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INCREASING KENYA'S AGRICULTURAL COMPETITIVENESS: FARM LEVEL ISSUES

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This paper draws from working papers prepared by T.S Jayne, Maria Wanzala, Thomas A. Awour, Gem Argwings Kodhek, Mary W. Kiiru, Mercy Kamau T. Yamano, Raphael Gitau, Tony Sisule, Francis Karin, Betty Kaunga, Brigit Ochieng, and Elliot Mgenyi for Assistance accorded in the preparation of this paper.

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INTRODUCTION

The agricultural sector like the rest of the economy continues to perform poorly. From a high rate of 4.8% in 1994, growth in the sector has declined year-by-year to reach its lowest level of –2.3% in year 2000. Similarly, the performance of key food commodities has also been poor over the same time. Between 1994 and 2000, maize and wheat production declined by 24 and 60% respectively (Republic of Kenya 2001) Production of other food commodities like rice milk and sugar has also declined. Export commodities have also not been spared. Coffee production has declined by more than 50% in the last 10 years. Equally other crops such as sugar cane and pyrethrum have recorded dismal performance in production.

The decline in food and exports has adversely affected food security, a decline in employment opportunities and an increase in overall poverty in rural areas. The decline in food production has taken place against a backdrop of growing demand for food caused by, among other factors, high population growth that has caused structural deficits in key food commodities like maize, wheat, rice, and sugar. To meet the deficit, the country continues to depend on imports of key foods commodities. In the last year, for example, Kenya imported 409 tons of maize valued at Ksh 4.7 billion for commercial and relief purposes (Republic of Kenya 2001) Similarly, large volumes of wheat were imported to bridge the ever-increasing gap between production and consumption.

Kenya today can get maize from neighboring countries like Uganda and Tanzania, and sometimes from as far as Brazil, South Africa, and Mozambique at prices lower than that of domestic production. Similarly, the domestic horticultural production is now facing stiff competition from imports of products that traditionally have been provided from local sources. The local domestic horticultural market is now being supplied with fresh and processed horticultural products such as oranges, apples, onions, bananas, grapes, marmalades, jams, and tomato products from Tanzania, Uganda, South Africa, Italy, Spain, Egypt, and Israel. These imported commodities are well known for their top quality, as they are more attractive and are more consistent in color and favor than the locally produced ones. They are also available throughout the year. Prices of some of these food imports are sometimes lower than that of local food production. Policy makers have responded to this situation in Kenya by imposing tariffs on food imports to protect domestic production

High domestic food production cost compared with imports creates a “classic food price dilemma.” Because while this policy protects sellers of cereals – a relatively narrow segment of the rural population – it penalizes consumers who have to pay high food prices and is also inconsistent with international and regional agreements (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 takes 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.

On the other hand, domestic agricultural production is the center of the country's economy because of the proportion of people who depend on agriculture for income and employment. Over dependence on imports is likely to displace the only livelihood of the local population. Kenya must ensure that it continues to supply the bulk of its food needs through improvements in agricultural productivity and reduced production, transportation and marketing costs. This would make prices of domestic production comparable to the import prices of similar commodities. The key strategy for the country should focus on reducing costs – productivity growth – not raising output prices. Efforts to reduce costs allow farmers to compete in international markets and countries to bargain from a standpoint of strength in international trade agreements.

On exports and other commercial production, high domestic costs of key crops like coffee, pyrethrum, tea, and export horticultural commodities have hampered the translation of the long-term comparative advantage into a competitive one. Traditional markets for these commodities are now being faced by stiff competition from other producers whose costs are lower. Where markets are not entirely lost, high production costs juxtaposed by declining world commodity prices have squeezed profits, rendering the production of these crops unprofitable. Producer incomes have been adversely affected rendering most of them poor and unable to meet their basic needs. A new strategy to reinvigorate productivity and competitiveness of this commercial production, is necessary to stir up growth in smallholder incomes and generate employment in the rural areas. The achievement of the twin objective of poverty reduction and economic growth will require renewed initiative in revitalizing productivity growth in the commercial and food crops. The agricultural productivity growth pertains to the entire food system, including production, processing, and marketing. Such growth will allow farmers to compete in international markets and allow them to bargain from a standpoint of strength in international trade. It is productivity growth that will enable the local producers to become competitive in the international markets and use the emerging opportunities such as the African Growth Opportunities Act (AGOA). Productivity growth means producing greater output at lower costs. This will, in turn, reduce costs of production and marketing.

The objective of this paper is to address the farm level issues that affect the production costs and so the competitiveness of domestic food and commercial production. It compares domestic production prices of key food commodities with the equivalent parity prices to assess the extent to which the domestic prices for maize, wheat, and sugar, and export and domestic crops are competitive. This paper identifies and assesses the factors that influence domestic production costs. It also identifies strategies that could increase food and export crops' productivity, by that reducing production costs and encourage competitiveness of the domestic production. The paper is divided into three parts. The first parts analyses the domestic production costs of maize, wheat and sugar, domestic horticultural crops and dairy and compares the costs of local production costs of maize, wheat, onions with imports prices. The second section analyses production costs for some export crops such as coffee and identifies factors that influence the domestic production. The final part identifies policies that could reduce production costs and enhance productivity in order to enhance Kenya's competitiveness in agricultural.

METHODOLOGY

The data for this study were derived from various sources. The bulk of it was drawn from the single visit survey of 1,540 rural households conducted in April 1997 (Argwings-Kodhek, A. Gem, T.S. Jayne, Gerald Nyamabane, and T. Nyamano, 1998), repeated in 1988, and most recently in 2000. The sample design for the household survey is shown in Table 1. The sample is drawn from 24 districts and regrouped into nine agro regional zones.

The survey information was augmented by updates on farm-based budget information and a market survey conducted in May 2001. Budget data for maize was collected from Nakuru, Uasin Gishu, Lugari, Bungoma, Trans Nzoia, Nandi, and Kapenguria and was synthesized to develop representative farm budgets for these areas. These budgets were compared with similar budget data collected in Uganda at Iganga, Mbale, and Kapchorwa districts. Similarly, budget data for domestic onion and other horticultural crops were collected form key production areas in Gare Dare in Timau division, Naroosura in Narok, and Lamuria in Kieni, Nyeri. In Tanzania, comparative data on onions were collected from Arusha, Mang'ola area. Dairy enterprise data were collected for the small-scale open grazing systems, which was then compared with the large-scale open grazed systems and the small-scale zero grazing systems prevalent in regions like Kiambu.

To compare the domestic maize and sugar production costs with their corresponding import parity prices, transport costs from each production region were added to the production costs. The combined production and transport costs (Nairobi) are 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 compare with import parity price.

Table 1. **Agro Regional Zones and Administrative Divisions for 1997, 1998, and 2000 Household Sample**

Northern Arid	Coastal Lowlands	Eastern Lowlands	Western Lowlands	Western Transitional	HP Maize	Western Highlands	Central Highlands	Marginal Rain shadow
Garrisa	Kilifi	Taita	Kisumu	Bungoma (Kandunyi	Bungoma (Kilili, Tongaren	Vihiga	Muranga	Laikipia
Turkana	Kwale	Taveta	Siaya	Kakamega Kabras, Mumias	Kakamega, Lugari	Kisii	Nyeri	
		Kitui			Bomet		Meru	
		Machakos			Nakuru			
					Narok			
		Makueni			Trans - Nzoia			
		Mwingi			Uasin Gishu			

Source: Tegemeo Institute Database

The study has specifically drawn information from the following papers:

Awour, Thomas A. 2001. Competitiveness on Maize Production from Western Kenya and Eastern Uganda in Kisumu Town of Kenya. Master thesis, Michigan State University.

