

Effects of Reforms on Productivity of Coffee in Kenya

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Abstract

Coffee is a major player in the agricultural sector and has contributed immensely to the Kenyan economy through foreign exchange earnings, farm incomes, and employment. To streamline the coffee subsector, many policies have been implemented since 1986. These policies were aimed at enhancing the performance of the coffee subsector in terms of increasing productivity. The general objective of this study was to assess the impact of policy reforms on coffee productivity in Kenya for the period 1980 to 2010. The study found out that only commercialization of many millers could spur productivity in the coffee sector. The study recommends that there is need to reform the cooperative societies which is the direct mechanism of the reforms transmission. The government should also put measures that focus on value addition of coffee enabling the country to export finished coffee products and thus fetch better prices for the same output.

1.1 Overview of Kenya's Agriculture

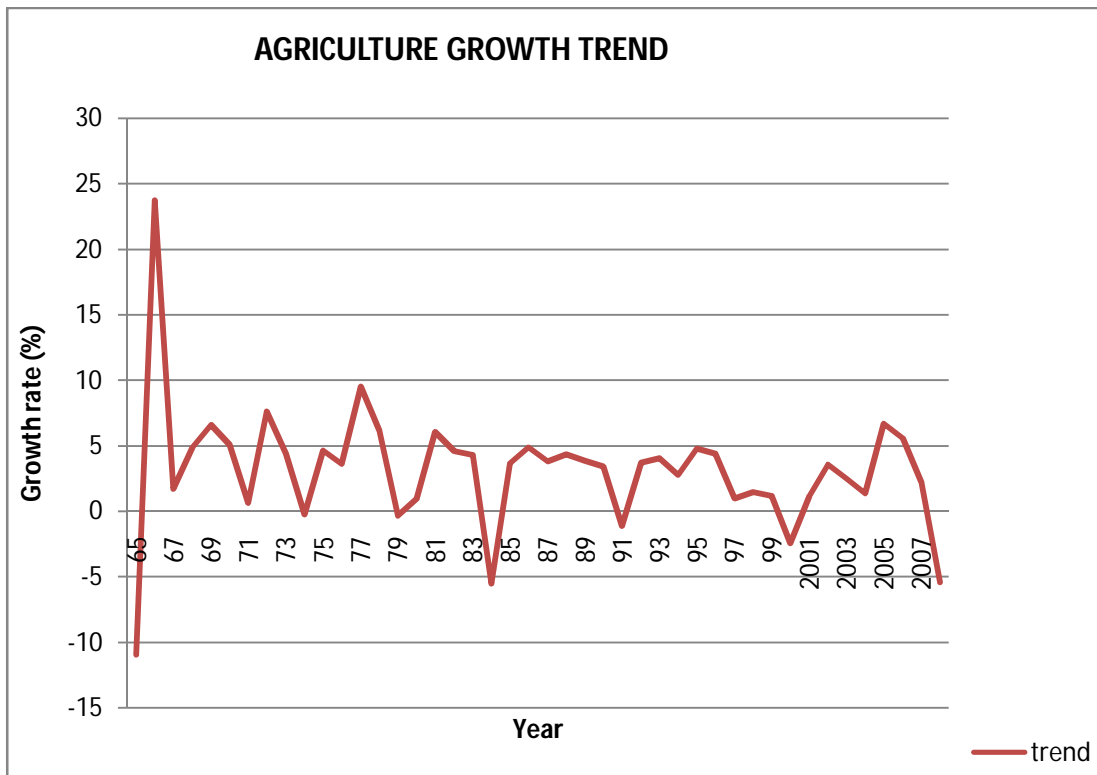
The role of agriculture in the overall economic development of Kenya and indeed sub-Saharan Africa is very vital. This is because agriculture is the backbone of most economies in the region. The reforms in agricultural practices to boost production are therefore central to economic progress in many of these countries. In Kenya, agriculture is recognized as one of the pillars necessary to support economic recovery (Republic of Kenya, 2008). The country's socio-economic and political development is heavily dependent on agriculture and the sector's growth is indeed a catalyst for growth in other sectors. More than 65% of Kenyans living in the rural areas derive their livelihoods from farming and related activities. With a contribution of 24% of GDP directly and another 27% indirectly, agriculture is the main productive sector upon which the success of Vision 2030 is anchored. The sector also remains critical to the attainment of the 10% economic growth the country is targeting from the year 2009 to 2030 (Republic of Kenya, 2008).

Agriculture continues to be a fundamental instrument for sustainable development, poverty reduction and enhanced food security in developing countries. Agricultural productivity levels in Sub-Saharan Africa are far below that of other regions in the world, and are well below that required to attain food security and poverty reduction goals. Sustained and accelerated growth in the sector thus requires a sharp increase in productivity of farmers. In the past, agricultural production was largely a function of acreage, but further growth in production will have to be driven by productivity growth (Kibaara, *et al.* 2008).

Nyangito and Okello (1998) noted that the turnaround from low to high growth in agricultural and economic development for most sub-Saharan African countries was seen to lie in reforming the policies under the structural adjustment programmes (SAPs). The SAPs, promoted by the World Bank and the International Monetary Fund advocated for both a reduction of government's intervention in the economy whereby market forces and the private sector could play a dominant role. The transition from government-controlled policies to liberalized markets has been in operation for most developing countries since 1980, but the impacts of these policies on agricultural productivity are not clearly understood.

The agricultural growth in the country is presented in Figure 1.1. As can be observed from the figure, the growth rate has been fluctuating over the years. In 1967 the growth rate declined to only 1.7% from an all time high of 23.75% in 1966. The sector’s growth improved in the year 1972 recording a growth rate of 7.62 %. In 1974 the sector recorded a negative growth of 0.24%. There was a marked performance in the year 1977 when the sector grew by 9.54%. The worst performance for the sector was recorded in 1984 with the sector recording a growth rate of negative 5.51%. This decline was attributed to the famine that occurred in that year. The sector again improved in the following years but in 1991 it went down to negative 1.1%. In the year 2000 the agricultural growth rate declined from 1.2 percent in 1999 to negative 2.1 percent. The sector again grew by 3.6 percent in 2002 but declined in the year 2004. In the year 2008, the sector dropped to negative 5.4 percent from 2.2 in the year 2007. This high drop in the growth rate was attributed to high cost of inputs, adverse weather conditions and the disruptions from the post election violence.

Figure 1.1 Agriculture Annual Growth Rate, 1965-2008



Source: Economic surveys, KIPPRA Compendium

1.1.1 History of Coffee in Kenya

Coffee was first brought to the region by French missionaries in 1893. Before independence, production was concentrated in a small number of large estates, and Kenyans were not allowed to own or manage coffee farms. It was illegal for smallholders to grow coffee except for small trial areas in the Meru and Kisii districts and almost all Kenya’s coffee was produced, by estates owned by expatriate farmers (Akiyama, 1987).

