the unit of transportation
Cost of transport of maize to the market in Ksh **TRCOSTMKT** _____
Unit of maize transported to the market **TRUNITMKT** _____
(1=Kgs 2=90 Kg bag 3=Ton 4=Others (Specify))

20. Would these costs changes if you are a member of group? *1=Yes 2=No* **GRPTRCOST** _____

21. If Yes what will be the transport cost in Ksh? **GRPTRMKT** _____
Unit of maize transported to the market **GRPUNIT** _____
(1=Kgs 2=90 Kg bag 3=Ton 4=Others (Specify))

22. **C: Information on Transporters**

23. What is the cost of transporting maize and the average distance in kilometres

Cost of transporting maize Ksh **TRCSTMZ** _____

Unit of transportation **TRUNITMZ** _____

Distance in kilometres **TRDISTMZK** _____

(TRDISTMZK *1=Kgs 2=90 Kg bag 3=Ton 4=Others (Specify))*

24. What is the transport cost if you are hired to provides this services

Category of Market 1=Farm gate to first primary market 2=Primary to secondary market 3=Secondary to wholesale market 4=whole sale to miller 5=Miller to Consumers 6=Others (Specify)	**Mode of transport** 1=Bicycle 2=Pick-up 3=Lorry 5MT 4=Lorry 10MT 5=Others (specify)	**Cost Charged (Ksh)**	**Unit of Transportation** 1=Kgs 2=90 Kg bag 3=Tonnes 4=Others (Specify)	**Distance Travelled in KM**
TRCATMKT		**CATMKT**	**UNIT**	**DISTKM**

25. From your cost of transportation above what is the cost breakdown (e.g. Kita Transporters)

Vehicle Operating = fixed costs +administrative	**Cost in Ksh**
FIXCOSTV	**FIXKSH**

Variable Costs	Cost in Ksh
VARCOSTV	**VARKSH**

FIXCOSTV	**VARCOSTV**
1=Licensing fees	5=Fuel
2=Labour wage	6=Tyre/tubes
3=Capital	7=Maintenance
4=Depreciation	8=Others (Specify)

26. What are the **cost** and **delays** encountered during your transportation

Transporting Cost incurred	**Cost in Ksh**	**Delays in hours**
TRINCST	**COSTTRP**	**DELAY**

TRINCST

1=Local Council Cess *6=Quality of road charge*

2=Market Cess *8=Others Specify*

3=Broker Commission

4=Bribes

5=Weigh bridge

27. If you get maize from low production areas or remote place is there an extra charge on the normal transport cost *(1=Yes 2=No)* **EXTRCOST** _____

28. If Yes what is the charge, the unit cost and average distance travelled to get the maize
Cost of transport from remote/low producing areas **REMCOST** _____ Unit of cost of maize transported **REMUNIT** _____
Distance in Kilometres travelled **REMDIST** _____

*(**REMUNIT** 1=Kgs 2=90 Kg bag 3=Ton 4=Others (Specify))*

After question 28 go Section H on NTB and

D: Information on Domestic and Cross Border Trade

Domestic Trade

29. What form of maize trade are you involved in **TRDFORM _____**

(1=Domestic trade 2=Cross Border Trade 3=Both)

If the respondent is involved in 1 or 3 go to question 30 otherwise jump to question 45 on Cross border trade

30. If the respondent has been selling maize to which districts have you been selling your maize over the past year (*Rank them in order of importance and volume)*
TRDMZSD1_____
TRDMZSD2 _____
TRDMZSD3 _____

31. If the respondent has been buying maize from which districts have you sourced your maize over the past year (*Rank them in order of importance and volume)*
TRDMZBD1_____
TRDMZBD2 _____

TRDMZBD3 _____

Activities involved

Activity Involved in *1=Buying Maize 2=Selling Maize 3=Both*	Category of Business	**From whom** do you **source** or **sell** your maize	Payment mode	**Contractual** arrangement	Specifications of the Contractual agreement	
TRDACT	**TRDBUSC**	**TRDSOURC**	**TRDPAY**	**TRDCON**	**TRDSPEC1**	**TRDSEPC2**

TRDBUSC / TRDSOURC
1=Farmer
2=Small-scale traders
3=Medium trader/Retailer
4=Large scale trader/wholesaler
5=Miller
6=NCPB
7=Others (Specify_____)

TRDPAY
1=Cash at purchase
2=Cash paid in advance
3=Credit
4=Others (Specify)

TRDCON
1=None
2=Oral-informal
3=Written-informal
4=Formal
5=Others (Specify)

TRDSPEC1/ TRDSPEC2
1=None
2=Price
3=Quantity delivered
4=Frequency of delivery
5=Time of supply

32. On average what is the amount of maize have you sold in these market for the past:

One Month: TRDAMNTM _____ TRDUNITSM_____

Six Month: TRDAMNTH _____ TRDUNITSH _____

One Year : TRDAMNTY _____ TRDUNITSY _____

(TRDUNITSM/TRDUNITSH/TRDUNITSY 1=90 Kgs bag 2=Kgs 3=gorogoro 4=debe 5=tonnes 6=Others (specify))