Jayne, T.S., T. Yamano, J. Nyoro, and T. Awuor. 2001. *Do Farmers Really Benefit from High Food Prices? Balancing Rural Interests in Kenya's Maize Pricing and Marketing Policy*. A paper prepared in a joint collaboration with Tegemeo Agricultural Monitoring and Policy Analysis (TAMPA) Project, Egerton University/Michigan State University with support from the United States Agency for International Development/Kenya.

Kamau, Mercy. 2001. *Regional Competitiveness in Production and Marketing of Horticultural Crops for Domestic Market.* A paper prepared for Tegemeo Agricultural Monitoring and Policy Analysis (TAMPA) Project.

Kamau, Mercy. 2001. *The Way Forward in Export Oriented in Export Oriented Small-Holder Horticulture.* A paper prepared by Tegemeo Agricultural Monitoring and Policy Analysis (TAMPA) Project.

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Nyoro, J.K. 1994. Maize Production: Impacts of Market Reform. Conference Proceedings on Market Reform, Agricultural Productivity and Food Security. June 1994, Policy Analysis Project, Egerton University.

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Nyoro, J.K., T.S. Jayne, and T. Yamano. 2001. *Capturing the Synergies Between Food Crop and Cash Crop Production Evidence from Kenya*. Working paper. Tegemeo Institute, Egerton University.

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Wanzala, Maria, T.S. Jayne, John M. Staatz, Amin Mugera, Justin Kirimi, and Joseph Owour. 2001. *Fertilizer Markets and Agricultural Production Incentives: Insights from Kenya*. A paper prepared in a joint collaboration with Tegemeo Agricultural Monitoring and Policy Analysis (TAMPA) Project, Egerton University/ Michigan State University, with the support by the United States Agency for International Development/Kenya, and by USAID/Africa Bureau/Office of Sustainable Development and Rockefeller Foundation.

DOMESTIC PRODUCTION COSTS AND IMPORT PARITY PRICES

Maize

Maize in Kenya is produced almost everywhere including in the arid and semiarid 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 acres (2.0 and 5.4 tons per hectare). Production levels and structures of production costs differ between the large and small production systems (Table 2). 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% more intermediate inputs – fertilizer 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, so, incurring higher labor costs. Although the yields for the large-scale systems in Trans-Nzoia are about 47% higher than that in the small-scale systems, the costs of production are about the same at approximately Ksh 780 per bag, because the large-scale systems incur, on average, a higher cost per acre. Due to slightly lower yields, Uasin Gishu has a higher cost of production than Trans Nzoia.

Table 2. Costs and Returns for Large and Small-scale Maize Production Systems (1999)

	Trans Nzoia Small-scale	Trans Nzoia Large-scale	Uasin Gishu Small-scale	Uasin Gishu 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 Labour Inputs	2,520	1,685	2,385	1,662
Mechanization costs	3,400	5,200	2,782	4,325
Other non labour 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
Profit per bag	223	311	133	202
	22%	31%	13%	20%

[1]Source: Tegemeo Institute's Data Base

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

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 beans. Regional maize production, handling and transport costs to Nairobi are shown in Table 3.

Competition with Maize Imports

Outside the East African region, the other source of competition for maize that is domestically produced is imports from countries such as Brazil and Southern Africa including South Africa itself. Based on the FOB maize price in Durban obtained from Safex Website prices for August 2001, costs, insurance and freight, port handling and charges in Mombasa, and transport to Nairobi, the import parity price for maize at Nairobi at an exchange rate of Ksh 79 to a dollar is Ksh 1510 per 90 kg bag in August 2001[2]. Using the same Exchange rate, the export parity price for maize from Nairobi is Ksh 322 per bag[3]. Given the expected maize consumption of 34

Table 3. Regional Maize Production and Transport Costs (Nairobi) for 1999

	Production Costs in Ksh per Bag	Production and Transport Costs (Nairobi)
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's database and author's compilation

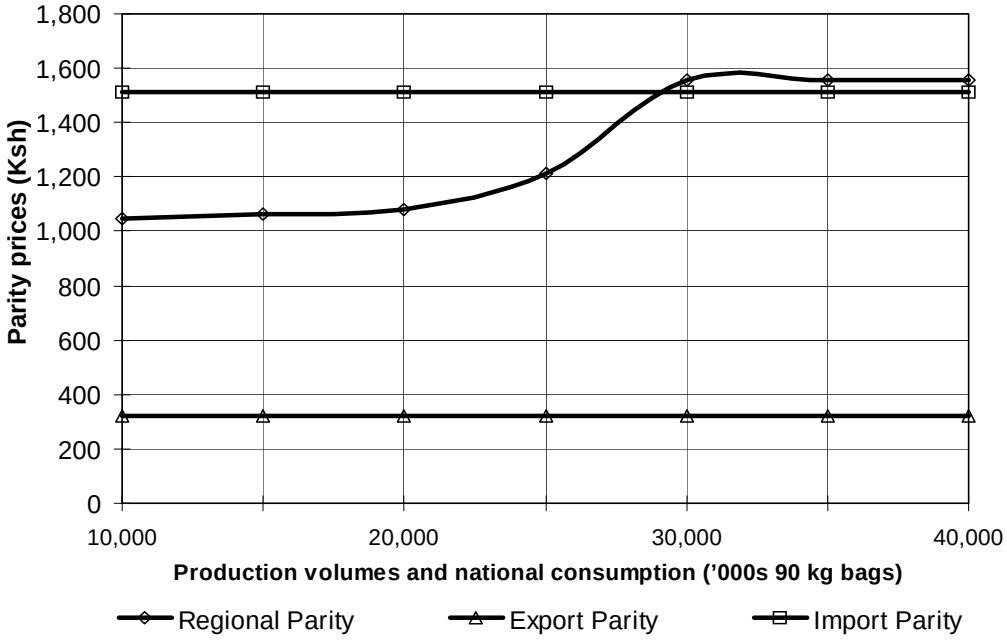
[2] CIF Durban price converted to local currency using the August Exchange rate of Ksh 79 per dollar and is added the handling and transport costs to arrive at an import parity price Nairobi wholesale market at Ksh 1510 per bag.

[3] Export parity price for Nairobi is the import parity price less transport, handling and freight charges the port or Durban.

million bags per year, the August 2001 maize price estimated from the long run expected maize supply curve[4] is Ksh 1550 per bag. Yet because maize is a tradable commodity and imported in Kenya, efficiency rather than the self-sufficiency price is the parity price, which here is Ksh 1500 per Bag of maize in Nairobi.

In 1994, estimated in the same manner, the maize price was Ksh 840 per bag when the import parity price for maize in Nairobi 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. With the self-maize price lower than the import parity, Kenya was then 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 1, in a normal year the country can supply approximately 60% of its maize 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 at or near import parity level, which makes the country less competitive in maize production as compared with the imports. The results also suggest that due to the low level of maize export prices compared with the actual cost of production, Kenya cannot produce and export maize to the world market efficiently even in conditions of excess maize production.

Figure 1. Maize Supply Schedule in a Normal Year and Parity Prices



[4] 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).

Comparison of Wholesale Maize Prices between Kenya and its Regional Neighbors

Real maize prices in Kenya are quite high by regional standards. Average monthly wholesale maize prices between January 1996 and December 1999 in three major maize production areas of Kenya in the High-Potential Zones were as follows: Ksh 971, 935, and 1072 per bag for Eldoret, Kitale, and Kakamega, respectively (using MOALD/Market Information Bureau data). When converted into US dollars at nominal exchange rates for each year, the average price for these three surplus markets was $190 per ton -- well above those in most producer regions in other African countries and the world (Table 4).

