KENYA'S COMPETITIVENESS IN DOMESTIC MAIZE PRODUCTION: IMPLICATIONS FOR FOOD SECURITY

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1. Introduction

Agricultural productivity growth throughout history has been intimately tied to productivity growth in marketing systems (North 1985). Abundant worldwide evidence has shown that the incentives and ability of farmers to make investments in productivity-enhancing inputs and production methods depends on reducing the transaction costs and risks of exchange across inputs, credit, and output markets. Throughout the world, the major share of staple food costs to the consumer is typically accounted for by marketing costs. In most countries in eastern and southern Africa, maize marketing costs account for about 40% to 60% of the total retail price of maize meal paid by consumers. (Jayne 1999) The reduction of these costs represents a major opportunity to improve farm production incentives and simultaneously make food more affordable to low-income consumers.

It is with this objective that since the early 1980s, donors and international lending agencies have promoted the reform of agricultural marketing in southern and eastern Africa as a central component of the Structural Adjustment Programs (SAPs) in Africa. The basic theory underlying donor advocacy of market reforms was that once governments free market channels and prices, private traders were expected to automatically bid up formerly depressed agricultural prices (Barret 1994). By virtue of a positive price elasticity of supply, higher prices induce greater production, which further stimulates demand for purchased inputs, including hired labor. Larger agricultural incomes were expected to have significant multiplier effects due to the relatively high marginal propensity to consume for the poor farmers. Thus a liberalized agricultural sector was expected to propagate prosperity across all sectors of the economy in a distributional progressive manner."

Maize being a staple food in Kenya and a source of carbohydrates to a large proportion of people is one commodity that has undergone these structural reforms. As a food commodity, maize provides a large proportion of calorie needs to a majority of consumers in urban and rural areas (Nyoro 1992). A large proportion of maize production comes from small-scale producers although most of them retain part of their produce for consumption. About 3.5 million small-scale farmers are involved in maize production producing about 75 percent of the total maize crop. Large–scale farms account for the remaining 25 percent of the production and are estimated to be just about 1000 farmers (Economic Survey 2001. Maize production increased substantially from about 1.75 million tons in 1979 to reach 2.9 million tons in 1986 from an area of about 1.4 million hectares. The national average maize yields per hectare are estimated at 1.8 tons per hectare (20 bags of 90kilogram bags). These yields are about one twentieth of those attained internationally in countries such as Argentina. In the early 80s, the maize yields started to increase following adoption of hybrid maize varieties and the accompanying high fertilizer use to the extent that by 1986, the average national yields were over 2 tons per hectare. However, this increase was not sustained as the maize yields started to fall gradually to stagnate at the current levels of 1.8 tons per hectare. Maize yields however differ by agro-ecological zones as some farmers particularly those in the high potential maize zones have been able to achieve between 4 and 6 tons per hectare hence indicating the potential that exists to increase maize productivity.

Kenya for a long time pursued the goal of attaining self-sufficiency in key food commodities like maize, wheat, rice etc. Self-sufficiency was achieved in very few years during the 70s when the production was high to the extent that some maize was exported. The policy of food self-sufficiency implies that that food security would be achieved only through domestic production without much consideration of the maize prices. Similarly, attainment of self-sufficiency did not

automatically imply that household food security was attained. Other factors such as maize prices and household income become more important for household food security. But rather than attain the self-sufficiency goals, it is the food production that has declined against a backdrop of increasing demand for food. Declining production when demand for food is increasing has caused deficits in key food commodities like maize, wheat and. To bridge the gap between the production and demand, increasing quantities of the commodities have been imported. The increasing deficit between maize production and consumption, the high marketing costs of maize and the burden on the national budget to the national food agency the National Cereals and Produce Board (NCPB) were among the factors that stimulated the demand for reform in food marketing.

The maize market reform in Kenya began around the same time as other countries in the region when it embarked on the Cereal Sector Reform Program in 1987/88 supported by the European Union as part of the country's structural adjustment policies. The reform process intensified in the early 1990s when, under pressure from international lenders, the government eliminated movement and price controls on maize trading, deregulated maize and maize meal prices, and eliminated direct subsidies on maize sold to registered millers (Jayne and Kodhek 1997). Maize and maize meal prices, which prior to policy change were set at pan-seasonal and pan-territorial levels, were deregulated. Private traders were allowed to transport maize across districts without any hindrance. Prior to this policy change, they were required to acquire movement permit for varying quantities of maize that was to be transported. The government still participates in markets, albeit on a more limited scale. For the first time in several years, the NCPB purchased about 72,000 tons -- 2.5% of maize production -- of domestically produced maize, in 1999. In 2000 and 2001, again, the NCPB bought about 90, 000 tons -- 3% of the maize production-- of the domestically produced maize as part of a governmental decision to stabilize maize prices. The NCPB purchase prices have been much higher than the prevailing market prices. The interests for the NCPB to continue purchasing maize on behalf of the government stems from the political interests to protect the politically correct large-scale farmers in Northern Rift some are either in politics or are senior government officials. The quantities purchased by the NCPB are also very small to stabilize maize prices in the country.

The reforms were expected to reduce costs in the maize marketing system by encouraging competition through the participation of more private sector participants in the market. The reform process in Kenya has nevertheless been slow and marked with a series of advances and reversals regarding the amount of freedom the private sector was to be permitted in maize marketing. Uncertain policy environment and frequent government interventions such as trade controls on maize imports and exports through use of tariffs and bans also affected the extent of cereal market reform and the response by the private sector. For example, in 1994, the government introduced a variable import duty following substantial imports by private traders that have been blamed for a slump in the price of domestically produced maize. The reluctance on the part of the government to refrain from controlling prices through policy tools such as tariffs and trade bans emanated from the perception that liberalization would expose maize producers and consumers to predatory practices of private traders (Kodhek *et al*., 1993). Further reluctance stemmed from the concern that maize meal prices would no longer be controlled in an unregulated market that, especially in a drought year could adversely affect household food security (Pinckney, 1988. It was also feared that removal of food subsidies would hurt poor consumers by jeopardizing their access to food.

On the production side, the country's agricultural sector has continued to perform poorly over the same decade when reforms have been implemented. Though this may not be attributed directly to the reforms, they cannot entirely be exonerated. For example, the production of key food commodities and export products has declined thereby adversely affecting food security, reducing employment opportunities and increasing overall poverty in rural areas.. Maize has been imported to bridge the ever-increasing gap between production and consumption. The imported maize has been cheaper than that most of that locally produced thus created a perfect

food price dilemma because high prices would have acted to stimulate supply response yet the high prices also impose a heavy cost on low income consumers and rural producers who are net-food buyers and must pay more for food. Due to the price differences between the locally produced maize and that imported and in the interest of raising additional revenue, the government has applied tariffs on imports to protect the domestic producers thereby raising the price of maize to the consumers. Raising prices of maize protects sellers of cereals -a relatively narrow segment of the rural population –but it penalizes consumers who have to pay high food prices. The dilemma is extended further because whereas the imported maize ensures food security for all, this displaces a large proportion of producers who depend on food production for their livelihood The challenge therefore for Kenya-- an agricultural based economy -- is to ensure that the bulk of its food needs is made available at prices that are at par with those from imports if food security is to be ensured and that the livelihood of these producers is not threatened. Timmer, Falcon, coined the idea of food dilemma and Pearson (1993) as it affects the farm households as well as the urban consumer. Maize consumers for example, would like maize prices to be lower so that it takes a small proportion of their family income. Maize farmers however would like their crop prices to be higher, to provide them greater returns for their investment. This then creates the tension between the producers and consumers thereby creating a dilemma for policy makers.

