DETERMINANTS OF TEA EXPORT SUPPLY IN KENYA

(1970-2007)

BY

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DECLARATION

This is my original work and has never been presented for any degree in any other university.

Signed .....

Date 12th May 2009

Approval

This research paper has been submitted with our approval as university Supervisors

Signed.....

DR. GEORGE M RUIGU

Date...5th May 2009.....

Signed.....

DR. ODHIAMBO SULE

Date 12/5/09

DEDICATION

This paper is dedicated to my Parents.

ACKNOWLEDGMENT

First and foremost, I thank God for giving me strength to do this paper. I wish to acknowledge the constructive guidance and contribution from my supervisors, Dr. Ruigu and Dr. Sule, who tirelessly took time to assist me throughout the process of developing this paper from its initial stages, I'm deeply convinced that without their assistance, this paper would not be what it is. My vote of thanks also goes to School of Economics, University of Nairobi for their vehemence in upholding the economic discipline.

I am grateful to the Kenya Tea Board staff a, Meteorological Department, Charles Mucheke of Nyayo Tea Zones Development Corporation whose assistance enabled me get the relevant data on tea price, output and rainfall. To you I say thank you. My fellow classmates including David Mbugua,Patrick Ngumi and John Njoroge who highly motivated me through the discussions we constantly held. I am greatly indebted to each one of them. Special thanks also go to my parents (Mr. and Mrs. Miano) and especially my dad Mr. P M Njagira for his financial and moral support when the going seemed tough. I cannot forget my brothers Paul and John who have shown concern and supported me over my entire academic life. To you I say follow the suite.

Time and space would not allow me to mention everyone who contributed in various ways to the successful completion of this paper. To all I say "may the good Lord reward you richly''.

Finally, any errors likely to be found in this paper sorely remain mine and should not be attributed to anyone else.

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LIST OF ACRONYMS AND ABBREVIATIONS

ARCH - Auto- Regressive Conditional Heteroscedasticity

BLUE - Best Linear Unbiased Estimator

CFU - Continuous Fermenting Unit

CET - Common External Tariff

CPI - Consumer Price Index

CUSUM- Cumulative Sum test

CTC - Cut Tear and Curl

DW - Durbin Watson statistic

EATTA - East Africa Tea Trade Association

ECM - Error Correction Model

ECT - Error Correction Term

EPZ - Export Processing Zone

EU - European Union

GDP - Gross Domestic Product

GAP - Good Agricultural Practices

GMP - Good Manufacturing Practices

GOK - Government of Kenya

GDP - Gross Domestic Product

KTDA - Kenya Tea Development Authority

KUSSTO - Kenya Union of Small Scale Tea Owners

MRLs – Maximum Residue Levels

MT - Metric Tones

RER - Real Exchange Rate

SAL - Structural Adjustment Lending

SAP - Structural Adjustment Program

SCDA - Special Crops Development Authority

TBK - Tea Board of Kenya

MM - Millimeters

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ABSTRACT

The aim of the study was to identify the factors that determine tea export supply in Kenya. Specifically, the study attempts to describe the tea export performance of Kenya for the period 1970 – 2007, investigate the determinants of tea exports and make policy recommendations for improving tea export performance in Kenya. It explains how real exchange rate, input prices, price of tea substitute, weather pattern, real wage rate in tea sub industry and structural adjustment programme affect the tea export supply in Kenya. To do this, a simple log linear model was estimated using ordinary least squares (OLS).Eviews Statistical Program was used to analyze the time series data for the period 1970-2007.

The finding of the study indicate that real producer price of tea and the real exchange rate are highly significant in explaining tea export performance at any given time period. The real milk price and input price variables were also found to be significant in explaining amount of tea exported from the country. The weather variable was also found to influence amount of tea exported at a given time period. However, the SAP and input price variables were found to be insignificant in explaining tea export supply.

Based on the findings of the study, policy recommendations have been made which can remedy the situation. This includes price stabilization or price guarantee scheme, flexibility in the exchange rate movements in line with the economic fundamental, value addition and innovative marketing designed to improve tea producer prices. To compete globally, the government should help to reduce costs including transaction costs like electricity and fuel that make tea production and marketing expensive and hence uncompetitive in the region.

The government through ministry of trade should also take the advantage of economic integration, particularly the East Africa Cooperation, COMESA, together with African Growth Opportunity Act (AGOA); in these partnerships there is potential for export opportunities that can be explored to Kenya's advantage

CHAPTER 1

1.0 INTRODUCTION

1.1 Background of the study

The tea industry makes an important contribution to the Kenyan economy. In the year ended 31st December 2007, tea exports earned the country about Kshs 43 billion placing it third after tourism and horticulture. However, this was a drop from Kshs 47 billion recorded in 2006(GOK, 2008). The industry supports directly and indirectly about 4 million people making tea one of the leading sources of livelihood in the country.

Since the liberalization of the Tea industry in the year 2000, a lot of changes have taken place in the industry both locally and globally. In the last ten years, global tea production has outstripped demand by about 2.4 percent annually and the output is expected to grow at 1.8 percent yearly in the next decade (GOK, 2008). Consequently, average global auction prices have been declining. In Kenya, the cost of production has been escalating arising from high cost of labor, fertilizers, electricity, furnace oil as well as high taxation and the fluctuation of the Kenya Shilling against the international currencies, leading to reduced grower's earnings. This has made some farmers in Kenya to switch resources to other substitutes like horticulture and dairy farming and some have completely uprooted the crop.

Globally, there have been new entrants into the market such as Vietnam and Nepal. In this regard, stakeholders in Kenya have to realize the need for the industry to re-evaluate itself and make a strategic shift in order to remain profitable and globally competitive. It is significant to note that Kenya's main competitors in the world market, Sri Lanka and India, have taken measures to address these challenges by enhancing the value of their exports through value addition, product diversification and aggressive promotion unlike Kenya, which continues to sell most of its tea in bulk form.

1.2.0 Overview of the Agricultural Sector in Kenya

The agricultural sector contributes about 24% of the country's GDP and 60% of the export earnings. Through links with manufacturing, distribution and the service sector, agriculture indirectly contributes a further 27% to the country GDP. Additionally, about

45% of the government revenue is derived from agriculture while the sub sector contributes over 75% of industrial raw materials. More important is agriculture's contribution to the achievement of national food security as a large proportion of the Kenyan population live in the rural areas and derive livelihood largely from agriculture related activities. (GOK, 2007)

While agricultural sector performed exceptionally well in the early years of independence, its performance in the recent years has been poor. The sector grew at 6.4% per annum between 1963 and 1972(Nyagito and Okello, 1998). The high rate of growth was attributed to various factors. They included major land reforms that took place soon after independence when the government distributed considerable amounts of the settler's farms in medium and higher potential areas to small-scale farmers.

During the same period, the government through the Ministry of agriculture devoted about 10% of its annual budget to the agricultural research. As a result, there was a major breakthrough in the release of high yielding varieties of maize and wheat (Nyangito and Okello, 1998). Further, cash crops (coffee, tea, sugarcane and cotton) enjoyed special research programmes funded through their respective parastatals.

The growth performance of the sector dropped to 3% between in mid 1970,s and 1980s (Nyangito and Okello, 1998). This was mainly due to inefficiencies in marketing, limited expansion of smallholder farming, limited development and use of new technologies, restrictions on private trade and processing of commodities and deteriorating infrastructure. The internal factors were compounded by the economic crisis caused by the oil shocks of 1970s and bad weather (Nyangito and Okello, 1998).

During 2001-2007, there was a fluctuating performance of the sector. The sector recorded 10.5% growth in 2001 then dropped to –3.0% in 2002(GOK, 2007). The sector recovered in 2003 by registering 2.6% and then declined again to 1.6% in 2004.This decline in growth rate was attributed to poor performance in coffee, maize and pyrethrum sub sectors. There was an impressive performance of the sector in 2005, when it recorded a 6.7% growth rate.

The performance of the agricultural sector has a strong correlation with the overall Kenyan economy such that whenever the sector performed well so has the general economy and vice versa. According to Block and Timmer (1994), the growth multiplier

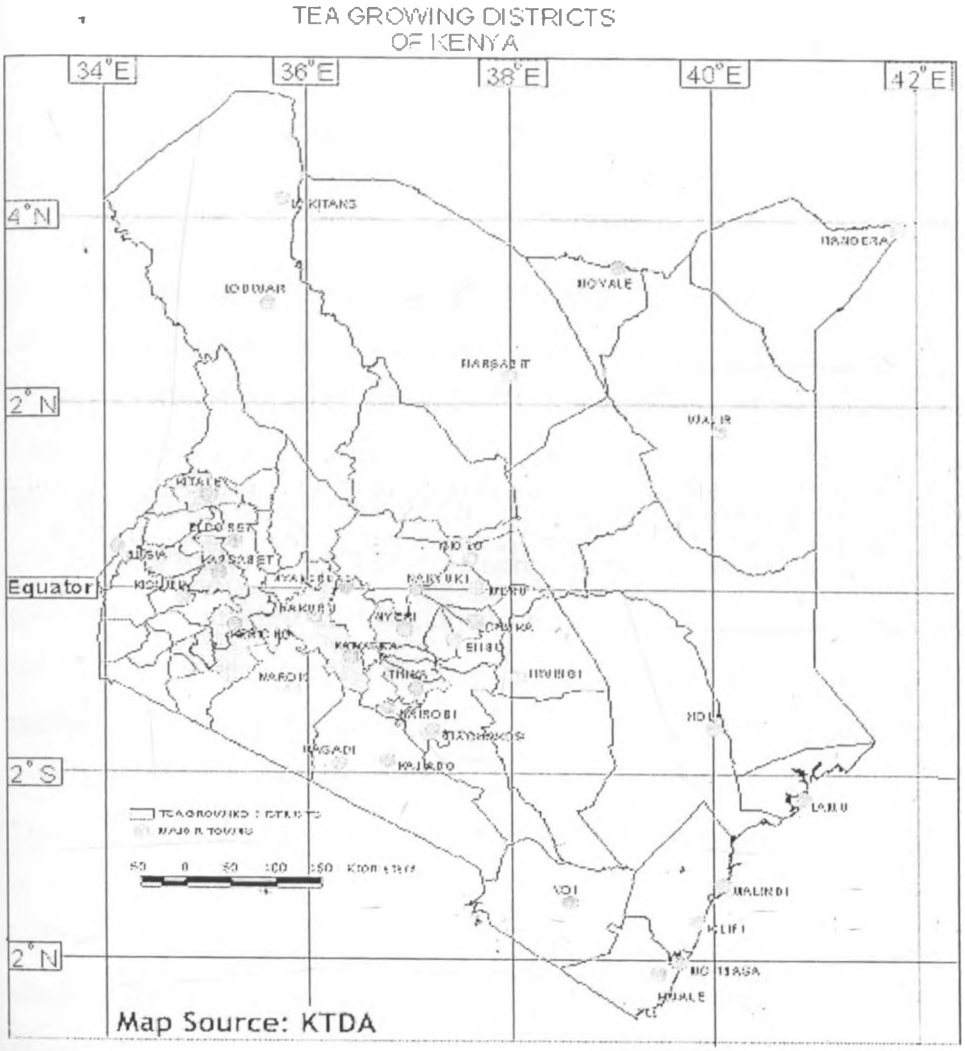
from the Kenyan agricultural sector to the whole economy is about 1.64.This implies that a 1% growth in the agriculture sector brings forth a 1.64% growth in the GDP.

1.3 .0 Tea Sub -Sector in Kenya

Tea is a perennial crop, which is grown for its leaves that are processed to make tea for preparing beverages. A European settler, Mr.G.W.L.Caine, introduced tea into Kenya from India in 1903. It was exclusively grown in estates by the private companies, which were owned by the white settlers. Small-scale tea farming was started as a pilot scheme in 1954 in Nyeri and Kericho districts. In 1961, it was declared a special crop under section 191 of agriculture Act (Cap318) and was placed under the management of Special Crops Development Authority (SCDA) in the same year.

Tea is produced in high altitude areas ranging from 1500 and 2700 meters above the sea level where rainfall ranges between 1200mm and 2700 mm annually with long sunny intervals and well-drained soils. Suitable temperature for tea growth ranges from minimum 12^0 C to a maximum of 28^0 C and a soil PH range of between 4.5 and 6.5 beyond which the tea is retarded. The major growing areas are Kericho, Bomet, Nandi, Nyamira, Kisii, Sotik, Kakamega, Kiambu, Thika, Maragwa, Nyeri, Kirinyaga, Embu and Meru districts.

Figure 1.1 Tea Growing Districts in Kenya



Source; KTDA

Tea production in Kenya is divided into two categories, privately owned large plantations, which account for about 40% of the total tea production in the county and the smallholder tea farmers who produce the remaining 60% of Kenyan tea. The smallholder tea is produced under the management of the Kenya Tea Development Agency (KTDA). The management of the smallholder tea by KTDA involves supervising and advising on good husbandry practices; provision of inputs on credit, collection of harvested tea, transportation to the factories, processing, marketing of the final product and payment to farmers. Payment to farmers is done on regular monthly basis pegged on the quantity of tea that is sold to the factory for that particular month. The farmers also receive a lump sum payment in the month of May and November generally referred to as tea bonus.

Tea estates are privately owned companies which produce, process and market their own tea individually. The largest tea estate belongs to Brooke Bond Kenya Ltd with the highest production of 32,370 MT in 2007(TBK 2007). The other big estate producers are James Finlay (Kenya) Ltd., Eastern Produce Kenya Ltd. and George Williamson Tea Kenya Ltd.

