ASSESSMENT OF EFFICIENCY OF AGROFOOD MARKETING SYSTEMS: A CASE OF MACADAMIA NUTS VALUE CHAIN IN THE CENTRAL KENYA HIGHLANDS

WILFRED MUCHIRI MURIOGA, (MBA)

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DECLARATION

This thesis is my original work and has not been presented for the award for a degree in any other university or any other award. The thesis has been completed by making references from various scholars who were properly acknowledged. Where text, data, graphics, or tables have been used from other works including internet, the sources are accredited through referencing in accordance with anti-plagiarism regulations.

Signature …… Date ……...……

WILFRED MUCHIRI MURIOGA

Department of Agribusiness Management and Trade, Kenyatta University

We confirm that the work reported in this thesis was carried out by the candidate under our supervision and has been submitted with our approval as the Kenyatta University appointed Supervisors.

Signature …… Date ……...……

DR. PATRICK MBATARU, (Ph.D)

Department of Public Policy & Administration, Kenyatta University

Signature …… Date ……...……

PROF. MWANGI PETER WANDERI, (Ph.D)

Directorate of Quality Assurance and Linkages, Mount Kenya University

Signature …… Date ……...……

DR. FLORENCE KITHINJI, (Ph.D)

Department of Training, Research and Consultancy, Kenya School of Government

DEDICATION

To my beloved mother Cecilia Njoki, an intelligent woman who knew the importance of education and although illiterate, took me to School at a relatively early age to fulfil a wish jointly shared by her late husband and herself. I also wish to dedicate this thesis to my late father, Murioga Muchiri who was shot down and died on the slopes of Aberdares forest in August 1955 as a freedom fighter at the height of the state of emergency in Kenya. My dedication also goes to all other freedom fighters in Kenya who died for the same noble course.

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ABBREVIATIONS AND ACRONYMS

AFFA	Agriculture Fisheries and Forestry Australia
CI	Confidence interval
DSM	Decision support models
FAO	Food and Agriculture Organization
GCC	Global Commodity chain
GDP	Gross Domestic Product
GoK	Government of Kenya
HCDA	Horticultural Crops Development Authority
KNC	International Nut council
KENS	Kenya National Bureau of Standard
KIPPRA	Kenya Institute of Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
KRA	Kenya Revenue Authority
MOA	Ministry of Agriculture
NIS	Nut in Shell – uncracked raw nuts
NNCDP	National Nut Crops Developments Policy
SCP	Structure, conduct and performance
SKR	Sound Kernels Recovery
SN	Shelled Nut – processed nuts
SPSS	Statistical Package for Social Scientists
USA	United States of America

OPERATIONAL DEFINITIONS OF KEY TERMS AND CONCEPTS

Asymmetric price transmission	Price transmission differs according to whether prices are increasing or decreasing.
County	This refers to both political and administrative divisions in Kenya. There are 47 counties in Kenya
Kernel	Refers to the inside edible part of macadamia nut obtained after removing the hard-top shell.
Macadamia	This refers to specific edible tree nuts grown in Tropical counties mostly between 1500-1850b meters above sea level, where two types that are widely grown in Kenya are; M. *integrifolia* and *M. tetraphylla*
Margins	This refers to gross profit which is the difference between the buying price at one level and the selling price at the next level.
Market concentration	Extent or degree to which a relatively small number of firms account for a relatively large percentage of the market.
Market integration	Occurs when prices among different locations or related goods follow similar patterns over a long period of time.
Quality circles	This refers to group of 5 to 15 people having a common objective of developing quality control, who develop their own methods of checking quality standards.
Sound kernel recovery	Good and edible kernel recovered or obtained from a given sample after removing the hard shell, mouldy, discoloured, immature nuts and all other defects which is normally expressed in form of percentages.
Value Chain actors	This refers to the five trade levels which are farmers, middlemen, processors, distributors and retailers.

ABSTRACT

The macadamia industry in Kenya has been faced with numerous operational and marketing challenges forcing the government to impose export ban of raw nuts since 2008 to date. The then Ministry of Agriculture appointed a task force in 2011 to specifically look into challenges that have been facing the macadamia industry including import ban of Kenya's kernel by USA. Export of macadamia nuts from Kenya has also dropped from 2nd to 5th position in sales volume in the world from 1990s to dare. These problems point to efficiecy challenge. It was upon this background that this study was carried out. The main purpose was to examine and assess the intervening multi-factor market variables that affect the the efficiency of this value chain by concentrating on Central Kenya Highlands. The study sought to assess the efficiency of agrifood marketing systems in five purposively selected counties in the Central Kenya Highlands, focusing on quality control systems, information flow, pricing systems, gross margins, promotion and advertising, as well as market organizational structures and conduct. To achieve this, the study relied on the world economic triangle model and social marketing theory. The world economic triangle model was used in providing information on global markets and global value chain, while social marketing theory was used in providing the strategic orientation of macadamia marketing to increase efficiency. The study developed a conceptual framework which linked the research objectives with five market channel players in order to develop efficiency in the macadamia marketing system in the central Kenya highlands. Multistage sampling procedure was carried out and five sets of questionnaires were used to obtain primary data for analysis. There were 292 market traders taken from 32 stratified market centers in Embu, Kiambu, Kirinyaga, Murang'a and Nyeri counties. Each set of questionnaires was tailored to elicit particular information from the market traders who were 162 farmers, 28 middlemen, 7 processors, 30 distributors and 65 retailers. Data from the field was cleaned, coded and saved for processing using Statistical Packages for Social sciences SPSS version20 and STATA version 12 for descriptive statistics. Both descriptive and inferential statistics were used alongside statistical models such as regression, multiple regressions, integration, co-integration and price transmission, in determining macadamia marketing efficiency. Findings from the study showed that lack of proper organizational structures and conduct, poor pricing systems, lack of centralized authority for quality control standardization and certification of macadamia for exports are some factors that lower the market efficiency. The existing macadamia marketing system was inefficient, which required a total marketing system overhaul and a new marketing strategy in development of macadamia industry. This included adoption of alternative new technology to reverse the current downward market trend of macadamia industry in Kenya, where it has moved from second to fifth position in sales volume in the world in last few years. This study recommends proper organizational structures on quality control, better pricing policies, promotions and advertising as well as auction board to be set, to improve efficiency of macadamia marketing systems in Kenya.

CHAPTER ONE

INTRODUCTION

1.1 The Background of the Study

The efficiency of agricultural and food marketing systems in the economic development has not been given adequate attention which seems to be true to Kenya and many other developing countries. There have also been relative neglects of the agricultural marketing system in research and planning (Wambugu, 2005).The current study on assessment of efficiency of agrifood marketing systems of macadamia nuts is intended to fill this research marketing gap.

Macadamia is a wood tree that belongs to protacease and is classified as a nut tree with about 1000 species spread and grown around the world but only three species are grown commercially (McConacchie, 1995). Macadamia nut tree is grown and processed by more than 40 developed and less developed countries in the world with millions of hectares of land devoted to growing the tree nuts (International Nut Council, 2002). This provides economic livelihood to millions of producers both small and large-scale farmers.