Due to the background of the self-sufficiency objectives, the Kenyan, policy makers have often acted in favor of producers by offering prices that are higher than market prices. Also, the government has imposed a levy on maize imports varying from 25 to 75 percent of the landed costs of the imported maize. Although this tax accrued to the government as income, it penalizes consumers because the taxes raise the price of maize above what they would be without the government intervention. High domestic food production costs compared to imports penalizes consumers who have to pay high food prices and is also inconsistent with international and regional agreements such as the Common Market for Southern and Eastern Africa, Eastern African Cooperation (Jayne et al 2001). The high food prices also hinder the transfer of resources from food [systems to other parts of the economy as it take more resources from non-food sectors to purchase a unit of food. In addition, high food prices force consumers to demand higher wages, which makes industries and manufacturing less profitable and competitive internationally. Protectionist polices force consumers to bear the brunt of farmers' low productivity. With the trend toward integration of regional and international markets, protectionism will increasingly create political problems with neighbors.

The issue of international competition is compounded further by the increasing cross border trade in the Eastern African made possible through the elimination of trade barriers such as tariffs and quotas. The introduction of the Common Market for Eastern and Southern Africa (COMESA) Treaty and the East African Cooperation (EAC) has enabled trade liberalization between member countries. The regional trade blocks like COMESA strives to reduce of tariffs on intra COMESA trade liberalize rules of origin and simplified, ratify free movements of persons, adopt a single goods custom declaration and integration of the private sectors. Introduction of free trade between these countries assume that countries have some comparative advantage in the production of certain commodities. It is in deed the comparative advantage that stimulates trade between countries. The expectation is that countries in the region would increase employment, raise incomes, increase improve food security for their citizens. However, the pattern of competitiveness may not be very clear. The need for this continuous integration therefore requires an assessment of agricultural competitiveness in these countries.

Along with the changing economic environment in Eastern Africa several questions arise on the competitiveness of the domestic food production systems considering that domestic agricultural production is the center of the country's economy with a large proportion of people who depend on agriculture for incomes and employment. Over dependence on imports from international markets of even from the region is good for food security of many poor people and the urban consumers. However, over-dependence on imports is likely to displace the only livelihood of

the local population particularly if the producers are limited in enterprise choices. Can Kenya therefore ensure that it continues to supply the bulk of its food needs through improvements in agricultural productivity and reduced costs in production, transport and marketing and therefore make prices of domestic production comparable to the import prices of similar commodities? The crucial question therefore is whether it is possible for the country to focus on reducing costs -- productivity growth – not raising food prices thereby compromising on food security. Can such strategies allow farmers to compete in international markets and therefore enable the countries to bargain from a standpoint of strength in international trade agreements? These are the issues discussed in this paper.

The objective of this paper is therefore to address issues that impact on production costs and hence the competitiveness of domestic food and commercial production. The paper identifies and analyses the factors that influence domestic production costs. It then compares maize production costs with the equivalent international and regional parity prices to assess the extent to which the domestic prices for maize are competitive. It also identifies strategies that could increase maize productivity and therefore reduce production costs to encourage competitiveness' of the domestic maize production.

2. Conceptual Framework

The analysis in this paper is based on the international price formation conceptual framework developed in economic theory (Timmer et all 1983). This framework allows a comparison of the domestically produced commodity delivered to a common wholesale market with the imported commodity from an international market to the same wholesale market. The comparison shows whether the locally produced food can survive international competition in the wholesale market and subsequently in the interior market where the locally produced foodstuff have a more competitive cost advantage. If the commodity is not competitive with imports, the government may choose to limit imports with tariffs or quantitative restrictions otherwise the comparative advantage of the commodity will then dictate its performance in comparison with the import.

The international price formation concept thus entails developing local maize production schedule within the import-export parity band indicating how domestic production competes with the world prices. Local production costs in an importing country are therefore located between imports and export parity price band. The likely effects of increases in agricultural productivity to the competitiveness can also be examined by identifying how much the increased or decreased supply affects production costs and as a result the competitiveness of the domestic market. Under the international price formation framework, effects of trade restrictions that protect the domestic market and therefore drive a wedge between world prices and the domestic price are empirically estimated. The extent of how the trade policy impose either per unit tariffs (import tax) or limits the quantity of the foodstuff imported thereby raising the domestic price above the world market are estimated in the conceptual framework. Food production is expected to responds to the high price rising from the import tax by expanding; consumption on the other hand is expected to declines and the quantity of imports reduced. Higher prices induced by the import tax will thus increase domestic food production, but this higher supply will subsequently cause a price decrease, which if it falls to the level of the import price will reduce the need for imports. Since tariffs raise the domestic price therefore, consumers transfer income to producers and to the government budget because of the duties paid on imports Efficiency losses also occurs in both production and consumption because the policy adjusted prices are higher than the world prices which represent the actual opportunity costs of domestic production imports.

The international price formation method has several shortcomings. First it involves the use of border prices or international commodity prices, which in the case of maize[1] shows sharp yearly price variations. Maize international prices therefore do not represent the long run trend value that compensates for any short-term fluctuations in price. The international maize prices are also heavily influenced by large maize producers like the US and Europe who affect the overall levels of international market. It is therefore the yellow maize not white maize that is being widely traded on world markets. International prices thus are distorted and may therefore reflect dumping or cartels or some form of market power. The distorted international prices may therefore fail to reflect the producing country's real opportunity of the domestic production. The other drawback of this framework is in its use of foreign exchange rates. Exchange rates for developing countries could either be overvalued or undervalued and thus overprice or under price the commodity to the domestic economy. Exchange rates in most developing countries are overvalued thereby undervaluing the imports and therefore not reflecting their true scarcity value.

Nevertheless, international prices are still the best way of reflecting the opportunity cost of tradable commodities like maize and hence the domestic production. These prices therefore reflect what the country would have to pay if it is trading internationally. The important consideration therefore is not whether international markets are competitive but whether the prices a given country faces is likely to prevail for long therefore influencing the domestic production. Similarly, the exchange rates are liberalized and can therefore be considered to reflect their real values and are unlikely to undervalue or overvalue the commodity to the domestic economy.

The import parity price is evaluated as follows:

$$Px = \{Pcif \times ER\} + IC,$$

Where

Px = import parity price of the commodity x at destination.
Pcif = Cost insurance and Freight per unit of commodity at port of entry (Mombasa)
ER = Foreign Exchange Rate
IC = port charges, internal handling and transport costs

3 Data and Methods

Data for this study was derived from various sources. The bulk of it was drawn from the single visit survey of 1540 rural households conducted in April 1997 (Kodhek A Gem, T.S Jayne, Gerald Nyambane, T. and T.Yamano, 1998), repeated in 1998 and 2000 and most recently the in year 2002. The sample for the household survey was drawn from 24 districts grouped into 9 agro regional zones classified as the coastal lowlands, eastern Lowlands, western lowlands, western transition, the high potential maize zone, western highlands, central highlands and marginal rain shadow. This data includes production characteristics, input-output relationship, household characteristics and household demography. The panel household survey was augmented by updates on farm based budget information and market survey conducted between August and September 2002, which included the input output data for the 2001 production season. Budget data for maize was collected from all the maize surplus and deficit regions of the country. Synthetic[2] budgets were collected from these maize deficit and surplus regions (Monke and Pearson, 1989) for the purpose of interregional comparisons. In areas with both the small

[1]The world market for yellow maize is quite stable however; Kenya prefers to consume white maize. The white maize is thinly traded because limited quantities of maize enter into the international maize market.
[2] Synthetic budgets are composites of information obtained from several interviews where several farm budgets are summarized a simple representatives budget to represent a production system or region

and large production systems, the production system with the majority practice was chosen to represent that region. For example, small-scale production systems in large-scale dominated areas were excluded; similarly, large-scale production systems in predominantly small-scale areas also are excluded. Where intercropping is practiced, the pure stand[3] equivalent approach was used to model the maize production systems in the intercropped systems.

Similar production and budget data were collected in Uganda at Iganga, Mbale and Kapchorwa districts (Awour 2001). These are the dominant maize production areas within Uganda. To compare the domestic maize production costs with their corresponding import parity prices, transport costs, handling and other marketing costs from each production region were added to the production costs. The combined production and transport costs (Nairobi) are located within the import and export parity band to develop an aggregate maize cost schedule (Pearson 1992). The schedule shows how production costs in each zone compares with import parity price.