1.3.1 The Position of Tea in Kenyan Economy

This sub sector plays a very crucial role in development process in Kenya. Currently tea contributes 4% of the GDP (GOK, 2007). Tea is still one of the leading foreign exchange earners in Kenya after tourism and horticulture. This sub sector also provides market for the industrial goods for example fertilizers besides providing employment to Kenyans. The incomes from this sub sector are normally used by economic agents to finance major household expenditure such as, food, health care and school fees. The tea industry therefore has a direct impact on rural poverty and any decline in the production of this commodity will lead to increased poverty in the growing regions and in the overall economy.

Through taxation of this sector, the government is able to get revenue that it uses to meet its annual expenditures. The incomes are also used as savings for industrial expansion as well as to import capital goods for economic development. Since this sector is rural based, it helps to improve equity role, a feature that cannot be matched even by the capital-intensive service sectors such as tourism which requires big capital outlay. This sector is therefore very important in the economy and in the overall development process.

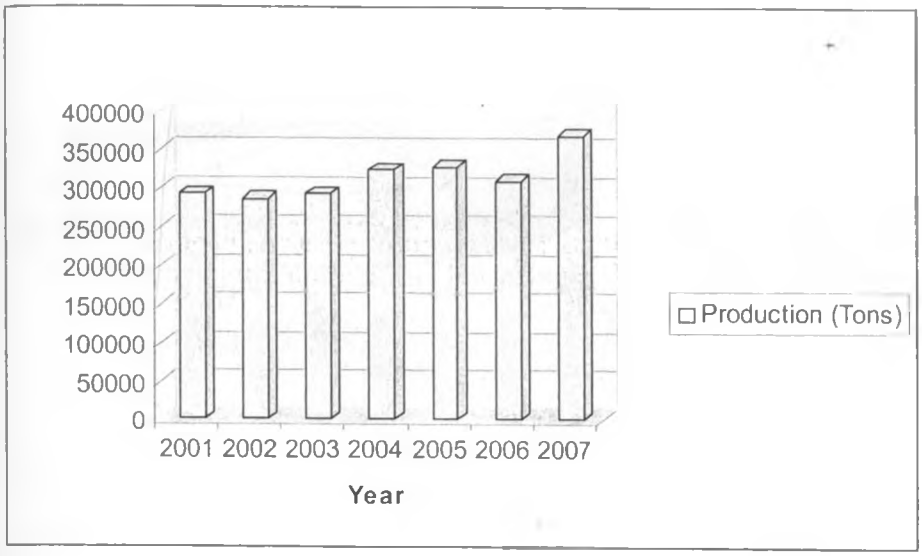
1.3.1.0 Tea Industry Performance in Kenya

1.3.1.1 Tea production

The Tea industry has experienced rapid growth in planted area, production and exports, with tea plantings increasing from about 147,080 hectares in 2006 to more than 149,000 hectares in 2007.During the same period the annual tea production has increased from 310 million (kilograms) to 369 million kilograms (ITC Bulletin of Statistics, 2007).

The high production was mainly due to increase in crop yield attributed to good rainfall distribution in the tea growing regions particularly during the first quarter of the year.

Fig 1.2 Tea Productions in Kenya, 2000-2007



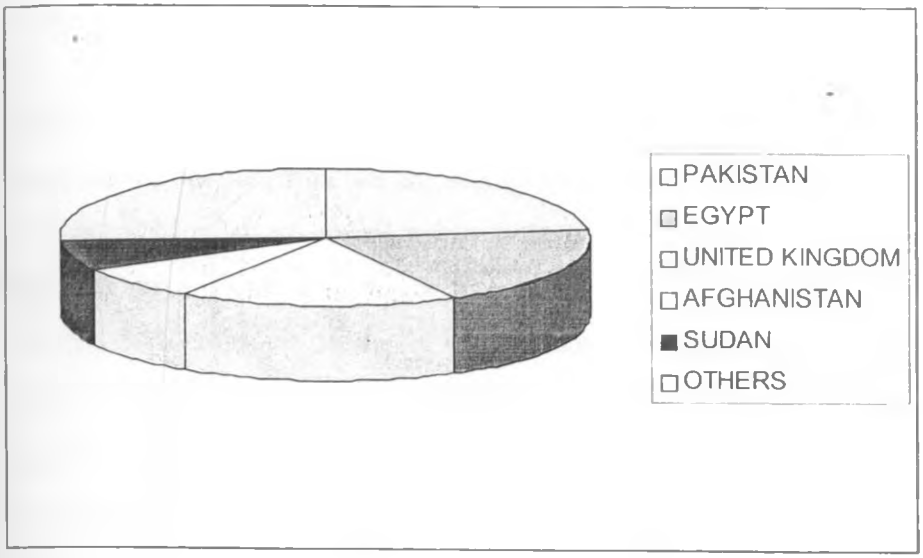
Source: KTDA

1.3.1.2 Tea Marketing and Promotion

The Kenya Tea Development Authority (K.T.D.A) markets tea on behalf of small-scale tea growers. The local tea market absorbs only 5% of the total production (GOK, 2007)). About 95% of the locally produced tea is exported. Most of this tea is exported in bulk and only a small percentage is packaged for export. About 10% of the total tea production is exported by producers, directly through private arrangements with tea importers across the world (ITC Bulletin of Statistics, 2007).

Pakistan is the leading export market for Kenya, followed by Egypt, United Kingdom, Afghanistan and Sudan. The five leading export destinations collectively imported 260 million Kgs (accounting for 75% of the total export volume) valued at Kshs. 31 billion as shown in figure 1.3

Figure 1.3 Kenya's Major Tea Export Destinations, 2007



Source: Tea Board of Kenya 2007

A number of institutions are involved in tea promotion including individual companies involved in tea marketing namely, Tea Board of Kenya, KTDA, Export Promotion Council (EPC) and individual companies dealing in tea. There are a number of companies who buy and package tea into their own brands for which they undertake individual promotion activities both in the local and export markets. These include Unilever Kenya Ltd, James Finlay (Kenya) Ltd and George Williamson Tea (Kenya) Ltd.

The Tea Board of Kenya is responsible for regulating tea trade and promotion in both the local and the international markets. In the last three years the Board promotion activities have targeted West Africa, Eastern Europe and Middle East. The Export Promotion Council, which has an overall mandate in export promotion and development activities in the country, has been instrumental in promoting tea in different countries. The Council's trade promotion activities target all Kenyan exportable products and tea has benefited from the Council's promotion activities not only in the traditional markets of the European Union (EU) and the Middle East but also in USA, Eastern Europe and Africa especially Egypt, Sudan and South Africa.

1.3.1.3 The Tea Auction

Located in Mombasa, the tea auction is conducted under the auspices of *The East African Tea Trade Association (EATTA)* whose membership consists of Brokers, Buyers, Producers, Warehousemen and Packers. Over 84% of Kenya tea is sold through the Mombasa tea auction, which is the second largest tea auction in the world. Auctions take place every Monday except on public holidays, in which it is held on the day after the public holiday.

Mombasa Auction has become a world-renown tea market centre for East and Central Africa tea producing countries. Brokers on behalf of the producers offer tea at the auction. The selling broker announces the line of tea on sale, and invites bids in US Dollars per kilogram. The buyers announce their bid, which advances by at least one US cent per kg. The tea is knocked to the highest bidder, and the next lot is offered for sale. The tea bought from the auction is mainly exported.

1.3.1.4 Kenya Tea Development Agency (KTDA)

Kenya Tea Development Agency Limited was created in the year 2000 to replace the Government owned Kenya Tea Development Authority, following the liberalization of the tea industry. KTDA Ltd is the single largest tea Management Agency in the country with approximately 422,000 tea growers farming 95,779 hectares (2006) of planted tea, managing 57 operational tea factories each with at least annual processing Capacity of 15 million kilograms of green leaf (KTDA 2006)

KTDA Ltd mission is to provide effective management services to the smallholder tea sector for efficient production, processing and marketing of high quality tea and investing in related profitable ventures for the benefit of its shareholders and other stakeholders.

KTDA's services to farmers are broadly divided into agricultural services, factory operations and, selling and distribution of processed tea. The costs for selling and distributing made tea vary according to the point of sale and the volumes handled. Farmers' payments vary according to the quality of the tea sold from each factory and overhead costs incurred for each factory.

Selling and distribution functions of the KTDA are important in determining final tea earnings and take 4% of the gross sale value. Each factory's tea realize different prices

according to the value of the tea but it seems the directors do not understand how the auction markets work and the importance of tea quality in price determination. This is an area that requires concentrated educational efforts for the factory company directors.

The factory operational expenses constitute the largest cost component item (23% of the gross value sales) but these are not clearly disclosed to farmers and this may be one of the reasons for the farmers' complaints over the KTDA's management.

The KTDA's borrows (internally and externally) to finance building of new factories and renovations, and to finance bonus payments when factories do not have sufficient funds in their accounts but the interest paid for the loans and the repayment procedures are not clearly disclosed to farmers and conflicts have risen over these. The provision of agricultural services (fertilizer and gunny bags) and purchase of other materials of tea processing in large quantities allow the KTDA to enjoy economies of scale which can be passed on to farmers in terms of lower costs for the items. However, transparency on charges for these services is required to avoid conflicts among farmers and the KTDA.

There have also been issues relating to the ownership and management of KTDA. Transition from Parastatal to Private status (Authority to Agency) did not allow for sufficient time for creation of appropriate transitional structures, policies and procedures. At the same time, there was no deliberate program to educate growers on the new role and relationship between themselves and KTDA. Information regarding tea marketing, earnings and transfer of tea ownership is unevenly distributed since KTDA has superior access to market information. Whereas KTDA does not accept the ownership of the tea and associated liabilities, it dominates the processing and marketing and passes all the costs to the farmers who consider the costs to be exorbitant.

The KTDA management style is rigid and has not adopted modern management practices such as computerization and all key decisions continue to be made in the headquarters.

The body has also continued to contravene the tacit agreement between itself and the factory companies, as it makes profits in the provision of services to its shareholders. The agreement states that profits should be made at the factory and not at the KTDA, thereby resulting in better leaf prices and high bonuses for green leaf deliveries.

KTDA has usurped the role of Tea Factory company Boards and routinely makes decisions without consulting them. For instance, the tea gardens and factory properties

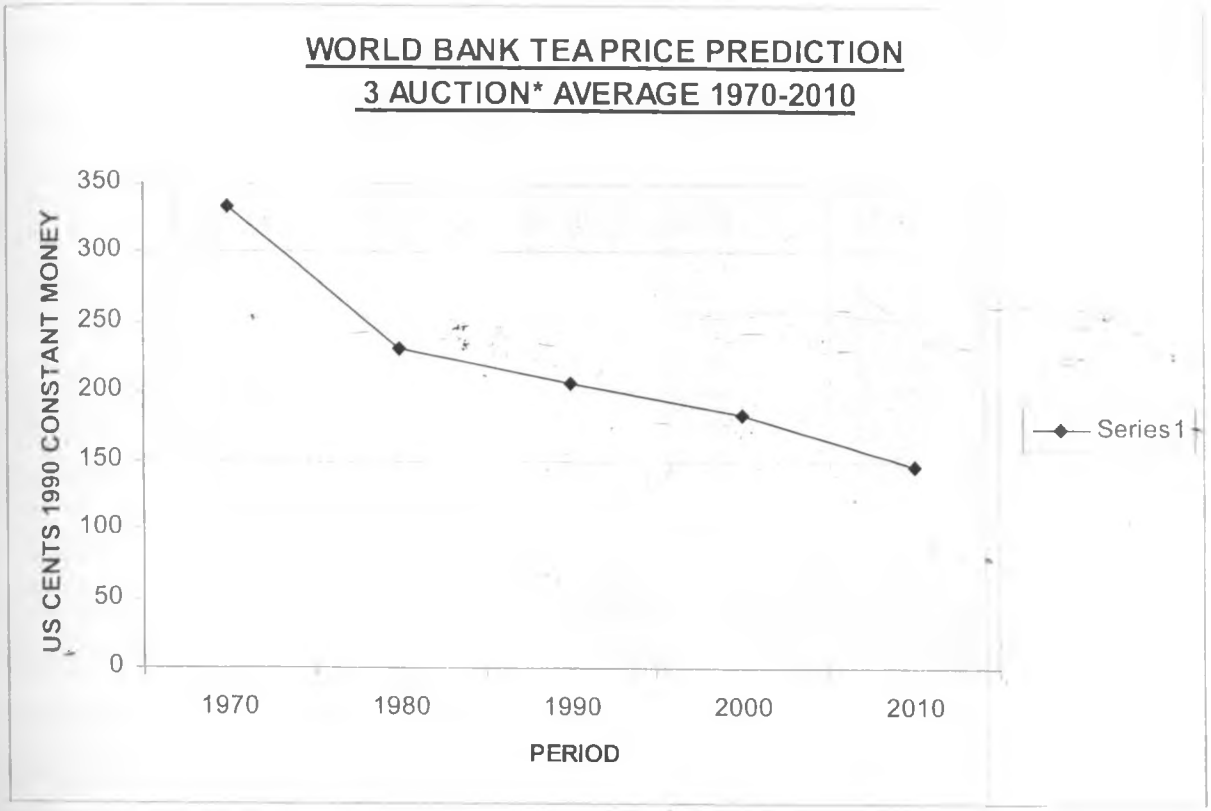
are registered in the name of the KTDA. The Management Agency fees at 2.5 % of net sales borne by the grower are too high.

Controversies among the farmers regarding the efficiency of the provision of the services by the KTDA and lack of clear liberalization policy guidelines about the roles of the KTDA and the government in tea farming has resulted in two farmers' groups with opposing views-those for the existence of KTDA and those for dissolution of the KTDA (KUSSTO group).