In Kenya, it is a viable alternative source income in the background of the coffee crisis. According to Wasilwa, *et al.*, (2012) macadamia is the most popular nut today because its oil is unsaturated at 84% compared to olive oil at 74% which are ranked first and second highest unsaturated oil respectively in the world. It is also cholesterol free and is recommended for consumption by diabetics. Macadamia is rich in unsaturated fatty acids and is considered as a healthy food product as it keeps blood cholesterol levels in check (MacConachie, 1995).

Commercial farming of macadamia in Kenya started in 1970s after the realization that the crop could be of export potential. Farmers were encouraged to plant macadamia nuts with a belief that the income from macadamia nuts would be comparable or better than that of coffee and tea which were the main cash crops at that time (GOK, 2007). The efforts by the government to improve in quality macadamia production culminated in the technical co-operation between Kenya and Japan through JICA. Based on these efforts, macadamia nuts experienced an upsurge in production from 3170 Metric tons in 1996 to 10753 in 2001. This was possible due to improvements in agronomic practices (Waithaka, 2001). There was also a modest expansion in the area planted with macadamia and greater focus was placed on protected cropping.

The success of this program made Kenya to be the second largest macadamia exporter in the world in 1980/1990. However, Kenya currently is the 5th largest exporter after a sharp drop in demand prices, production and sales volume. This was caused by loss of export market in the USA and China due to bad and poor-quality kernel (Wasilwa, *et al.*, 2012). The current study intended to evaluate the effect of the ban on the macadamia marketing system.

The increased importance of macadamia nuts was reflected in the Kenya National Bureau of Statistics data for 2009 that indicated horticulture to have earned 73.7 billion Kenya Shillings while macadamia nuts alone earned more than half a billion Kenya Shillings in the same year (KEBS, 2009). According to data from the Ministry of Agriculture, in 2007, the production stood at 10,000 metric tons. However, the crop production has stagnated at that level despite the enormous potential of growth. This was usually

attributed to inefficiency in the macadamia marketing system that has been put in place by the stakeholders (Gitonga, *et al.,* 2009). The conclusions need to be evaluated further in relation to market efficiency.

After the establishment and collaboration of the Kenya-Japan Horticulture Development Project in 1985 to develop skills in macadamia nuts growing (JICA, 1985) failed; the Kenya Nut Company Limited was left as a monopoly to develop market structures. It was not until the Farm Nut Company was registered in 1993 that the monopoly ended (Kiuru, *et al.,* 2004).

The entry of the Farm Nut Company Limited into the marketing system of macadamia has not provided adequate solutions to the problems facing the industry. Although scholars such as Gitonga, *et al.,* (2008) have pointed out that macadamia has great potential for poverty reduction, macadamia sub sector in Kenya has been faced with numerous marketing challenges in the last decade. This has prompted the Kenya government to impose an export ban of raw nuts from 2008 to date to stop harvesting of immature nuts, (Kenya Gazette, 2010). The importation ban of macadamia nuts from Kenya from 2008 by USA and China has adversely affected the macadamia industry by reducing demand which justifies further analysis.

1.1.1 The World Macadamia Production and Marketing Systems

Macadamia market is segmented into organic and conventional. By 2018, the conventional segment was estimated to account for over 88% of the market value. The product type segment is further sub-segmented into in-shell and kernel. By practice, the

global market for macadamia is segmented into raw, processed, and oil. In these forms, the processed segment is estimated to account for over 36% of market share in terms of value of the overall global Macadamia market, in 2018 (FMI, 2018)

Production of macadamia is spread all over the world and annual production figures for the leading producer countries are indicated in Table 1.1. Kenya was ranked position four in the world. However, according to Wasilwa, *et al*., (2004) Kenya had been ranked as one of the highest producer of macadamia nuts at position two in early nighties. However, in the 2000s onwards; the value chain has been experiencing turbulence with farmers getting diminishing returns.

According to Kiuru, Nyaga and Wasilwa (2004) the drop of Kenya's position can only be associated to lack of research on development technologies and innovations to add value to the chain on marketing systems among many other challenges. However, the efficiency of the value chain can also be a problem in the chain and the current study intended to meet this challenge by assessing and analysing efficiency marketing process of macadamia marketing system in the Central Kenya highlands.

Table 1.1: Estimated World Macadamia Production (metric tonnes)

Country	Estimated World Macadamia Production (metric tons)				
Year	2004	2005	2006	2007	2008
Australia	12600	10000	12200	11600	10500
South Africa	3063	4205	4480	4902	5600
USA(Hawaii)	4750	5200	5500	3750	3750
Kenya	1650	1800	2052	2000	2000
Malawi	1150	1595	1100	1468	1523
Guatemala	1000	1200	1250	1230	1250
Brazil	500	665	750	900	750
Costa Rica	250	200	100	200	200
Zimbabwe		225	208	100	100
Others	200	400	400	450	450
World Total	25,163	25,490	28,040	26,600	26,123

Source: Global Agricultural Information Network (GAIN, 2009) and (HCDA, 2011).

Roduner (2004) argues that technological changes, organizational innovations and policies of trade liberalization and investment have allowed for functional fragmentation of value chain tasks into distinct units in some value chains. He further argues that in order to outsource these tasks to capable producers worldwide, there is need of incorporating global marketing system into the local market clusters. The current study has partly filled this gap by incorporating the social marketing theory and the world economic triangle concept in the current efficiency study of macadamia marketing system in the Central Kenya highlands.

In Africa, macadamia is mainly grown in Kenya, Malawi, South Africa and Zimbabwe. South Africa is the largest producer of the nuts in the world. The South African

macadamia value chain is relatively well developed as is grounded on a sophisticated food industry (Wainert and Yannakou, 1995). The potential challenges in the Malawi's macadamia value chain is alluded by Fernandez (2012) who says that up to forty percent of the country's macadamia were not good for export. The crop in Malawi was threatened by ignorance in post-harvest and pest management. Other risk included fluctuating international prices and poor infrastructure.

1.1.2 Introduction of Macadamia in Kenya

In Kenya Macadamia nuts were introduced at Thika in 1946 from New South Wales by Bob Harries on trial basis. By 1974 Bob Harries limited (BHL) had already supplied 800,000 seedlings to farmers in Central and Eastern Provinces (Waithaka, 2001; Harris, 2004). Cultivars were mainly distributed in Central, Eastern and Coast provinces, but the industry did not pick up as expected due to high variability in yield and quality of nuts. National surveys in 1971 and 1977 revealed high genetic potential in the existing germplasm in farmers' fields that required to be conserved for further improvement (Kiuru, Nyaga, Wasilwa, 2004).

The emerging challenges that affect the macadamia sub-sector require urgent action. This calls for assessing the efficiency of the macadamia marketing systems in the country's leading producing counties of Kiambu, Nyeri, Muranga, Kirinyaga and Embu. Further there is need to examine the performance of marketing variable activities identified in the study objectives which were marketing quality control systems, marketing prices, market organizational structures, marketing margins, marketing barriers, promotion and

advertisement. All these independent variables were assumed to affect the efficiency of macadamia marketing system in the Central Kenya highlands.

The introduction of macadamia in Kenya was aimed at diversifying the income streams of coffee farmers; and the crop proved reliable during the years when the international market prices of coffee had plummeted. Indeed this crop proved to be a life saver for those farmers who adopted its production early when the coffee boom of the 70s and 80was over. The price of the nuts became so good overtaking that of coffee by up to 10 times (Kiuru, et al., 2004).