Competition with Uganda

Locally produced maize is also subjected to competition by maize from Uganda and Tanzania. The competition has intensified with the implementation of the provisions of the Market for Eastern and Southern Africa (COMESA) Treaty agreements. Information on cross border trade shows that during 1994-96 period, maize imports from Uganda average about 100,000 to 150,000 tons annually (Ackello-Ogutu, C. and P. Echessah, 1997). Imports from Uganda typically make up a large share of the domestic short fall in Kenya.

Data from Kenyan and Ugandan production systems were compared to assess 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 because they are (or are nearly) adjacent to each other, and having similarity in the agro-climatic conditions and household land parcels.

Iganga district is one of the biggest maize producing districts in Uganda according to Iganga District Agricultural Office. It has a total of 45,000 hectares of maize for two seasons. The major varieties are composite Longe 1, local varieties, Zimbabwe hybrids and Uganda hybrid B. It is estimated that about 60% of all maize farmers in Uganda use either Longe variety or the hybrids. Most maize farmers 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,

Table 4. Prices for Maize Grain, January 1996 - December 1999

	Ethiopia	Kenya	Zambia	Zimbabwe	South Africa	Mozambique
	US$ per metric ton (average from Jan. 1996 - December 1999)					
Wholesale price surplus regions	97	190	133	119	113	101
Wholesale price Capital city	135	241	174	127	n/a	217

Source: Jayne et al. 2001.

maize yields were between 25 and 40% higher than in Kenya, except in Kapchorwa where the yields were very similar to those in Kitale (Table 5).

But, maize costs of production per bag and prices received by the Kenyan farmers were about 30% higher than those in Uganda. Maize is a less preferred type of food in Uganda compared with bananas, which is the staple food. So it is not in high demand like it is in Kenya. The non labor costs for the Kenyan production systems are generally higher than in Uganda. The Kenyan system uses higher quantities of fertilizers, relies on hybrid maize varieties, and is more mechanized (except in Kapchorwa, which is more mechanized and relies 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 used in Bungoma (Fertilizer application used was 30kg per acres and 30kg of top dressing compared with 75 kg of DAP and 75 kg of CAN in Bungoma). The costs for fertilizer in Uganda are also higher than in Kenya (Cost of DAP was Ksh 35 per kg in Uganda compared with 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.

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. Composite varieties are also less dependent on high quantities of fertilizers. The Kenyan systems are dependent on hybrids 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

Table 5. 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: Extract from Awuor 2001.

fertility and favorable weather conditions, making it conducive for maize production. The limitations of relying on this natural advantage, particularly on the soil fertility, are widely recognized by the Ugandan farmers and authorities who are 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 with Kenya.

Most of the maize produced in Uganda is exported through informal trade to Western Kenya markets, particularly in Kisumu. Despite the high transport costs from the maize production regions, in addition to the high transaction costs like bagging in small containers to evade harassment from the police and custom officials, maize from Uganda reaches Kisumu consumers at lower prices than those from Kitale and Lugari (Awour 2001).

Wheat

Domestic wheat accounts for less than 40% of the total consumption with the rest being met from imports. Like in the case of maize, millers prefer the imported wheat because it is at times cheaper and is of superior quality than the local wheat. To protect the producers, wheat imports are taxed.

Data collected in 1998 and updated in May 2001 show that domestic wheat production costs vary from Ksh 900 to Ksh 1700 per bag, (Table 6) depending on production technology and the scale of production. A comparison of the domestic wheat production costs with the import parity prices revel that wheat price Ex-Australia at Nairobi, without duty, is Ksh 1535 per bag of soft wheat and Ksh 1567 per bag of hard wheat. At this level, the import price for wheat is only slightly lower than the most inefficient wheat production system in the country.

Table 6. Costs and Return of Wheat Production (2000)

Yields in Bags/acre	5	12	16	18
Price Ksh/bag	1500	1500	1500	1500
Revenue	7,500	18,000	24,000	27,000
Labor Ksh	225	348	655	700
Intermediate inputs	8194	11853	15237	19090
Total Costs	8419	12201	15892	19790
Cost per bag	1,684	1,017	993	1,099
Profit per bag	(184)	483	507	401
Profit Margin	-12%	32%	34%	27%

Source: Tegemeo Institute Database and Author's Compilation

Wheat production budgets reveal that the production techniques, in both small- and large-scale systems, are highly mechanized. Out of the total non labor costs, mechanization alone accounts for about 40% of the total costs as compared to about 30% for fertilizers. Further analysis of the mechanization reveals that most machinery costs are attributed to the fuel costs, while the rest are capital expenditures. Fuel in the country is taxed at about 35%. Since spare parts for farm machinery are taxed, this has also influenced the rise in mechanization and production costs. The tax acts as a disincentive to wheat production and raises the costs of local production.

Due to the high degree of mechanization in wheat production, ownership or rental of machinery affects wheat production costs. Some small-scale farmers who depend on hired machinery have difficulties in accessing the rental machinery, by that delaying farm operations. As a result, farmers using their own machinery attain higher yields than those hiring because of more thorough land preparation and timeliness in farm operations. Yet ownership of machinery is hampered by lack of credit to purchase them. The gap left by the Agricultural Finance Corporation to finance the procurement for farm machinery has not been filled. Farmers currently rely on their own financing or the commercial banks to finance such operations. Because of the production and marketing risks inherent in wheat production, commercial banks have hesitated to provide assistance to farmers, hence the continued reliance on old and inefficient machinery.

The costs of wheat production are also influenced by the quality of seeds available to farmers. The quality of wheat seeds has raised major concerns among wheat producers. Some certified seed varieties available are contaminated with other seeds. This has led the majority of farmers to prefer to use retained or non certified seeds, and selected and treated seeds from neighbors. Most often these seeds may not be treated. Some farmers are now forced to invest in seed drying and treating plants, thus, developing the market further for uncertified, treated seed.

Domestic Horticulture

Free trade has enabled the importation of other food commodities such as onions and tomatoes from neighboring countries. Onions are now being imported from Mang'ola in Arusha, Tanzania, and Nairobi, as well as other parts of the country. Onion production costs and returns from Mang'ola production system in Tanzania were compared with similar production systems in Naroosura in Narok. Results shown in Table 7 reveal that onion yields in Mang'ola, Tanzania are double those achieved in Naroosura, Kenya. The higher yields realized by the Tanzania farmers were attributed to use of high quality seeds compared with their counterparts in Kenya. Seed costs in this area were double those used by Kenyan farmers. Respected and credible farmers did the seed multiplication in Tanzania. The farmers in Tanzania would not buy seed from unknown traders or seed distributors because of fear of contamination. Although the Tanzania onion seeds were traded in the Kenyan market, they are of inferior quality than those sold in Tanzania. Nevertheless, the high quality seed selection and distribution by Mang'ola farmers are done without much support from local or national seed certification of inspection units. Quality is, however, assured through self-regulation by the seed merchants and the farmers. Due to the superior quality of the onion seeds used, pests and disease incidences are lower, by that, reducing the costs of agrochemical inputs.

Table 7. Costs and Returns of Onion Production in Kenya and Tanzania (2001)

	Mang'ola, Arusha Tanzania	Naroosura Narok, Kenya
Costs in Ksh per Acre		
Seeds	4,600	2,100
Chemicals	5,884	6,000
Fertilizers	13,271	5,560
Labor	25,980	32,180
Fuels & Oils	-	
Rent	3,000	
Total	52,735	45,840
Yields in 14kg Nets	865	468
Costs/Net	61	98

Source: Mercy Kamau 2001

In addition to the use of high quality seeds, Tanzanian farmers used more fertilizers than their Kenyan counterparts. As a result, fertilizer costs are more than double those in Kenya, although the fertilizer prices were higher than in Kenya. The price of sulphate of ammonia was Ksh 36 per kilogram compared with Ksh 24 per kilogram of CAN in Kenya. Because of this, production costs of onions from Mang'ola are about 60% that of in Kenya. Consequently, due to transportation costs, onions from Mang'ola get to Nairobi at the same price as that from Naroosura although the demand for the onions from Mang'ola, Tanzania is high due to their superior quality.