1.3.2 Challenges facing tea industry in Kenya

This sub sector is faced with myriad of constraints. They include declining global tea prices. Kenya is a net exporter of black CTC teas and is significantly affected by declining price trends in the global tea market. Currently, tea supply has outstripped global demand. By the end of 2006, global supply was 3,523 million kilograms against a demand of 3,413 million kilograms, leading to an over-supply of 110 million kilograms (Tea Industry task force report 2007). The oversupply is forecasted to grow by approximately 1.8 percent per annum in the next decade while consumption is expected to grow by only 1.3 percent p.a. This glut has resulted in fluctuation of Kenyan tea average auction prices between US$ 1.50 and US$ 2.00 per kg over the last one decade against rising cost of production. In spite of this gloomy outlook, Kenyan production has been increasing by about 1-2 percent annually (GOK, 2007). Predictions are that tea prices will continue to decline (World Bank 2007). See figure 3 below.

Figure 1.4 World Bank Tea price Predictions (1970-2010)



*Mombasa, Colombo, Kolkata

Source; World Bank Development Economics, International Tea committee booklet

The industry faces challenges in the high and escalating cost of production which is causing great uncertainty in the future of tea farming. Kenyan tea is predominantly for exports and competes mainly on its quality.

However, Kenya is among high cost producers, with its cost of production currently at US$1.33 per Kg (Technoserve 2007). The cost of production compares poorly with other tea producing countries like Vietnam and Indonesia at US $0.81 and 0.58 per Kg of made tea respectively (Technoserve 2007). In Africa, Kenya has the highest cost of production compared to Rwanda (US $ 1.32), Uganda (US $ 1.20), Tanzania (US $ 1.16) Malawi (US $ 1.14) and Zimbabwe (US $ 1.11) (Technoserve 2007).This can be explained by the high cost of labor in Kenya and poor infrastructure.

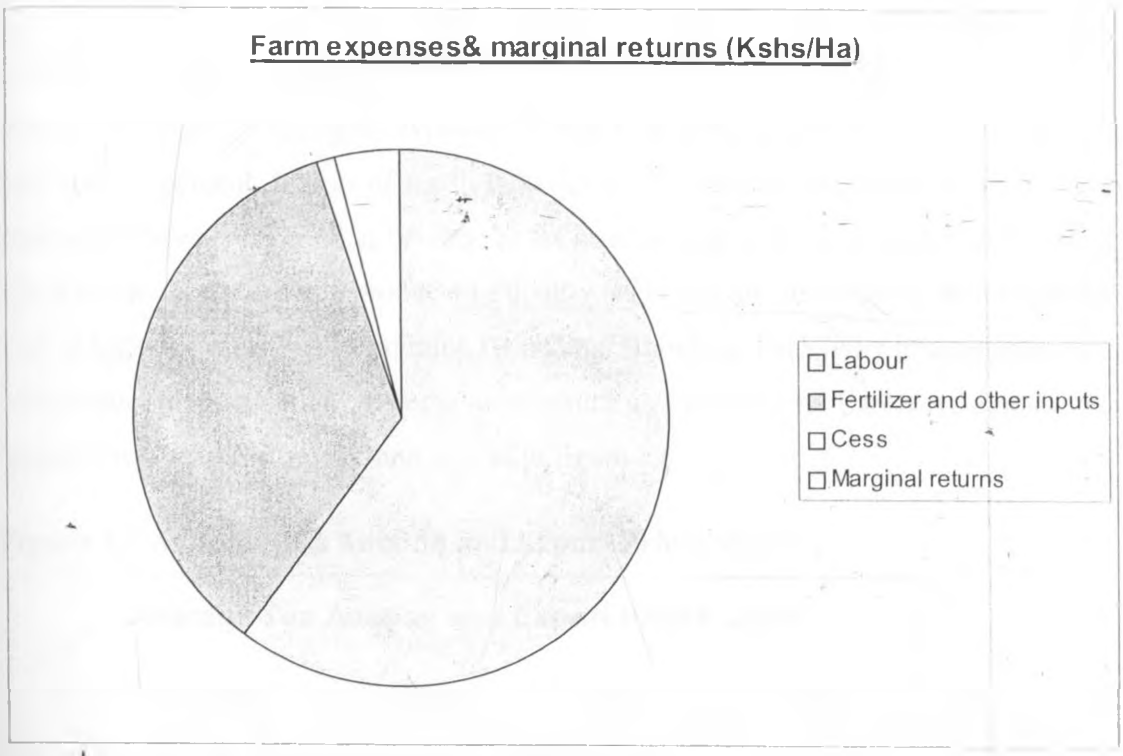
Figure 1.5: Kenya's Cost of production compared with other producer countries (US $ /Kg)

PRODUCER	Field Cost	Factory Cost	Sales cost	Overhead cost	Total cost
SRI LANKA	$0.00	$0.00	$0.00	$1.89	$1.89
NORTH INDIA	$0.84	$0.52	$0.11	$0.16	$1.63
KENYA	**$0.78**	**$0.28**	**$0.10**	**$0.16**	**$1.32**
RWADA	$0.90	$0.11	$0.21	$0.10	$1.32
UGANDA	$0.64	$0.22	$0.12	$0.21	$1.19
TANZANIA	$0.58	$0.22	$0.14	$0.22	$1.16
MALAWI	$0.55	$0.28	$0.21	$0.10	$1.14
ZIMBABWE	$0.69	$0.23	$0.02	$0.16	$1.10
VIETNAM	$0.61	$0.12	$0.04	$0.04	$0.81
INDONESIA	$0.00	$0.00	$0.00	$0.58	$0.58

Source: Tea Board of Kenya

Increasing growing and processing costs have been on the rise and this has been a major set back in the industry. These include skyrocketing cost of fertilizers and other farm inputs, high fuel costs (wood and oil), increasing labor costs and rising transport and supply chain costs. According to the KTDA survey, in 2006 labor costs account for 60% while the fertilizer cost account for 35%. After the deduction of the government cess ,the farmer is left with only 4% of his turnover as the marginal returns, which is very frustrating especially for the small holders.

Figure 1.6: Farm expense and marginal returns in Kshs per Hectare



Source: Kenya Tea Development Agency (KTDA)

The use of wood fuel has been instrumental in reducing the fuel cost given the high prices of crude oil but this has not been sustainable. It actually poses a great threat to desertification if the stakeholders do not strongly encourage agro forestry.

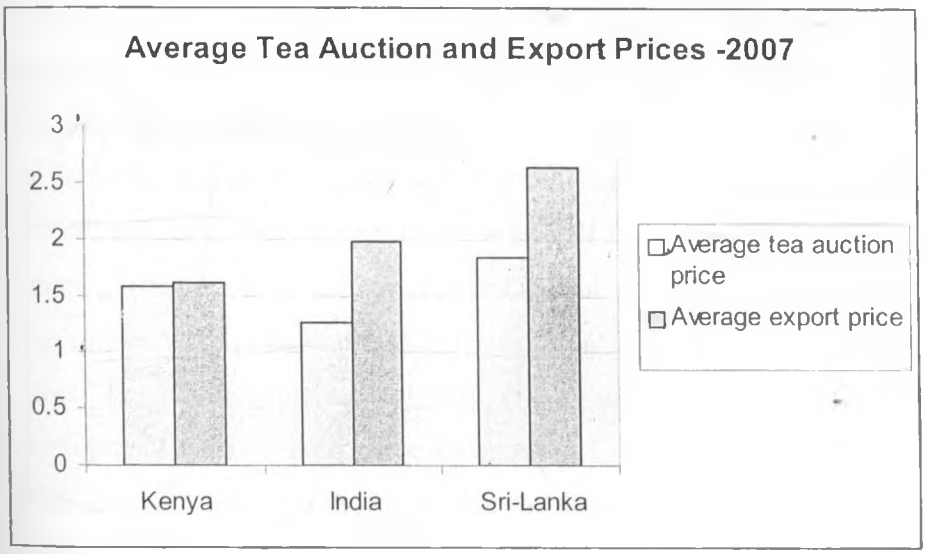
Good infrastructure is vital for good production and marketing of tea. In the tea growing areas, as in many parts of agricultural zones, there is absence of good roads, electricity, telephone and water. Poor road infrastructure which is at its worst during the rainy season results in widespread and lengthy delays in collecting and delivering green leaf to the factories. The result is poor production as well as a compromised quality of tea. There are also inadequate research and extension services in this sub sector. The training of extension officers by the government has declined recently and where it occurs it is not specialized, focusing on general agriculture rather than tea husbandry.

Reliance on few export markets is also a major issue in tea industry. Over 75 percent of Kenya's tea exports are destined to only five countries namely Pakistan, Egypt, UK, Sudan and Afghanistan while the balance is shared among over 46 other countries (GOK,

2007). This situation poses an economic threat in that if any of the five countries were to discontinue purchasing of Kenyan tea for any reason, the country may be left holding large stocks of unsold tea. Reliance on few export markets is largely due to inadequate funding for market promotion activities in emerging markets.

Further, Kenyan tea is largely exported in bulk with value added tea in packets forming less than 10 percent. Export of tea in bulk denies the country employment, as the tea is packaged elsewhere as well as revenue as tea once packaged fetches much higher returns. The Kenyan reputation as a producer of quality tea is lost due to blending with other teas. Due to higher levels of value addition (Blending, Branding, Packaging in consumer packs and product diversification), other countries such as India and Sri Lanka are able to fetch higher prices than Kenya for their teas as in figure 1.6.

Figure 1.7 Average Tea Auction and Export Prices-2007



Source: Tea Board of Kenya

Compliance with international standards and consumer requirement is another issue in the tea industry. Tea consumers worldwide are increasingly demanding for ethically responsible processes and adherence to "Codes of Practice" in respect of Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP). These demands include among others, Provision of good working conditions for workers, Ethical production, Environmental best-practice methods, Compliance with Maximum Residue Levels (MRLs) to ensure food safety. These demands are causing apprehension to the tea

industry owing to the high cost of compliance, which does not necessarily translate to higher returns. The situation is compounded since different consumer organizations require adherence to different standards and audit systems.

1.3.3 Reforms in the Tea Industry

To govern and provide for the control of tea production, the first legal instrument was enacted as the Tea Ordinance, 1934 (No. 46 of 1934) and revised in 1948 (No. 52 of 1948), which became effective on 25th August 1948. The Ordinance created the institution of the Directorate of Agriculture, which was responsible for controlling the production of tea by issuing licenses and permits to growers until 1950 when the Tea Board of Kenya was established under the Tea Ordinance (now CAP. 343, Laws of Kenya) to regulate the industry. The Special Crops Development Authority (SCDA) was established under the Agriculture Act in 1960 to promote the cultivation of cash crops including tea. In 1964, the Kenyan Tea Development Order was promulgated to form Kenya Tea Development Authority (KTDA) to assist smallholder tea growers in the processing and marketing of tea.

The Industry operated successfully until the year 2000, when it was fully liberalized to promote efficiency and competitiveness as well as to attract private sector investment and grower participation in factory ownership and management. It was also expected that programmes were to be undertaken to restructure various institutions in the industry. The Kenya Tea Development Authority (Parastatal) was transformed into Kenya Tea Development Agency, a private company.

Other changes that took place during the liberalization included the repeal of the tea growing license and the removal of tea planting cess.The government also removed subvention in respect of tea extension staff seconded to the smallholder tea factories. The ownership of the smallholder factories was transferred to the small-scale growers under the management of their own managing agent, KTDA.

1.4 Statement of the Problem

The central pillar of export success is sound macro economic policies and stable real exchange rate, which the government must pursue to keep export profitable and production efficient. Although tea export has been the third largest foreign exchange

earner, its performance has not been impressive in the recent past. The tea sub sector has shown a declining performance and as a coping mechanism against poor returns; most small-scale farmers have diversified from tea to other farm enterprises such as dairy farming and horticulture. This is the case in Othaya, Kiambu and some parts of Kericho. Horticulture and dairy farming have been performing reasonably well in comparison to other agricultural activities and this explains the switching of the resources from tea to these activities.

To reverse this downward trend in the performance of the tea sector, then reason for the decline have to be identified. As observed earlier the decline in the tea sector has been attributed to various factors. These comprise both domestic and external factors.

The domestic factors include, high cost of inputs like fertilizer, rising transport cost due to high prices of crude oil and inadequate infrastructure, processing capacity constraints, low and declining real domestic producer prices due to inefficient marketing channels. The external factors emanate from international commodity markets. As in other developing countries the conditions of trade in the world markets tend to restrict Kenya's export. These factors include, compliance with international standards and consumer requirement and bilateral and multilateral trade agreements, which erode the value of exports.

Kenya's economy is highly open and hence variations in real exchange rate are likely to explain a substantial proportion of the generally declining trends in tea export earnings. For instance, the Kenya shilling appreciated in value from an average of Kshs 79.17 to the dollar in the year 2004 to an average of Kshs 68 in the year 2007, i.e. an appreciation of 16percent. This means that the tea sector and other exporter's earnings in Kenyan Shillings declined by 16 percent in the past three years on account of the exchange.

Like many developing countries, Kenya faces with the problem of unemployment. The substantial decline in the performance of this industry could lead to increased unemployment and reduced income, which could lead to higher poverty levels.

This then raises the question; how do we restore high, sustainable growth and competitiveness in this sub sector? This can be achieved by enhancing the quality of tea through value addition, cost cutting measures e.g. introduction of wood fuel as cheaper source of energy compared to crude oil and introduction of efficient marketing system of

the commodity. Government support is also required in improvement of rural infrastructure such as road network to reduce the green leaf collection cost.