Since its introduction in Kenya in 1946, Macadamia has undergone extensive varietal development through selection breeding. Other states in USA such as California (Mchargue, 1996) and Hawaii, (Barrientons, 2007) have introduced varieties adaptable to various Agro Economic Zones (AEZ). The introduction of such varieties in Kenya has broadened the genetic base. However, they needed to be evaluated for adaptability to Kenyan conditions. Commercial farming of macadamia started in 1970s after the realization that the crop could be of export potential. Farmers were encouraged to plant macadamia nuts with a belief that the income from macadamia nuts would be comparable or better than coffee and tea which were main cash crops (GoK, 2007).

The efforts by the government culminated in the technical co-operation between Kenya and Japan through JICA. Based on these efforts, macadamia nuts experienced an upsurge in production to 5,800 (MT) tons in 2001. This was possible due to improvements in agronomic practices (Waithaka 2001). There was also modest expansion in the area

planted macadamia and greater focus placed on protected cropping. Success of the programme made Kenya to be the second largest exporter in the world in 1980/1990. Unfortunately, Kenya currently is the 5th largest exporter due to drop in demand prices and production volume caused by loss of export market in the USA, China and India due to bad and poor quality nuts (GoK, 2011). The increasing importance of macadamia nuts is reflected in the Kenya National Bureau of Statistic Annual Report (KNBS, 2009), where horticulture was indicated to have earned Kenya Shillings 73.7 billion with macadamia nuts alone earning more than Kenya shillings half a billion in the same year.

1.1.3 The Current Status of Macadamia Value Chain in Kenya

Between 1971 and 1973, a feasibility study funded by the Food and Agriculture Organization (FAO) was carried out by the Kenya Government. This was to determine the potential of revitalizing the macadamia industry and provide farmers with high quality cultivars (Waithaka, 2001). Results of the feasibility study indicated that macadamia had high potential as a cash crop and as foreign exchange earner for Kenya (Kiuru, *et al.,* 2004). Macadamia nuts yield, expressed as the number of kilograms per tree per year should be over 50 kg if the tree is growing under highly suitable conditions or 40 kg under moderate conditions, (Ondabu, *et al.,* 2007).

Nut quality has been accepted as the first criterion for the selection of improved macadamia cultivators (Muthoka, *et al.,* 2008). Nut and kernel characteristics have been improved to ideal ranges and these varieties were recommended for commercial planting in the late 1980s. First grade kernels contain over 72% oil content. Oil content is determined by specific gravity using dried kernels of below 2% moisture content, while

first grade kernels readily float in tap water. Kernels that contain 72% or below sink in tap water but float or sink in 1.025 specific gravity brine solution and are second or third grade respectively. Such nuts are usually immature and harder and they become over brown when roasted. The kernel ratio expressed as a percentage of nuts that float in tap water to the total weight of recovered kernels should be over 90% cultivars (Nissen and Williams, 2005)

The cultivation of macadamia is widely practiced in Central Kenya, which is also viewed as pioneers in almost all areas of agricultural activities (Wasilwa, *et al.,* 2004). The expansion and development of sustainable macadamia nut in Kenya has been a Public-Private Partnership (PPP) between Kenya Agriculture Research Institute (KARI) and Freshco Kenya Limited (FKL, 2005). This means that only counties which are operationally covered by the two organizations can grow the crop profitably.

The leading nuts grown in Kenya by value are coconuts 54%, Macadamia15%, Cashew nuts 12%, Peanuts 16% and Bambara nuts 3%. Macadamia nuts are included in the horticulture sub sector in agricultural sector in the Kenyan economy. According to a survey done by Ministry of Agriculture (2011) macadamia nut industry employed more than 100,000 people at the time of that survey. The sub sector contributed Kenya Shillings 7.4 billion, which was 5% of total value of the Horticulture sector in 2013 (HCDA, 2013).

Macadamia is among the nuts that are processed and exported in the horticultural sub-sector. This tree nut is of economic importance in Kenya contributing to both local and export markets. The share ratio of export and domestic market for macadamia was 99% and 1% respectively (HCDA, 2011). Promotion, advertising and proper integrated marketing systems are necessary in order to increase demand in the local market cluster from the current 1% to about 10% of total production as in the case of cashew nuts, whose prices are almost at par. The leading macadamia producing counties in Kenya are Kiambu, Muranga. Kirinyaga, Nyeri, Makueni, Trans Nzoia, Nyamira and Baringo, (HCDA, 2013).

Majority of Kenya's population, 80% live in the rural areas and about 56% of them live below the poverty line (GoK, 2011). Agriculture sector is the backbone of Kenya's economy and the main source of livelihood for majority of the rural population. The sector contributes about 26 % of the county's Gross Domestic Product and employs about 75 % of the population. The sector is the major source of revenue, with agricultural produce export accounting for nearly two thirds of total export (GOK, 2O15).

The agricultural sector is made up of four major sub-sectors, namely; industrial crops, horticulture, livestock and fisheries which make the sector the leading contributor to the Kenyan economy (Horticulture Development Authority, 2011). The horticulture sub-sector contributes 36 per cent of Kenya's agriculture's Gross Domestic Product (GDP) and is a significant contributor to the economy. This is vital in the transformation of Kenya into a rapidly industrializing middle-income nation as envisaged in Kenya Vision 2030 (GoK, 1999).

1.1.4 Macadamia Production and Sales Trend in Kenya

Macadamia production and sales trend for the years 2005-2009 is indicated in Table 1.2 which shows a big decline after the export ban from 2008 by the Government of Kenya.

Table 1.2: Kenya macadamia nut production and sales, 2005 to 2009

Year	Area HA	Prod. MT	Value KSH	Value MT KSH	Value KG KSH
2005	2591	18,137	1,088,220,000	60,000	60.00
2006	2935	20,545	1,222,850,000	59,518	59.52
2007	2801	19,607	962,080,000	49,068	49.10
2008	3382	19,290	547,330,000	28,374	28.37
2009	2183	16,769	421,907,000	25,153	25.15

Source: Kenya national Bureau of statistics (KEBS, 2011 and HCDA, 2011)

The analysis from Table 1.2 shows a constant decline of production and sales volume which is more significant after the ban of export of raw nuts by the GOK from 2008 (Kenya Gazette, 2010). The Table also indicates a decline of average prices per Kg by more than 50% from 2006 to 2009. There is need of assessing the effects of these price changes on macadamia marketing efficiency systems in the Central Kenya highlands.

1.1.5 Importance of Quality Control Systems in Kenya Macadamia Markets

According to Kenya Nut Company (2007) while competition is good, quality is compromised by farmers who pick immature nuts. In Kenya, each processing plant is left to determine its quality control standards and use them to check the quality of the kernel which is used in pricing. This means that there are no minimum set quality standards for the country. This leads to a challenge because Kenya's Sound Kernel Recovery (SKR) is

very low which averages between 18% and 22% in comparison to 33% and 30% for South Africa and Australia respectively.