Coffee

Farm level cost of coffee production in Kenya is among the highest in the World. This is due to a combination of factors, which includes the control of the two devastating diseases of the coffee berry and leaf rust diseases. Disease control accounts for a large proportion of the total production costs. Most other coffee producing countries suffer from either, but not both, of the two diseases. Also, Kenya coffee is wet processed. Although this adds value to the coffee by enhancing its quality, it also raises production costs. Costs of production are currently estimated at US $ 0.95 to US $1.5 per kilogram of coffee (Table 8). Small-scale production systems have lower yields than the large-scale production costs because of low qualities of inputs used and generally lower management standards. Yet because most of the large farms are capital intensive, their costs per ton are higher than those of the small production systems.

The high farm level production costs are exacerbated by high transaction costs by all coffee handling institutions such as the CBK, the coffee millers, cooperative societies, and factories. The costs incurred by these institutions that handle coffee for farmers are high, resulting in low coffee payments.

Table 8. Costs and Returns in Coffee for 2000

	Large-scale Systems	Small-scale Systems
	Ksh per Tons of Coffee	
Weeding and Handling	16,560	29,111
Fertilizers	11,320	22,071
Disease Control	20,192	7,278
Harvesting	20,660	12,000
Irrigation	10,400	-
Processing	-	-
Overhead labor	17,280	-
Total	96,412	70,460
Average Yields (Tons/Ha)	0.45	1.25

Source: Coffee Research Foundation and Author's compilation

The farm level production costs have escalated in the recent past. This is mainly due to major increases in the cost of purchased farm inputs, which have been affected by inflation and currency devaluation. Over the last 15 years the cost of coffee production per tonne has increased by from Ksh 17,000 (US $ 1,055) in 1985/86 to Ksh 65,200 (US $ 869) in 1999/2000[5]. The high costs of production of coffee have exposed producers further to the world coffee price risks and fluctuation. Several factors have reduced coffee profitability and led to the abandonment of coffee production by most farmers. They include production costs, declining coffee prices, high transaction costs due to mismanagement of coffee institutions, and high costs of production

Coffee production, particularly by the small-scale producers, is likely to remain low, unless there are improvements in farm productivity and coffee prices, as well as a reduction of transaction costs. Making new hybrids, such as Ruiru 11, that are resistant to diseases available for adoption by farmers could reduce production costs. Availability of these varieties has however been constrained in the past by restricted multiplication of the seeds and seedlings by the Coffee Research Foundation.

Sugar Cane

The gap between domestic sugar production and consumption has been increasing since the early 80s when the country was self sufficient in sugar. Since then, the consumption has grown faster than the production. Sugar imports are, at times, cheaper than the locally produced sugar, thus, requiring the need to impose tariffs on imports to protect domestic production. The high costs of locally produced sugar are attributed to several factors, including high cane production and processing costs. Cane yields are low compared with other countries mainly because of the poor

[5] Exchange rate in 1985/86 averaged at Ksh 16.10 to the US $ as compared to a rate of Ksh 75 to US $ in 1999/2000.

cane cultivars used, coupled with the poor husbandry practices in cane production. Therefore, local yields are low.

Sugar producer prices are still set by the government. The price set is uniform for all zones regardless of quality or sucrose levels. Also, the price does not reflect the large cost disparity for cane production costs, which vary widely across the cane production zones. Uniform ex factory sugar prices also disregard the costs of processing sugar, which again vary by the sugar factories.

The combination of poor cane varieties and below optimal fertilizer use has also adversely affected the sugar recovery rate, which is low. Cane production has a long gestation period – the period between planting and harvesting – thus requiring the financing for working capital to aid purchase of yield enhancing inputs. Credit in sugar cane production is lacking and this contributes to the low yields and poor cane quality.

Limitation in the mechanization of cane production is another drawback to cane production. In competing countries, cane production is fully automated from planting to harvesting, loading and crushing. Lack of mechanization of some operations has contributed to wastage and efficiency losses. Since the cane harvesting schedule is unpredictable, planning is difficult for farmers, by that, raising production costs because the cane is not harvested at its optimal stage when the sucrose content is high.

The future of sugar cane production in Kenya lies in the reduction of sugar processing costs through investing in the appropriate technologies. However, the potential is there to enhance productivity at the farm level. These production costs can be reduced by introducing better yielding sugar varieties, increasing use of farm inputs like fertilizers, and using capital investment to automate various stages of cane production, handling, and processing. Such technologies are available with our competitors in countries such as in Sudan.

Dairy

The dairy industry is one of the most important livestock activities in high potential and across the other agro ecological zones because of its daily income earning capability. This potential has not been fully utilized following the withdrawal of government support in disease control, artificial insemination and dipping. The biggest challenge faced by dairy farmers since the liberalization of the dairy industry is mainly in milk marketing following the collapse of Kenya Cooperative Creameries (KCC). Liberalization of artificial insemination and cattle dipping have led to a total break down of disease control and a degeneration of the breeding stock for milk production due to uncontrolled breeding. Whereas in some the disease management, cattle dipping, veterinary, and clinical and artificial insemination functions have been taken up by the private sector, this has not been the case in many small-scale dairy production systems particularly in some parts of Rift valley and the Western parts of Kenya. As a result, it would be necessary to redefine the role of government in the provision of certain services in order to assess whether it would be necessary to support of certain production systems either through directly intervention or through the promotion of private sector. In areas like Nakuru and Nandi for example, some farmers cannot afford to pay for imported semen, which is readily available

from the private sector. The farmers in such areas continue to depend on local bulls for insemination. Though farmers in Nairobi and its environ can have access to a ready market for milk to either private processors or the raw milk consumers those in other parts of the country do not have the benefit of a ready organized processed or raw milk market. It is therefore important to review the role of KCC in providing a market outlet to these farmers or some form of organization that will assist the producers in these disadvantaged regions. Producers particularly those in the Northern Rift will have to strengthen their associations or even form new ones where none exists to facilitate collective milk collection, marketing and also access artificial insemination at reasonable costs.

Poor enforcement of contracts between the producers and processors or other traders have also adversely affected milk marketing. Some farmers have lost money when creditors delay or totally fail to pay them.

The high cost of feed supplements has also hampered dairy production. The most affected producers are those who practice zero grazing because of the importance of purchased inputs in these systems. As shown in Table 9, costs of feed supplements alone account for about 38% of the total milk production costs in a zero grazing system. It is only 10% of the total production cost in the open grazing systems such as in Nandi where animals depend on open pasture and are only given feed with supplements mainly when being milked. During the 2001/2002 budget, the taxes on fish and blood meal were removed during 2001. Nevertheless, as long as maize remains the most important component of animal feed, the feed costs will remain high due to competition with human for consumption. Strategies to increase maize production to levels way beyond the domestic consumption levels could make more maize available for animal feed. Alternatively other non maize-based sources of carbohydrates could also be explored.