1.5 Objectives of the study

The primary objective of this study is to identify the factors that determine tea export supply in Kenya. This will help in tackling the current dissatisfaction by the tea farmers who are switching resources to other activities.

Specific objectives are;

1) To describe the tea export performance in Kenya for the period 1970-2007
2) To investigate the determinants of tea exports.
3) To make policy recommendations for improving the teal export performance in Kenya based on 1 and 2 above.

1.6 Significance of the study

As already indicated before, the tea sub sector contributes significantly to the external performance of the economy. This sector generates and saves scarce foreign exchange by producing beverage which otherwise would have been imported. In addition the sector generates foreign exchange and in doing so, contributes a substantial share to Kenya balance of trade and overall balance of payment. More than half a million small-scale farmers are engaged in production of this vital commodity. This sector performance is therefore crucial to the overall growth of the economy .The farmers should be supported through incentives such as subsidization of inputs, sound infrastructure, efficient marketing channels, and accessibility of affordable credit. If such measures are not taken and the tea subsector declines, this will result to high unemployment levels, reduced income due to declined production and this will have a bearing on poverty. This is because tea incomes are used to finance major household expenditure. Increased productivity and production of tea will increase farm incomes, which will reduce rural urban migration. The stagnation of the tea sector will translate into slower GDP growth, and decline in export earnings.

This study will help generate information, which will be useful in designing appropriate measures on how to support Kenyan tea industry and improve the performance of tea

exports. The study will identify the reason why KTDA farmers are hawking tea to private factories. This will assist the government in meeting Vision 2030 objective of 10% GDP growth.

sThis study is crucial in the sense that if the effect of each factor is known, and therefore it becomes easier for policy makers to formulate short run and long run policies for tea production in the country with aim of increasing tea exports and also show how the factors identified can be manipulated to achieve the desired results. The study could also help the policy maker in examining the effects of various bilateral and multilateral trade agreements. For example market protectionism through tariff and non Tariff barriers in some countries continues to limit market access for Kenyan tea. At the same time, recent bilateral and regional agreements between Kenya's main markets in Pakistan and Egypt as well as other tea producers has led to preference erosion. Further, when Kenya acceded to the EAC Protocol in 2005, the Common External Tariff (CET) on rice rose from 35% to 75% (Technoserve, 2007). This immediately led Pakistan which is the leading importer of Kenyan tea and exporter of rice, to issue a threat stopping further imports of Kenyan tea. These dynamics require an effective consultative mechanism involving stakeholders; the policy makers and trade negotiators so as to safeguard the Kenyan tea in key export markets.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Theoretical Literature Review

Like most sub -Saharan African countries, Kenya's export structure is predominantly composed of primary commodities-mainly tea, coffee and horticulture besides tourism. This has made the export sector more vulnerable to fluctuations in world prices.

In an exchange economy, price is one of the factors, which directs the concurrent flow of resources into alternative uses and the flow of goods and services to ultimate consumers. Prices guide producers in their choice of enterprises and purchase of factors of production. Prices also ration the available supplies of goods and services.

Economic theory suggests that the market supply of a product will depend on the price of a commodity, the prices of other commodities which could be produced and the prices of inputs into the production process. The relationship can be expressed inform of a supply function:

$$Qi=f(Pi, Pj, Pk, T, Ob, P_{1,\ldots\ldots}P_n) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2.1$$

Where Qi denotes the market supply of a product I, which has Pi as its current market price. The prices of alternatives products and k as given as pj and pk and the set of (n) input prices are specified as P_1.....,pn. Assuming the prices of other products and inputs are held constant, we can trace out the relationship between the supply of a commodity and its own price, i.e. the supply curve or supply schedule. Terms of trade and objective of the firm are denoted by T and Ob respectively.

According to Thomas and Nash (1991), it is less likely that the price elasticity of demand for agricultural exports for any individual crop is less than 1.Consequently, when a single country that is not a dominant supplier increases agricultural exports, these may be absorbed with no measurable fall in the market price and the country will increase its exports earnings. So a small supplier of agricultural commodities in the world market faces an indefinitely elastic foreign demand for the crop it produces, and for which changes in foreign country influences only through changes in world prices. However Kenya is a major producer and supplier of tea in the world market. In this respect the

increase of exports of agricultural commodities becomes the main focus for most non-oil developing countries and a way of assuring a harmonious transition towards industrialization.

A World Bank study (1986) found that the incentive structure that exists is the most important determinant of agricultural foodstuff supply. From that study the pricing policy was seen as a major limiting factor of production as domestic price reflects export and import parities that are usually distorted.

The bank in 1985 also analyzed pricing and marketing policy in Africa. It was noted that the second structural adjustment lending (SAL) in Kenya main focus had been on improved marketing and pricing policies in order to provide enough incentives to farmers. The Bank's findings were that despite SAL, agricultural production had not increased. They argued that the supply response of a given crop does not depend only on their own price.

The real exchange rate is a crucial factor in the international market. It influences the global prices of the agricultural commodities. A falling real exchange rate makes exportable goods less profitable. This leads producers of both farm and non-farm exports to direct resources to other activities. As a result, the export sector contracts and the ability of the country to earn foreign exchange are reduced. In addition, outflow of capital is encouraged.

Oyejide (1986) observed that changes in exchange rate policy have significant consequences for a country's domestic relative prices and economic growth through their effects on the real exchange rate. Oyejide defined the real rate of exchange as the terms of trade between the traded and non-traded sectors of the economy, which provides signals for resource movements. Oyejide further observed that the exchange rate policy affects the domestic prices of tradeble goods and non-tradable agricultural commodities through its influence on the entire domestic cost structure.

Oyejide noted that the real rate of exchange is determined in general, by trade policy of the country and foreign prices. In this context, trade policy refers to import tariffs and export taxes. Domestic trade policy creates a wedge between domestic and foreign prices. If an export tax is imposed the domestic price of the commodity is reduced relative to its

foreign prices. This causes a reduction in exports and shift resources away from the export sector.

Valdes (1989) argued that, the best way of studying how government's macro-economic decisions and policies affect agriculture has to evaluate the effects of such policies on the RER. This is due to the fact that correct RER alignment is required if a country is to take advantage of the growth opportunities offered by international trade. Valdes define RER as the ratio of the price of tradables to the price of non- tradables. The prices of tradables are determined by world market prices, nominal exchange rates and trade policies. On the other hand, prices of non -tradables (home goods) are determined domestically, by changes in domestic supply and demand. Valdes argues that RER plays a central role in the profitability of tradables (such as coffee and tea) in agriculture. It is indeed, through RER that trade and macro economic management of the economy, affects agriculture. RER provides a long-term signal for the allocation of the resources among various sectors. Valdes suggest that RER is perhaps the most influential price affecting incentive for agriculture.

Fosu (1992) also observed that a decline (appreciation) in RER tends to stimulate a decline in the price of tradable goods relative to the price of non-tradable goods. The study showed a movement of resources away from the production of tradable goods, including agricultural exports. A continued shift of productive resources away from the production of agricultural export commodities ultimately precipitates continued decline in agricultural export performance.

However appreciation in RER is a plus for the importers of capital inputs such fertilizers, agricultural chemicals, farm machinery and equipments. The importers use less local currency for the acquisition of the inputs. Access to affordable credit is a main factor which farmers, particularly small-scale farmers point out as causing low productivity in agriculture. Inadequate credit to finance inputs such as fertilizers, and capital investment is caused by high interest rates charged by the farmer's Savings and credit co-operative societies and harsh terms and conditions of lending which includes heavy collateral security and short repayment period. In the past Kenyan government through Agricultural Finance Corporation, the Cooperative Bank of Kenya provided

affordable credit to farmers. Due to mismanagement and political patronage, most of these institutions have collapsed or failed to provide these services thus leaving farmers without source of affordable credit. A number of micro finance institutions are however operating in some areas, but they reach only a small proportion of smallholder farmers, and provide very short-term credit and their effective lending rates are high. The formal banking systems are yet to develop credit facilities that particularly suit small scale farming business. There are however a few banks offer favorable credit facilities which include as Equity Bank, K-rep Bank, Family Bank and Fina Bank.

Askari and Cummings (1977) suggest that the supply of an agricultural product to the market will depend on the price of the product, the prices of competing products, the prices of joint products, the prices of inputs, the state of technology, the natural environment and the institutional setting. This study seeks to analyze the price and non-price determinants in tea export earnings in Kenya.

In the simplest model, farmers are assumed to take as their expected price the price received in the previous production period. In this study farmers are assumed to be rational producers who respond to economic opportunities and will be therefore responding positively to price increases and will also influence the prior period's yield in determining production for the current year. The exchange rate is selected since it will influence the cost of inputs such as machinery and fertilizer for increased output and the global price of tea.

Rainfall is expected to positively influence output. Favorable climatic conditions boost the production of tea. High cost of inputs (fertilizer) dampens the production since the farmers use too little or none at all and hence the yields dwindle. High cost of fertilizers also affects the earnings in the sense that when the price of tea commodity goes down in the international market the returns to the farmers diminishes, as has been the case in Kenya.

Structural adjustment policies have got positive impact on agriculture. Removal of exchange controls and import licensing in Kenya led to the full liberalization of the fertilizer market. The government also intervenes in the inputs market through import duties and taxes from which fertilizers are exempt.

Binswanger (1989) identified structural adjustment policies as an important determinant of agricultural output. He observed that the aim of structural adjustment programmes (SAPs) was removal of overvalued exchange rates, abolition of subsidies, reduction of industrial protection and fiscal austerity. These policies therefore improve terms of trade for the agricultural sector in favor of tradables. Binswanger study compared the agricultural growth rates of sub Saharan countries under adjustments. The growth rate under adjustment was discovered to be higher. This shows that African agriculture is responsive to changes in policies.

2.2 Empirical Literature Review

The agricultural export supply responsiveness is so important that numerous empirical studies have focused on this question over the last two decades or so. The virtually unanimous conclusion of the studies that have investigated the determinants of export earnings of agricultural commodities is that exports in LDCs are more responsive to price variables (Tshikala 1986).

Nzioki (2005) studied the effect of price factors in tea export earnings in Kenya. The results showed that the producer price of tea, price of its substitute (in that case coffee), RER affected the tea export performance in Kenya. However the study did not look at other fundamental factors such input costs, weather, infrastructure and structural adjustment policies.

Etherington (1973) in his econometric analysis of the smallholder tea production in Kenya derived a model for predicting the production function of tea. In his study, he used a regression analysis to predict tea exports by vintage approach. He considered a set of explanatory variables to be the number of stumps of a certain area; land quality and quantity, farm microclimate; the present and the past cultural practices in the farm and the distance to the buying centers. The study treated price factors to play a minor role in affecting production of tea unlike the case in this study.

Kagira (1994) in his study on the effect of RER on agricultural exports found that RER influences agricultural exports and in particular tea and coffee, through its effect on their prices. For example the study established that between 1970 and 1990 there was a positive relationship between the RER and the relative agricultural export price ratios. Real depreciation of the RER precipitated an improvement in the relative agricultural

export prices. On the other hand, the real appreciation was associated with the deterioration of the relative agricultural export prices. Thus, the effects of the RER on the relative prices have substantial impact on the structure of the incentives.

Forrest D (1985) in his study to find the potential of expanding tea exports from Kenya did an economic and institution analysis of alternative marketing channels. He found that forces of supply and demand determine tea prices, which tend to fluctuate considerably. He also found that the potential for expanding tea exports exists if value addition was emphasized as well as exploration of the new markets.

Akiyama and Trivedi(1987) analyzed perennial crop supply using a framework that allows for distinction between short run and long run dimensions of the producer decisions while at the same time recognizing the role of technology and institutions. This model was applied to Kenyan tea and the role of KTDA represented by the KTDA expenditure on nurseries, teastumps, field and factory development per hectare of smallholder planted'tea area. The expected price variable for Kenyan tea was proxied with the average of auction prices. The results indicated that, for Kenya the role of KTDA as represented by the expenditure of KTDA, was highly significant in explaining the supply response of smallholders. The estimated short run price elasticity for estate was higher than for smallholders. They concluded that the effect of changes in real producer prices on production, in the short run is mainly through the change in the level and intensity of factor use and in the long run through investments usually through planting and re-planting.

Were at al (2002) analyzed Kenya's export performance. They examined the factors that have influenced Kenya's export volume by disaggregating total exports of goods and services in to three categories namely; traditional agricultural exports (tea and coffee) and other exports of goods and services. For the three categories of exports, an empirical model was specified along the standard trade model that incorporated real exchange rate and real foreign income of a major trading partner as explanatory variables. An additional variable was included as a proxy to capture the constraints. An error correction formulation was used to distinguish between the short run and long run elasticities. Real exchange rate was found to have a profound influence on export performance. The supply response to price incentive for export goods and services was significant. The other

explanatory variables provided mixed results. The study acknowledged that other non price factors such as costs of inputs, labor costs and access to credit play a vital role in production and export supply response, even in the sub-sector like coffee where performance had been poor. The study concluded that flexibility in the exchange rate movements in line with fundamentals of the economy could be favorable. Also, the study advocated for the need of strategic domestic policies to help those sectors that might not be able to cope with the wave of globalization.

Gallagher and Houch (1976) studied the price responsiveness of U.S corn yields by using a multiple regression model. They found out a statistical significant relationship between the net price and corn yields. They contended that any study of corn production changes in response to price changes either market or induced by government policy, should explicitly take into account the relationship between corn and fertilizer prices faced by the farmers and the effect on the yield. This study would assess the impacts of tea prices on tea exports in the market. The World Bank (1983) attempted to solidify the empirical evidence on the price of internationally traded commodities. The Bank analyzed determinants of primary commodity volume of export movements by looking at the factors contributing to the decline in quantities of goods exported. This was done with reference to relationships between commodity prices and their principal determinants (i.e. income and exchange rate).