In 1934 the British Colonial Board in London, wanting to diversify the industry, launched a formal “local growers experiment” testing the ability of Kenyans to manage small-scale coffee farms. However, under pressure from local settlers, the government enacted the Native Coffee Growers Act regulating smallholder production. Limits were placed on farm size, restricting production to 100 trees grown on less than ¼ acre of land. The natives were also only allowed to establish their farms away from existing white estates. These restrictions limited the ability of smallholders to benefit from the infrastructure that the cluster had developed around Nairobi such as training and financial institutions and the Coffee Board of Kenya. The colonials also prevented small farms from competing with British estates for labor (Barnes, 1979).

In 1944, smallholders were required by law to join local growing cooperatives, which were run by the government under the Coffee Board. This gave large estates power over the smallholders, as the estates controlled the Board. After independence, the Kenyan government worked hard to expand smallholder production by providing farmers with land and financial support. In 1964 the government established the Coffee Development Authority (CDA) to support cooperatives and small farmers through technical assistance and raising money from local financial institutions to provide loans to cooperatives to build new processing factories.

Kenya joined the International Coffee Agreement (ICA) in 1962. The ICA was an organization of coffee exporting and importing countries. It was first established in 1962 and then renewed in 1968, 1976 and 1983. The agreement set production quotas on each country based on average production volumes in previous years. The objectives of the ICA were to raise coffee prices which would benefit producing member countries and stabilize coffee prices in the member market. When the agreements were in force, coffee market was regulated through systems of export controls (quotas), which were triggered when prices fell to low levels. (Karanja, 1998).

The success of the International Coffee Agreements was to maintain relatively high and stable prices and significantly strengthening the economies of coffee producing countries while enhancing development of international trade and co-operation. However, due to lack of consensus between and among consumer and producer countries the agreements were suspended in 1989 (Gilbert 1998). In desperation, the coffee producer nations formed the Association of Coffee Producing Countries (ACPC) in 1993 as lobby group. However, despite various attempts to impose supply quotas and price bands, the association did not managed to have a major impact on the world coffee trade. Eventually ACPC announced plans to voluntary wind up in January 2002.

With the ongoing international developments the government of Kenya also introduced land policies involving land redistribution, subdivision of some estates, and removal of restrictions that constrained Africans from planting cash crops. This measures led to increase in smallholder/cooperative coffee area and the production of small scale farmers surpassed that of estates (Condliffe, *et al.* 2008). Consequently co-operatives coffee area increased from 13,000 hectares to 128,000 hectares between 1964 and 2005, while the estates area under coffee increased merely from 32,538 hectares to 42,000 hectares in the same period. The near constant coffee area maintained by the estates indicates that policies articulated over this period of time did not favor the expansion of estate coffee. The increase in national total area under coffee was largely driven by smallholders.

1.1.2 Importance of Coffee to Kenya

Coffee is one of the major key players in the agricultural sector in Kenya, employing many people and contributed about 5% of export revenues in 2003 .The crop was the first major export in Kenya and has remained an important part of the Kenyan economy throughout its history. Its farming is mainly done by small-scale farmers organized into co-operative societies who account for 60% while 40% is done by large scale farmers at plantation or estates level. (Nyangito, 2005). Kenya coffee is worldly known for its high quality that makes it ideal among other brands. It is arguably the best coffee in the world and always fetches high premium prices in the world market. Coffee was the leading export crop and foreign exchange earner in Kenya from 1963 up to 1988. Between 1975 and 1986, it contributed over 40% of the total Kenyan exports value. It earned about KShs.107 billion, which was about 10% of agriculture's share of GDP between 1987/88 and 1997/98. (Republic of Kenya 1998).In 2007 coffee was the second highest contributor to the agricultural sector and the fourth foreign exchange earner to the economy after tourism, tea and horticulture respectively. Coffee has contributed immensely to the Kenyan economy due to its contribution to foreign exchange earnings, farm incomes, and employment. The crop has also led to foundation of many other economic development activities in coffee growing areas of the country (Republic of Kenya, 1995).

1.1.3 Coffee Liberalization in Kenya

The process to liberalize Kenya's market policies began in 1986 after the realization that the government controls of all sectors of the economy including the coffee subsector constrained their development. The policy reforms were spelt out in the government of Kenya 1986 sessional paper no 1 on Economic management for renewed Growth. The paper was calling for a reduction of the government involvement in the non strategic sectors of the economy and promotion of the private sector. As a result of this campaign, trade liberalization was effected in Kenya's sub-sector in 1992.

In 1992, the government issued broad policy guidelines, which started the liberalization of the coffee industry in line with structural adjustment programme (SAPs). Under these guidelines, the coffee board of Kenya (CBK) was required to conduct the Nairobi coffee auction in US dollars. Permission was given for coffee farmers to be paid in dollars and they were also allowed to retain dollars for their own use. This policy was intended to make it possible for farmers to benefit from currency gains and to allow them to participate in foreign exchange dominated trade. However the smallholder farmers who marketed their coffee through co-operatives benefited marginally from the liberalization of the foreign exchange market as most of them lacked the necessary skills needed in the money markets.

Another policy was the introduction of an alternative farmers' payment system. Prior to 1993, coffee payments were pooled together by the CBK, which made several interim payments based on the averaged price for the season and a final payment made after reconciliation of accounts. The purpose of this pool payment system was to consolidate price risks and maintain a steady flow of funds. This system was reviewed in 1992 by allowing farmers to opt for a direct payment system. In this system, farmers are paid the amount their coffee fetches at the weekly Nairobi coffee auction less statutory deductions. Another milestone was the reforms into the coffee-milling sector with the licensing of more commercial millers. The coffee milling monopoly held by Kenya Planters Co-operative Union was dismantled in 1993 when four more commercial millers were licensed. This move increased the installed coffee milling capacity in the country from around 140,000 metric tones to around 230,000 metric tones (Karanja, 1998).