The (SKR) quality levels negatively affects the international market value of Kenya's kernel which reduces the demand further and pushes prices down too (KARI, 2007). Quality level, for example, in South Africa macadamia kernel is first determined by the horticultural practices implemented by the producer, and second, the processing technology employed by cracking plant (Noleen and Wilma, 2005). A proper evaluation of quality control systems is necessary to assess the effect it has on the efficiency of macadamia marketing system in the Central Kenya highlands.

1.1.6 Macadamia Trade in Kenya

Macadamia nuts are packaged and distributed through vendors and also in other local market outlets such as supermarkets and retail shops. Five main market outlets exist in Kenya which is, farmers, middlemen, processors, distributors and retailers. Consumers of macadamia nuts in Kenya are mainly in urban areas.

This market segment involves nuts in shell which is determined by the level of Sound Kernel Recovery (SKR), the size and the colour of the nut. The quality of nuts in shell (NIS) affects and determines the prices of the kernel. Kenya's kernel is relatively very low, and averages between 18% and 22% compared to the world average of 30%. This reduces the demand further and pushes prices down too (KARI, 2007).

The study was to assess the market efficiency of the macadamia value chain taking into account relationships between global buyers, global lead firms, global value chain, global standards and transnational networks. This was examined in the theoretical framework where both world Economic Triangle concept and social marketing theory Figure 2.2 were adapted. The interface may be adapted to the local market clusters to broaden the efficiency of macadamia marketing system in the Central Kenya highlands as explained by world economic triangle concept, (Helleiner, 2000; Dorran 200;Nadvi and Waltring, 2002).

1.2 The Problem Statement

Macadamia sector has proved to be a viable alternative source of income, away from traditional cash crop like coffee and tea. However, the value chain is bedevilled by challenges which are not always understood. Understanding the efficiency of the value chain is crucial to addressing the challenges therein. Kenya's global ranking of Macadamia production has dropped from position two in the 1990s to position five in 2004 against a background of high global prices of macadamia. It was not clearly known, what was the cause of the drop of the export ranking globally.

According to data from the Ministry of Agriculture (2007) the production of macadamia stood at 10,000 metric tons but the production stagnated at that level despite the significant potential of the crop as a viable source of income. This was usually attributed to inefficiency in the macadamia marketing system that has been put in place by the stakeholders (Gitonga, *et al.*, 2009). The conclusions need to be evaluated further in relation to market efficiency.

Many studies carried in Kenya by various scholars such as Waithaka (2001); Kiuru (2004); Muthoka, et *al.,* (2008); Gitonga, *et al.,* (2011) and Wasilwa *et al.,* (2012, have focused mostly on production and processing, ignoring marketing systems. This is in spite of declining demand in both export and local market clusters. It is not known why locally, researchers have neglected this marketing area. The current study purposed in filling this research gap.

Price fluctuations from one year to another makes planning for marketers to be a big challenge. For example, the average price per kg in 2005 was Ksh 60.00 compared to Ksh 25.15 in 2009 (KEBS, 2011 and HCDA, 2011). This is a major problem and requires to be addressed too, to understand the true causes of these price fluctuations.

Studies on the macadamia have focused largely on production and processing, ignoring quality control standards and specifications in spite of declining of both export and local market because of poor quality (Waithaka, 2001; Kiuru, *et al.,* 2004; Muthoka, *et al.,* 2008). The average sound kernel recovery in Kenya is between 18% and 22% compared to 30% and 33% for South Africa and Australia respectively. This reduces the demand further and pushes prices down too (KARI, 2007). This is a problem which requires further analysis to find how quality control systems affect market efficiency in the Central Kenya highlands.

At 84% macadamia nuts have the highest level of unsaturated oil in the world compared to the second highest, olive oil at 74% and is also cholesterol free and is recommended for diabetics but it is not known why its consumption locally is relatively low compared

to cashew nuts at the ratio of 1:10 in spite of its high health care benefits and economic value compared to other nuts, (Nissen and Williams, 1980; Wasilwa, *et al.*, 2012)

The longer the channel, the more inefficient it might be. The number of players in the marketing chain (the farmer, broker, processor, distributor and retailer) in the macadamia marketing system in the central Kenya highlands is too far many compared to other agricultural horticulture produce such as tea and coffee which have an average of between two and three marketing channels. This may affect efficiency in many ways, which study seeks to elucidate.

1.3 The Main Objective of the Study

The purpose of this study was to assess the efficiency of macadamia marketing systems in the Central Kenya highlands and to give recommendations and strategies towards its improvement.

1.3.1 Specific Objectives of the Study

i. To assess the effect of marketing management structure and conduct on the efficiency of the macadamia marketing systems in the Central Kenya highlands.
ii. To assess the effect of the existing marketing quality control standards and specifications systems on efficiency of macadamia marketing systems in the Central Kenya highlands.
iii. To assess the effect of the horizontal speed price transmission between the five counties on the efficiency of macadamia marketing systems in the central Kenya highlands.

iv. To assess the effect of the marketing gross margins earned by macadamia traders on efficiency of macadamia marketing systems in the Central Kenya highlands.

1.4 The Research Questions

i. How do the existing marketing organizational structures affect the efficiency of the macadamia marketing systems in the Central Kenya highlands?

ii. How do the existing marketing quality control standards and specifications systems affect the efficiency of macadamia marketing chain in the Central Kenya highlands?

iii. How does horizontal speed price transmission between the counties affect the efficiency of macadamia marketing chain in the Central Kenya highlands?

iv. How do gross marketing margins earned by traders affect the efficiency of macadamia marketing chain in the Central Kenya highlands?

1.5 The Rationale and Significance of the Study

Given the persistent low price of traditional cash crops like coffee and tea in the central Kenya highlands, macadamia nuts are a viable alternative income generator. However, prices are determined mainly by the efficiency of the marketing chain. There is a research study gap on the assessment of efficiency of agrifood marketing system focusing on efficiency of macadamia marketing system in Kenya. This was the overall research gap that this study sought to fill.

The findings of this study would contribute greatly to the future studies and the lacuna of information on value chain focusing on macadamia marketing in Kenya. The thrust of

this study was to provide new insights on the efficiency of macadamia marketing practices in Kenya, especially given the potential of the crop as an income generator for small scale farmers.

Second, researchers and academicians are likely to benefit by getting additional information on marketing system of macadamia nuts, which would be used as a basis for further research.

Third, all stakeholders such as farmers, brokers, processors, distributors and retailers who are in the macadamia industry, need proper information readily available to assist in making informed decisions on macadamia business. Marketing information will be available from this research for their use.

Fourth, the recommendations from this study may effectively assist on the policy formulation and policy change in relation to the Kenya Vision 2030 which would assist the Kenyan government in macadamia strategic planning.

Fifth, the findings from this study will assist the government in formulation of management organisational structures, quality control systems, pricing systems and marketing margin systems which would also help other stake holders in macadamia industry who are interested in efficiency marketing systems.

The research was proposed in showing how the last ban of export of NIS by the Kenya Government (Kenya Gazette, 2010) affected the efficiency of macadamia markets in Kenya. The research was also interested in determining whether the ban was a marketing

barrier which interfered with free market and in turn affected the market efficiency. Value addition shifts the market from local to international or global market (Barrietons, 2007). Therefore, there is need of analysing both local clusters and global markets. An interface of the two-tier systems was necessary in the assessment of efficiency of macadamia marketing system in the Central Kenya highlands.