Tshikala (1986) studied the effects of trade and exchange rate policies on agriculture. The centrality of the real exchange rate in the economic development process was emphasized by the study. The effects of trade and exchange rate policies on the relative prices were found to have had substantial impact on the structure of incentives.

Balasa (1990) indicated that exports in general and agricultural exports in particular are responsive to price incentives in sub Saharan Africa (SSA). The agricultural exports were found to be responsive to changes in RER.The regression coefficients of the RER variable for agricultural exports were uniformly higher for SSA countries than for all developing countries. This was against the popular notion that changes in RER would have less of an effect on exports of SSA than in countries at higher levels of development.

Valdes (1989) attributed this to the fact that, most of African countries overvalue their exchange rates. As a result considerable losses were registered in export market share of four SSA countries, namely Tanzania, Kenya, Ghana and Ivory Coast for the 1974-87 and 1979-1981 periods. The data showed a 1% average decrease in Tanzania's market in its traditional agricultural exports in 1974-78, followed by a 19% decline in 1979-81.The study attributed the loss to the increase in overvaluation of RER.

Gerrmina (1990) examined the effects of structural adjustment policies on the supply conditions of Uganda coffee. A modified Nerlovian model was used. The model concentrated on the determinants of changes in output per hectare or land productivity to which variations in labor can be applied in short run and technology improvement, purchased inputs and tree planting applied in the long run. Due to lack of qualitative data, it was impossible to compute the price elasticity of supply related to higher producer prices of coffee made possible by devaluation. Instead qualitative information was gathered on own producer price of coffee, smuggling, efficiency of the marketing system, the opportunity cost of competing crops and the prospects of introducing new technology. The qualitative evidence suggested that the supply of coffee in Uganda is price inelastic.

Jaeger (1989) analyzed the influence of price, policies natural disaster and rainfall on beverage export and food crop supply separately using pooled cross section time series model. Natural disaster was represented by the percentage of population affected by disasters. Rainfall was proxied with residual from estimating a regression trend line for tea and coffee yields. The use of this proxy for rainfall was based on the assumption that for most countries, variations in average yields of tea and cereal crops will result primarily from variations in weather. The rainfall variable was highly significant in all the equations and the coefficient ranged from 0.15 to 0.46.The price elasticity of exports supply estimated from this model ranged from 0.1 to 0.3 while elasticities with respect to real effective exchange variable ranged from –0.1 to –0.25 and consistent across different types of crops.

Oni (1990) used simple linear models to analyze the production response of oil and palm kernel in Nigeria. The non-price factors included in the models were technology and the weather variables. The technology factor was represented by time trend while the Purvis

weather index was used as the weather variable. Oni's model included prevailing producer prices rather than lagged producer prices because palm producer are more concerned with short run production decisions. The results showed that palm oil and palm kernal production in Nigeria was price inelastic (0.34 for palm oil and 0.22 for palm kernel). The weather variable was statistically insignificant in both results while the square of the trend variable was significant only in the case of palm oil.

Kabubo (1991) also did a study on response of wheat in Kenya. Two equations were estimated, one for output and the other for hectarage. The relative price of wheat was found to be important factor influencing with hectarage. Rainfall was also an important variable in influencing output at any given time. The yield on wheat in the previous period was also found to influence hectarage planted to wheat in the present period while time trend and price indices for fertilizer were found to be significant.

Bond (1989) used dummy variable to represent shifts in weather. Time trend variable was used to capture the impact of technology and applied the model to nine countries in sub Saharan Africa. The results showed that the price elasticity was significant only in two countries; Ghana and Kenya, where long run elasticity was found to be 0.34 and 0.16 respectively.

2.3 Overview of the Literature Review

From the literature reviewed, there is a general consensus that price and non-price factors influence the agricultural price incentive structure, particularly in relation to agricultural export prices. The price factors identified include price of the commodity itself, price of its substitute, input prices, prices of crude oil and real exchange rate. The non-price factors include the weather pattern, structural adjustment policies and accessibility of credit.

This influence in turn affects the agricultural performance. The studies reviewed have shown that when the prices are distorted, the output of agricultural products will be affected through reduced allocative efficiency in the static sense (given factor supplies and technologies) but more importantly through the long run negative effects on agricultural labor supply and investment. All these factors are likely to be affected by relative price changes, for example higher prices of tea will attract more private capital,

both physical and human into tea industry. Moreover the higher rates of returns will attract more government expenditure, which may include rural infrastuctural facilities like good road networks and power supply.

The few studies on tea export performance in Kenya have not been comprehensive. For instance, the study by Nzioki (2005) looked at the role of tea prices, prices of other substitute, RER in determining the value of tea export earnings. The study omitted important factors like cost of inputs, weather pattern and structural adjustment policies.

Kagira (1994) in his study on the effect of exchange rate on tea and coffee export performance only concentrated on the real exchange rate and the prices leaving out crucial non-price factors. He also did not perform important tests such as stationarity tests, which are vital to avoid spurious results.

This study hopes to be more comprehensive by studying both price and non-price factors influencing tea export earnings in Kenya. The study will use time series data and will carry out necessary normality and stationarity tests.

CHAPTER 3

3.0 METHODOLOGY

3.1Theoretical Framework

The efficacy of the price systems in agricultural production remains intact, but the overbearing concern that once prices are right farmers will increase their output requires that studies be continually carried to establish supply response to both price and non-price factors.

Most crop supply studies use the Nerlovian model. The reason for the application of the model is due to its wide use as well as its comprehension (i.e. it can be easily understood) making it obvious choice for analysis of supply response. This is due to the fact that lagged models are dynamic as they take into consideration future expectations as well as the length of adjustment process. The Nerlovian Model is dynamic and it states that output is a function of expected price, output (area) adjustment and some exogenous variables especially for developing countries.

The simple Nerlovian Model basically consists of three equations:

$$A^*_t = a_0 + a_1 P^*_t + a_2 Z_t + u_t \quad \ldots\ldots 3.1$$

$$P^*_t = P^*_{t-1} + b\,(P_{t-1} - P^*_{t-1}) \quad \ldots\ldots 3.2$$

$$A_t = A_{t-1} + Y\,(A^*_t - A_{t-1}) \quad \ldots\ldots 3.3$$

Where A_t and A^*_t are actual and desired output at time t, P^*_t is expected price at time t and b and y are the expectation and adjustment coefficients respectively. Z_t represents other exogenous factors affecting supply at time t.

There is however differences in the way the model have been employed in actual empirical work (Askaris and Cummings, 1977). Most of these distinctions can be grouped in three categories: modifications affecting the variables used by Nerlove, inclusion of factors of particular interest in the situation under investigation (corresponding to the variable z in equation 3.1) and attempts to represent quantitatively situations not considered by Nerlove.

Nerlovian Model has got many shortcomings and therefore, many researchers employ a modified form of the Nerlovian adjustment lag model that captures technological and

institutional constraints hence allowing only certain number of intended variables to be realized during a given time.

The model uses integrated time-series data, which is subject to the danger of spurious regression. It is not also possible to give an adequate distinction between short-run and long run elasticities.

Supply functions have also been used to analyse the effect of price and non-price factors in tea exports for instance Nzioki (2005) and Kagira (1994).

The methodology in this study will draw heavily on the empirical work of Nzioki (2005) where the factors that influence the tea export earnings will be looked into incorporating important determinants like rainfall, labor, transport cost, cost of inputs and structural adjustment policies.

3.2. Model specification

This study will use export supply function which can be specified as follows,

$$X_t = b_0 + b_1P^t - b_2P^m + b_3RER - b_4Zt - b_5WR - b_6T + b_7W + b_8SAP + U_t \quad \text{.....(3.4)}$$

Where:

X_t= Quantity of tea exported at time t

P^t =Real producer price of Tea

P^m =Average annual price of milk (introduced to reflect possible shift of resources from tea in periods decline in tea performance)

RER= Real exchange rate

Z=input prices (fertilizer)

WR= real wage rate per kilogram of tea.

T= Transport cost proxied by the fuel prices.

W= Weather pattern (Dummy Variable)

SAP= Structural Adjustment Programme

U_t = Error term

Tea export is primarily a function of real exchange rate, prices of tea in the global market, input costs, labor costs, and weather pattern, prices of tea substitute (milk), transport cost and structural adjustment policies

However estimation of the above function may result in residuals that violate the assumption of normality of the error terms. This is a simplifying assumption of the classical normal linear regression model, and must be satisfied for the method of ordinary least squares to be the best linear unbiased estimator. To ensure the normality of the residuals, the estimation equation used in this study is expressed in logarithmic form. The transformation is justified because it ensures that the errors are both homoskedastic and normally distributed.

The export function can be specified in log-linear form as follows;

$$\ln X_t = b_0 + b_1 \ln P^t - b_2 \ln P^m + b_3 \ln RER - b_4 \ln Z + b_5 \ln WR - b_6 \ln T + b_7 W + b_8 SAP + U_t \quad \ldots\ldots(3.5)$$

Co-integration and error correction technique will be used in this study. The ECM specification is based on the idea that adjustments are made so as to get closer to the equilibrium relationship.

3.3 Justification for using co-Integration and error- correction approach

The use of co-integration and error- correction technique overcomes the problem of spurious regression and gives distinct and consistent estimate of long-run and short-run elasticities that satisfy the properties of the classical regression procedure. This is because all variables in the ECM are integrated of order zero,1(0). Spurious regression and inconsistent and indistinct short-run and long-run elasticity estimates are major problems exhibited by traditional Adaptive Expectation and Partial Adjustment Models. An ECM specification represents a forward looking behaviour, such as the solution of a dynamic optimization problem can be represented by an ECM. The ECM can thus be interpreted as describing farmers reacting to 'moving' targets and optimizing their objective function under dynamic conditions.

3.4 Hypothesis of the study

The study made the following hypothesis:

1. A positive relationship exists between the real producer price of tea and the quantity of tea export. This will be tested against the null hypothesis that there is no relationship between real producer price of tea and export earnings. It is expected that when real producer price of tea increases, the farmers will increase the output of tea and hence more earnings.
2. A negative relationship exists between the price of milk and output of tea. This will be tested against the null hypothesis that a positive relationship between the area under tea production and the price of milk. It is expected that when the real producer price of tea falls, tea farmers will switch to other substitutes (dairy farming in this case)
3. A positive relationship exists between real exchange rate and the quantity of tea exports. This will be tested against the null hypothesis that a negative relationship exists between the two.
4. A positive relationship exists between the real wage rate per kilogram of tea and the quantity of tea export. This will be tested against the null hypothesis that a negative relationship exists between the two. It is expected that when the real wage rate per kilogram of tea goes up the tea farms attract more casual laborers and hence the farmer is able to pluck all his produce.
5. A negative relationship exists between the cost of fertilizer and the tea export. This will be tested against the null hypothesis that a positive relationship exists between the two.
6. A negative relationship exists between transport cost and the value of tea export. This will be tested against the null hypothesis that a positive relationship exists between the two. It is expected that when the fuel price goes up the real producer price goes down and so is the volume of exports.
7. A positive relationship exists between the weather pattern and tea export. Favorable weather conditions boost the production of tea and this increases the

earnings by farmers. This will be tested against the null hypothesis that a negative relationship exists between the two.

8. A positive relationship exits between structural adjustment policies in agriculture and this will be tested against the null hypothesis that a negative relationship exits between the two.

A dummy variable of (1) will be used for the SAP reform period otherwise (0) will be included to capture the effect the reforms had on tea production. The effects of the policies has been improved incentives to producers, correcting currency over valuation and shifting terms of trade in favour of agriculture.

3.4.0 Econometric Tests:

Equation 3.5 was estimated by ordinary least squares (OLS). A specification associated with error correction model (ECM) was applied. By using cointegration and correction model, the study established the short run and long run equilibriums. The appropriate stationary tests for stationarity for all the variables used were performed to avoid spurious regression results. When the variables were not stationary, they where differenced to achieve their stationarity. Co-integration test for the series with higher order of integration was performed.

3.4.1 Stationarity Tests:

It is known that most macro-economic time series data are not stationary. That is, are likely to be trended or integrated and as per definition, the variables may have a mean that changes with time and non-constant variance. This means that working with such variables in their levels will give a high likelihood for spurious results and furthermore no inference can be made since statistical tests like F-distribution or T-distribution are invalid. So the first step is to test whether the variables are stationary or to test the level of integration through the Augmented Dickey Fuller unit root test. It has been argued that Dickey-Fuller (DF) test fails to take in to account possible auto-correlation in error process. The ordinary least squares (OLS) estimates of the variants of the DF test will be inefficient if the error term is auto-correlated. As a solution to this problem, this study employed the Augmented Dickey-Fuller (ADF) test of the following form.

$$\Delta X_t = \beta_o + \gamma T + \beta_1 X_{t-1} + \beta_i \sum_{1}^{n} \Delta X_{t-1} + \mu_t \quad \text{..... (3.6)}$$

Where β o, β_1 and β_1 are the estimated parameters. T is the time trend variable and U_i is the error term which is independently and identically distributed. In each equation, the null hypothesis is that non stationarity exists. The acceptance of the null hypothesis confirms the presence of a unit root.

This study adopted equation 13 above considering that it takes in to account stochastic trend and constant rather than just assuming that there exists a stationarity trend. Further more since the data generating process of the model is unknown; the use of this equation ensures that the deterministic component present is taken care of as much as possible.