33. Who are your major customers for the maize sale
TRDCUSTM_____

(1= households 2=small-scale traders 3=medium traders 4=large scale trader/wholesaler 5=NCPB 6=Others (Specify))

34. Who transport your maize from the collection point to the market
TRDTRAN_____

(1=Self transport 2=Supplier transports 3=hired transporters 4=Others (Specify))

35. What was the mode of transportation from collection point
TRDMODE_____

(1=On foot 2=Cart 3=Bicycle 4=Public vehicle 5=hired transport 6=Others (Specify))

36. Amount of maize transported **TRDAMTB**_____ Unit **TRDUNITT**_____

What was the cost of transportation **TRDTCOST (Ksh)** _____ Unit **TRDTUNIT**_____

Average distance in Kilometres **TRDDISTV** _____

*(***TRDUNITT** ***/TRDTUNIT*** *1=90 Kgs bag 2=Kgs 3=gorogoro 4=debe 5=tonnes 6=others (specify))*

37. What is the cost of transportation across the various categories

Category of Market 1=Farm gate to first primary market 2=Primary to secondary market 3=Secondary to wholesale market 4=whole sale to miller 5=Miller to Consumers 6=Others (Specify)	**Mode of Transportation** 1=Bicycle 2=Pick-up 3=Lorry 5MT 4=Lorry 10MT 5=Others (Specify)	**Cost Charged (Ksh)**	**Unit of Transportation** 1=Kgs 2=90 Kg bag 3=Tonnes 4=Others (Specify)	**Distance Travelled in KM**
TRDCATMT	**MODETR**	**TRDCATKSH**	**UNIT**	**TRDISTKM**

38. What are the challenges facing transportation along the value chain

Category of Market 1=Farm gate to first primary market 2=Primary to secondary market 3=Secondary to wholesale market 4=whole sale to miller 5=Miller to Consumers	**Challenges facing transportation (RANK)** 1=Poor roads 2=High transportation costs 3=Lack of transportation

6=Others (Specify)	4=Others (Specify)
CHALLMKT	**CHALLFACED**

Costs Involved in business activities .The cost below should only be for the trader, e.g. licence, labour (unloading etc), rental fee, capital, salaries if he does pay,) (reference period is one year)

Variable Costs of the Business	Cost Ksh
VARCOST	**COKSH**

VARCOST

1=Storage /Rental fee

2=Transportation charges

3=Hired labour loading/unloading

4=Council cess

5=Road blocks

6= Licensing fees

43 Do you *own* your own storage facilities? *1=Yes 2=No* **TRDOWNST** _____

44 If yes what is the capacity (in bags) **TRDCAPB** _____ Average months of storage before sell **TRDAVSTRE** _____ If you were renting what is the cost in Ksh cost **OWNSTC** _____

Unit **OWNUNIT**_____

(1=Kgs 2=90 Kg bag 3=Tonnes 4=Others (Specify)

43 If you don't own storage do you rent? *1=Yes 2=No* **TRDRENSTG** _____

44 If yes what is the Cost in Ksh Cost **TRDRECST** _____ Unit **TRDR**_____

(1=Kgs 2=90 Kg bag 3=Tonnes 4=Others (Specify)

After question 44 got to Section H on NTB

Cross-Border Trader

45 Over the last 12 months have you been involved in cross border trade **BODTRD** _____

(1= Yes 2=No)

46 If Yes what was the form of maize trade were you involved in **FORMCTRD** _____

(1= Importing maize 2=exporting maize 3=both)

47 If **Qn22 =1** to from which country/ies did you import and through which border town

IMPMCOU1 _____ **IMPBODRT1** _____

IMPMCOU2 _____ **IMPBODRT2** _____

IMPMCOU3 _____ **IMPBODRT3** _____

48 If **Qn22=2** to which country/ies did you export and through which border town

EXPMCOU1 _____ **EXPBODRT1** _____

EXPMCOU2 _____ **EXPBODRT2** _____

EXPMCOU3 _____ **EXPBODRT3** _____

Quantity traded and Costs involved

Activity Involved in *1=Importing 2=Exporting*	Quantity Exported/Imported for **6 Month**	Type of transport *1=Own 2=Hired*	Common Mode of Transportation across the border	Duty/taxes paid for the maize
ACTIVITY	**HALFYR**	**TYPETRAN**	**MDTRAN**	**DTAXES**

MDTRAN

1=Head

2=Bicycle

3=Cart

4=Vehicle

5=Boat

6=Others (Specify)

DTAXES

1=IDF fees

2=Export duty

3=Import duty

4=Others (Specify)

Cost involved in business activities

Variable Costs of the Business	Cost Ksh
CBVARCST	**CBKSH**

CBVARCST

1=Storage /Rental fee

2=Transportation charges

3=Hired labour loading/unloading

4=Council cess Licensing fees

5=Road blocks

6=Others (specify)