In 1996, the government reduced the minimum acreage required for a farmer to be licensed as a coffee planter from 10 to 5 acres. In June 1998 the government enacted the new Co-operative Act that ensured that the government only retained a minimal regulatory role in the co-operatives while encouraging members of the societies to run them as economic units. The sessional paper on Liberalization and Restructuring (2001) led to the separation of the roles of coffee marketing and regulation. The coffee board of Kenya (CBK) was to retain the regulatory role while the marketing function was to be taken over by the marketing agents. The act also saw the removal of archaic rules in coffee production where in the new act, a smallholder farmer was only required to register with a co-operative society if he/she wanted to plant or uproot coffee. The coffee planting zones and rules on inter-cropping were also abolished. This change gave farmers a leeway to diversify from coffee production where possible. Under the new Act, it was still illegal for farmers to trade in cherry at the farm-gate level. The smallholder farmers were supposed to deliver coffee cherries to their co-operative societies for processing and marketing. This was meant to safeguard the investments made by farmers in cooperatives and enhance economies of scale in coffee processing.

Another important feature in the act was that it proposed an establishment of a Coffee Development Fund, whose funds were to be used for farm development, purchasing farm inputs and operations, and price stabilization. This fund has already been established. Other interventions included the debt relief of non-performing loans owed by farmers to the Cooperative Bank, retirement of outstanding growers' arrears, and liberalization of coffee marketing through introduction of direct coffee sales. There have also been other notable developments like the adoption of the *Ruiru 11* variety which was developed by the coffee research foundation. This is a disease resistant crop which was introduced in the market and expected to cause a reduction in the cost of chemicals.

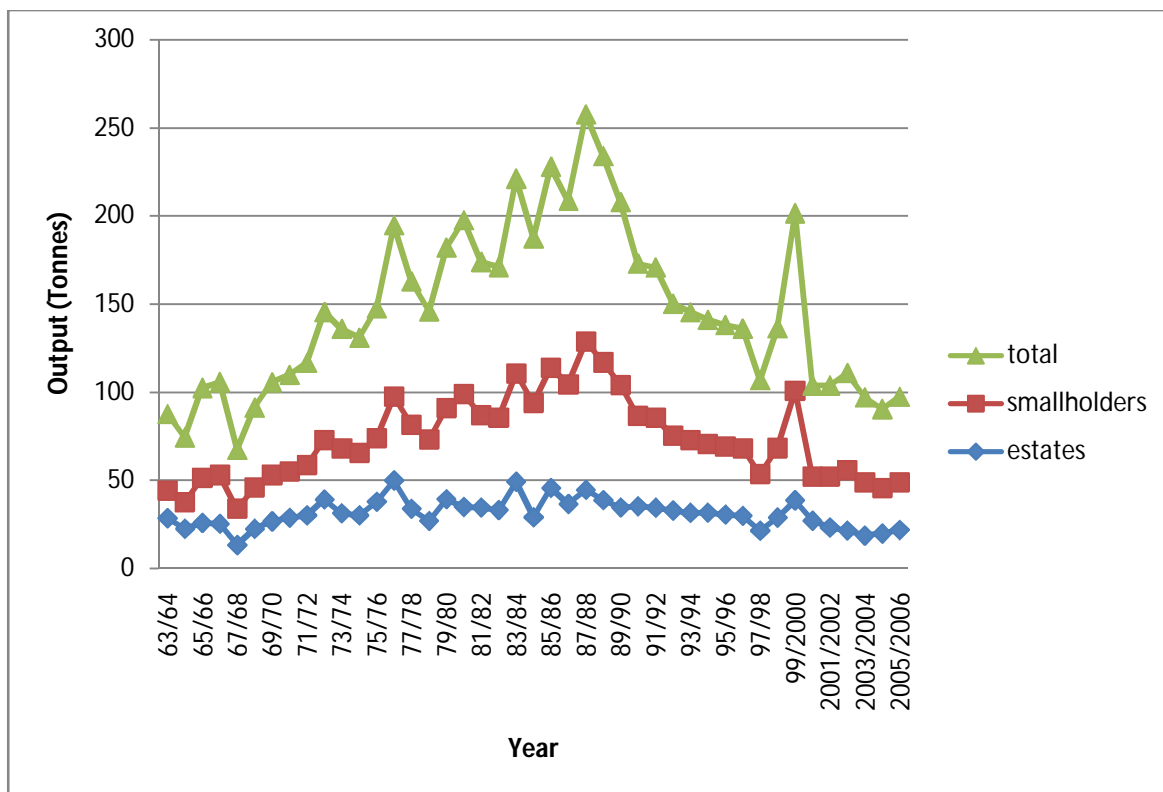
1.1.4 Coffee Production in Kenya

Coffee is a tree crop of Rubiaceae family. There are many species of coffee but only two are commercially important, Arabica and Robusta. The best coffee however comes from the trees of Arabica species. Coffee grown in Kenya is mainly the Arabica species and occupies nearly 163000 hectares. It is grown in the upper midland agro ecological zones with higher attitudes that range from about 4000feet to 7000feet with mean temperature of about 70⁰F. It flourishes best in rich and deep volcanic soils which are well drained.

In Kenya, there are two distinct coffee-marketing channels, one for the co-operatives and the other for the estates. The difference in the two channels is mainly at the primary processing level. The smallholder farmers (farmers with less than 2 ha under coffee) are required by law to sell their coffee through local growing cooperatives as compared to the estate farmers who have processing factories located in their farms. In the year 2006, there were 569 cooperatives, but even with this high number of cooperatives there was limited competition between them because farmers have to process cherries within 24 hours of harvest and with limited access to transportation, the farmers are forced to work through the closest cooperative (Mude, 2006).

Prior to April 2002, CBK was the sole marketing agent. Since then a number of marketing agents have been licensed to undertake the coffee marketing function with CBK relegated to industry regulator. This is in line with the new Coffee Act, 2002. Kenyan coffee production had been on an upward trend since 1963 to its all time high in 1987 when a record 130,000 metric tonnes of clean coffee was produced. Its production has however decreased since then. In the 1990s the national coffee Production was on a declining trend except a few years when there was an upswing in production. The upswings in production were mainly attributed to increases in coffee prices following drought/frost in Brazil in 1994 and 1998 (Karanja and Nyoro, 2002). Despite all the moves by the Kenyan government to improve the sector, coffee production has continued to show a falling trend in terms of output as shown in figure 1.2. Exports fell from 2.1 million to 0.9 million bags between 1987 and 2007 and world market share has declined from 3.1% in 1986 to 0.6% in 2006. In line with the trend in coffee production, coffee yield in Kenya have declined from 892 kilogram/hectare in 1980 to 284 kilograms/hectare in 2006. These yields are very low compared to average yields for Arabica coffee worldwide of 698 kg/ha and yields of 1160 kg/ha in neighboring Rwanda and 995 kg/ha in neighboring Ethiopia (Damianopoulos,2005). The total output in the year 2006/2007 was only 53,400 metric tonnes compared to 130,000 metric tonnes in 1987/88 (Republic of Kenya, 2007).