Table 9. Costs and Return in Dairy Production Systems (2000)

	Small-scale Open Grazing		Small-scale Zero Grazing
	Nakuru	Nandi	Kiambu
Labor	2.8	1.89	4.98
Supplements	0.63	0.39	4.75
Other Feeds	1.17	0.04	2.17
Dewormers	0.65	0.18	0.13
Vet Services	0.24	0.31	0.19
AI			0.12
Chemicals/Acaricides	1	0.84	0.04
Salt	0.53	0.21	0.55
Others			0.19
Total	7.02	3.65	12.38
Profit Margin	6.98	7.35	5.62
Profit Margin %	50%	67%	31%
Percent of supplements	9%	11%	38%

Source: Tegemeo Institute Database and author's compilation

FACTORS INFLUENCING PRODUCTIVITY

This section addresses the factors that have contributed to the high domestic production costs, identifies interventions that could reduce the costs and reinvigorate agricultural productivity thereby increasing the competitiveness of agriculture in Kenya to ensure that the country continues to supply the bulk of its food needs at prices similar to those of imports.

Machinery Costs

Machinery costs include costs of ploughing, harrowing, chiseling, planting, spraying, harvesting, shelling, and transport to stores. Machinery costs are generally high, particularly in the maize and wheat production. Farmers have also complained that the ownership of farm machinery has been reduced in the last 10 years due to lack of financing mechanisms for procurement of farm machinery. High costs of farm machinery 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. In 1994, most maize producers did two ploughs and two harrows to create a fine seedbed suitable for planting maize and wheat. In the 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 (KARI 1998). Reduction in the quality of land preparation could have adversely affected maize yields and hence an increase in production costs per unit production.

The extent of machinery costs particularly in seedbed preparation is corroborated by production costs data for Trans Nzoia in 1992 and 1999. Results indicate that land preparation charges increased by 30% between 1992 and 1999 after controlling for inflation. However, during the same time, the actual mechanization costs declined from 31 to 26% of the total production (Table 10). This was attributed to the number of ploughs and harrows. Further, in 1992, when maize prices were about Ksh 700 at the farm gate, farmers in required to sell 0.8 bags of maize to plough one acre for planting maize. In 1999, however, they needed to sell 1.25 bags of maize to plough the same area. Most of these increases in costs is attributed to the high cost of diesel fuel and spare parts for farm machinery, which have been increasing over the past 10 years.

Farmers also have to contend with poor availability of farm machinery, particularly those who rely on hired machinery. Machinery owners complained that they have been unable to replace the old tractors due to working capital constraints. Because the existing machinery is old and in poor condition, their performance is diminished. Timely execution of agricultural tasks such as land preparation and planting is crucial in predominantly rain fed maize production, and as has been observed in the last few years, rainfall tends to be unreliable and erratic in most cases (Mrema 1990). Reduction in the taxes on diesel fuel, and farm machinery and equipment could reduce production and processing costs and promote higher usage of farm machinery.

Table 10. Costs and Returns for Maize for 1992 and 2000

	Trans Nzoia		Uasin Gishu	
	1992	2000	1992	2000
Items	**Ksh/acre**	**Ksh/acre**	**Ksh/acre**	**Ksh/acre**
Revenue	15,466	27,500	14,060	17000
Fixed Cost/acre	550	3,750	500	1,250
Total Labour Inputs	1,092	1,685	1,227	1662
Mechanization costs	3,813	5,200	3,304	3425
Other non labour input	6,767	9,085	6,297	7230
Total Costs	12,222	19,720	11,328	13567
Total Profit	3,244	7,780	2,732	3433
Cost per bag	556	789	566	798
Profit per bag	147	311	137	202

Source: Awour 2001

Seeds and Other Planting Materials

Despite the liberalization of the seed industry and the introduction of Kenya Plant Health Inspectorate Services (KEPIS) as an independent seed inspection authority, the quality of seed, particularly that of maize and wheat, continues to be poor. Most farmers, particularly in wheat production, continue to rely on retained seeds for lack of confidence in the certified seeds. Similarly, an increasing number of maize farmers use either the local maize varieties or the retained hybrid maize despite the increase in the number of hybrid maize varieties released by the seed companies. At the distribution level there is widespread seed adulteration, some of which involves the sale of commercial maize seeds purporting to be hybrid. Seed prices have also been increasing which has acted as a major disincentive to the adoption of the high quality maize. This, with the decline in quality, has adversely affected the adoption of hybrid seeds.

Although the adoption of hybrid seeds has remained high, particularly in the high potential maize zones, their use has not been as expected. As shown in Table 11, a large proportion of farmers across all the zones used other types of seed in addition to the hybrid maize. Most of these seeds are not certified; neither are they cleaned nor 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. What is clear from these results is that the information and potential for using hybrid or certified seed exist within the 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 – the multiplication and distribution seeds – could have compromised the seed quality.

The challenge, then, is to encourage wider use of hybrid and other certified seeds through improving its quality to gain back the farmer's confidence in the hybrid and certified seeds. This will discourage the farmers from using the local maize or retained seeds. They should also be encouraged to use optimal amounts of fertilizers with the hybrid seeds because this is the only

Table 11. Types of Maize Seed Used by Agro Ecological Zones

	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 Database and author's compilation

way that the full potential for the hybrids can be tapped by making the fertilizer available at low farm gate prices.

Just like in maize and wheat, producers of horticultural crops suffer from poor seed quality. This is caused mainly by either poor multiplication or distribution, or because of direct adulteration of the seeds. Fake seeds are sold as improved type at exorbitant prices to unsuspecting farmers. Inferior packaging materials are easily counterfeited where poor quality seeds are packaged and sold without any certification. Although imported seeds are also available, the seeds are expensive and are packaged in large amounts that the farmers cannot afford. Repackaging of the imported seeds by stockist into affordable packages has contributed to the seed adulteration. Unlike Tanzania, where farmers locally vet the local seed multipliers and distributors, there is no local vetting mechanism in Kenya. Inspection and certification are also inadequate, further contributing to the low seed quality.

Planting Materials for Commercial Crops

The main source of seeds and seedlings for most export crops are the commodity marketing bodies themselves. These are the Coffee Board of Kenya (CBK), Kenya Tea Development Agency (KTDA), and the Pyrethrum Board of Kenya for, coffee, tea, and pyrethrum respectively. For these crops, the availability and the quality of the planting materials are hampered by lack of commercialization of seed and seedlings multiplication and distribution by the commodity bodies and their respective commodity research bodies. Seed and seedling's availability and distribution are dependent on the liberalization of the commodity bodies dealing with these commodities such as the CBK, KTDA, and PBK.

Liberalization of the seed development, multiplication, and distribution, then, depends on the restructuring of these commodity boards. For example, for coffee, the CRF has been unable to cope with the high demand for the new coffee hybrid variety and has been unwilling to contract this out to private companies (CRF Annual Report, 1994). Results from a survey by Tegemeo Institute on pyrethrum farmers showed that about 72% of those interviewed were using own splits or the pyrethrum splits borrowed from neighbors with 45% of them splitting old traditional

materials (Kiiru 2001). The study further shows that new farmers wanting to establish a new pyrethrum crop were unable to do it because of unavailability of the planting materials. The main reason the planting materials are not available to the farmers is because only the PBK has the mandated to develop, multiply and distribute the improved seeds or clones. PBK is nevertheless unable to cope with the increasing demand. PBK like CRF has been unwilling to contract out the multiplication of the planting materials to private companies who would accelerate the production. Farmers have also complained that materials currently made are less adaptable to certain areas, thus, producing low yields.