1.6 Scope and Delimitation

This study focuses on the efficiency of marketing system in the Central Kenya highlands focusing on macadamia nuts value chain. It examined 32 selected macadamia market centres in Embu, Kiambu, Kirinyaga, Murang'a and Nyeri counties as its scope. The study evaluated many more variable marketing activities such as information flow, market structures, quality control systems, price transmission and product margins. Many more multifactor variable activities were examined and analysed in relation to the efficiency of macadamia marketing system, but only a few have been highlighted in this study because they were statistically significant and important in relation to social marketing theory and the world economic triangle concept.

Additionally, the study limited itself to the cross-sectional research design which guided data collection and systematic content analysis in the interpretation, analysis and presentation of the findings. Coverage of many other factors could not be possible due to problems of bad weather conditions, limited funds, and in a few cases lack of cooperation of market traders at certain market levels.

Finally, in some instances the research had to rely on some data and references that date back to 1960s. Such documents were purposively used due to vital information they contained and they had no newer data available which was a delimitation of application of current and relevant knowledge. Lack of updated literature focussing on macadamia areas forced the use of many recently published papers by various scholars.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Studies on macadamia value chain have focused mostly on production and processing, ignoring quality control standards and specifications in spite of declining of both export and local market because of poor quality (Waithaka, 2001; Kiuru, et al., 2004; Muthoka, et al., 2008). In this chapter, an empirical and theoretical review is presented. The presentation flows from global through regional to local macadamia market chain. At the theoretical level, different models are reviewed including perspectives on the role of efficiency of market systems and measures of market efficiency. The chapter further covers literature review and theoretical approaches relevant to the study. This is followed by a description of the different measures of market efficiency, including their procedures, strengths and weaknesses. The chapter also covers the models that are used to analyse the current market efficiency study. Further, reviews of related past studies that have analysed efficiency of agricultural markets are included in the chapter. This chapter also evaluates both conceptual and theoretical frameworks that assisted in the study and concludes with the summary of the chapter.

2.2. Empirical Review

Most studies on the macadamia value chain are generalists. FMI (2018) for example focuses on production and consumption trends but very little on efficacy of the market chain. Still, the study gives insight in to the challenges facing Kenya macadamia. For example FMI says that in the decade ending in 2018, macadamia consumption increased

by 78% world. This begs the question why the Kenya's macadamia value chain has not expanded.

Studying the Hawaii macadamia market chain, Tompson et al., (2009) identify mismanaging at farm level as the major problem. Suryanata (2002 gives perspectives on social construction the Macadamia crop in Hawaii. Ziehlke (2015) present an overall situation of the Australian macadamia market chain. His study gives insights of why the macadamia value chain is efficient.

In his doctoral thesis, Walto (2005) pointed out that Australian Macadamia chain shifted from cultural concerns to focus on quality. The study was largely on the chemistry of handling the nut during processing. Atechnavio (2017) study gives a global anatomy of this value chain where Kenya is mentioned as key player but there is no analysis of efficiency.

In his report on South African value chain, Uys (2017) points out the need to diversify risks. The South African market is over exposed to the Chinese market as about 60% of the macadamia is sold there something that Kenya could put into account while developing marketing policies. Other than analyses on general dimension of the market chain, Maigua et al., (2017) focuses on gender perspectives of the value chain. Still in this study, the authors allude to the challenges facing the Kenya macadamia value chain. Most relevantly, the authors identify supply of immature nuts, cartels, insufficient nuts and access to nuts. Some of these problems are confirmed in this study.

In Kenya, different researchers have analyzed the applicability of efficiency models in different settings. For instance, Njuguna (2015) carried out a study on agricultural food prices in Nairobi County. In his study, he chose 25 food types and categorized them in three broader groups of proteins, carbohydrates and minerals and vitamins. Then the average monthly prices for each category per kilogram were calculated. The R statistical software was then used to analyze the resulting data to bring about co-integration and causality of the commodities. By using Johansen test of co-integration, it was established that there existed two co-integrated models of food prices. There was also causality of prices between some of the commodities.

In assessing macadamia nuts value chain in central Kenya highlands, co-integration model can be applied to counter price volatility and uncertainty by applying measures provided in the co-integration model. The model can be used to identify co-integration of macadamia nuts with any other commodity, establish how positively or negatively it affects the prices of macadamia. Further, the model can be applied to show causality, hence determining a commodity combination that best describes the prices of macadamia nuts in the Central Kenya highlands.

2.3 Agrifood Value Chain

Kaplinsky and Morris (2002) clearly explain value chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production, transformation and delivery to final consumers, and eventual disposal after use. They also note that value chain analysis seeks to characterize how chain activities are performed and to understand how value is created and shared among

chain participants. They further explained that, agrifood chains as systems are a result of the gradual development of methods and approaches to analyze economic sectors. Agricultural Economists, in particular, have long been concerned with the ways in which individual sectors are organized and perform. Their work in the area of industrial organization has also offered the theoretical and analytical background that inspired much of the earlier work on value chains. Bergsten (2007) argues that the concept of value system is broader compared to the one of enterprise value chain. However, in Porter's explanation, the concept of value system is mostly a tool for assisting executive management in strategic decisions.

Roduner (2004) explains further that the goal of these activities is to offer the customer a value that exceeds the cost of activities resulting in a profit margin. Van den Berg, *et al.*, (2009) were interested in primary activities that affect marketing efficiency which they identified as inbound logistic, operations, marketing and services.

The value chain analysis, according to Fasse, *et al.,* (2009) is restricted to the firm level neglecting the analysis of upstream or downstream activities beyond the company. The current study focused on agrifood marketing system using macadamia nuts value chain system in five selected counties of Central Kenya highlands as a case study. This study was therefore expanded to cover an integrated macadamia marketing system which has not been covered in previous studies.

The "Global Commodity Chain (GCC)," concept was introduced in the mid-1990s by Gereffi and others. The concept utilized the framework of value chain to examine the

ways in which firms and countries are globally integrated and to assess the determinants of global income distribution. GCC focuses on the power relations in the coordination of globally dispersed, but linked production systems. The concept shows that commodity chains are generally characterized by a leading party that determines the overall character of the chain. Gereffi (2011) established four core elements which he identified as input-output structure, territorial (international) structure, institutional framework and governance structure. However, all of the organisational structures mentioned in the study do not explain how they impact on efficiency of marketing system but the current study has very well built up on their study to assess efficiency of macadamia marketing systems in the Central Kenya highlands.

The global commodity chain concept has also been further developed into the Global Value Chain Concept reflecting a more dynamic view of the government chain (Sturgeon, 2008; Gereffi, 2011). The current study has built on the information obtained from these concepts and theories which includes world economic triangle concept, concept of value system, Global Commodity Chain (GCC) concept and social marketing theory. The application of the knowledge obtained would assist in developing an efficient and an integrated marketing system for macadamia traders in the Central Kenya highlands.