[3] The pure stand estimates were based on seeding rates and input, output quantities were adjusted depending on their pure stand equivalents.

4. Factors Influencing Productivity

This section addresses the factors that influence the maize production costs and those that are important in inducing productivity and competitiveness of maize production systems in Kenya. These factors include high quality maize seeds, fertilizers and their prices, agricultural credit and other financial services, land preparation costs, price instability, farmers' services and technology development.

4.1 Seed quality

Access to high quality maize seed is a prerequisite for high maize productivity. In the mid 60s, Kenya recorded one of the highest hybrid maize seed adoption rates in Africa. Adoption of hybrid seeds has up to now remain high particularly in the high potential maize zones. As shown in Table 1, an adoption of hybrid maize is about 88 percent in the high maize potential zones and also about the same in the western and central highlands. But this high adoption rate of hybrids is not widespread all over the country. A large proportion of farmers across all the agro ecological zones used other types of seed such as the open pollinated varieties (OPVs), retained hybrids and the local varieties. Most of these non-hybrid seeds are not certified neither are they cleaned or treated. A large proportion of farmers in the Western and central highlands and Western Transition used local maize varieties although these areas traditionally have high potential for hybrid maize. Use of the local seeds or retained hybrid reduces yields because these types of seeds are neither cleaned from weeds or other seed contaminants nor certified

Table 1. Types of maize seed used in agro ecological zones (percentages of households in the sample)

	Hybrid seeds	Retained Hybrids	OPVs	Local Varieties
Northern Arid Lands	0	0	60	44
Coastal Lowlands	25	9	14	65
Eastern Lowland	36	6	3	74
Western Lowlands	21	20	2	67
Western Transition	64	5	1	34
High Maize Potential	88	8	1	25
Western Highlands	85	9	5	40
Central Highlands	87	2	5	21
Marginal Rain shadow	37	9	9	22

Source: Tegemeo Institute data 2000 household survey and author's compilation

Quality of maize seed in Kenya has reduced over the last ten years despite the entry of more seed companies into the seed market following the liberalization of the seed industry and the introduction of Kenya Plant Health Inspectorate Services (KEPHIS) as an independent seed inspection authority in 1996. Most of the maize seed have therefore been of poor germination and are normally contaminated with weeds (Nyoro 1998). Farmers who adopt this poor quality although certified seeds have been disappointed because of its poor germination and low yields. Farmer's who therefore lack confidence in the certified seeds rely on retained seeds. Similarly, an increasing number of maize farmers use either the local maize varieties or the retained hybrid maize. Incidentally the drop in the adoption of the certified maize seed is taking place at the time when many seed companies have been releasing new hybrid maize varieties. What is clear from these results is that the information and potential for using hybrid or certified seed exists

with farmers. It is the confidence of the seed quality that affects their adoption and not entirely the lack of information of their existence. The institutional set up in seed development; multiplication and distribution seeds could have compromised the seed quality. The challenge in increasing maize productivity therefore is to encourage wider use of hybrid and other certified seeds through improving their quality in order to win back farmer's confidence in the hybrid and certified seeds.

4.2 Fertilizer

Fertilizer adoption rates and quantities and types of the fertilizer are other factors that influence domestic maize production costs and productivity. An examination of the adoption of fertilizers in Kenya reveals a generally widespread use by farmers in almost all agro-ecological zones (Table 2). According to the household data, more than 70 percent of the sampled households used mineral fertilizers in 1997 and 1998, The highest adoption of mineral fertilizer in maize production zones was in the High-Potential Maize Zone, the Western Highlands and the Central Highlands where, on average, 90% of the households used fertilizer in 1997 and 1998. The use of fertilizers are also reasonably high in the Western Transitional and Eastern Lowlands (79% and 51% for 1998, respectively), but then they fall off dramatically for the Western Lowlands; in 1998 only 13% of these households used mineral fertilizer.

Table 2. Fertilizer Adoption in various Agro ecological Zones [percentage of households using fertilizer]

	1997	1998	2000
Eastern Lowlands	45	51	45
Western Lowlands	11	13	12
Western Transitional	69	79	79
High Maize Potential	92	88	90
Western Highlands	91	86	90
Central Highlands	99	97	99
Total	74	73	66

Source: Tegemeo Institute data and author's Compilation

High adoption rates of fertilizers are necessary but not sufficient for high maize productivity. The high adoption rates needs to be accompanied by use of reasonable quantities of the fertilizers. The biggest disparity in fertilizer use in maize production thus is in the quantities and types used rather than whether farmers adopt it or not. Levels of fertilizers used by various categories of farmers are shown in Table 3. About 55 percent of households in the main maize high potential zone were using quantities of fertilizers that were less than 50 kg per acre. In deed 64 percent of households in the Central Highlands and 77 percent in the Western highlands used less than 50 kg of mineral fertilizers nutrient per acre. In eastern Highlands, the average dose rate is much lower than the Central Highlands and High-Potential maize zone. The difference comes from a lower number of high-end users. In the Western Highlands, only 14 percent of households used more than 50 kg of fertilizer nutrient per acre. The potential for the hybrid maize is normally not tapped if less than optimal levels of fertilizer are used. Therefore adoption of hybrid maize, which is not accompanied by use of adequate levels of fertilizer, will not result in tapping of the full hybrid maize potential

Table 3. Nutrients use by agro ecological zones

	% Households using various levels of fertilizer per acre				
	0-25kgs	26-50kgs	51-75kgs	76-100kgs	Above 100kgs
Northern Arid	0	0	0	0	0
Coastal Lowlands	100	0	0	0	0
Eastern Lowlands	85	7	2	3	3
Western Lowlands	100	0	0	0	0
Western Transitional	53	24	6	12	5
High Potential Maize Zone	23	33	11	17	17
Western Highlands	53	29	9	5	5
Central Highlands	39	25	9	15	11
Marginal rain Shadow	96	4	0	0	0

Source: Tegemeo households Surveys

Farmers complain of high fertilizer prices, which as they say are important to the use of fertilizers. Nominal fertilizer prices have increased in the post-liberalization era; however, the price of most fertilizers has declined in real terms (Wanzala 2001). Among the factors that increase the farm gate prices of fertilizer is the local distribution costs. A major portion of the farm-gate price is taken up in distributing DAP internally. Import prices of fertilizer in Mombasa during the 2001 season were 45% to 55% of the farm-gate fertilizer price of DAP in western Kenya. The internal costs include transportation and handling, storage and interest charges for financing the fertilizer purchases, and charges for transit losses, and bagging. Most, if not all of these costs are beyond the control of fertilizer traders themselves. The traders hire out for these services and must simply absorb them as costs that are then passed on to the next buyer. Ultimately, farmers pay for these costs. There may be some scope to reduce these costs through procedures to improve efficiency. The traders also reported that losses of fertilizer in transit thereby increasing final price of fertilizer to the consumer. The transit losses were especially large toward the end of the marketing channel as fertilizer was transported to the smaller towns in rural areas. Retailers transit losses were on average about 3 times greater per unit shipped than for importers and large wholesalers. These transit loss costs are passed on to farmers in the form of higher prices.