Certification, which is compulsory for many crops in Kenya, has not resulted in an improvement in quality and has not contained the contamination of the seeds and other planting materials. As with onions in Tanzania, it was the self-regulation by onion farmers and traders rather than compulsory certification and inspection that ensured that the quality of onions seeds produced was high. Allowing a voluntary certification through, for example, a decentralized farmer bases approach to seed certification would therefore be necessary to facilitate the certification of the non-compulsory seeds. NGOs and other agencies interested in these seeds would obtain breeder seed from the research institutions such as KARI, and produce the basic seeds and distribute the same to individual farmers. They, in turn, would produce the commercial seed and sell it to other farmers. The multiplication, harvesting, drying, processing, storage, and marketing would be done by individual farmers under the guidance of qualified NGO seed technicians who are trained and accredited by KEPIS.

Working Capital

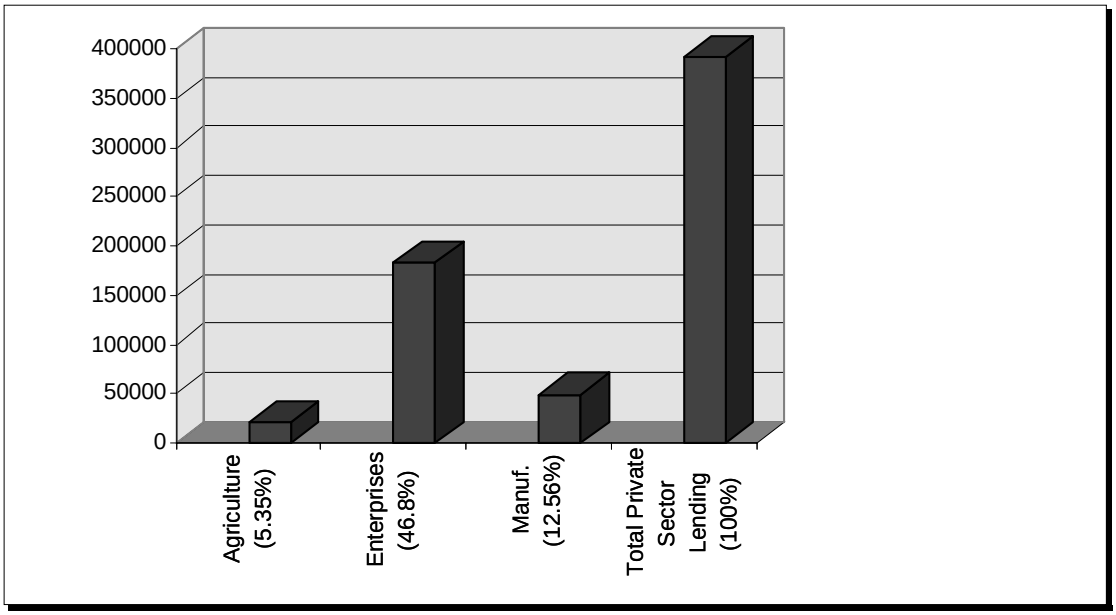
Agricultural input finance has been declining since the early nineties when the liberalisation of the agricultural sector began. Currently farmers are unable to access credit through the formal banking systems, the commodity marketing bodies, or even the producer organizations where they exist. Working capital for both long-term investments in capital and the short-term needs have not been available. Agriculture has also not received its rightful share of commercial credit, despite its contribution 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 2). The total incremental lending to agriculture and related enterprises stood at 10.8% compared with manufacturing (17.8%), trades (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. The banks circumvent the statutory requirements to lend to that sector by preferring to finance commodity traders such as exporters and high value crops 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 operation 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. Results from the household survey show that only about 32% of all households sampled in the 997 household survey and 32% in 1998 received agricultural credit (Table 12). The rest had to depend on cash purchase on inputs. Households in the coffee and tea areas of Central Highlands (Muranga, Nyeri, and Meru districts in the sample) received most of the credit. 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. For example, the vast majority of those receiving credit from either coffee cooperatives or the Kenya Tea Development Authority (KTDA) are often required to use it for coffee and tea respectively. However, some cooperatives under interlocked credit/input/output sale arrangements[6] provide inputs to cover other crops such as the food crops. Households in the coffee and tea areas of Western Highlands (Vihiga and Kisii districts) also received receive credit, and again, most of these households received credit 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.

Figure 2. Lending by Commercial Banks by Sectors from CBK's Consolidated Statistics, 1998



[6] 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.

Table 12. Sources of Agricultural Credit by Region in 1997 and 1998

Zone	Year	Number of sampled households	Households who received agricultural credit	Sources of agricultural credit of those who received						
				Coop (sugar-cane)	Coop (Coffee)	KTDA[1]	Parastatal[3]	AFC	Trader, cash sale[2]	Friends /relatives
			Number (%)	---------- Number (Percent) ----------						
Eastern Lowlands	1997	75	19 (25)		7				2	10
	1998	75	7 (9)		6					1
Western Lowlands	1997	85	5 (6)	3			1		1	
	1998	85	11 (13)	8			1		1	1
Western Transitional	1997	75	21 (28)	19					1	1
	1998	75	34 (45)	30					3	1
High Potential Maize Zone	1997	166	18 (11)		1			7	3	7
	1998	166	11 (7)				1		3	7
Western Highlands	1997	90	50 (56)	1		21	2	1	25	
	1998	90	50 (56)	1	3	34	3		6	3
Central Highlands	1997	121	85 (70)	2	36	41		1	3	2
	1998	121	98 (81)		46	48			2	2
Total	1997	612	198 (32)	25 (13)	44 (22)	62 (31)	3 (2)	9 (5)	35 (17)	20 (10)
	1998	612	211 (34)	39 (18)	55 (26)	82 (39)	5 (2)	0 (0)	15 (7)	15 (7)

Source: Nyoro, J.K, T.S. Jayne, and T. Yamano. 2001

Interlocking credit input with output marketing where it can be applied has enabled the producers to access credit, inputs, extension services, and farm equipment without requiring offering collateral, as 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. This reduces the credit default rates and makes such financing schemes sustainable.

The liberalization of commodity markets has however undermined the interlocking system between the commodity output and the input supply by encouraging side selling of commodities following the 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.

Competition among traders has also been affected by lack of adequate working capital because of lack of credit therefore reducing competitiveness in commodity trading. For example in coffee trading, although there are about 120 registered coffee traders, only about 30 of them are actively involved in active trading due to mainly working capital constraints. Most maize in the high potential maize zones is traded mainly between December and January to meet household cash needs for school fees, uniforms, and Christmas festivities. The trading in maize could have been spread into more months if there were a facility to finance the working capital of the traders or organized groups of farmers. Exploring the possibilities of starting a Warehousing Receipt financing instrument is, therefore, necessary. Under the warehousing receipt arrangements, banks and other financial institutions could offer short-term funds against the security of the commodity in storage. The commodity is normally stored in a warehouse under the supervision of a manager who holds the security and the full title to the goods for the bank through reputable collateral management. This system of financing could be used to improve access to short term credit to commodity traders and farmers.

The development of this system of collaterised credit in Kenya is currently hampered by lack of appropriate legislative machinery that recognizes the warehousing receipts as legal documents. Also lacking is an enabling legal and regulatory framework for effective contract execution and arbitration in case of defaults. A well-functioning legal and political framework for market activity reduces the risks and transactions costs of financiers. A Warehousing Act of Parliament, thus, must be put in place.

Fertilizers

Fertilizer adoption rates and quantities and types of fertilizer are other factors that influence domestic production costs and agricultural productivity in Kenya. In a recent study on fertilizer markets and agricultural production incentives by Tegemeo Institute (Wanzala et al., 2000), details have emerged on constraints on fertilizer marketing. The study has also revealed various insights on the extent of use and the incentive structure of fertilizer markets.