2.4 Efficiency of Marketing Systems

Assessing marketing efficiency is an increasingly important management process, however difficult task for managers and other corporate stakeholders. The marketing challenge is apparent since marketing efficiency depends on external, largely

uncontrollable factors and actors, such as customers and competitors, as well as on internal measures of efficiency (Clark, 2002). To ease the complex situation at hand, several simplifications can be made to assist in solving these problems. These are three measurement orientations relevant to efficiency assessment: customer-focused indicators, (e.g. customer satisfaction and customer retention); competitor-centred indicators (e.g. relative sales growth and relative market share); and internally oriented indicators. What complicates the interpretation and comparison of market efficiency in companies is that companies face a need to come up with good marketing efficiency. This influences the selection of marketing metrics and, consequently, "what you measure is what you get" (Ambler, Kokkinaki and Puntoni, 2004). It is, however, crucial to measure the efficiency since, as they say, "if you don't measure it, you can't improve it".

Other needs are brought up in relation to marketing efficiency measurement. According to Lehmann (2004), it is a prerequisite in getting marketing function involved to important business decisions. As a consequence of assessment-related difficulties, both academics and managers currently lack a comprehensive understanding of the marketing efficiency process and factors that affect the design and use of assessment systems within companies (Morgan, Clark and Gooner, 2002).

Clark (2000) argues that managers have a multidimensional view of marketing efficiency and they judge efficiency drawing from several dimensions, to certain degrees. Generally, effectiveness matters and several measures are often used; sales being the most important. In regard to effectiveness, correct expectations are very important. Reactive

control approaches can become dangerous especially in markets experiencing fast structural changes (Clark, 2000).

Using another different approach, literature in strategic marketing has highlighted three measurement orientations relevant to efficiency assessment: customer-focused indicators, (e.g. customer satisfaction and customer retention); competitor-centered indicators (e.g. relative sales growth and relative market share); and internally oriented indicators (e.g. profitability and ROI) (Morgan, Clark and Gooner, 2002). Eccles (1991) suggests that companies are better off using current competitor than internally oriented past company efficiency.

2.5 Measure of Market Efficiency

Efficient commodity market is one that will establish prices that are spatially inter-related by transfer of transaction costs and storage costs (Bressler and King, 1970). According to Cramer and Jensen (1982) market efficiency is measured by the ratio of output to input with a high ratio indicating high efficiency. The output of a market is measured from consumer satisfaction with the goods and services while inputs are the various resources used by the marketing firms. Effective and efficient marketing systems induce the production of goods in quantities that result in maximum returns to consumers after deduction of marketing charges and production costs (Kohls and Uhl, 1985).

Technical efficiency is concerned with the performance of physical marketing functions to achieve maximum output per unit of input. According to Warrack (2008), the physical marketing functions add form, place and time utility. Abbot and Makeham (1981) note

that technological changes like new packaging methods can be evaluated to determine whether they reduce marketing costs per unit of output by preventing quality deterioration.

Price efficiency is concerned with price transmission between producers and consumers to reflect product demand. Pricing efficiency aims at improving the operation of buying, selling and pricing aspects of the marketing process and is affected by marketing costs and the nature and degree of competition in an industry (Kohls and Uhl, 1985). Cramer and Jensen (1982) identify improvement of market news and information, and competition as important for enhancing pricing efficiency of a market. The current study has relied, incorporated, and improved on these different approaches to assess the market efficiency in the Central Kenya highlands.

2.6 Marketing Models

Various marketing models exist but only a few models that are very relevant to the current assessment of the efficiency of macadamia marketing systems in the central Kenya highlands were analyzed in this chapter.

2.6.1 Theoretical Approaches

There are various different approaches of analysing efficiency of markets that have been applied in literature. The Structure-Conduct-Performance (SCP) model is one of them which is used in the current study to establish whether the structure of the market tends to conformity.

2.6.2 Structure Conduct Performance (SCP) Model

The SCP model is used for the analysis of market power-profitability relationship (Aleksandrova and Lubys, 2004). The model suggests that there exists a relationship between structural characteristics of a market and the behaviour of the market participants and that their behaviour in turn influences the performance of the markets (Scott, 1995). Market performance represents the result of market structure and conduct that are relevant to the attainment of economic and social goals. The indictors are product quality, price integration between market channels and margins at different operational marketing levels. The SCP approach postulates that as market structure deviates away from perfect competition, the extent of competitiveness of the market will decrease, which is likely to affect market efficiency (Scott, 1995; Onyuma et al., 2006). The current study has also used quality control, price transmission, and market margins to assess market efficiency in the central Kenya highlands. In addition, the current study has used management organisational structures as an indicator of market efficiency.

The SCP model while emphasizing the concepts of market competition and efficiency has a number of limitations. The criteria of establishing the level of market efficiency based on the number of firms in a market is based on the neoclassical perfectly competitive market assumptions. The neoclassical paradigm embodies powerful assumptions about perfectly competitive and complete markets, absence of transaction costs and full availability of information to all market participants. These assumptions are hardly fulfilled especially in developing economies (Goossens, 1995).

According to Tecgüç (2013), if barriers to entry are sufficiently low, the threat of entry can force existing monopolies /oligopolies to behave as if they were operating in a competitive market, thus it is not enough to measure market efficiency on the basis of share of the market in larger firms. The assessment of market performance based on costs and margins also fail to incorporate the long run dynamic issues of how incentives can be structured within the rules of economic exchange so as to reduce the costs at the various production and marketing stages (Jayne, 1997).

Establishing whether competition exists based on the number of firms in the market is also a limitation especially in the presence of large scale economies. The high costs of transportation between a market in a high production region and a market in a demand region may result in very low producer prices in the remote production region which in turn depress the market surplus. According to Nyoro et al. (1999), the existence of small surpluses limits the number of traders that can profitably operate in such an area, particularly in the presence of scale economies in marketing activities. Tecgüç (2013) adds that sometimes the benefits of oligopolies outweigh their potential costs when they deliver lower prices to consumers because they enjoy economies of scale. Therefore, high market concentration would not necessarily point to lack of competition or artificial barriers to entry, nor would a large number of traders each handling very small volumes indicate that the market is efficient.

2.6.3 Market Integration Model

The concept of market integration, defined on the basis of the econometric concept of co-integration is used to describe the extent to which demand and supply shocks arising in

one market are transmitted to other markets (McNew and Fackler, 1997). Integration thus refers to the extent to which events in one market have impact on each other.

2.6.4 Co-integration Model

Co-integration marketing models are used for testing market efficiency and integration. The model is informative in the analysis of spatial price relationships by testing the law of one price and in examining the extent to which different regions are mutually integrated. As a result, it is possible to identify relationships for observable variables. According to this model, profit opportunities emerge when the economy is away from the attractor and arbitrage forces towards the attractor (P_1=P_2).

A number of studies have applied this approach to test co-integration model. For instance, in Johansen co-integration analysis of American and European stock market indices, Maggiora and Skerman (2009) identified how the model had been used. Their main purpose was to determine and analyze the existing connections among the U.S.A. and four major stock markets. The specific approach used was a co-integration analysis and was applied to determine the existence and extent co-movement between the markets. Therefore, in this case, the model can be viewed as the statistical expression of the nature of equilibrium relationships, with co-integrated variables sharing common stochastic trends. According to this research, the model was used successfully to establish presence and extent of co-integration and its benefits to investors, the role of economic shock such as financial crisis in affecting the co-integration, establishing possible adjustments that can impact on the profits, and establishing the role of diversification.