Figure 1.2 Coffee Productions in Kenya 1963-2006



Source: Economic Surveys various

Karanja and Nyoro (2002) noted that the decline in production was more pronounced in smallholder farms. In most cases, yields in smallholder farms are usually half those realized by plantations mainly due to differences in intensity of input applications, and availability and use of production technologies such as irrigation. Apart from the decline, the yields exhibit high inter-year variation mainly due to weather factors and the bi-annual coffee bearing patterns. Equally, there is wide variation in yields among smallholder farmers even in the same zone or locality depending on their level of coffee management.

With all the interventions by the government through policies implementation, the sector has not thrived as expected. The productivity of the crop in the year 2000/01 was 305 kilograms/hectare, in the year 2005/06 it was 284 kilograms/hectare as compared to 825 kilograms/hectare in the year 1987/88. According to the economic survey (2008) the slight increase in production in the year 2006/07 was only attributed to favorable weather conditions.

This shows that in spite of the big area covered by coffee, its production has remained quite low meaning that many people are not attending to the commodity once referred to as black diamond of Kenya. The area under coffee has also gone down from 170,000 hectares in 2005/06 to 163,000 hectares in 2006/07 with the decrease accounted for by the cooperatives which are made up of small scale farmers. Despite this reduction in coffee productivity in Kenya, world coffee consumption has been increasing at a steady compound annual growth rate of 1.6% over the 1993-2003 period, with a total consumption at 6.8 million metric tons in 2003 (Condliffe 2008).

Damianopoulos (2005) found out that since 1980 the coffee industry in Kenya has been in a state of decline whereas Uganda's coffee sector has experienced success and industrial growth during the same period. The study noted that the coffee industry in Uganda has been completely liberalized whereas Kenya's coffee sector remains the most illiberal in the region. In Uganda the coffee yields increased from 6,036Hectograms per hectare (hg/ha) between 1980 and 2004 to 7,045Hg/Ha while at the same period Kenya's yields decreased from 8,919Hg/Ha to 3,794Hg/Ha. Away from home Brazil has continued to increase its production and has remained the biggest exporter of the coffee in the world with its highest yield recorded in 2001. This decline in Kenya shows that the process of coffee growing, processing and marketing is not in order and calls for strategies to change the situation for the better. This decline has led to impoverishing farmers and denying the country foreign exchange as well as increasing the rate of unemployment in the country.

1.2 Statement of the Problem

A diverse range of policies has been used to foster growth of the coffee sub- sector in Kenya. After the implementation of these reforms there was a major shift from government controls to liberalized markets. The shift meant that the government had to reduce its control of agricultural production and marketing and provide an enabling environment for enhanced participation by the private sector. Some of the measures put in the coffee sector included the liberalization of the sector by separating the roles of coffee marketing from its regulation, debt relief of nonperforming loans owed by farmers to the cooperative Bank, retirement of outstanding growers arrears and the establishment of the coffee development Fund to provide affordable credit to coffee growers.

A key expected consequence of market liberalization was that farmers could respond positively to these reforms and increase their supply. This is in line with the assertion of many studies that focus on effects of liberalization on productivity which hypothesize that reforms that offer price incentives and promote efficient marketing encourage producers to respond by increasing supply. However the response of coffee productivity to liberalization has unfortunately been dismal. Coffee productivity in Kenya has continued to decline since its peak in 1987 while at the same period, production in other countries like Uganda, Rwanda, Ethiopia and Brazil have been on an upward trend. The area under coffee in Kenya also went down by more than 7000 hectares in 2007. Kenya's production of Arabica coffee per hectare has remained far much below the world's acceptable threshold of 698Kg/ha with the country's productivity only at 265kilograms/ha in 2004/05 and 284kg/ha in the year 2005/06. This decline has occurred at a time when there is an invariable increase in the world's coffee demand implying that there is still ready market for the cash crop.

Given the impetus of the coffee sector to the Kenyan economy and all the efforts the government has put in place to reform the sector, the study seeks to assess the impact of the said reforms on coffee productivity. The following research questions assisted the researcher in undertaking this study.

- 1) Is there any impact of reforms on coffee productivity?
- 2) In light of (1) what policies can be undertaken to enhance the production of the coffee sub-sector in Kenya?

1.3 Objectives of the Study

The general objective of this study was to assess the effects of reforms on the performance of the coffee sector in Kenya. The specific objectives were:

1. To assess the impact of reforms on coffee production.
2. To suggest policies in the light of the study findings on how to enhance the performance of the coffee subsector in Kenya.

Literature Review

2.1: General Literature

Islam (1972) found out that the problems associated with agricultural development are a constraint on the rate of growth to the entire economy. These problems account for the prevalence and persistence of low yields of productivity in a country's agriculture. The problems of agricultural development are caused by environmental, management, economic, social and institutional factors. Basic natural resources like soil climate and vegetation provide environment for agriculture production. Soils in many developing countries are mostly destroyed by leaching and poor husbandry practices. Fertilizers could be used to improve the quality of the soils but are only used to a limited extent. This is because they are generally expensive to buy and invariably in short supply and very few farmers can afford to purchase them for farming.

The basic form of farming in developing countries is mostly small scale where family labor issued and relatively little capital is needed and thus opportunities for high rate of capital formation and technological advancement are very limited. Thus large scale mechanized farms are seen to be more productive and more economic to operate. A key economic factor is labor migration especially of the youth from rural areas to the towns. This implies that there is shortage of labor which directly increases the cost of production. Another economic issue is that of marketing and prices of agricultural products. This is because an effective marketing system induces additional production from the farm with no change in its cost of production and facilitates the reduction of prices of agricultural products to the consumers. Lack of agricultural credit, poor education and extension services to farmers, and poor rural infrastructure also contributes heavily to decline of productivity in the developing countries (Islam 1972).

Ritson (1988) expressed the supply function of agricultural products as;

$$Q_s = f(T, P_p, P_{1...n}, I_{1...m}, O, N, R) \quad (2.1)$$

Where;

Q_s	The quantity of agricultural output supplied.
T	the production function
P_p	the price of the product
$P_{1...n}$	the prices of (n) other products
$I_{1...m}$	are the prices of (m) inputs
O	the objective of the firm
N	the number of firms supplying to the market
R	size of distribution of farms supplying the market

The study also looked at the aspect of uncertainty in the agricultural sector and found out that the outcome of a particular production decision cannot be predicted with complete accuracy. This is because of three reasons. The first is because the relevant production function will not be perfectly known, the second one is because the quantities applied of some biological and climatic inputs lay outside the control of the decision maker in this case the farmer and the third is because the prices paid for inputs and received for products vary through time. Thus because of variations in the quantity of output which results from the use of a specific quantity of controllable resources and because of fluctuating prices, no production decision has a unique outcome. There will rather be a range of outcomes relating to all alternative production decisions.