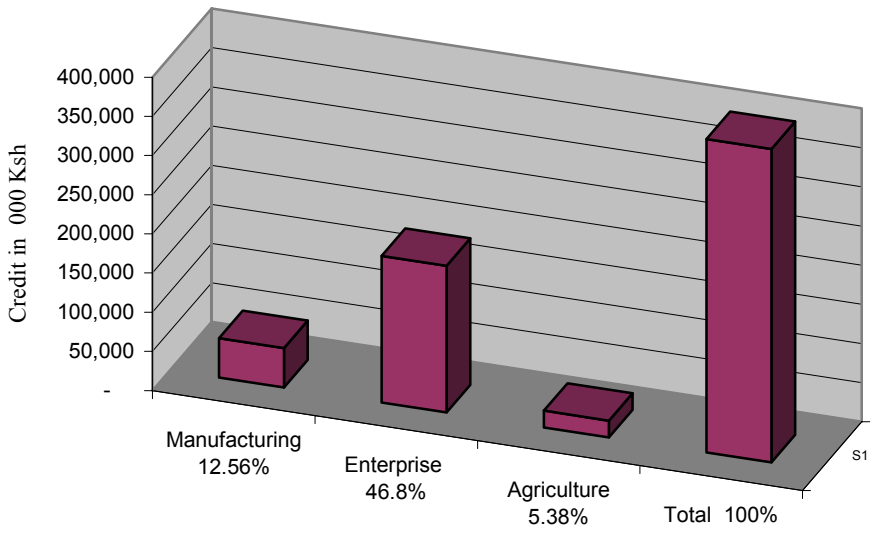
4.3 Credit and financial services

Maize framers have always found it difficult to access agricultural credit. This situation did not improve with the liberalization of the agricultural sector. Agricultural input finance has therefore continued to decline since the early nineties. The situation was exacerbated by the collapse of agricultural cooperatives that used to be the only main source of credit to small-scale farmers. Currently farmers are unable to access credit through the formal banking systems, the commodity marketing bodies or even the producer organizations where they exist. Working capital for both long-term investments in capital and the short-term needs have therefore not been available. Agriculture has also not gotten its rightful share of commercial credit despite its contribution to the to the economy. In 1998, for example, the lending by commercial banks to agriculture stood at a mere 5.35% of the total lending assets to the private sector (Figure 1). The

total incremental lending to agriculture and related enterprises stood at 10.8% compared to manufacturing (17.8%), trade (16.5%), "other activities "(13.9%) and building and construction at 13.3%.

Of the small proportion lent to agriculture the actual lending directly to small-scale farmers is minimal given that the banks circumvent the statutory requirements to lend to the sector by preferring to finance commodity traders such as exporters and high value crop producers. This qualifies as 'agricultural lending' as opposed to being reported as 'traders' in commercial bank returns to the Central Bank. Farmers and commodity traders are also unable to access commercial credit because of the inordinately high cost of borrowing due to high interest rates. At such a high cost of finance, investment in commodity production becomes totally unattractive. Lack of financing to farmers by the commercial banks and other organization translates to inadequate working capital at the farm level where farmers are unable to finance farm operations by cash. Lack of the working capital limits the farmer's ability to purchase the productivity enhancing inputs like seeds, fertilizers, pesticides, land preparation and weeding. As shown in table 4, only 32 percent of all households sampled in the 1997 household survey and 34 percent in 1998 received agricultural credit. The rest had to depend on cash purchase on inputs.

Figure 1. Lending by Commercial Banks by Sectors from Central Bank of Kenya's consolidated statistics, 1998 in Million Ksh



Households in the coffee and tea areas of Central Highlands received most of the credit mainly from the cooperatives and other producer organizations. However, the amounts received even in these areas were insufficient to cover most of the requirements. The credit received is also limited to use in certain crops only. Some of the cooperatives under interlocked credit/input/output sale arrangements[4] provide inputs to cover other crops such as the food crops. This means for example that coffee farmers could get input credit to use in coffee production but also get some additional inputs for use in producing maize and beans. Households in the coffee and tea areas of Western Highlands (Vihiga and Kisii districts) also received credit, and again, the majority of these households were under interlocking arrangements. This decline or lack of input finance has contributed to the reduction in yields, quality control, and investment and reduced income for small producers. Producers who access

[4] This involves tying up the credit provided to the marketing of the output where the credit is recouped upfront at the point of sale. Linking the credit to production and intensive screening of farmers improves payment rates reduced incidence of default in payments.

credit are able to purchase yield-enhancing inputs like fertilizer and hybrid seeds thereby raising their maize productivity. As shown in Table 5, of the farmers who accessed agricultural credit in the high potential maize zone, about 49 percent used hybrid maize and 58 percent used fertilizers. Similarly in the high potential maize zone, producers who obtained credit were able to purchase hybrid maize and use fertilizers in maize production.

In addition to accessing the interlocking credit input producer the interlocking arrangement has also enabled the interlocked producers to access credit, inputs, extension services and farm equipment without requiring collateral, as is the case in other credit arrangements. The system of interlocking credit inputs with output marketing is also able to overcome the problem associated with credit recovery because the credit is recouped up front after sales before the small scale farmers are paid thus minimizing the credit default rates and also making such financing schemes sustainable. Opening up of commodity markets through market liberalization has however undermined the interlocking system between the commodity output and the input supply because this has allowed producers to sell their commodities outside the official marketing channels thereby making it difficult for the interlocking organizations to recover their money upfront as was the case before liberalization. Side selling thus broke down the potential for recovering the credit advanced to small-scale farmers up-front at the marketing stage. The following are the constraints that have adversely affected agriculture-input finance.

Table 4. Proportion of Farmers getting agricultural credit

	Year	Households who received agricultural credit
Zone		(%)
Eastern Lowlands	1997	25
	1998	9
Western Lowlands	1997	6
	1998	13
Western Transitional	1997	28
	1998	45
High Potential Maize Zone	1997	11
	1998	7
Western Highlands	1997	56
	1998	56
Central Highlands	1997	70
	1998	81
Total	1997	32
	1998	34

Source: Tegemeo households Surveys (1997 and 1998)

Table 5. Relationship between access to credit and use of inputs

Northern Arid	% Obtained Agricultural Credit	% Obtained credit and used Hybrid maize	% Obtained credit and used Fertilizer
Coastal Lowlands	1.5	0.0	0
Eastern Lowlands	2.5	0.0	7.4
Western Lowlands	14.3	7.5	15.3
Western Transitional	14.7	24.3	26.5
High Potential Maize Zone	53.6	49.6	58.3
Western Highlands	17.8	18.0	18.3
Central Highlands	42.4	48.2	43.0
Marginal Rain Shadow	74.1	74.9	74.1
	20.4	22.0	22.4

Source: Tegemeo households Survey 2000

4.4 Land Preparation costs

Machinery costs includes costs of ploughing, harrowing, chiseling, planting, spraying, harvesting, shelling and transport to stores. Machinery costs are generally high particularly in maize. Farmers have also complained that the ownership of farm machinery has reduced in the last 10 years due to lack of financing mechanism for procurements of farm machinery. High costs of farm machinery thus have affected the quality and timeliness of farm operations such as the land preparation in the key maize production zones. The high costs of farm operation have forced farmers to reduce the quality of seedbed preparation. Whereas in 1994, most maize producers for example did two ploughs and two harrows to create a fine seedbed suitable for planting maize and wheat, in 1999 and 2000 seasons, most farmers had reduced the number of times they ploughed and harrowed thereby reducing the quality of the seed bed. Thorough land preparation normally involves deep ploughing and thorough incorporation of weeds and crop residues, row planting, correct placement of fertilizers through use of machinery; superior and thorough crop protection against weeds, and better harvesting operations due to use of machinery. Reduction in the quality of land preparation thus could have adversely affected maize yields and hence cause an increase in production costs per unit production.