An examination of the adoption of fertilizers in Kenya reveals a generally widespread use by farmers in most agro-ecological zones. It is probably the levels and types of fertilizer use that has

had greater influence in crop productivity rather than the actual adoption of fertilizers or the knowledge of their existence. Results from the household survey data reveals that more than 70% of the sampled households used mineral fertilizers in 1997 and 1998, whereas about 57% of them used manure (manure data is only available for 1998 Table 13). The highest adoption of mineral fertilizer 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 fertilizer is 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.

Yet the biggest disparity in fertilizer use is probably in the quantities and types used. In 1998, only households in the Central Highlands and High-Potential maize zone applied more than 30 kg of mineral fertilizers nutrient per acre (47.9 and 33.5 kg per acre, respectively). In the Western 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% of households used more than 30 Kgs of fertilizer nutrient per acre in 1997, but in 1998 that figure was 13%. More than 40% of households used more than 30 Kgs of fertilizer nutrients in the Central Highlands and High-Potential maize zone.

At an aggregate level, national fertilizer consumption has increased in the post liberalization era. Annual fertilizer consumption increased by 19% between 1984/85 and 997/98 (Table 14). However, the aggregate increase in consumption conceals the actual usage by specific patterns of use by crops that, when done, reveals important variations. Consumption of maize fertilizer (DAP) declined from 70,182 tonnes between 1984/85 and 1992/93, to 67,636 tonnes between 1993/94 and 1997/98. So, the overall share of DAP in total fertilizer consumption declined from 30.1 to 24.4%. In contrast, the overall share of tea fertilizer increased from 18.4 to 21.2% during the same period; the share of wheat fertilizer (MAP) rose from 2.1 to 6.8%; and the share of specialty fertilizer rose from 2.1 to 4.2%.

Analysis of secondary price data reveals that while nominal fertilizer prices have increased in the post liberalization era, the price of most fertilizers has declined in real terms. The two factors that account for this increase are the depreciation of the Kenya shilling against the US dollar compounded by a steady upward trend in world fertilizer prices during this period (Wanzala et al. 2001).

Table 13. Fertilizer Nutrient Use Per Acre in 1996/7 and 1997/8

Zone	Year	Percent of house-holds using manure	Percent of house-holds using fertilizer[1]	Fertilizer Nutrient applied[2]	Fertilizer nutrient application per acre				
					0 kg	0-10 kgs	10-30 kgs	30-50 kgs	50 + kgs
		----- Percent -----		-kg/acre-	-------- Percent of Households --------				
Eastern Lowlands	1996/7	n.a.	45	5.31	55	35	11	0	0
	1997/8	84	51	6.54	49	37	13	0	0
Western Lowlands	1996/7	n.a.	11	8.79	89	7	2	1	0
	1997/8	18	13	13.7	87	6	7	0	0
Western Transitional	1996/7	n.a.	69	15.1	31	29	32	5	3
	1997/8	48	79	16.6	21	31	32	16	0
High Potential Maize Zone	1996/7	n.a.	92	32.2	8	10	35	37	11
	1997/8	48	88	33.5	12	9	32	29	18
Western Highlands	1996/7	n.a.	91	19.5	9	27	50	10	4
	1997/8	51	86	19.4	14	27	46	10	3
Central Highlands	1996/7	n.a.	99	37.6	1	12	43	20	24
	1997/8	91	97	47.9	3	8	22	24	42
	1996/7	n.a.	74	27.3	26	17	31	17	9
Total	1997/8	57	73	30.4	27	17	26	17	14

Source: Tegemeo Institute Database

Note: The total number of households is 612 for both years. 1) DAP is applied on 48% of the total 2216 plots on which fertilizer was applied; CAN 21%; NPK 16%; Urea 5%. 2) Among households who used fertilizer.

Table 14. Annual Fertilizer Consumption by Selected Crops

	1984/85 to 1992/93		1993/94 to 1997/98	
Crop/Fertilizer type	Metric tonnes	% Share	Metric tonnes	% Share
Maize (DAP)	70,182	30.1	67,636	24.4
Tea (25:5:5s)	42,902	18.4	58,733	21.2
Coffee (17:17:17 & MOP)	23,605	10.1	23,220	8.4
Wheat (MAP)	4,947	2.1	18,788	6.8
Horticulture (Special fertilizer)	4,821	2.1	11,632	4.2
Others (TSP, Urea, CAN, etc)	86,515	37.1	97,073	35.0
Total	232,974	100	277,084	100

Source Wanzala et al. 2001

Fertilizer consumption could also have declined in maize because of unfavorable terms of trade between maize and DAP fertilizer. That is, the decline in real fertilizer prices paid by farmers has not translated into increased incentives to use fertilizer on maize, because real maize prices have fallen even faster than fertilizer prices during the 1990-1999 period. However, the decline in fertilizer use in maize does not imply that fertilizer use on maize has become unprofitable in an absolute sense. Indeed, the mean value-cost ratio for DAP fertilizer use is calculated at 5.86. This means that for every Ksh spent on DAP fertilizer, the farmer gets 5.86 Ksh back in value of maize output. Karanja et al. 1998.

Among the other findings of the study was that most of the farm-gate price is taken up in distributing DAP internally. Import prices of fertilizer in Mombasa during the survey period were roughly 45 to 55% of the farm-gate price of DAP in western Kenya. The internal costs include transportation and handling, storage, interest charges for financing the fertilizer purchases, charges for transit losses, and bagging. Most, if not all of these costs are beyond the control of fertilizer traders themselves. They 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 means to reduce these costs through procedures to improve efficiency. The traders also reported that losses of fertilizer add in transit costs, by that, increasing final price of fertilizer to the consumer. The transit losses were especially large toward the end of the marketing channel when fertilizer was transported to the smaller towns in rural areas. Retailer's transit losses were on average about three 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.

Traders indicated that they could not transport their fertilizer directly up-country from the port of Mombasa but rather needed to transport the goods to a local warehouse near the port before securing road transport for subsequent movement up-country. This extra stage involves a 55 Ksh per bag addition to transport and handling costs. The Kenya Port Authority (KPA) also has a stipulation that stevedoring and KPA employees or 'gangs' (as they are commonly referred to) can only carry out loading onto vehicles at the port. Moreover, only certain transporters are licensed to be on hand at the port to load and transport the fertilizer outside the port. This extra stage involves a 37 Ksh per bag addition to transport and handling costs. Also, transit losses are

incurred with each additional handling and transport stage. The net effect of these problems is to cause relatively high domestic transport rates per ton/kilometer. Reduction of transport costs port charges, and waiving of port taxes on the farm-gate price of DAP could have positive implications for the profitability of using DAP on maize by farmers.

The impacts of the stipulated changes of the changes in fertilizer costs are simulation and are presented in Table 15. Using the maize production costs for Bungoma, Lugari and Trans Nzoia, the results indicate marginal changes in the costs of fertilizer of an average of 5%. However, changes in the maize profitability are higher in areas like Bungoma where the fertilizers are a large proportion of total production costs compared with the other districts.

These simulation results are likely to underestimate the actual increase in the profitability of using fertilizer on maize in western Kenya. This is because the simulations are based simply on benefits from lower fertilizer prices, holding application rates constant. In reality, farmers are likely to respond to lower fertilizer prices by increasing the quantity applied to maize, other factors constant.

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 competitiveness in agriculture. The development of the high yielding maize and wheat varieties in the early 60s, the design of measures to control the Coffee Berry Disease in late 60s and the breeding for high yielding, disease resistant coffee varieties, are among some of the examples which indicate how important agricultural research is to a country's agricultural development.