Alderman and Shively (1991) investigated the issue of market integration in sub-Saharan Africa after market liberalization. Market integration refers to the extent to which events in one section of a market has an impact on events elsewhere in the same market. Gains from liberalization to farmers depend on the integration of markets. Markets that are isolated may convey inaccurate price information that might distort producer-marketing decisions and contribute to inefficient product movements Furthermore, given that ecological conditions often influence differences in regional crop production patterns, governments may be interested in knowing the relationship of price movements of crops in different regions. Generally, market liberalization could be expected to encourage spatial integration –the movement of products from a low-priced to a high-priced market. This in turn may reduce price gaps between some markets while raising them between other markets. Thus, market liberalization and increased arbitrage should reduce inter-market price spreads.

The study argued that the success of market liberalization policy depends on the strength of transmission of price movements among the markets in various regions of the country. Integration of the markets is essential in order to transmit the intended incentives of liberalization to the beneficiaries. Gains from liberalization to farmers, especially, depend on the integration of markets.

Bautista *et al.* (1993) investigated the response of agriculture to price changes. Prices are the channel through which market reform policies affect agricultural variables like output, supply, exports and income. Market liberalization in developing countries maintains that pricing policies were biased against agriculture. Therefore, the study advocates setting of the “right” price as an effective mechanism to increase supply response and subsequently expand agricultural growth. The study hypothesizes that reforms that offer price incentives and promote efficient marketing encourage producers to respond by increasing supply. Whereas their study argues that the “right” price would offer incentives for adoption of agricultural technologies that enhance production.

Chhiber (1989) noted that non-price factors mainly technology, infrastructure, research and extension are more important mechanisms in increasing supply response and sustaining agricultural growth. The study demonstrated that the aggregate supply elasticity with respect to prices in many sub-Saharan African countries lies in the range of 0.3 to 0.9, partly due to inadequate supportive infrastructure, imperfect markets and lack of capital. Supply response in these countries may be minimal because the subsistence sector is assumed to be risk averse and also farmers are assumed to have income targets such that if the producer price increased, the production of smaller amounts of a commodity would provide the necessary income. A key expected consequence of market liberalization was that farmers could respond positively to the expected price incentives by increasing supply.

Besley and Burgess (2000) investigated the effects of land reform on agricultural productivity and poverty across different states in India. They generated a cumulative variable that aggregates the number of legislative reforms in each particular state. Their model had the following specification:

$$Y_{st} = \alpha_s + \beta t + \gamma x_s + \psi l_{st-4} + \varepsilon_{st} \quad (2.2)$$

Where:

y_{st} is the log of agricultural yield, defined as real agricultural state domestic product divided by the net sown area,

α_s is a state fixed effect,

βt is a year dummy variable,

x_s is a vector of controls that vary by state and year,

l_{st-4} is a vector of cumulative land reform measures lagged by 4 years, and ε_{st} is an error term. They found out that the lagged version of their cumulative land-reform variable had a negative and significant effect on poverty. They also found out that the effect of this cumulative aggregative land-reform variable on agricultural productivity had considerable heterogeneity in their effect on productivity across states, for which difference in intensity of implementation could be a possible reason. The study also showed evidence that land tenancy reform has actually increased inequality in operational land holdings in India. However they suggested that future work should focus on disentangling the direct from the indirect effects of land reform.

Thiele (2002) investigated the responsiveness of farmers in Sub-Saharan Africa (SSA) to changes in incentives. Employing Johansen's multivariate cointegration approach, the study looked at the long-run effect of pricing policies, macroeconomic distortions, and certain non-price factors on agricultural production. The study revealed that first, estimated supply elasticities tend to be well below unity, but they appear to be high enough to imply that the remaining discrimination against agriculture in SSA entails substantial welfare costs, thus indicating the need of further agricultural and macroeconomic reforms. Second, among the non-price factors, the coefficient of the time trend pointed towards low productivity growth in all sampled countries, implying that the agricultural growth had been impaired significantly by drought episodes. The study suggests that if agricultural research in SSA was carefully tailored to local conditions, there seems to be a rationale for intensified international cooperation that aims, for example, at the development of more drought resistant seed varieties. Another important feature of the empirical analysis was that no long-run relationship could be detected reflecting the absence of a supply response.

Msuya (2007) examined the impact of foreign direct investment (FDI) on agricultural productivity in Tanzania. The study suggested that there might be a positive impact of FDI on smallholder productivity and efficiency.

The study found that apart from general determinants such as macroeconomic stability, efficient institutions, political stability and a good regulatory framework, the smallholder institutional setup has positive impact on FDI flow into the sector. It has been observed that crops whose smallholders are well organized attracted more FDI. An important implication of the result is that FDI to the agricultural sector is not solely driven by policies and incentives to foreign investment and that the institutional setup of smallholder farmers can play an important role in promoting investments to the sector. In the short and medium term, efforts to foster integration and creation of strong bonds between smallholders and investors through integrated producer schemes can increase FDI to the sector and thus increase productivity. Other determinants such as investment regulatory frameworks, policies that promote macroeconomic economic stability, and improved physical infrastructure also have a role to play both in the short and long run. In the long run, more FDI can be attained by developing strong institutions in all sectors.

2.2: Literature Specific to Kenya

Maitha (1971) estimated the price responsiveness of coffee growers in Kenya. The study examined the influence of price changes on productivity pointing out the particular suitability of the approach to Kenya where the government attempts at controlling coffee output were implemented largely through a planting license scheme. With acreage more or less fixed by physical or institutional limitations the farmers are never free to vary their inputs and thus both the quality and quantity of the output. Maitha's model embodied a constant elasticity of substitution production function and assumed constant returns to scale and estimated the parameters of the equation.

$$\text{Log } \frac{Q}{A} = \alpha_0 + \alpha_1 \text{Log } \frac{R}{P} \quad (2.3)$$

Where:

Q/A is the coffee productivity index

R is land rent

P is the producer price

α_0 is the elasticity of substitution, a weather index and an index of technical progress.

Maitha expressed the land rent –coffee price ratio in terms of past produce prices and used Fisher distributed lag form to estimate productivity elasticities.