4.5 Price instability

Maize in Kenya is referred to as a potentially[5] tradable commodity because in normal years the price of maize in the local market is determined by supply and demand subject to the government's policy (Pearson 1992). In exceptionally good years, the prices drop due to increased supplies but the prices rises during poor production years when the harvest drops. The price is therefore buffeted by weather induced supply shifts. Volatility in maize prices has therefore increased as the price determination is left to the rules of supply and demand and is subject to the weather conditions. Liberalization of maize markets was accompanied by higher degree of instability in the price of maize that was the case prior to reform (Karanja 2001). Price instability increases price and income risks thereby influencing maize production

[5] Potentially tradable is a term coined by Scott Pearson in 1992 referring to a case where the country is normally self-sufficient in maize or any other staple and whose prices. Prices of a potentially tradable commodity are determined by domestic supply and demand

4.6 Technology Development

Generation and transfer of appropriate cost reduction and productivity enhancing technologies is a key strategy towards reducing local production costs and increased agricultural productivity to enhance Kenya's maize competitiveness. Investment in biotechnology is now taking the center stage as the key agricultural research strategy. Providing disease-free planting materials through tissues culture, increasing yields, resistance to pests, improving soil fertility, controlling and eradicating livestock diseases, development of novel vaccines, improving animal pastures and fodder through gene technology and increasing genetic potential of livestock and their adaptation to different agro ecological zones are some of key research agenda currently been addressed through biotechnology. The contribution of agricultural technology development is nevertheless facing several constraints. Financial support for research has generally been low and is largely donor dependent. Government's contribution to the main agricultural research institute in Kenya is low at less than one percent of the GDP. The research budget is also skewed towards recurrent budget rather than actual research projects and programs.

4.7 Extension

As shown elsewhere in this paper, there is widespread adoption of fertilizers and seeds across most of the agro-ecological zones. It could be that technology dissemination is lagging behind the development because of the poor delivery of the extension service It is therefore plausible to argue that extension service is necessary to raise the awareness of the farmers of new and existing technologies, but not sufficient to raise maize productivity due to the many problems facing farmers. Nevertheless, delivery of extension service will remain in demand and will become more constraining as the productivity increases.

5. Domestic Production Costs and Import Parity Prices

Maize in Kenya is produced almost everywhere including in the arid and semi arid agro ecological zones. However the high potential maize zones encompass mainly the Northern Rift districts of Nakuru, Uasin Gishu, Trans Nzoia, Kapenguria and Nandi. Maize yields in the country during the favorable weather conditions vary from 10 to 27 bags per acre (2.0 and 5.4 tons per hectare). Production levels and structure of production costs differ between the large and small production systems (Table 6). Large-scale production systems have higher yields than the small-scale systems because of various reasons. In Trans-Nzoia for example, large-scale maize production systems use about 39 percent more intermediate inputs- fertilizers and agrochemical-than the small-scale systems. Similarly, the large-scale systems have higher mechanization costs than the small-scale systems. The small-scale systems on the other hand depend on manual labor for some operations hence incurring higher labor costs.

5.1 Production Costs

Although the yields for the large-scale systems in Trans-Nzoia are about 47 percent higher than that in the small-scale systems, the costs of production are about the same at Ksh 780 per bag because the large-scale systems incur on average a higher cost per acres. Due to slightly lower yields, Uasin Gishu have a higher cost of production than Trans Nzoia.

Table 6. Costs and Returns for Large and Small-scale Maize Production Systems (2001)
(In Ksh per acre and per bag)

	Trans Nzoia	Trans Nzoia	Uasin Gishu	Uasin Gishu
	Small-scale	Large-scale	Small-scale	Large-scale
Yield	17	25	13	17
Price Ksh/bag	1,000	1,250	1,300	1,000
Revenue	17,000	27,500	13,000	17,000
Fixed Cost/acre	750	3,750	250	1,250
Total Labor Inputs	2,520	1,685	2,385	1,662
Mechanization costs	3,400	5,200	2,782	4,325
Other non-labor input	6,545	9,085	5,855	6,330
Total Costs	13,215	19,720	11,272	13,567
Total Profit	3,785	7,780	1,729	3,433
Cost per bag	777	789	867	798

Source: Tegemeo Institute data

As maize production moves away from the high maize potential zones, maize productivity decreases due to among other factors, changes in rainfall, altitude and inputs use. In most of these areas maize is also intercropped with other crops such as bean. Regional maize production, handling and transport costs to Nairobi are shown in Table 7. Although some regions such as Narok may have higher production costs than others, due to their closeness to

Nairobi, the considerations of the transport costs reduces the production costs. Similarly, though the differences in production costs between Kitui and Siaya is low (about 2 percent), the differences in the transport and delivery costs for Siaya is 12 percent more than Kitui because Kitui is nearer to Nairobi than Siaya. Competitiveness of regions in maize production thus reduces due to the long distances between them and the consumption regions.

Table 7. Regional Maize Production and Transport Costs (Nairobi) (2001)

	Production Costs in Ksh per Bag	Production and Transport Costs (Nairobi)[6]
Trans Nzoia	780	1048
Uasin Gishu	795	1022
Narok	850	968
Nakuru	870	1004
Bungoma	850	1136
Kakamega	800	1076
Kisii	800	1061
Nyeri	990	1118
Embu	920	1038
Meru	950	1138
Laikipia	900	1054
Kitui	1,250	1392
Siaya	1,270	1557

Source: Tegemeo Institute data and author's compilation

5.2 Maize Profitability

Compared to several other enterprises, maize is relatively less profitable thereby making it a low value commodity. Compared to other competing enterprise maize profits are low and the returns per shilling invested are lowest in maize (Table 8). Profits are higher in tomatoes and dairy than in maize. However it is also true that enterprises with higher returns also have higher high start up capital. Therefore the capital constrained producers invest in the lower value commodities like maize. The other disadvantage with the high profit commodities is that they suffer from high price volatility and therefore exhibits high risks. As shown therefore in Figure 2, returns to maize production are quite low. As a result, small changes in maize prices are likely to make the production completely unprofitable. The figure shows that maize production is quite unprofitable in drier parts of the country such as Kitui, Mwingi and Siaya and in a few small-scale dominated production systems such as Nakuru, Kisii and Bungoma that traditional are surplus maize production areas. The Price, which is a key determinant of profits, has been low due to good harvest in these areas. Similarly, the high production costs in other areas also

[6] To the average production costs, retail costs and trader's margin and transport costs are added to make them comparable to imports.

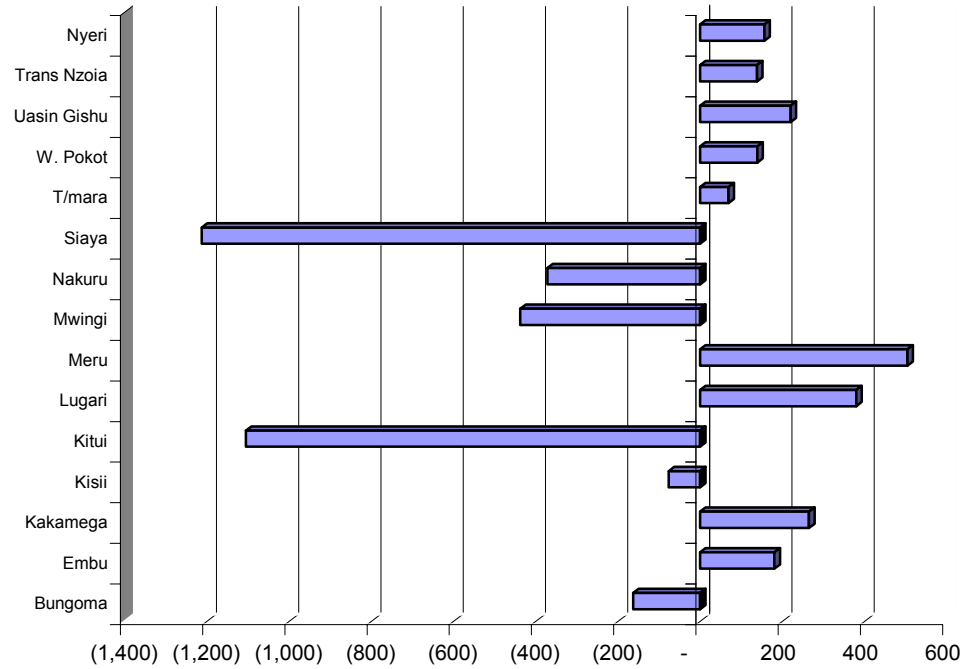
reduce maize profits. But even in the main grain basket of Kenya consisting of Uasin Gishu (Eldoret), Trans Nzoia (Kitale) and West Pokot, maize profits are quite low being less than Ksh 200 per bag. Low maize profits particularly in the key production areas threaten maize production in the country as farmers can easily shift to the more profitable enterprises. Lugari, Kakamega and Meru are the only areas where maize is most profitable.