The model has also been used in different markets such as price adjustment in the world wine market (Castillo-Valero and Garcia-Cortijo, 2015). The two researchers were aiming at measuring the degree of price integration in the international wine market, in a scenario of increased globalization and re-adaptation of strategies. The approach included taking into account the prices from both the old world exporting countries and the new world exporting countries. The methodology adopted was based on the estimating the error corrections, linear and with thresholds. Through this approach, the co-integration model analysis was able to establish homogeneity in export prices for the old exporting countries and sought equilibrium with the same co-integration space. Therefore, in this model, there was no shared exporting dynamics.

2.6.5 Price Transmission Model

Price Transmission Models are used to understand, monitor and regulate the degree to which market shocks are transmitted across the market chain as well as across separate markets. The model deals with analysis of competitiveness of different markets in relation to the transmission of prices and how supply and demand shocks at given level in a market chain, is reflected at a different market channels in the chain. Therefore, for price transmission to occur there must be data from at least two market channels, that influence in prices between the markets and a considerable time period to effect the change. Price transmission models are very useful in analyzing, understanding, and predicting price trends for commodities. Further, in a context of two different domestic prices, the models describe the relationship between two markets and which of the two influences the other. Finally, the models are very necessary in interpreting price changes within the market (Rapsomanikis and Conforti, 2006).

Scholars have reviewed different market scenarios where price transmission models have been applied. For instance, Sami, Arovuori and Pyykkönen (2014) conducted a detailed review of vertical price transmission of vegetable markets in Finland. Their research found out that any change in input was reflected in output prices. Further, they found out that, equal change in the two directions resulted to change in margins at the same level. The results of their study indicated that, in Finnish market, there was no asymmetric price transmission for the vegetables; hence price transmission was similar regardless of an increase or a decrease in packing or import prices.

Siahi, N'geno and Nyangweso (2018) conducted a study analyzing the vertical price transmission along sugar supply chain in Kenya. In their study, they conducted a review on the vertical price transmission, highlighting its applicability and success in the sugar industry. The study focused on the use of data and information in determining market imperfections and its performance. While the analysis could be spatial or vertical, they chose to review the vertical analysis in the sugar market supply chain. According to their review and in the line with the time series data used, factory prices affected wholesale prices, while wholesale prices affected the retail prices but retail prices did not affect wholesale prices.

Price transmission model can be applied in macadamia nuts value chain in Central Kenya highlands due to its ability to establish a relationship in prices between the different market levels within the market chain. For instance, through an analysis of the existing data, it can be possible to establish the relationships between the five market channels

(farmers, brokers, processors, wholesalers and retailers), hence accurately describing important aspects of the market segments.

2.7 Overview of Related Agrifood Chain Management

The "Global Commodity Chain (GCC)," was introduced in the mid-1990s by Gereffi and others. The concept utilized the framework of value chain to examine the ways in which firms and countries are globally integrated and to assess the determinants of global income distribution.

GCC focuses on the power relations in the coordination of globally dispersed, but linked production systems. The concept shows that commodity chains are generally characterized by a leading party that determines the overall character of the chain. Gereffi (2011) established four core elements which he identified as input-output structure, territorial (international) structure, institutional framework and governance structure. However, all of the organisational structures mentioned in the study do not explain how they impact on efficiency of marketing system but the current study has very well built up on their study to assess macadamia marketing systems.

The global commodity chain concept has also been further developed into the Global Value Chain Concept reflecting a more dynamic view of the government chain (Sturgeon, 2008; Gereffi, 2011). The world Economic Triangle Concept covers global marketing segment but fails to link with local market cluster as in the case of the nuts sub–sector in Kenya and the current study. According to Messner (2002), local buyers have a low purchasing power while other markets which include international markets are

perceived to have higher purchasing power which translates to better prices and margins for the producers and therefore the need of assessing global market in the current study.

The main market channels at the local level of the market chain are processors who require huge capital outlay to build processing plants. The segment is also labour extensive. These factors have acted as market barriers to the export market because of high costs involved. The ban of export of nut in shell by Ministry of Agriculture in 2010, (Kenya Gazette, 2010) directly affected this segment of the market and it is likely to have impacted negatively on the whole value chain.

The assessment of efficiency of agrifood marketing system was also to examine and analyze the impact on the ban of export of raw nuts for this segment of the market. Therefore, there was need to study the efficiency of macadamia marketing system by analyzing the system. It was also necessary to develop and achieve an efficiency macadamia marketing value chain model in the agrifood sub-sector of agriculture industry which the current study addressed.

2.8 Summary Review of Related Studies

Warfied, (1994) carried out macadamia research for Australia Macadamia Society to identify what barriers existed in macadamia marketing and how to improve the marketing activities and services which is relevant to the current study. The study found that, macadamia products were perceived as being too expensive which is also applicable to Kenyan domestic market segment. The research further found out that the industry was faced with a possible erosion of traditional export markets which was also applicable to

Kenya markets having lost traditional export markets to USA, Japan and China from the year 2005. The study carried for Australia Macadamia Society is relevant to the current efficiency marketing study of macadamia nuts in the central Kenya highlands. However the study by Warfied, (1994) fails to identify the factors that affect the marketing system while the current study has identified four factors that affect the market efficiency of macadamia, which are management organisational structure, quality control systems, price transmission and gross margin systems.

Timmer, (2000) carried out marketing system study which aimed at building efficiency in agricultural marketing by evaluating marketing systems which he identified as degree of market efficiency in terms of marketing margins, price analysis, structure, conduct and performance analysis, market information and intelligence analysis. The study is relevant to the current study which has assessed efficiency of macadamia marketing system in agrifood sub-sector of agriculture industry using SCP, price, margins and index of marketing efficiency. However, the current study has added quality control, management organisational structures, market concentration and integration to assess and measure the market efficiency systems of macadamia markets.

Onyuma and Owuor, (2006) in their market integration for fresh pineapples in Kenya explains that measuring market efficiency usually has two components, operational efficiency and price efficiency and adopts the latter to analyse market integration which also measures market efficiency. The study is on agrifood and also uses price as a measure of efficiency which is akin to the present macadamia nuts market study.

However the current market efficiency study has added quality control, management organisational structures, and margins as factors that affect market efficiency.

Mbora, et *al.*, (2008), while addressing challenges faced by small scale farmers of fruits and nuts in Kenya, identified macadamia nuts as a key cash crop in Kenya economy and further identified lack of knowledge as a major problem in fruits and nuts sub-sector of agriculture. He did not identify the factors that are the cause of the problems. The current study has identified marketing systems as the cause of problems in macadamia industry to fill the gap. The former study by Mbora, et *al.*, (2008), indicated that Kenya was the third largest processor of macadamia and second largest exporter of macadamia in the world but does not explain the cause of different positions in the world while the current study has identified the main cause of the problem as the market inefficiency. The former study by Mbora, et *al.;* (2008 focused on distribution and production of macadamia while the current study focuses on assessing efficiency of macadamia marketing system covering five marketing channels which is broader than the former that had addressed performance of one marketing channel only, the farmer.