Table 15. Simulated Changes in Maize Costs and Profits from Changes in Fertilizer Marketing Costs (1999)

	Bungoma	Lugari	Trans Nzoia
Cost per acres in Ksh	11,607	13,567	19,870
Yields in bags/acre	14	17	25
Cost (Ksh/bag)	829	798	795
Profit in Ksh/bag	135	202	305
Combined effects Changes			
Cost per in Ksh/acre	10,991	12,951	19,080
Yields Bag/acre	14	17	25
Cost in Ksh/bag	785	762	763
Profit in Ksh/bag	179	238	337
% Change in Costs	-5%	-5%	-4%
% Change in profits	33%	18%	10%

Source: Compilation from Wanzala et al. 2001

Investment in Biotechnology in agriculture is now taking the center stage as the key agricultural research strategy. Providing disease-free planting materials through tissues culture, increased yields and resistance to crop pests, poor soil fertility and soil salinity, control and eradication of livestock diseases, diagnosis and development of novel vaccines, improvement of animal pastures and fodder through gene technology, and increase genetic potential of livestock and their adaptation to different agro ecological zones (Ngichabe 2001) are some key research agenda currently been addressed through biotechnology.

The contribution of agricultural technology development is nevertheless facing several constrains. 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 1% of the Gross domestic product. The Research budget is also skewed toward recurrent budget rather than actual research projects and programs. Even the commodity-based research institutes financed through a crop levy are now faced with serious financial constraints due to decline in coffee production, compounded by the current decline in coffee prices and the general mismanagement of the industry. The institute is currently facing serious financial constraints and is, thus, unable to sustain research operations. The funding constraints have adversely affected both the generation of new technologies and activities such as the production of breeders' materials for multiplication and distribution to the farmers. It would, therefore, be necessary to establish research funds from the government and the commodity bodies that could cushion the commodity financed research institutes during the lean years. The institutes should also be allowed to keep surpluses generated during the good years for use when the commodity prices and marketing are not doing well.

The private sector should also be encouraged to either collaborate or invest directly in the generation of the technologies. Currently, private sector participation in agricultural research is limited. Creating conducive environment through offering the right incentives and removal of prohibitive legislation could attract the private sector funding of research. Wheat growers' association would, for example, want to fund some elements of wheat research if they are allowed to determine the wheat research agenda and are represented in the decision making process on wheat research by KARI.

Extension

The household survey data reveals widespread adoption of fertilizers and seeds across most of the agro-ecological zones as shown in Tables 8 and 9. Nevertheless, it is probably the quantities and the types of fertilizers used by farmers that have the biggest impacts on productivity more than information on fertilizer types and quantities to be used. Similarly, in the case of seeds, it is the availability of high quality of seed, availability of working capital to buy the seeds and fertilizer and availability of reliable markets that probably has biggest impact on productivity. Arguing that extension service is necessary to raise the awareness of the farmers of new and existing technology is plausible, but not sufficient to raise agricultural 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. It is also acknowledged that, whereas the funding of

extension should remain the responsibility of the public sector through the ministry in charge of agriculture and livestock, the delivery of the service could best be contracted to the private sector and the NGO's. In this way the delivery of extension service could be made relevant by making it demand driven.

Grades and Standards

Most agricultural commodities that are locally produced are not graded to differentiate them by quality. This is because the payment systems adopted are uniform and do not recognize quality differences in the commodities. Results from a maize study in 1999 indicated that at all stages in the maize marketing chain before the milling stage, quality was distinguished by eyesight (Nyoro et al. 1999). The study reported that in all cases, traders reported depending on visually inspecting the maize before purchasing it. Maize traders use color, size of the kernels, and amount of foreign material as the main criteria determining quality and price. There was no objective quantifiable maize or maize product differentiation. At the large-scale miller's level, quality inspection was normally enhanced by the use of moisture meters. According to the quality standards in Kenya, the maximum moisture content level should be 13.5%. Millers often reject grains with higher moisture content. On the contrary most imported agricultural commodities are graded, and are differentiated by colors, size, shape, degree of ripeness, and sometimes other quantifiable criteria such as moisture and nutrient content. Some local multinational companies such as those in tea production and processing have been awarded certificates such as ISO 9001 and ISO 14000 in recognition of the quality production of the commodity.

Production differentiation will be the sure way to ensure fair competition between the local and domestic production. Kenya's private sector should therefore be encouraged to establish grades and standards to be used at all stages of marketing. Establishment of grades and standards could encourage product differentiation and therefore improve returns to the farmers who produce commodities of high quality.

CONCLUSION AND POLICY IMPLICATIONS

Poverty and food insecurity are currently the main challenges facing most of the population. International trade has provided opportunities for exports of traditional and other emerging commodities, which in some ways has brought with it several challenges. The local production, which has been characterized by high production costs, is threatened by imports. Livelihoods of a majority of the population are threatened by over dependence on imports, thus, creating a food policy dilemma where the country must continue to supply its bulk of food at low prices in order to enable transfer of resources from the food systems to other non-food sectors that would facilitate agricultural transformation, while at the same time avoiding the displacement of the majority of people who depend on agriculture for livelihood.

Strategies that could overcome this dilemma and improve productivity will make prices of domestic production comparable to the import prices of similar commodities thereby allowing

farmers to compete in international markets and allows for countries to bargain from a standpoint of strength in international trade agreements. Similarly, further increases in incomes from export and other cash crops will require new initiatives and a redirection of the government policy towards attaining the much-desired competitiveness.

Due to the increasing costs of food commodities like maize, the quantity of maize provided to the market at prices lower than that of imports have reduced making the country to be more dependent on imports. Production costs for food commodities like maize and similar food crops are high locally compared to the neighboring countries because in addition to high soil fertility and favorable weather conditions, the type and quality of their seeds are high. Yields are therefore higher and the costs of production are lower than those from the local production.

The low yields in crops like maize and wheat are attributed to the low quality of seeds used by farmers. Although traditionally, the adoption of hybrid seed varieties has been high, this is no longer the case because in almost in all the agro- ecological zones there are a large proportion of farmers using retained hybrid seeds or just the local varieties whose yields are lower than those of the hybrid seeds. But even in the high potential maize zones, adoption of hybrid maize is not accompanied by optimal use of fertilizers. The full potential of the hybrid seeds is thus not attained when not attained.

The challenge is to encourage wider use of hybrid and other certified seeds through improving their quality in order to win back the farmer's confidence in the hybrid and certified seeds. This will discourage them from using local or retained maize seeds whose yields and disease resistance are lower. By making fertilizers available to farmers at lower prices, the farmers are encouraged to use optimal amounts that, when used with the hybrid seeds, increase yields.

Availability of seeds and seedling materials has also affected the productivity export crops like coffee and pyrethrum, which are currently constrained because they are developed, multiplied, and distributed under monopoly status of organizations such as the Coffee Research Foundation and the Pyrethrum Board of Kenya. Whereas the development of the seeds and planting materials could be left with the research commodity bodies, privatization of the multiplication and distribution of the seeds and planting materials could improve their availability and hence, adoption by farmers.

Similarly, although the adoption of fertilizers reveals a generally widespread use by farmers in almost all agro-ecological zones, the quantities applied are sub optimal Farmers attribute the low usage in fertilizer to the high farm gate prices of fertilizers that makes them unaffordable. There is room to reduce fertilizer costs at the farm level by reducing port charges, reducing transport

costs of fertilizer between Mombasa and the farm gate, reducing transit losses in fertilizers and reorganization of the handling of fertilizer at the port such as removing restrictions at the port that requires use of certain type of employees. This would reduce production costs and increase profits.

The inability of the commercial banks to lend to agriculture makes it necessary for the country to explore the potential of establishing an agricultural development bank whose portfolio and mandate would be to lend to agriculture. However, due to the low rates of return and the inherent lending risks in agriculture, the development bank should be facilitated to this by being exempted from the provisions of the Banking ACT.

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