Table 8. Returns in Maize and other competition enterprises

Enterprise	Cost Ksh (acre)	Profit (Ksh/acre)	Returns per (Ksh) invested
Cabbages	21,277	8,850	0.42
Irish Potatoes	11,160	5,680	0.51
Tomatoes	39,424	101,153	2.57
Dairy	46,040	64,876	1.41
Maize	11,600	4,400	0.38

Source: Tegemeo database

Figure 2. Regional Maize Profitability for 2001 (ksh per bag)

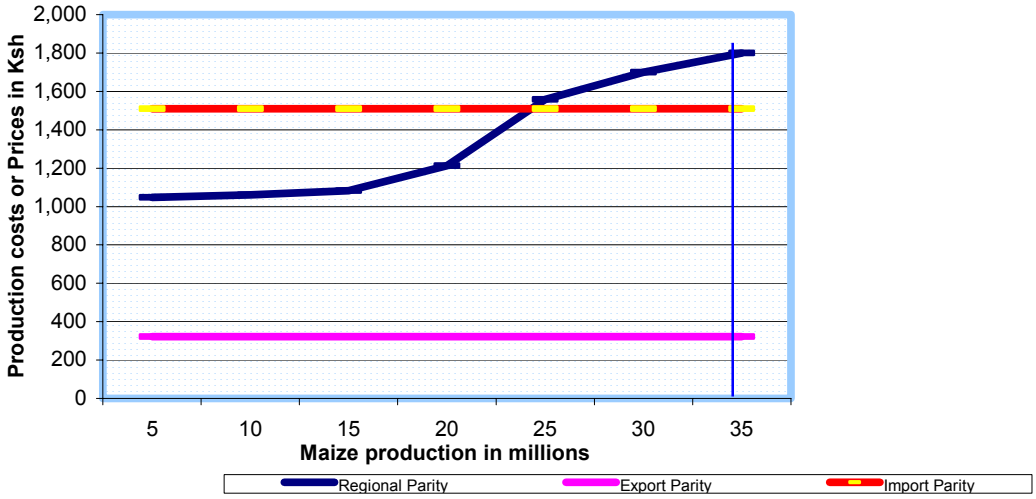


5.3 International and Regional Prices

The locally produced maize is subjected to competition from maize imports from countries such as Brazil, Argentina and South Africa. During 2000 Kenya importing large quantities of maize from South Africa. In deed, South Africa has become a key supplier of maize to Kenya during years of shortfall. Based on the Free on Board (FOB) maize price in Durban -- obtained from Safex commodity exchange Website prices for August 2002 -- Costs, Insurance and Freight, port handling and charge in Mombasa, and transport to Nairobi, the import parity price for maize at Nairobi at an exchange rate of Ksh 8 to a South African Rand is Ksh 1550 per 90 kg

bag in August 2002[7]. The export parity price for maize at the same exchange in Nairobi is Ksh 565 per bag[8]. The import export parity band thus is about Ksh 985 per bag. The import export parity band is wide due to the long distance between Mombasa port and the main maize production and consumption areas including Nairobi. The high transport costs is caused by poor infrastructure. The maize production schedule is located between the import and export parity price as shown in Figure 3. Given the expected maize consumption of 34 million bags per year in Kenya, the maize price estimated from the long run expected maize supply curve[9] is Ksh 1700 per bag. But because, maize is tradable commodity and is therefore imported in Kenya, the import parity price rather than the local price prevails which is Ksh 1550 per bag of maize in Nairobi.

Figure 3. Aggregate Maize supply Schedule for a normal season



In 1992, estimated in the same manner, the maize price was Ksh 840 per bag when the import parity price for maize in Nairobi then was estimated at Ksh 1200 per bag. The price of Ksh 840 per bag was the price at which the maize from local production was made available to consumers given the levels of production and consumption estimated then at 31 million bags. The maize price then was therefore lower than the import parity (Nyoro, 1992).

The domestic maize supply schedule also shows that only about 22 million bags of maize or about is produced below the import parity price and is therefore considered to be competitive at the current international prices. Kenya then was able to supply the bulk maize for consumption from its domestic production at prices well below the import parity level. Only a small short fall in production was then imported at the import parity price to bridge the gap between supply and demand. This situation has now changed because of the increases in maize production costs. As shown in Figure 3, in a normal year, the country can only supply about 60 percent of its maize

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8 Export parity price for Nairobi is the import parity price less transport, handling and freight charges the port or Durban

9 The long run maize expected curve is estimated by adding to the local regional costs the handling and the transport costs incurred to move maize from its production area to a central consumption area where it is likely to converge with imports in this case Nairobi given the expected production for each zones (Nyoro 1994).

consumption at prices below the import parity prices thus indicating the degree of self-sufficiency in maize. The rest of the production can only reach consumers at prices higher than the import parity level. This level of domestic production is no longer competitive. The results also indicate that due to the low level of maize export prices compared to the actual cost of production, Kenya cannot produce and export maize to the world market efficiently even in conditions of excess maize production.

5.4 Competition with Uganda

With the signing of COMESA and EAC treaties, competition of Kenyan maize production systems has shifted from international to the region. Eastern part of Uganda for instance is able to produce large quantities of maize for the Kenyan markets. The emphasis of competition in maize in Kenya should therefore shift from international market to the region market for maize. Information on cross border trade indicates that during 1994-96 period, maize imports from Uganda averaged about 100,000 to 150,000 tons annually which accounts for about 4 to 5 percent of the total maize consumption in Kenya (Ackello-Ogutu et all, 1997). Imports from Uganda typically make up a large share of maize imports into Kenya.

Data from Kenyan and Ugandan production systems were compared to assess the degree of competitiveness between the two countries. The areas compared are Mbale district in Uganda compared with Bungoma district in Kenya, Iganga district of Uganda and Lugari district of Kenya, and Kapchorwa district of Uganda with Trans-Nzoia district of Kenya. . These regions were selected not only because they are (or are nearly) adjacent to each other but also due too the similarity in the agro-climatic conditions and household land parcels. Maize varieties produced includes the local varieties, open pollinated varieties and hybrids It is estimated that about 60 percent of all maize farmers in Uganda use a combination of the open pollinated varieties and hybrids. Most maize farmers however prefer to use Longe variety because it is a high yielding composite and can be used for three seasons before it starts to loss its vigor. In all the three regions of Uganda, maize yields were between 25 and 40 percent higher than in Kenya except in Kapchorwa where the yields were very similar to those in Kitale (Table 9).

Comparing the Kenyan production systems with the Ugandan one reveals that maize yields from Uganda are higher than those from Kenya. There are two reasons why the Ugandan maize production systems achieve higher yields of maize than in Kenya even when less fertilizer is applied. First the Ugandan systems rely more on composite maize varieties, which are of high quality. Composites varieties are also less dependent on high quantities of fertilizers. The Kenyan systems are however dependent on hybrid whose high yields are achieved only when accompanied by high fertilizer use. The quality of the Kenyan hybrid seeds has also been low because of poor certification and inspection during multiplication and distribution of the seeds. Secondly, the Ugandan systems have high soil fertility and favorable weather conditions thus making it conducive for maize production. The limitations of relying on this natural advantage particularly on the soil fertility is widely recognized by the Ugandan farmers and authorities and are thus intensifying the adoption of hybrid seed varieties and fertilizers. This is likely to enable the country to more fully exploit the maize production potential which further could reduce the costs of maize production for Uganda farmers and increase their absolute advantage in maize production compared to Kenya. Ugandan systems receive lower prices that the Kenyan farmers, their revenues per acre are slightly lower.