3.4.2 Co integration analysis and error Correction Mechanism

If a variable contains a unit root then it is non-stationary and unless it combines with other non stationary series to form a cointegration relationship, then the regression involving the series can falsely imply the existence of meaningful economic relationship. Variables are said to be cointegrating if a linear combination of these variables assumes a lower order of integration.These variables must always be of the same order. If cointegration is established, the relationship between the independent and dependent variables will be most efficiently represented by an error correlation model (see Engle and Granger). The error correction specification facilitates the analysis of the short run effects on the dependent variable and also suggests the speed of adjustment to the long run equilibrium. The study applied the Augumented Dickey Fuller (ADF) test rather than the levels of the series.

Following the work of Engle and Granger (1987), the cointegrating regression is specified as;

$X_t = \alpha_o + \alpha_1 Z_t + \varepsilon_t$ ..... (3.7)

The residual of the equation $\varepsilon_t = (X_t - \alpha_o - \alpha_1 Z_t)$ is simply the I (1) series. The residuals from the linear combination of non stationary series which are themselves stationary, hence the study accepts that the I(1) series as cointegrating and residuals from the co-

integrating regression is a valid error correction term which is then built into an error correction model (ECM)

3.4.3 Diagnostic tests:

Diagnostic tests are typically used as means of indicating model inadequacy or failure. For example, in the case of linear regression model which is estimated by OLS, a series of the assumptions required for OLS to be the best linear unbiased estimator (BLUE) appears to be violated. These assumptions include serially un-correlated and homoskedastic error-term, absence of correlation between the error-term and regressors and correct specification of the model. Applied econometric work can be viewed as consisting of a number of steps, including specification of the model(s) estimation and model evaluation. Diagnostic testing plays an important role in the model evaluation stage of econometric studies (Otto, 1994). This study carried out various diagnostic tests including AR for autocorrelation of residuals, the ARCH for heteroscedasticity errors, normality test for distribution of the residuals and the RESET test for the regression specification. In addition CUSUM test for stability was carried out.

3.5 Data Sources

Secondary data was used covering the period, 1970-2007. Annual farm gate producer price of tea was obtained from the various issues of statistical abstracts and economic surveys. In estimating the export supply response to price, real producer price is the most suitable price variable to use as it captures changes in product prices, intermediate input costs, real exchange rates and the nominal value added price to the economy wide price level. The real producer price of tea was obtained by dividing the farm gate producer price by the consumer price index. Consumer price index was obtained from the World Bank library.

The annual producer price of milk was obtained from statistical abstracts and economic surveys. The real producer price of milk was also obtained by dividing the farm gate producer price by the consumer price index. Tea export figures were obtained from the Tea Board of Kenya, World Bank documents, statistical abstracts and economic surveys.

The price indices of fertilizers were collected from various issues of economic surveys. To get the price indices of fertilizer, the index number splicing method was applied to convert the figures into a common base year. The method of combining two or more overlapping series of index numbers into a one continuous series is known as splicing. Splicing arises in order to make comparison possible.

The rainfall data was collected from the Meteorological Department in Nairobi. The annual average rainfall for the main tea growing districts of of Kiambu, Nyeri, Kericho, Kisii, Kapsabet, and Meru were taken to represent the annual rainfall for the country in a given year. The rainfall was then approximated using a dummy variable, to which a value of (1) was assigned if there was adequate rainfall in that particular year (0), otherwise.

3.6 Estimation method

The study employed the ordinary least squares method to run the regression using E-views statistical programme.

CHAPTER 4

4.0 REGRESSION ANALYSIS AND RESULTS

4.1 Descriptive Statistics

It is important to examine whether the data exhibits normality before embarking on details of empirical issues. Economic data is mostly skewed (non-normal), possibly due to the fact that it has a clear floor but no definite ceiling. Also there could be the presence of outliers. The Jarque –Bera statistic test is used to test normality of the series. It utilizes the mean based coefficient of skewness and Kurtosis to check normality of variables used. Skewness is the tilt in the distribution and should be within the -2 and +2 range for normally distributed series; Kurtosis put simply is the peakedness of a distribution and should be within -3 and +3 range when data is normally distributed. Normality test uses the null hypothesis of non-normality. If the probability value is less than Jarque-Bera Chi-square at the 5% level of significance the null hypothesis is not rejected. The table below gives the summary of the descriptive statistics of the data used in the study.

Table 4.1 Summary of Descriptive Statistics

Date: 01/03/09
Time: 11:41
Sample: 1970 2007

	LNRMPL	LNRPTL	LNRWR	LNER	LNX	LNZ	WR
Mean	2.435518	1.462888	3.617948	3.303202	18.72599	4.662707	0.67567
Median	2.231089	1.321756	3.521052	3.188004	18.91041	4.768368	1.00000
Maximum	4.356709	2.890372	5.023881	4.865224	19.67270	5.527562	1.00000
Minimum	0.048790	0.095310	1.778336	1.423108	17.21913	2.742323	0.00000
Std. Dev.	1.322781	1.037887	1.041489	0.977131	0.662582	0.776264	0.47457
Skewness	-0.232650	0.057195	-0.202905	0.013257	-0.369352	-1.022190	-0.7505
Kurtosis	1.978391	1.409252	1.764475	2.087021	2.080062	3.171162	1.56333
Jarque-Bera	1.942790	3.921328	2.607272	1.286109	2.145955	6.488540	6.65590
Probability	0.378555	0.140765	0.271543	0.525684	0.341989	0.038997	0.03586
Observations	37	37	37	37	37	37	37

Transport cost variable, export and input variables are not normally distributed. This is likely to impair the normality of the residuals forming the long-run relationship. However the logarithmic transformation has reduced this effect. The descriptive statistics among other things, give guide on which of the equation is more able to yield better results and

highlight on possible problems to encounter. However there is need to supplement the statistics by more incisive analysis such as the correlation matrix.

The correlation matrix is an important indicator that tests the linear relationships, between the explanatory variables. The matrix also helps to determine the strength of the variables in the model, that is, which variable best explains the relationship between tea exports and its determinants .This is important and helps in deciding which variable(s) to drop from the equation. The correlation matrix of the variables is presented in the figure below.

Table 4.2 Correlation matrix.

	LNRMPL	LNRPTL	LNRWR	LNER	LNX	LNZ	WR
LNRMPL	1.000000	0.959712	0.961593	0.973014	0.968897	0.953657	-0.196366
LNRPTL	0.959712	1.000000	0.943775	0.939831	0.947874	0.868690	-0.133986
LNRWR	0.961593	0.943775	1.000000	0.942516	0.937508	0.905979	-0.218015
LNER	0.973014	0.939831	0.942516	1.000000	0.959750	0.911562	-0.180473
LNX	0.968897	0.947874	0.937508	0.959750	1.000000	0.941301	-0.069324
LNZ	0.953657	0.868690	0.905979	0.911562	0.941301	1.000000	-0.226170
WR	-0.196366	-0.133986	-0.218015	-0.180473	-0.069324	-0.226170	1.000000
SAP	0.835799	0.895975	0.835279	0.812142	0.787286	0.710197	-0.173742

The study shows that there is positive high correlation between real milk price, real tea price, real wage rate, transport cost, export volume and input variables. Low negative correlation exists between SAP variable and weather variable. High correlation indicates a serious problem of multicollinearity. There exists no high negative correlation among the variables.

4.2 Time Series Properties

Non-stationarity of time series data has often been regarded as a problem in empirical analysis. Working with non-stationary variables leads to spurious regression results from which further inference is meaningless. The test for the order of integration is the first step in any cointegration analysis. An integrated series is non-stationary series. The Augmented Dickey –Fuller (ADF) test was used to test stationarity of the series. The results of the test for the variables in levels are presented in the tables below.

Table 4.3 (a) Unit root tests at levels

Variable	ADF Statistics	1% critical value	5% critical value	comments
LNRMPL	2.064604	-2.6300	-1.9507	Non stationary
LNRPTL	1.784354	-2.6321	-1.9507	Non stationary
LNRWR	-2.896809	-4.2324	-3.5386	Non stationary
LNER	-3.420181	-4.2324	-3.5386	Non stationary
LNX	-3.788776	-4.2324	-3.9586	Non stationary
LNX	-2.306660	-4.2324	-3.5386	Non stationary

Table 4.3 (b) Unit root tests at first difference

Variable	ADF statistics	1% critical value	5% critical value	Comments
LNRMPL	-2.228035	-2.6321	-1.9510	stationary
LNRPTL	-2.626178	-2.6321	-1.9510	stationary
LNRWR	-5.848974	-4.2412	-3.5426	stationary
LNER	-4.404265	-4.2412	-3.5426	stationary
LNX	-6.617187	-4.2412	-3.5426	stationary
LNZ	-4.355868	-4.2412	-3.5426	stationary

The test shows that no variable is stationary at levels. The test shows that all the variables are stationary after first differencing. The next step after finding out the order of integration was to establish whether the non-stationary variables at levels are co-integrated. Differencing of the variables to achieve stationarity leads to loss of long-run properties.

4.3 Cointegration

The concept of cointegration implies that if there is a long-run relationship between two or more non stationary variables, deviations from this long-run path is stationary. The Engle-Granger two step procedures was used to generate residuals from the long-run equation of the non-stationary variables, which were then tested using ADF test. A table reporting the stationarity test for the residual of the Co-integrating regression is shown in

the appendix of the studyThe residuals were found to be stationary at 1%, 5% and 10% levels of significance by ADF test. The residuals become the error correction term and consequently, an error correction formulation is adopted.

4.4. Error Correction Modeling

After accepting Co-integration, the next step was to re-specify the equation 3.5 to include the error correction term (ECM). This term captures the long run relationship. It reflects attempts to correct deviations from the long-run equilibrium and its coefficient can be interpreted as the speed of adjustment or the amount of disequilibrium transmitted each period tea exports. A high R^2 in the long-run regression equation is necessary to minimize the effect of small sample bias on the parameter of the co-integrating regression, which may otherwise be carried over to the estimates of the error-correction model. The result of the error correction model is represented in the long run model

4.5. Diagonistic tests

Before embarking on the discussion results, the error correction model was subjected to a number of diagonistic tests in order to evaluate its validity. The diagonistic tests outcome were satisfactory. These were the LM-autocorrection which supplements the DW-statistics, the ARCH (Autoregressive Conditional Heteroscedasticity), the Jarque-Bera test for normality of the residuals and the RESET test for specification of the regression. In addition to the above tests, CUSUM test was done. The results obtained revealed that the parameters were stable and the model could be used for forecasting at the 5% level. Apart from Jarque-Bera normality test, which is distributed as Chi-square statistics, the rest of diagonistic tests utilized the F-statistic distribution. The result of co-integrating regression is given below.

Table 4.4. (Cointegrating regression, reporting the long-run relationship)

Dependent Variable: LNX
Method: Least Squares
Date: 02/03/09 Time: 14:29
Sample(adjusted): 1971 2007
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.65126	0.384889	40.66431	0.0000
LNRPTL	0.319523	0.086629	3.688415	0.0009
LNRMPL	-0.149965	0.125580	-1.194178	0.2421
LNRWR	0.036449	0.066556	0.547636	0.5881
LNER	0.257511	0.083392	3.087937	0.0044
LNZ	0.413844	0.099834	4.145331	0.0003
WR	0.158720	0.040613	3.908092	0.0005
SAP	-0.123694	0.090279	-1.370133	0.1812

R-squared	0.678772	Mean dependent var	18.72599
Adjusted R-squared	0.973648	S.D. dependent var	0.662582
S.E. of regression	0.107559	Akaike info criterion	-1.432749
Sum squared resid	0.335498	Schwarz criterion	-1.084442
Log likelihood	34.50585	F-statistic	191.0178
Durbin-Watson stat	1.827902	Prob(F-statistic)	0.000000

The error term is the ECT (error correction term) and it is derived from the above cointegrating regression and is expressed as;

$ECT = I*\ln X_t - 15.65126 - 0.319523*\ln P^t + 0.149965*\ln P^m - 0.036449*\ln WR - 0.257511*\ln RER - 0.413844*\ln Z - 0.158720*W + 0.123694*SAP$

The long-run relationship for tea export supply is thus;

$\ln X_t = 15.65126 + 0.319523*\ln P^t - 0.149965*\ln P^m + 0.036449*\ln WR + 0.257511*\ln ER + 0.413844*\ln Z + 0.158720*WR - 0.123694*SAP$

In the long-run model, the real exchange rate variable has the expected sign. The coefficient of real exchange rate is 0.26 and is statistically significant. The real price of tea variable has the expected sign; it has the coefficient of 0.32 and is highly significant. The real producer price of milk variable had the expected negative sign; the coefficient is 0.15 and is statistically insignificant. The real wage rate variable has the expected sign and the coefficient was found to be 0.04. The variable was however found to be statistically insignificant. The input price variable coefficient was found to be 0.41 and was highly significant. The weather variable had the expected positive sign and was also found to be highly significant.

The input price variable coefficient of 0.39 was found to be highly significant at both 5% and 1% levels of significance. It has unexpected positive sign. This can be explained by the fact that the fertilizer prices has been increasing over time but farmers have not responded by reducing application of the input as economic theory suggests. It is hard to substitute fertilizer input by any other farm inputs. Tea exports have also increased over time as farm input increases. This could also be explained by the fact that tea is a fixed crop and farmers do not react by uprooting tea when input prices goes up. Also, by authority of K.T.D.A factories, farmers must order fertilizer mainly through their factories or at least apply their own purchased fertilizers.

The coefficient of weather variable in the long-run model was found to be 0.16. The SAP variable was found to have unexpected sign and it turned out to be statistically insignificant. This can be explained by market imperfections in developing countries which hinders implementation of structural adjustment policies.