Akiyama (1987) argued that the vintage capital approach to investigate on production is the preferable option in the perennial crop supply analysis given the heterogeneity of capital stock with respect to yield in perennial crop production. The following supply response was derived from the vintage production function:

$Q_t = \sum F \{K(t, v), L(t, v)\}$ also

$K(t, v) = N(t) + R(r)$

Where Q_t is total output, $K(t, v)$ is capital stock of vintage at the end of period t with uprooting and removals accounted for: $L(t, v)$ is non labor inputs: N_t is new planting and $R(r)$ is replanting. The results showed that the new plantings were highly price responsive for both Kenya and Sri- Lanka. Parameter estimates were found to be underestimated, thus long run references could not be made unambiguously. This was due to absence of additional country specific information.

Ekborm (1998) conducted a study on the determinants of agricultural productivity in Kenyan highlands and found a positive and significant correlation between labor input per farm and productivity. Although only statistically significant at 10% level of significance, the study also finds that household capital, proxied by the value of domestic animals, capital availability, and nonagricultural farm incomes are positively related to agricultural productivity. Increasing labor and capital availability is therefore important for productivity increases in the country. An often-mentioned impediment to agricultural productivity in Kenya especially among small-scale farmers is the lack of credit. The study argued on the basis of the above findings that increased access to credit can positively influence productivity by increasing the farm's capital base. More directly, access to credit enables farmers to purchase farm materials such as fertilizers, improved seeds, and herbicides that are important for enhancing productivity.

Farm sizes have been hypothesized as a determinant of agricultural productivity. Ekborm (1998) and Odhiambo (1998) included farm size as one of the factors determining agricultural productivity. Ekborm (1998) found a negative but statistically significant relationship between farm size and agricultural productivity. This implies that smaller farms are more productive than larger farms.

According to the study, this finding is plausible because smaller farms are often forced to intensify production to sustain household welfare. Larger farms on the other hand can afford the luxury of extensification. The study by Odhiambo (1998) further indicates that the negative relationship between productivity and farm size operates largely through labor resource inputs where smaller farmers tend to use more labor per unit of land than the larger ones.

Soderlund and Oberg (2001) observed that both domestic and international factors contribute to the decline in coffee production. A good case in scenario is the collapse of the international coffee agreement in 1989 as one case that destabilized the world prices for coffee. Other factors includes higher prices on farm inputs, wages, fuels and interest rates, lack of access to credit to short-term working capital needs and long-term investments, low coffee payments due to high processing and marketing costs. Another cause of poor productivity includes liberalization and privatization policy guidelines. The reforms were necessary to streamline coffee marketing, processing and handling institutions to reduce excess costs, remove delays in payments and enhance payments to farmers. However these measures have not resulted in competition in coffee-marketing, which still remains the sole responsibility of the Coffee Board of Kenya. In 2001, Kenya's coffee contribution to the world market stood at only 2% which means that their production volumes do not affect world coffee prices.

Karanja and Nyoro (2002) observed that market reforms in most developing countries have greatly limited the direct market intervention options such as stabilization funds by governments and agricultural marketing boards. It is however possible for producer countries, to trade away much of the price risks by using modern market instruments such as futures, option and commodity swaps. The study also singles out the escalation of coffee production costs due to major increases in the cost of purchased farm inputs as a major cause for the coffees decline in productivity. The study found that their prices rose from Ksh 4 per kg in 1990 to Ksh 24 per kg in 2001. The resulting low and declining trends in fertilizer use have significantly depressed coffee yields. Given the situation, smallholder farmers have resulted to substituting fertilizers with manure. The other major contributor is the costs involved in diseases and pest control. The cost of labor has also increased significantly during the market reform period. For example, the daily wage for casual labor had increased from Ksh 24 in 1990 to around Ksh 120 in 2001. Equally, the cost of picking coffee has increased from Ksh 10 in 1990 to the Kshs 25-30 per *debe* in the year 2002. The other major issue was that given the poor returns from coffee production, farmers are investing in other farm enterprises. Dairy production, cultivation of horticultural crops (vegetables and fruits), honey production and poultry keeping were identified as the alternative farm enterprises taken up by many scale farmers.

In the study of processing of coffee in a liberalized market Nyoro (2004) found that the decline in production quality is mainly associated with small scale producers whose cooperative associations are involved with the current industry debt stalemate. Farmers find that they are unable to either obtain farm input advances at normal rates or receive timely payment for their produce. Because cooperative coffee farmers wait a long time to get paid, farm input advances are necessary to pay for inputs that farmers have to buy to grow more crops. These inputs include fungicides and pesticides that are needed to regularly spray against pests which make up a big percentage of farm input costs. Small farmers linked to cooperatives cannot afford the price of the inputs they need, so their farms only produce very little coffee as compared to estates that are not burdened by the cooperative debt situation. The other issue is the inability to separate functions and management structure of cooperatives. Lack of qualified employees and a professional management to manage day-to-day operations, administration and finances have also contributed to this decline.

Nyangito *et al.* (2004) found out that trade policy can also affect growth and productivity through the foreign exchange market. This is through two hypotheses on the relationship between the exchange rate and productivity. The first is the so-called exchange-rate-sheltering hypothesis which states that a depreciating real exchange rate reduces growth in domestic productivity because it shelters domestic producers from foreign competition. This reduces their incentive to make productivity enhancing investment. The second hypothesis is the factor-cost hypotheses, which stipulates that movements in the real exchange rate affect the absolute and relative cost of new capital and labor, therefore influencing both total factor productivity and labor productivity. Depreciation can also reduce growth, and an overvalued exchange rate can sometimes contribute to productivity growth by forcing productivity gains in the tradable sector. Mude (2006) found out that the deterioration of management of coffee cooperatives in Kenya can be partly explained by institutional changes in cooperative organization that gave full ownership and administrative control to members.

The rules by which cooperatives' memberships elect their leaders lead them to be captured by corrupt individuals whose rent-seeking predictably reduces members' efficiency and welfare. Another thing that he captures is that making it illegal for growers to sell their coffee to other potential buyers effectively grants cooperatives local monopsony protection and shields them from potential competition. Yet, protecting such organizations against competition discourages them from being efficient as there are no longer constraints that force them to maximize the benefits to cooperation. This has led to the exploitation of members by self-serving boards even though intermediary agents could offer them better terms. As payments to members fall, they respond by cutting back on output.

Condcliffe *et al.* (2008) observed that before the privatization of the coffee sector, the government used to manage and give financial support to grower cooperatives, the Kenya Planters Cooperative Union (KPCU) and the Coffee Research Foundation (CRF). This prevented those groups from building the management capacity needed to efficiently manage their operations and finances after the privatization. A second factor that they point out which has led to low productivity of coffee is corruption and weak management at the cooperatives. This is because corruption in the sector prevents market forces from selecting the strongest players to carry the sector forward. They notes that at the cooperative and grower levels, corruption takes multiple forms, including the election of unqualified but politically connected cooperative managers who sometimes unduly influence union election meetings, continued relations with the KPCU in spite of increased competition, and the investment of cooperative resources in unprofitable side projects. The third point is demand for coffee in Kenya which they found that it's too low and that the domestic market only consumes 1% of the total produce. Kenya has a tea rather than a coffee culture and consumption is very low relative to other coffee producing countries like Ethiopia which consumes 50% of the coffee they produce. This means that the country has to improve its coffee quality so as to compete with other countries in the global market.