Table 9. Yields, costs and Return for Maize in Kenya and Uganda

	Bungoma Kenya	**Mbale Uganda**	Lugari Kenya	**Iganga Uganda**	Kitale Kenya	**Kapchorwa Uganda**
Yields in Bag/acre	13.5	**18**	17	**21**	25	**26**
Price Ksh/bag	1,000	**765**	1,000	**675**	1,100	**649**
Revenue	13,500	**13,770**	17,000	**14,175**	27,500	**16,874**
Fixed Costs	1,125	**1,000**	1,250	**1,000**	3,750	**1,250**
Labor Inputs	2,332	**3,400**	1,662	**3,975**	1,685	**4,800**
Non Labor Inputs Ks	8,150	**5,696**	10,655	**6,250**	14,285	**8,838**
Total Costs	11,607	**10,096**	13,567	**11,225**	19,720	**14,888**
Cost (Ksh per Bag)	860	**561**	798	**535**	789	**573**
Profit (Ksh /bag)	140	**204**	202	**140**	311	**76**
Profit Margin	14%	**27%**	20%	**21%**	28%	**12%**

Source: Tom Awuor MSc thesis, Michigan State University summer 2001 in collaboration with Tegemeo Institute.

The non-labor costs for the Kenyan production systems are generally higher than in Uganda. The Kenyan system use higher quantities of fertilizers rely on hybrid maize varieties and are more mechanized (except in Kapchorwa which is more mechanized and rely on hybrid maize seeds). The Ugandan maize production on the other hand is more labor intensive and uses fewer quantities of fertilizers. For example, farmers in Mbale used about half the quantity of fertilizers that is used in Bungoma (fertilizer application used was 30kg per acre and 30kg for top dressing compared to 75 kg of DAP and 75 kg of CAN in Bungoma). The costs of fertilizer in Uganda are also higher than in Kenya (cost of DAP was Ksh 35 per kg in Uganda compared to Ksh 27 per kilogram for the same in Kenya). Overall the Kenyan maize production systems have higher maize production costs than the comparative Ugandan systems. Maize cost of production per bag in Kenyan was about 30 percent higher than those in Uganda.

Maize is a less preferred type of food in Uganda compared to bananas, which is the staple food. It is therefore not in high demand like it is in Kenya.. Most of the maize produced in Uganda is exported through informal trade to Western Kenya markets particularly in Kisumu. To the production costs, handling[10] and transport[11] costs are added to get the maize price in Kisumu and Nairobi as shown in Table 10.

[10] Handling costs includes storage costs at the local assembly and border points, marketing costs, mark ups and costs of bags.

[11] The transport costs includes transport to the assembly point, transport costs to the border and to Kisumu or Nairobi.

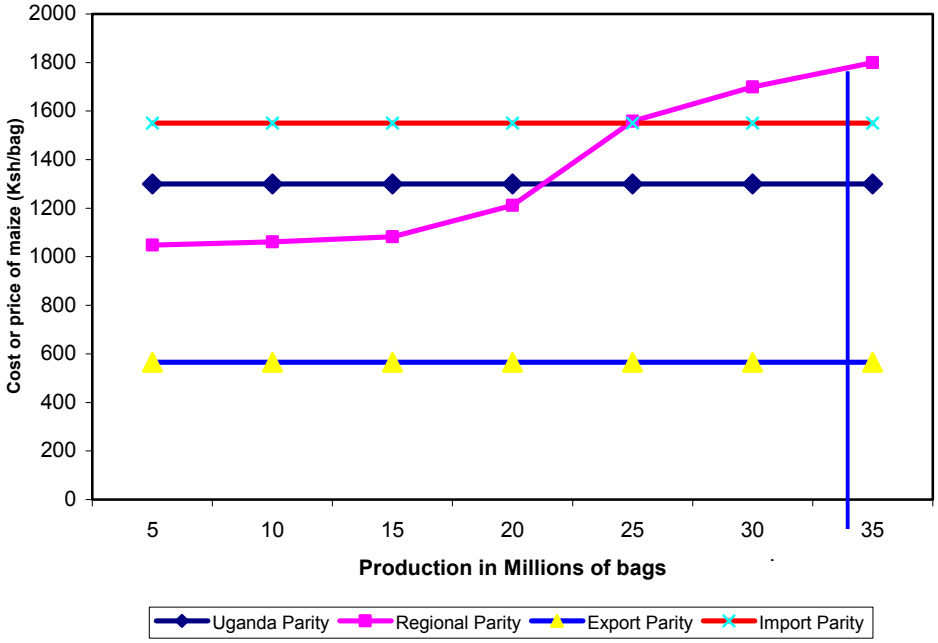
Table 10. Production and transport costs of maize to Nairobi

	Mbale	Iganga	Kapchorwa
Farm gate Costs Ksh per bag	765	675	675
Handling costs Ksh/ bag	225	247	372
Transport costs Ksh/bag	213	168	238
Total Costs to Kisumu	1203	1090	1285
Distance to Nairobi Km	345	345	345
Transport Costs Ksh per Km	0.6	0.6	0.6
Transport Costs to Nairobi Ksh/bag	207	207	207
Maize Costs in Nairobi Ksh/bag	1410	1297	1492
Average Costs	1,400		

Source: Author's computation

But as shown in Figure 4, the Ugandan maize production systems using the current technology could only out compete only a few Kenyan production systems if the Uganda maize was to be consumed in Nairobi and surrounding areas. However due to the long distance between production systems in Uganda and Nairobi imports from Uganda becomes less competitive than that from the Kenyan production systems. But the cost of the Ugandan maize sold in the western Kenya food deficit areas of Kenya such as Kisumu, Siaya and South Nyanza is lower than that from the Kenyan production systems For example, maize from Mbale Uganda would get to Kisumu at Ksh 1203 per bag compared to Ksh 1227 per bag for the maize from Bungoma. The price of maize from Iganga to Kisumu would also be Ksh 1090 per bag compared to Ksh 1252 per bag for the maize from Lugari. Similarly, maize from Kapchorwa would reach Kisumu at Ksh 1285 per bag, which is Ksh 175 per bag cheaper than the maize from adjacent Kitale.

Figure 4. Aggregate Maize Supply Schedule with Ugandan Maize Delivered to Nairobi



5.5 Protection of Domestic Production

The government has maintained a policy to protect the domestic production to discourage imports and therefore allow the domestically produced maize to be marketed. A per unit tariff on between 25 as normal duty and 75 variable levy percent of the import price has been subjected to import international imports. Before the COMESA agreement came in force in 1994, maize imports from the region have also been taxed like maize from any other destination at a rate of 25 percent normal levy and 75 percent variable levy. With the COMESA agreement in force, only 2 percent of the import price will be charged on imports from the region. The impacts of the protection to production as argued elsewhere in this paper taxing imports does accentuate the food policy dilemma. As shown in Figure 5, an import tariff of about 25 percent of the import price raises the maize price to way above the self-sufficiency price and consumers are penalized because they now have to buy maize at this high price.

6. Implications for Food security

The World Bank defines food security as access by all people at all times to enough food for an active healthy life. The reference food poverty line is 2250 calories per adult equivalent, which implies that adequate consumption must be at least that minimum. The source of food could be through production by the household in a farm setting or though purchase or both production and purchase. Household food production and household income therefore are important factors in the household food security. Prices are also important because they determine the food value of household incomes. Policies therefore that affect food production, incomes and prices impact on food security.

Evidence from many Africa countries has shown that solving the food security from the production point of view which overlook the demand side does not solve the food security problem particularly especially the access of vulnerable groups to enough food (Adebayo 1989).