The lagged error correction term (ECT), included in the export function to capture the long-run dynamics between the cointegrating series is correctly signed (negative) and it is statistically significant both at 5% and 1% levels of significance. It indicates a rapid response of exports to deviation from long-run relationships with each of the variables. In particular, negative deviations from the stationary relationship are "corrected" by increase in exports. The coefficient 0.86 is stable and statistically significant. This indicates the speed of adjustment of 86% from the actual exports in the previous year to equilibrium rate of tea exports. This is high and implies that deviations from the long-run equilibrium are almost corrected in almost on time period.

Table 4.5, (An error correction model reporting the short-run relationship)

Dependent Variable: DLNX
Method: Least Squares
Date: 22/03/09 Time: 14:59
Sample(adjusted): 1972 2007
Included observations: 36 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.93463	0.293037	54.37754	0.0000
DLNRPTL	0.387821	0.064744	5.990095	0.0000
DLNRMPL	-0.196950	0.095576	-2.060663	0.0491
DLNRWR	0.021486	0.055320	0.388387	0.7008
DLNER	0.271191	0.063262	4.286802	0.0002
DLNZ	0.392032	0.081115	4.833007	0.0000
WR	-0.061441	0.029882	-2.056141	0.0496
SAP	-0.144791	0.080795	-1.792084	0.0843
RESID_01	-0.859678	0.141792	7.191380	0.0000

R-squared	0.687872	Mean dependent var	18.70000
Adjusted R-squared	0.984279	S.D. dependent var	0.652574
S.E. of regression	0.081822	Akaike info criterion	-1.956234
Sum squared resid	0.180759	Schwarz criterion	-1.560354
Log likelihood	44.21220	F-statistic	274.9180
Durbin-Watson stat	2.202920	Prob(F-statistic)	0.000000

In the short run model, the lagged real price coefficient of tea was found to be 0.39. It is highly significant at 5% and 1% levels of significance. We therefore reject the null hypothesis and conclude that real price of tea is an important determinant of tea exports. The sign is positive as expected for the real price of tea.

The lagged real price of milk coefficient was found to be 0.20 and has the expected negative sign. It was found to be significant at the 5% and 1% levels of significance. We therefore conclude that real price of milk is an important determinant of tea exports at any given time.

The real wage rate coefficient is 0.02. It was found to have the expected sign but turned out to be highly insignificant. We therefore accept the null hypothesis and conclude that the real wage rate is not an important determinant of tea exports. The real exchange rate coefficient is 0.39 and has the expected sign. It was found to be highly significant both at

5% and at 1% levels of significance. We therefore reject the null hypothesis and conclude that real exchange rate is an important determinant of tea exports.

The weather variable coefficient was found to be 0.06. It has the expected positive sign. It was found to be significant at both 5% and 1% levels of significance. We therefore conclude that weather is an important determinant of amount of tea exported in any given year. The structural adjustment policies coefficient was found to be 0.14. It was found to have the unexpected negative sign. The variable was found to be insignificant both at 5% and 1% levels of significance. We conclude then conclude that structural adjustment policies are not an important determinant of tea exports. The input price variable coefficient is 0.41 and has unexpected sign. The variable is significant at both 5% and 1% levels of significance. We therefore reject the null hypothesis and conclude that input prices are an important determinant of tea exports.

4.6 Summary of the regression results

The coefficient of real exchange rate in the short-run model is 0.39 and represents the short-run elasticity of exports of tea to real exchange rate. The coefficient being positive and significant shows that tea farmers are responsive to exchange rate of the local currency hence the real price improvement in the short-run.

The SAP variable had an unexpected sign and was found to be statistically insignificant. The main aim of SAP was to devaluate the local currency in favour for local farmers especially those dealing with exportables like tea. This perhaps suggests that SAP policies cannot function in the context of sub-Saharan African countries mostly due to market imperfections. The real wage rate variable had the expected sign but it was highly insignificant in explaining export supply function. Perhaps, as the real wage rate increased, farmers used less of hired labour and substitute it with family labour which is abundant in Kenya.

CHAPTER 5

5.0 CONCLUSIONS AND POLICY RECOMMEDATIONS

5.1 Results

The study set out to identify the factors that determine tea export supply in Kenya over the period 1970- 2007. The study specifically aimed at describing the tea export performance in Kenya during this period as well as investigating the determinants of tea exports.

The real producer price of tea was found to have a profound effect on tea export supply response in Kenya. The price elasticity was found to be 0.39 and it implies that a unit percentage increase in price leads to 39% increase in tea exported in a given time period. This implies that when prices of tea increase farmers respond by increasing tea output perhaps by increasing the intensity of variable factors of production and hence higher exports of tea.

In the short run model, the real exchange rate was found to be significant in explaining tea exports. High exchange rate was found to have an effect of stimulating tea production. This could be explained by the fact that exchange rate influences the farm gate price of tea such that depreciation of the local currency leads to higher pay per kilogram on the side of the farmer.

The structural adjustment policies were found to be insignificant in explaining the export performance of tea. This could be explained by the fact that liberalization of tea sector was not completed and KTDA continues to run the tea sector on behalf of farmers. The real wage rate was found to be insignificant in explaining tea export performance. The input price variable was found to influence the amount of tea exported at a particular time. This implies that as the prices of input increased so does the amount exported . This can be explained by the fact that the inputs used in tea production are hard to substitute and the existence of laws by KTDA management on input use by all farmers in tea growing regions.

Weather variable was found to influence the amount of tea exported. This implies that as the amount of rainfall in tea producing regions increase, the amount of tea produced and

hence exported increases. The real price of milk in tea growing regions negatively affects the amount of tea exported at any given time period. This reflects the shifting of factors of production to areas where they attain more returns.

5.2 Conclusions

The results obtained raise a number of policy implications in increasing the exports of tea by the country. The real exchange rate was found to be a very important factor in influencing the quantity produced and hence quantity exported. The positive relationship suggests that tea producers are responsive to price incentives through exchange rate. There is therefore a need to find ways of stabilizing the exchange rates, for instance through Central Bank intervention when the local currency has appreciated much.

The price variable was found to be a very important factor in influencing tea exports. This implies that farmers are responsive to price incentives. This suggests that the government should come up with such programs like price stabilization schemes such that farmers are cushioned in time of depressed global tea prices. The input variable was found to be a very important determinant of tea exports. The positive relationship implies that farmers still have to apply fertilizers to the crop owing to the fact that tea requires high amount of nitrogen in a particular growing season. Farmers can increase the intensity of fertilizer use when fertilizer prices are lower. This can be done by ensuring input costs especially fertilizers are stable and predictable. The current fluctuations and spiraling of fertilizer prices hinder planning by farmers which eventually lead to decrease in fertilizer use hence lower yields.

The structural adjustment policies did not have the expected sign and was not significant. However, there is a need for the re-examination of these policies pursued with a view of making them more workable. There is the need for complete and careful liberalization so that output prices benefit farmers more in order to enhance their overall production and export of tea.

The real wage rate variable had the expected sign but was highly insignificant. There is however the need to lower the labour costs since they are one of the highest among tea exporting countries. The labour costs can be lowered by introduction of machines for tea

harvesting. However, this will have implications on the unemployment in the country since many workers would be rendered jobless.

The time trend variable was dropped from the model due to its high correlation with other variables. However, the use of improved technology should be encouraged through research and development. The government should come up with technological innovations and inventions that can address the unique needs of tea farmers for example, developing high yielding tea clones.

The overall objective of the study was to investigate the impact of exchange rate on tea exports in the country. Having achieved that, there is need now for putting forward relevant policy recommendations. These would see a drastic improvement in tea sub-sector to realize the ultimate goal of enhancing production of tea.

5.3 Recommendations

The focus of policy should be in relaxing the constraints in tea production as well as in its marketing in both domestic and international market. To address these challenges that farmer's face that leads to fluctuations in tea production and hence exports, the government needs to place incentives in place. The real exchange rate was found to have profound effect on export supply response. While maintaining a stable exchange rate is important, strategies that lead to a relatively overvalued exchange rate could be a disincentive to exports, implying that flexibility in the exchange rate movements, in line with the fundamentals of the economy might be beneficial. The government should also interfere when the exchange rate is overvalued through Central bank to promote exports .

The government should enhance the real producer price of tea through such schemes like guarantee schemes (price stabilization). Yearly variations adversely affect decision making as far as production, income and expenditure schedule is concerned. There is therefore a strong case for intervention to create mechanism that can not only stabilize price but also give a minimum price guarantee to farmers.

There is also a need to improve extension services system, increase effectiveness and more towards demand driven delivery system. The link between research, extension and the farmers should be improved. This can be achieved through enhancing private sector participation in extension service delivery. This will enable farmers to switch from

competing (substitute crop ventures) and traditional crops to more high income yielding crops like tea.

The country should exploit its competitive advantage in order to address the trading aspects through innovative marketing strategy. Kenyan tea is normally geared towards global market that suffers from over supply and poor quality tea.

The niche markets are growing and the same time emerging offering premiums for good quality tea. Kenyan tea farmers especially small-holder tea holders produce high quality tea that qualifies to enter these emerging markets. Kenya should also try to solve trade issues with its trade partners like Egypt and Pakistan which usually has trade disputes with. This will ensure that our traditional tea destinations are safe and ensure stable tea auction prices. Kenya needs to promote Kenyan tea through trade fairs especially in emerging economies especially in China, East Europe and former Soviet republics.

The country should also undertake value additions like Rwanda and take the lead in the region in adding value to domestically produced tea. This will create more demand for Kenyan tea with higher returns to farmers. The county should also take the advantage of economic integration, particularly the East Africa Cooperation, COMESA, together with African Growth Opportunity Act (AGOA); in these partnerships there is potential for export opportunities that can be explored to Kenya's advantage.

The government should also enhance domestic tea consumption in addition to promoting tea exports. Kenya's domestic consumption stand at 4% of the total national production and it is the lowest in tea producing countries. The tea drinking culture should be enhanced to wade off competition from soft drinks and imported finished (processed) beverages. The well developed Kenyan tourism sector should also be used as a ready market for Kenyan tea.

To compete globally, the government should help to reduce costs including transaction costs like electricity and fuel that make tea production and marketing expensive and hence uncompetitive in the region.

Besides the recommendations given above, the following can also help in addressing the problems faced in the sector. Enhancing the role of Agricultural finance corporation (AFC) in provision of credit facilities to tea farmers to enable them purchase required inputs as well as farm implements needed for increased production.

There is also the need to channel more funds and monitoring of farmers Sacco's to which tea farmers are members. This will not only make credit to farmers available but also ensure that farmers are not exploited.

There is also the need for total liberalization of tea sub-sector and monitoring by the government to ensure that farmers are not exploited by management. This will lead to farmer's total control of the tea sector than in the present case where KTDA is the umbrella body of farmers. The individual factories would thus be able to produce and export tea more efficiently than in the current scenario where KTDA controls all tea production to marketing operations. Strategic supportive domestic policies are vital the in tea sub-sector where liberalization affects the industry negatively.

There is need for improvement in the efficiency and performance of tea factories. This calls for adoption of more modern methodologies of tea processing like embracing the continuous fermenting unit (CFU) in factories to cut labour costs. The factories could also adopt mechanisms to use firewood instead of furnace oil to heat boilers during tea processing. This can cut down the tea processing costs. Other measures include micro projects by factories to generate their own power instead of depending on the national grid for power supply. As such, there are needs to address problems such as poor governance, huge debts and structural problems that plague factories. There is the need to improve the governance, transparency and accountability of management in the tea sub-sector.

5.5 Areas for Further Research

This research paper has not dealt with all the factors that determine the export of tea in the country. Such factors include the availability of credit to farmers which the study did not capture due to data problems. With the availability of reliable information about credit to farmers, this can be incorporated in the model and its effects on the export function estimated.

Another research area would be the incorporation of income of trading partners in the model to see whether it explains the variations in tea exports. The paper acknowledges that non-price factors like input costs, labour costs etc, plays a crucial role in production and export supply response. A comprehensive analysis of these factors would require

micro or sectoral analysis. A detailed sectoral analysis would help to understand and appreciate the mechanisms between macro level policies and farm-household behavior in the tea-sub sector. Nonetheless, the results of the study are quite informative and arguably point out several issue of policy concern.

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APPENDIX

Summary of Descriptive Statistics

Date: 12/17/08
Time: 11:41
Sample: 1970 2007

	LNRMPL	LNRPTL	LNRWR	LNER	LNX	LNZ	WR
Mean	2.435518	1.462888	3.617948	3.303202	18.72599	4.662707	0.6756
Median	2.231089	1.321756	3.521052	3.188004	18.91041	4.768368	1.0000
Maximum	4.356709	2.890372	5.023881	4.865224	19.67270	5.527562	1.0000
Minimum	0.048790	0.095310	1.778336	1.423108	17.21913	2.742323	0.0000
Std. Dev.	1.322781	1.037887	1.041489	0.977131	0.662582	0.776264	0.4745
Skewness	-0.232650	0.057195	-0.202905	0.013257	-0.369352	-1.022190	-0.7505
Kurtosis	1.978391	1.409252	1.764475	2.087021	2.080062	3.171162	1.5633
Jarque-Bera	1.942790	3.921328	2.607272	1.286109	2.145955	6.488540	6.6559
Probability	0.378555	0.140765	0.271543	0.525684	0.341989	0.038997	0.0358
Observations	37	37	37	37	37	37	37

Correlation matrix.