49 The cost involved in the maize coming through the border and it transmission through the different stages till it gets to Nairobi

Before the maize get to the Border

Price of Maize (90 Kg bag) at the Source in Uganda in USH	Mode of Transportation to Busia ***1=Bicycle*** ***2=Pick*-up** **3=Lorry 5MT** **4=Lorry 10MT** **5=Others** (Specify	Cost for transportation in Ush	Unit of Transportation 1=90 Kg bag 2=5 MT lorry 3=10 MT lorry 4=Others (specify)	Price of maize across the border on Ugandan side (90 Kg bag)
UGPRICE	**MODTRP**	**COSTTRP**	**PRICE**	**TIME**

After maize get to the border and crossing over to Kenya

Border Point 1=Busia 2=Malaba 3=Others (Specify)	Common mode of transportation to cross to Kenyan side	Transport price	If you incur any other cost which cost are these specify	How much are this cost incurred (Ksh)	Price of maize on the Kenyan border side (90 kg bag) Ksh	Time Spent to have the maize cross to the Kenya side
BORDER	**MTACRBD**	**PRICE**	**OTHCOST**	**OTHAMT**	**PRICKSD**	**TIME**

MTACRBD

1=On foot

2=Cart

3=Bicycle

4=Lorry 5MT

5=Lorry 10MT

6=Others (Specify))

50 The cost involved in the maize coming through the border and it transmission through the different stages till it gets to Nairobi

After maize get to the border and crossing over to Kenya (*Both formal and informal*)

Type of trader *1=Formal 2=Informal*	Border Point *1=Busia 2=Malaba 3=Others (Specify)*	Common mode of transportation to cross to Kenyan side	Transport price	If you incur any other cost which cost are these specify	How much are this cost incurred (Ksh)	Price of maize on the Kenyan border side (90 kg bag) Ksh	Time Spent to have the maize cross to the Kenya side
TYPETRD	**FBORDER**	**FMTACRBD**	**FPRICE**	**FOTHCOST**	**FOTHAMT**	**FPRICKSD**	**FTIME**

FMTACRBD

1=On foot

2=Cart

3=Bicycle

4=Lorry 5MT

5=Lorry 10MT

6=Others (Specify))

FOTHCOST

1.Bribes

2. Others (Spoecify)

51 Which offices do you visit in clearing your maize ?

Custom offices **CUSTOM**_____ Charges in Ksh **CUSTMCH**_____

Bureau of standards **BSTAND** _____ Charges in Ksh **BSTCHGS** _____

KEPHIS offices **KEPHIS** _____ Charges in Ksh **KEPCHAR**_____

52 Once the maize crosses the border and is on the Kenyan side we want to establish the costs involved in moving the maize from border point till it reaches Nairobi (***both formal and informal)***

Category of Market 1=From Busia to Nairobi 2=Others (specify)	**Cost and price Charged (Ksh)**	**Unit of Transportation** 1=Kgs 2=90 Kg bag 3=Tonnes 4=Others (Specify)	**Mode of transport**	**Distance Travelled in KM**	**Quality of the road**
BDCATMKT	**BDCATKSH**	**UNIT**	**MDTRP**	**BDISTKM**	**BDQLTY**

H: Non-Trade Barriers (NTB) (Ask this question to transporter as well as traders)

53 Please **PROMPT** the traders on the following problem facing the traders with respect to these Non-Trade Barriers

Non-trade barriers *1=Customs* *2=Road Blocks* *3=Weigh Bridges* *4=Transiting* *5=Standard and certification*	What are the challenges facing (traders/transporters)	How many times do you encounter this problems (frequency)	How many hours wasted if applicable	How much do you pay to overcome this problem if applicable
NTB	**CHALNG**	**FREQ**	**HRSWST**	**PAYBRIB**

Total NTB				

CHALNG

Customs	***Road Block***	***Weigh Bridges***
1=Offloading problems	*5=Many road blocks*	*11=Too many weigh bridges*
2= Inconvenient operating hours	*6=Unfriendly police check*	*12=Faulty equipments*
3=Failure to clarify rules /rules/regulations	*7=Confiscate license*	
4=Discrimination	*8=Bribes*	
	9=Few police on site	
	10=Discrimination/harassments	

Transiting	***Standard and Certifications***
13=Corruptions	*16=Corruption*
14=Abrupt import /export	*17=Complicated requirement in documentation*
15=Insecurity	*18=Others (Specify)*

GENERAL INFORMATION

54 Where does the Council Cess collected in the area end up to ? **CCESS**

_____

(*1=Local Council 2=Central Government)*

55 What is the criteria used by the Council to levy cess in the area **CRITCESS**

_____

(1=Tonnage of truck (size) 2=Per bag 3= Per trip 4=Weight 5= Others (Specify)

56 If based on weight how accurate are the measurements

_____

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