2.3: Overview of Literature

From the literature reviewed there are several aspects that deserve some scrutiny. Most of the studies reviewed were done outside Kenya and they relate to diversified commodities. Most of the studies concentrated more on the effect of price changes on productivity hence they were not able to capture the net effect of all the policy reforms. In the study by Ekborm (1998), only labor was considered as having an influence on productivity. The study did not consider the influence of all other factors that increase production of agricultural products.

Only a few studies have concentrated on coffee sector liberalization and growth in Kenya. Even with these studies they have looked at specific reforms rather than the aggregate liberalization process. Mude (2006) highlighted the impact of cooperative management on the productivity of coffee in Kenya. This study was only limited to small-scale farmers who form these cooperative societies leaving out the contribution of estates farmers. Although Karanja and Nyoro (2002) investigated the causes of escalation of coffee production costs after the reforms the study was silent on how the sector thrived after the reforms had been implemented. In view of these, there are gaps of how the recent developments in government policies reforms and implementation and global economic integration have affected openness policy implementation. Furthermore, many studies do not construct and estimate econometric models of policy reforms in crop productivity in Kenya.

Theoretical Framework

3.1: Theoretical Model

Starting with a simple production relationship in which output (Q) depends on capital input (K), labor (L), and land (T) the production function can be expressed as:

$$Q=f(K, L, T) \quad (3.1)$$

Where Q (output) depends on capital, labor and land used. If the levels of capital, labor and land are increased / reduced, then it is expected that output will also correspondingly increase/decrease. However, output (Q) can also increase by using the same level of capital (K) labor (L) and land (T). This is possible if a superior technology is used in the production process. However, output growth can also be attributed to other factors other than growth in the conventionally defined inputs. When this is the case, then technical progress has taken place. In terms of the production relations, such a change represents a shift in the production frontier and can be defined as:

$$Q=A_t f (K_t, L_t, T_t) \tag{3.2}$$

Where A_t is a vector of all other factors that goes on influencing output other than capital, land or labor at time t .

Dividing each variable on both sides of the production function by T_t , to harmonize output per unit of land, the production function yields:

$$\frac{Q}{T_t} = \frac{1}{T_t} f(A_t, K, L, T) \tag{3.3}$$

Where

- $\frac{Q_t}{T_t}$, is the yield per unit of land
- $\left(\frac{L_t}{T_t}\right)$, is labor per unit of land
- $\left(\frac{K_t}{T_t}\right)$, is capital per unit of land
- $\frac{A_t}{T_t}$, is all other factors per unit of land

Equation 3.3 can be expressed as:

$$q = f (\mu_t, k, l) \tag{3.4}$$

Where:

- q is the yield per unit of land
- k is capital per unit of land
- l is labor per unit of land and
- μ_t is all other factors per unit of land

3.2: Empirical Model

3.2.1 Assumptions

In order to estimate the model the study assumed the following.

A Constant Elasticity of Substitution (CES) production function.

1. Fertilizer is the proxy for capital in the model.

To capture reforms in the year 1992, 1993 and 2001, dummy variables were included as follows:

Dollar usage: is a dummy capturing the policy change instituted encouraging usage of US dollars to pay the farmers.

$$D92 = 1 \text{ if paid in Kshs.} \\ 0 \text{ if otherwise}$$

Many millers: is a dummy capturing the implementation of many commercial millers.

$$D93=1 \text{ if only one commercial miller} \\ 0 \text{ if otherwise}$$

Coffee act 2001: is a dummy capturing the implementation of the coffee act 2001.

$$D01=1 \text{ if before 2001.} \\ 0 \text{ if otherwise}$$

To estimate productivity in coffee, a linear model is specified as:

$$Productivity = \alpha_0 + \alpha_1 Capital + \alpha_2 Labor + \alpha_3 DollarUsage + \alpha_4 ManyMillers + \\ \alpha_5 CoffeeAct2001 + \varepsilon \tag{3.5}$$

Where:

- Productivity* - Change in output (q) given by $(q_t - q_{t-1})$
- Capital* - Change in capital (k) given by $(k_t - k_{t-1})$

Labor - Change in labor (l) given by $(l_t - l_{t-1})$

Dollar Usage- Dummy capturing the policy change instituted encouraging usage of American dollars to the farmers

Many Millers - Dummy capturing the implementation of many commercial millers

CoffeeAct2001- Dummy capturing the implementation of the coffee act 2001.

$\alpha_0, \dots, \alpha_5$ are the parameters to be estimated and ε is the error term. Ordinary least square (OLS) method is used.

3.3: Data Collection and Sources

The data used in the study is time series data that was collected from secondary sources. Data on average yield was from economic surveys of Kenya and statistical database for the Food and Agriculture organization (FAOSTAT). Data on fertilizer was sourced from the ministry of agriculture while the labor force engaged was obtained from Central Bureau of Statistics. The data on yield was transformed from hectograms per hectare to kilograms per hectare.

Analysis and Estimation Results

4.2 Unit Root Tests

When time series data is non stationary and used for analysis it may give spurious results because estimates obtained from such data will possess non constant mean and variance. Because this study used time series data, it was therefore important to establish the stationarity of the data or what order they are integrated to make sure that the results obtained are not spurious. In this regard Augmented Dickey Fuller (ADF) was used to test for unit roots. The unit roots results of the variable in the model are reported in the Appendix A (1-2). The results of the unit root show that output, labor and capital are non stationary. The tests establish that all the variables are stationary after differencing once which implies that they are integrated of order 1. This vindicates the use of equation 3.5

4.2: Serial Correlation and Arch Test

Unlike the Durbin-Watson statistic for AR(1) errors, the LM test may be used to test for higher order ARMA errors, and is applicable whether or not there are lagged dependent variables. The null hypothesis of the LM test is that there is no serial correlation. The statistic labeled “Obs*R-squared” is the LM test statistic for the null hypothesis of no serial correlation. The probability value (0.057) indicates the absence of serial correlation in the residuals at five percent significance level.