	LNRMPL	LNRPTL	LNRWR	LNER	LNX	LNZ	WR
LNRMPL	1.000000	0.959712	0.961593	0.973014	0.968897	0.953657	-0.196366
LNRPTL	0.959712	1.000000	0.943775	0.939831	0.947874	0.868690	-0.133986
LNRWR	0.961593	0.943775	1.000000	0.942516	0.937508	0.905979	-0.218015
LNER	0.973014	0.939831	0.942516	1.000000	0.959750	0.911562	-0.180473
LNX	0.968897	0.947874	0.937508	0.959750	1.000000	0.941301	-0.069324
LNZ	0.953657	0.868690	0.905979	0.911562	0.941301	1.000000	-0.226170
WR	-0.196366	-0.133986	-0.218015	-0.180473	-0.069324	-0.226170	1.000000
SAP	0.835799	0.895975	0.835279	0.812142	0.787286	0.710197	-0.173742

Unit root tests at levels

Variable	ADF Statistics	1% critical value	5% critical value	comments
LNRMPL	2.064604	-2.6300	-1.9507	Non stationary
LNRPTL	1.784354	-2.6321	-1.9507	Non stationary
LNRWR	-2.896809	-4.2324	-3.5386	Non stationary
LNER	-3.420181	-4.2324	-3.5386	Non stationary
LNX	-3.788776	-4.2324	-3.9586	Non stationary
LNX	-2.306660	-4.2324	-3.5386	Non stationary

Unit root tests at first difference

Variable	ADF statistics	1% critical value	5% critical value	Comments
LNRMPL	-2.228035	-2.6321	-1.9510	stationary
LNRPTL	-2.626178	-2.6321	-1.9510	stationary
LNRWR	-5.848974	-4.2412	-3.5426	stationary
LNER	-4.404265	-4.2412	-3.5426	stationary
LNX	-6.617187	-4.2412	-3.5426	stationary
LNZ	-4.355868	-4.2412	-3.5426	stationary

Stationarity test for the residual of the cointegrating regression

ADF Test Statistic	-4.408132	1% Critical Value*	-4.2412
		5% Critical Value	-3.5426
		10% Critical Value	-3.2032

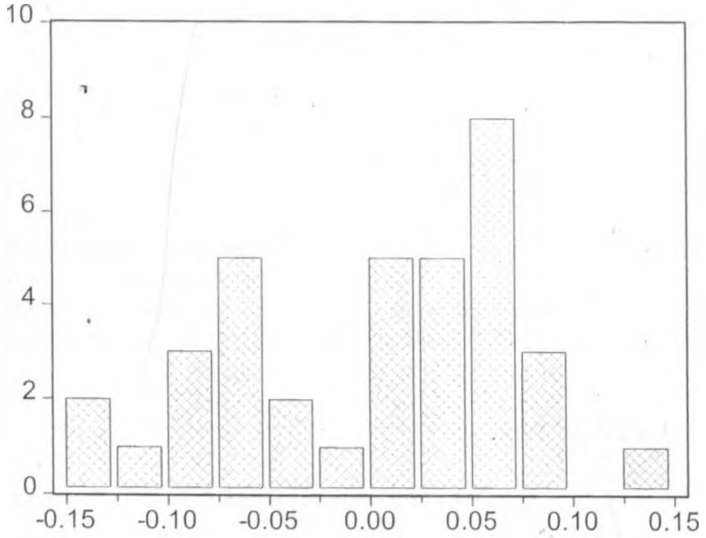
*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID02)
Method: Least Squares
Date: 12/23/08 Time: 14:32
Sample(adjusted): 1973 2007
Included observations: 35 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID01(-1)	-0.846071	0.191934	-4.408132	0.0001
D(RESID01(-1))	0.112336	0.126017	0.891431	0.3796

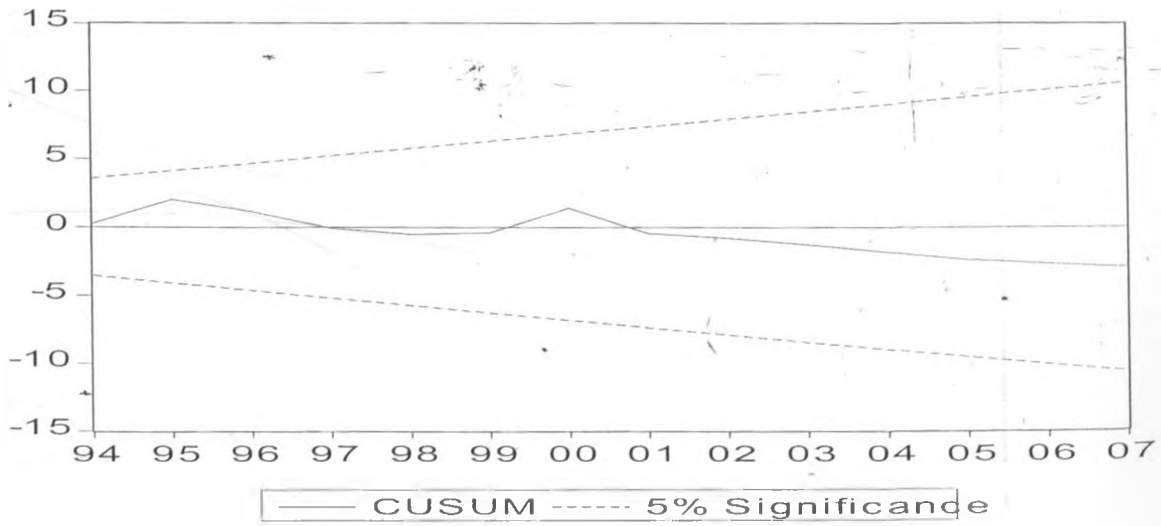
R-squared	0.778795	Mean dependent var	-0.008119
Adjusted R-squared	0.428356	S.D. dependent var	0.095353
S.E. of regression	0.072094	Akaike info criterion	-2.314492
Sum squared resid	0.161122	Schwarz criterion	-2.136738
Log likelihood	44.50361	F-statistic	9.492512
Durbin-Watson stat	2.037650	Prob(F-statistic)	0.000133

NORMALITY TEST



Series: Residuals	
Sample 1972 2007	
Observations 36	
Mean	-3.01E-15
Median	0.009396
Maximum	0.140952
Minimum	-0.148927
Std. Dev.	0.071865
Skewness	-0.269384
Kurtosis	2.165880
Jarque-Bera	1.479039
Probability	0.477343

CUMULATIVE SUM (CUSUM) TEST



RAMSEY RESET TEST

Estimation Command:

==========

LS $\ln X_t$ C $\ln P_t$ $\ln MP_t$ lnRWR lnER lnZ WR SAP RESID_01

Estimation Equation:

==========

$\ln X$ = C(1) + C(2)* $\ln P_t$ + C(3)* $\ln MP_t$ + C(4)*lnRWR + + C(5)*lnER + C(6)*WR+ C(7)*SAP+ C(8)*RESID_01

Substituted Coefficients:

==========

$\ln X_t$ = 15.93463 + 0.33782* $\ln P_t$ - 0.196950*lnMP + 0.021486*lnRWR + 0.271191*lnER+ 0.392032*lnZ – 0.061441*WR – 0.144791*SAP - 0.859678*RESID_01

LM TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.986162	Probability	0.387053
Obs*R-squared	2.632464	Probability	0.268144

WHITE HETEROSKEDASTICITY TEST

White Heteroskedasticity Test:

F-statistic	1.367553	Probability	0.251299
Obs*R-squared	17.16861	Probability	0.247304

ARCH TEST

ARCH Test:

F-statistic	0.240204	Probability	0.627302
Obs*R-squared	0.252921	Probability	0.615026

BREUSCH GODFREY LM TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.986162	Probability	0.387053
Obs*R-squared	2.632464	Pr	0.268144

Tea exports in kilograms from Kenya.

Year	Output
1970	33851055
1971	30072656
1972	49483857
1973	50528200
1974	49646800
1975	52682600
1976	59154300
1977	75257865
1978	80791032
1979	88984528
1980	74799000
1981	75700671
1982	80371415
1983	100644735
1984	91198110
1985	126086264
1986	116455892
1987	134778631
1988	138201002
1989	163188149
1990	169585818
1991	17555818
1992	166506564
1993	188390150
1994	183739627
1995	237497459
1996	244237163
1997	198551684
1998	263023210
1999	241739293
2000	216989625
2001	270151810
2002	272458768
2003	269961799
2004	333802071
2005	349738362
2006	313720495
2007	345877445

Source: Tea Board of Kenya

Exchange rate in Kenya

Year	Exchange rate
1970	14.63
1971	15.52
1972	17.28
1973	22.13
1974	29.97
1975	33.66
1976	39.04
1977	43.32
1978	67.24
1979	82.66
1980	102.46
1981	93.23
1982	92.51
1983	96.55
1984	95.21
1985	103.74
1986	104.87
1987	113.56
1988	117.73
1989	124.13
1990	132.54
1991	136.84
1992	135.78
1993	106.87
1994	211.92
1995	178.47
1996	202.40
1997	192.84
1998	178.47
1999	190.35
2000	192.82
2001	204.64
2002	207.95
2003	243.55
2004	246.79
2005	250.33
2006	251.53
2007	248.52.

Source: CBS, economic surveys and statistical abstracts; various issues.

Input price indices

Year	Price index
1970	3.79
1971	4.15
1972	4.24
1973	6.23
1974	8.05
1975	11.28
1976	10.86
1977	10.81
1978	10.68
1979	14.00
1980	14.00
1981	14.26
1982	14.50
1983	15.14
1984	15.20
1985	18.60
1986	21.94
1987	21.94
1988	22.58
1989	22.24
1990	29.33
1991	30.80
1992	33.87
1993	44.96
1994	32.94
1995	31.7
1996	33.76
1997	56.51
1998	64.8
1999	76.62
2000	79.85
2001	100.44
2002	91.80
2003	93.70
2004	110.1
2005	127.6
2006	122.9
2007	129.7

Source statistical abstracts and economic surveys; various issues

Price of milk in Kshs per Liter

Year	Price in Kshs
1970	1.44
1971	1.1
1972	1.11
1973	1.1
1974	1.1
1975	1.15
1976	1.32
1977	1.32
1978	1.32
1979	1.46
1980	1.85
1981	2.15
1982	2.15
1983	2.06
1984	2.4
1985	2.84
1986	3.25
1987	3.4
1988	3.75
1989	4.3
1990	4.9
1991	5.2
1992	6.5
1993	7.8
1994	12.5
1995	14.5
1996	12.5
1997	14.5
1998	15.49
1999	14.94
2000	15
2001	13.87
2002	13.87
2003	14
2004	16
2005	16
2006	18
2007	20

Source, economic surveys and statistical abstracts; various issues

Tea prices in Kshs per kilogram

Year	Price
1970	6.73
1971	6.5
1972	6.01
1973	5.92
1974	8.85
1975	8.07
1976	10.56
1977	21.49
1978	16.5
1979	13.56
1980	15.91
1981	17.7
1982	19.4
1983	21.84
1984	51.84
1985	33.66
1986	33.82
1987	25
1988	20
1989	27
1990	35
1991	38
1992	29
1993	92
1994	87
1995	65
1996	79
1997	106
1998	133
1999	125
2000	152
2001	113.89
2002	116.38
2003	117.73
2004	126.96
2005	118.24
2006	145.41
2007	118.74

Source, Tea Board of Kenya, Economic survey and statistical abstracts

Wage rates in Kshs per kilogram.

Year	Wage rate in Kshs/kg
1970	0.2
1971	0.2
1972	0.25
1973	0.25
1974	0.3
1975	0.3
1976	0.35
1977	0.35
1978	0.35
1979	0.4
1980	0.4
1981	0.45
1982	0.45
1983	0.45
1984	0.5
1985	0.5
1986	0.5
1987	0.5
1988	1
1989	1
1990	1
1991	1.5
1992	1.5
1993	2
1994	2
1995	2.5
1996	3
1997	3
1998	3
1999	3
2000	3
2001	3.5
2002	3.5
2003	4
2004	5
2005	5
2006	5
2007	5

Source, economic survey and statistical abstracts; various issues.

Consumer Price index in Kenya

Year	CPI
1970	3.53
1971	3.66
1972	3.87
1973	4.23
1974	4.99
1975	5.94
1976	6.62
1977	7.6
1978	8.89
1979	9.6
1980	10.93
1981	12.2
1982	14.72
1983	16.4
1984	18.08
1985	20.43
1986	20.95
1987	22.76
1988	25.55
1989	29.08
1990	34.25
1991	41.13
1992	52.33
1993	76.44
1994	98.47
1995	100
1996	108.86
1997	121.23
1998	129.38
1999	136.86
2000	150.47
2001	159.1
2002	162.22
2003	178.14
2004	179.26
2005	180.44
2006	209.66
2007	228.51

Source, World Bank and CBS.

Structural Adjustment Dummy Varaiable

Year	Dummy
1970	0
1971	0
1972	0
1973	0
1974	0
1975	0
1976	0
1977	0
1978	0
1979	0
1980	0
1981	0
1982	0
1983	0
1984	0
1985	0
1986	0
1987	0
1988	0
1989	0
1990	0
1991	0
1992	0
1993	1
1994	1
1995	1
1996	1
1997	1
1998	1
1999	1
2000	1
2001	1
2002	1
2003	1
2004	1
2005	1
2006	1
2007	1

Source; author

Weather Dummy Variable

Year	Weather Dummy
1970	1
1971	1
1972	1
1973	1
1974	1
1975	0
1976	1
1977	1
1978	1
1979	1
1980	0
1981	0
1982	1
1983	1
1984	0
1985	1
1986	0
1987	1
1988	1
1989	1
1990	1
1991	1
1992	0
1993	1
1994	0
1995	1
1996	1
1997	0
1998	1
1999	0
2000	0
2001	1
2002	1
2003	0
2004	1
2005	1
2006	0
2007	1

Source; author's computation.