Whereas increasing local food production is necessary it is not sufficient to ensure household food security. It is therefore imperative that the domestic food production is accompanied by a more appropriate mix of domestic production, trade, price, technology, marketing and policies to raise the real income of the poor increasing availability of food in the domestic market alone (Eicher, 1988). Household food security is also constrained by poor infrastructure that hampers maize movement from the surplus to the deficit areas. However the strategy to raise maize productivity reduces production costs and therefore reduces maize prices is likely to benefit both the producers and consumers of maize. Further, majority of maize consumers are in some way producers or consumers or are somewhat related to food producers. For these categories of people, food security achieved through increased domestic production helps to ensure that they access food at reasonable prices. This also ensures that the livelihoods of a large proportion of producers who depend on maize production is thereby sustained. Low food prices arising from productivity gains will benefit the producers because of increased scale of operation thereby safeguarding their livelihood. Low food prices are also good for consumers as this reduces the proportion of income they spend on food. Poor consumers also access food more easily at low food prices.

Most farm households in Kenya are net buyers of grain and therefore do not benefit from "high" grain prices. In fact, most farm households in Kenya do not produce enough grains for them to feed themselves and are actually net buyers of grain. Net buyers are households that over the course of the year either only buy grain or buy more than they sell. In the 22 agricultural districts surveyed in 1997 and 1998, on average 52% of the small-scale farm households were net buyers of maize, 16% neither purchased nor sold maize, and the remaining 32% were net sellers of maize (Table
11). The net sellers of maize are from the main maize production zones where the majority of smallholder households sold more maize than they purchased.

Figure 5. Aggregate Maize Production Schedule with Import Tariffs

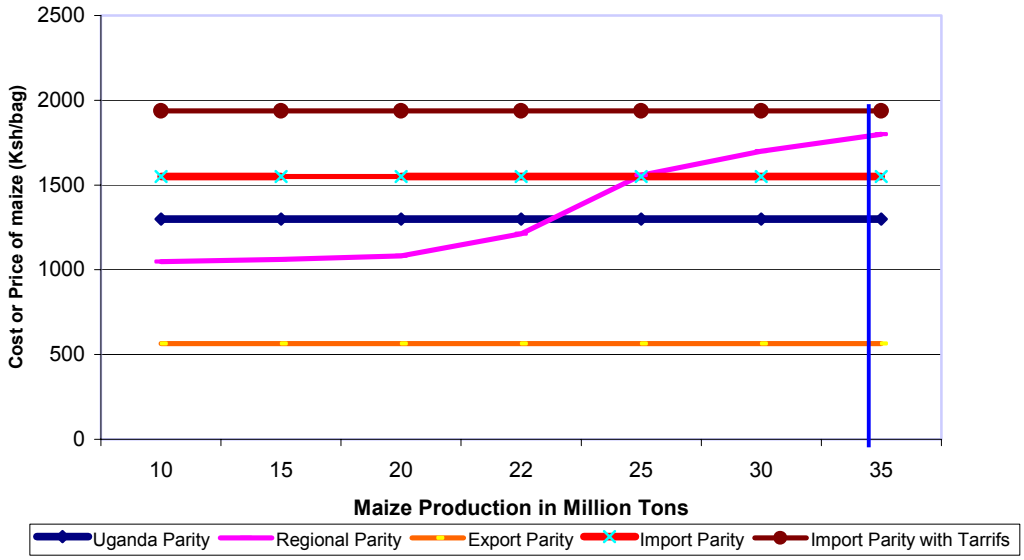


Table 11. Proportion of farmers buying or selling maize

Zone	Per Capita Income (Ksh)	Cropped Land size (Acres)	Maize Marketing Position (% Of households)		
			Net Seller	Neither purchased nor sold	Net Buyer
Western Lowlands	10,920	2.95	5	13	82
Eastern Lowlands	19,355	5.36	23	11	66
High-Potential Maize Zone	29,922	7.73	68	10	22
Western Highlands	14,055	2.96	23	19	58
Western Transitional	16,578	5.31	23	15	62
Central Highlands	28,010	2.8	16	21	53
Total	21,647	4.81	32	16	52

Source: Tegemeo Institute data and author's compilation

Except in the maize breadbasket of the North Rift, most small farmers derive the bulk of their income from non-farm income and from other crops. While they grow maize for consumption, it is generally insufficient for household requirements and they use the income derived from their non-farm and cash crop activities to buy much of their maize needs.

Conclusion and Policy Implications

The key challenge in Kenya today is to increase the food security for a large proportion of the population without compromising the livelihoods of a many producers who are currently threatened by the over dependence on imports thus creating a food policy dilemma. Strategies that could improve maize productivity and reduce prices of domestic production comparable to the import prices is likely to make the local farmers to compete in international markets and therefore allow for countries to bargain from a standpoint of strength in international trade agreements.

In striving to raise the maize productivity, there are several policy implications that arise regarding roles of government and private sector in a liberalized market. Questions arise on whether there is room for the public sector to regulate a liberalized market or whether the private sector self regulate their operations. This debate has really dominated the post liberalization era. Particularly it was not clear that the success of the liberalization of agricultural markets was placated on a working partnership between government and the private sector. The private sector is expected to ensure that their operations will guarantee that they remain in business and will not do anything that could jeopardize their future business. But as in the case of the seed market in Kenya, liberalization of the seed marketing has not guaranteed that the seed quality is high. The issue therefore is whether the public sector should guarantee that seed quality is improved and that the seed companies follow certain guidelines and conform to certain quality standards. This then calls for joint roles between the government and the

private sector. The private sector could endeavor to increase the quality of seeds used by farmers particularly of the hybrid seed varieties.

On fertilizers, the issue again is whether there is a public role in a liberalized fertilizer markets because the price of fertilizer obviously influences its use. Evidence from the results of this paper indicates that the low usage in fertilizer is due to the high farm gate prices of fertilizers that makes them unaffordable. It is the role of government to reduce fertilizer costs at the farm level by attending to areas such as improving the efficiency of Mombasa port, reducing port charges, improving the infrastructure in order to reducing transport costs between Mombasa and the farm gate, reducing transit losses and re-organization of the handling of fertilizers at the port such as removing restrictions at the port that requires use of certain type of employees. Once these public roles are undertaken, fertilizer prices are likely to be lower which may induce higher use my farmers.

The credit market also has been liberalized although it also is unable to deliver credit particularly to the small-scale producers. Then should the government address the market failures in the credit market by either participating directly in providing credit to the farmers or even provide the private sectors with incentives to do this. It is true that the commercial banks have been unable to lend to agriculture making it therefore necessary to explore the potential for establishing financial institutions that may carry greater risks and low rates of return and the inherent lending risks in agriculture. Such instructions would guarantee the commercial banks that lends to agriculture. Whose role is it to establish collateralised credit and therefore encourages use of the warehouse receipts to provide credit to farmers before they can all sell their produce thus reduce the need to sell all the maize after the harvest thus spreading out the sales with a view to avoiding sharp price drops after the harvest. This could also encourage storage of maize over the season. Should the government support introduction of credit schemes that are accessible to small-scale farmers through the SACCOS and micro financing organizations?

Should the government encourage or even establishing producer associations in areas where they do not exist and also strengthening them where they exist so that they can serve the dual role of financing and marketing? If the government establishes the producer organizations, then they are like government organizations. But again, if the government does not take the initiative to establish this producer organization, then probably nobody will. The issue therefore is to get the right balance between the role of government and that of the producers or traders in establishing these organizations. It is the producer organizations through which services such as the inventory credit, market information, credit and extension are easily delivered.

To what extent should the government interfere in the commodity markets particularly in the stabilization of maize? To what extent are costs of operating a maize stabilization scheme compensated by benefits in stabilization prices and in attainment of food security. How can the stabilization scheme be operated without distorting the maize markets? Should the government for example maintain national strategic reserves and if yes, should they be maintained as a buffer fund or a buffer stock? What factors influence the choice of the method? The multiple desires that the governments have to enhance food security for consumers and improve productivity for farmers require some form of interventions and a reconsideration of maize price stabilization. What are the government revenue implications of the price stabilization as the stabilization involves tying some reasonable amount of money for the purpose and is therefore inherently expensive because the program will have to somehow subsidize the prices. What happens in a situation where the frequency of poor harvests years are more than the good ones thus demanding for interventions by government.

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