The statistic labeled “Obs*R-squared” is also the arch test statistic for the null hypothesis of autoregressive conditional heteroskedasticity (ARCH) in the residuals. The probability value (0.66) indicates that there is no heteroskedasticity in the residuals at five percent significance level. Both tests results are summarized in table 1.1

Table 1.1: LM-test and ARCH test results

Test	Obs*R-squared	Probability
LM-test	9.379064	0.052292
ARCH Test:	5.440851	0.065847

4.4 Regression Analysis Results

This section presents the results of the regression model specified in equation 3.5. The empirical estimation was based on ordinary least squares (OLS) technique. Time series data is used for this entire period and the results of the estimated model are reported in Table 1.2. The coefficients of the model represent marginal effects.

Table 1.2: Regression Results

Variable	Coefficient	Std Error	t-Ratio	P value
C	1.565284	1.637581	0.955851	0.3473
LNCapital	0.445256	0.188337	2.364147	0.0252
DollarUsage	0.067320	0.067245	1.001115	0.3253
LNLabor	0.156121	0.367045	0.425345	0.4268
Coffeeact	0.028373	0.280869	0.101020	0.9203
Many millers	0.488004	0.238812	2.043464	0.0305
R-squared	0.710819			
Adjusted R-squared	0.617868			
Durbin-Watson stat	1.391710			
F-Statistic	7.647237			
Prob (F-statistic)	0.000014			

The regression had a correlation coefficient (R^2) of 0.71 and an adjusted R^2 of 0.617. This means that the use of capital (fertilizer), labor and the policy reforms implemented by the government explain 61.7 percent of the variations on coffee productivity in Kenya. The F-value of 7.647 with a probability of 0.00 at 5% significance level is significant indicating there is linear relationship between capital, labor policy reforms and coffee productivity. The following is a discussion of each variable with regard to sign, significance and possible policy implications.

Capital

Using data from 1980 to 2010, the study found out that the use of capital (fertilizer) was positively related to productivity and also statistically significant on influencing the coffee productivity as indicated by a P-value of 0.0252. The results are consistent with the findings of (Rugendo, 2005) who asserted that Kenya is one of the countries that use fertilizers on coffee in a modest way.

Labor

The results also revealed that labor captured by the number of employees per hectare does not affect coffee productivity. The evidence in this study digress from the norm since coffee production is labor intensive, however in dealing with the labor production relationship, there have been some critics who suggest the possibility of a negative relationship. According to Lewis theory (1954) an unlimited supply of labor may be said to exist in those countries where population is so large relative to capital and natural resources, that there are large sectors of the economy where the marginal productivity of labor is negligible like in the informal sector where the marginal product of labor is zero. In the case of Kenya’s coffee sector, the labor force engaged in production of coffee, that is, those people who are employed in pruning, harrowing and even spraying is fixed and represent undisguised type of employment while the labor force engaged in picking coffee a process that is an end product of coffee production is the one that varies depending on the outcome of the harvest.

Dollar usage

The Results indicates that the introduction of an alternative farmer’s payment system was insignificant in determining coffee productivity as shown by a P-value of 0.3253. The results could be explained by the fact that this reform was implemented at a time when the government intervention measures to stabilize the sector were frustrated by the freeze of Aid by major donors in 1991 citing escalating levels of corruption and slow progress in the reforms implementation by the country. The Kenyan economy was restricted donor financing witnessed between 1991 and 2002 and the STABEX funds a grant meant to cushion the coffee sector against the falling world prices also got caught up in this suspension. The policy reform however may have improved earnings to the farmers but did not increase productivity.

5.1.4 Many commercial millers

According to the regression results the coefficient of many commercial millers was statistically significant as shown by a P-value of 0.0305. This implies that the commercialization of many millers had a positive impact on coffee productivity. The results are consistent with economic theory which stipulates that elimination of imperfect markets will auger well and spur growth and competitiveness in an economy. By the licensing many millers, it meant that the government was removing the milling monopoly in the market and making the sector to be more competitive.

This process however led to farmers selling their cherry at farm gate rather than through their cooperatives which is illegal an initiative that was meant to safeguard the investments made by farmers in cooperatives and enhance economies of scale in coffee processing.

Coffee Act 2001

The results indicate that the establishment of the coffee act has not brought any change to coffee productivity in Kenya. The act led to the separation of the roles of coffee marketing and regulation. The coffee board of Kenya (CBK) was to retain the regulatory role while the marketing function was to be taken over by the marketing agents. This change increased private sector participation in coffee marketing and also gave more autonomy to the cooperative societies. This resulted to exposing the farmers to performance risks in these marketing institutions.

The second factor was that the coffee act of 2001 abolished coffee planting zones and abolished rules on inter-cropping. This change offered farmers a leeway to diversify from coffee production where possible. This also gave a leeway for farmers to uproot their coffee which explains the decline of the total acreage of coffee by more than 7000 hectares in the year 2003.

4.4: Conclusion

Despite the many efforts put by the government to bring changes in the coffee sector, the results indicates that only commercialization of many millers could spur a change on coffee productivity. In view of this, there is need to reform the cooperative societies which have a major and direct impact on farmers' access to credit, inputs and the level of returns. This is because this is the only mechanism used to implement the reforms from the government to the coffee farmers. As such there is need to address problems such as poor governance, huge debts and structural problems that plague coffee co-operatives. The huge debts accrued by these cooperatives significantly increases the deductions made by the societies leading to low pay-out to farmer since the proceeds from coffee sales goes to servicing the debts.

The government should also put measures that focus on value addition of coffee enabling the country to export finished coffee products and thus fetch better prices for the same output. The government should also encourage strengthening of national certification systems and increase in co-operation between local inspection bodies and international inspection and certification agencies. This is because the cost of certification remains one of the major constraints in promotion and marketing of coffee.

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Appendices

Appendix A- Unit root tests

Table A-1: ADF Unit Root tests at levels

Variable	Lags	ADF	ADF Critical	Conclusion
		Statistics	Values	
Q	4	-1.592885	1% = -2.6040	Non Stationary
	4		5% = -1.9464	
	4		10% = -1.6188	
K	4	-1.431356	1% = -2.6040	Non stationary
	4		5% = -1.9464	
	4		10% = -1.6188	
L	4	0.229126	1% = -2.6040	Non stationary
	4		5% = -1.9464	
	4		10% = -1.6188	

Table A-2 ADF Unit root tests at levels

Variable	Lags	ADF	ADF Critical	Conclusion
		Statistics	Values	
Productivity	4	-5.289194	1% = -2.5716	Stationary
	4		5% = -1.9405	
	4		10% = -1.6161	
Capital	4	-5.953612	1% = -2.5716	Stationary
	4		5% = -1.9405	
	4		10% = -1.6161	
Labor	4	-4.143847	1% = -2.5716	Stationary
	4		5% = -1.9405	
	4		10% = -1.6161	