Mbaka, *et al.,* (2009) analysed production and distribution of macadamia using a descriptive survey sampling sites in each farm were marked by use of Global Positioning System receiver which was also used in the current study. Samples were randomly selected for the study while the current study used multistage sampling to select samples which is more effective. The main difference between the two studies is that the former study by Mbaka, *et al.,* (2009) focused on production performance but failed to show how market efficiency is affected by production performance while the current study

focused on analysing factors that affect performance efficiency of macadamia marketing system in Kenya, which is broader in the scope.

Wambugu, Karimi and Opiya, (2011) study was on assessment of marketing performance of small scale dairy farmers in Kenya which used descriptive statistics and gross margin analysis to assess the performance of the dairy sector. The current study used the same approach to analyse the data but differs with the scope and depth because current study included management organisation structures, quality stems and price transmission to analyse the market efficiency.

Ngaruiya (2012) study was on strategic and value chain of daily sector in Central Kenya which covered sales and producers marketing pattern in Kenya which indicated the optimal marketing channels which were controlled by the government and market forces respectively. The study was relevant to the current study because of demographic area covered; value chain and marketing channels covered which are relevant to the current agrifood marketing system. However the current study focused on assessment of total marketing systems which is broader in the marketing scope while the former covers sales only which is one element of marketing.

Ngare, (2014) carried out a study on efficiency of rural food markets in the Eastern central highlands of Kenya. The study was interested in establishing the efficiency of distribution of maize and beans from surplus to deficit areas. The study used market integration, asymmetric price transmission, structure and performance of markets. The study had relevance to the current market study because both studies evaluated agrifood

efficiency using SCP, integration and price transmission to assess market efficiency. The current study however uses quality control, margins and index of marketing efficiency as additional independent variables to assess the macadamia marketing efficiency in the central Kenya highlands which is broader. Additionally the study was integrated marketing efficiency assessments which additionally analysed cross functional relationships of all independent variables to enhance assessment of market efficiency while the former does not.

In Kenya, different researchers have reviewed the application of the Asymmetric Price Transmission in different markets. For instance, Ngare et al., (2013) reviewed the application of asymmetric price transmission in food markets in the highlands of Central Kenya. In their study, they were investigating the non-linear adjustments observed in maize and beans market of the Kenyan highlands in Meru South and Mbeere districts. In studying the asymmetry in price transmission between markets, the researchers applied the error correction model and a co-integration technique in order to establish a relationship between beans and maize markets. Their results indicated that the two markets were integrated while the retail price transmission between the two markets was asymmetric. According to their review, it was evident that the asymmetric price transmission model in the beans and maize markets in central Kenyan highlands helped prices to adjust quickly and increase in prices than to decrease in prices.

In the Kenya macadamia nuts industry, Asymmetric Price Transmission model can be applied like in the cases of maize and beans. In this case, the macadamia nuts can be focused on domestic higher taxes imposed on their export. As a result of such restrictions,

the macadamia nuts industry is cut from the competition of the international market, leading to an asymmetric price transmission.

In their study, they investigated the non-linear adjustments observed in maize and beans market of the Kenyan highlands in Meru South and Mbeere districts. In studying the asymmetry in price transmission between markets, the researcher could apply the analysis in macadamia efficiency marketing assessment.

2.9 Conceptual Framework and Theoretical Framework.

2.9.1 Conceptual Framework

The conceptual model was adapted from social marketing theory (Day, 2008).There are various factors that affect efficiency in marketing systems. The study conceptualizes that the market efficiency of macadamia nuts in the Central Kenya highlands is affected by several factors. These include management organisational structures and conduct, quality control standards and specifications, price transmission and margins in different market levels.

A marketing system consists of a number of different channels and segments through which commodities are marketed (Mullins, 2012). The current study has identified five marketing channels which are farmers; brokers; processors; distributors, retailers and two market segments which are export and local clusters to assess macadamia marketing efficiency in the Central Kenya highlands. For an efficient macadamia market to exist, proper cross functional and good integrated relationships must exist in the specified industry as is indicated by figure 2.1. Efficiency in marketing system brings benefits to

all market players and there was no need of imposing barriers as was experienced by export ban of raw nuts in 2008 and 2009 which is contrary to the World Economic Triangle concept (Messner, 2002).

Wambugu, (2005) argues that conceptual framework is a synthesized and simplified system of factors that lead to a well-integrated market and hence efficient marketing system that serves the market participants adequately. This can also be applicable to both theoretical and conceptual frameworks of macadamia value chain as indicated in Figures 2.1 and 2.2. Wambugu's study was on efficiency of maize marketing, where he has used simplified conceptual framework which is also within agrifood sector and is relevant to the current macadamia marketing system efficiency study. Wambugu, (2005) idea on conceptual framework is also adopted in the formulation and development of this study

The study was mainly interested in examining and assessing the interlink of the five intervening variables with the main macadamia marketing prayers in terms of: Orientation of the business to farmers, middlemen, processors, distributors and retailers. Marketing organisational structures, market characteristics and local market barriers were also analysed and evaluated in relation to Global market.

It is hoped that a combination or synthesis of global value chain, global standard settings, and transnational networks as explained in the social marketing theory (Porter, 2000; Gereffi, 2011) would improve market efficiency. The interface of the five intervening variables and five main players would yield an effective or successful market organisation leading to efficiency in the marketing of macadamia in Kenya.

The social marketing theory posits that higher effectiveness and performance for organisations have reconciled the competing needs facing them (Day, 2008) and (Clapps, 2005). The increased effectiveness is attributed to internal consistency or fit among the relevant internal factors (Doty, Glick and Huber, 1993). The modelling of co-alignment is predicated on the assumption that the degree of co-alignment is a desirable property of the organisation. Thus, the conceptualisation of co-alignment is that a set of important decisions should be internally consistent for the achievement of superior performance. Day (2008) argues that the capabilities of market-led organisations need to be aligned for maximum effectiveness and efficiency as shown in figure 2.1. The application and adoption of social marketing theory is interested on analysing of market characteristics of the market players and activities from the local market cluster level to global market level. Co-alignment of the two the social marketing theory and the world economic triangle would achieve an efficient market which is the objective of this study as shown in figure 2.1.

To summarize, it is the contention of this study that the value addition on macadamia nuts will be greater when its marketing organization characteristics are similar to those of the efficiency- maximizing ideal profile in which marketing activities are arranged to fit the implementation requirements of the business strategic type in ways that minimize the resources consumed. Therefore, this study sought to investigate, assess, and analyse the current macadamia marketing system and propose ways to improve the efficiency. In this regard, social marketing theory and World economic triangle concept were used in exploring how the various components and elements that constitute the

macadamia marketing systems can be co- aligned to achieve maximum efficiency at both local and global levels

The study relied to a certain level on the world economic triangle concept as to co-alignment or co-variation of internal marketing features and tests its performance implications on macadamia marketing system in Kenya as indicted in figure 2.1. In this regard, we rely on a normative perspective in developing explicit linkages between co-alignment of global buyers, global lead firms and local macadamia market actors as explained by various scholars (Porter, 2000) and (Day, 2008) in the social marketing theory. Therefore, we examine co-alignment of global market with local market cluster and local policy networks as indicated in figure 2.1 to assist in the study.

Efficient market brings benefits to all market players and there is no need of imposing barriers as was experienced by export ban of raw nuts in 2008 and 2009 which is contrary to the World Economic Triangle concept (Gereffi, 2011) and (Messner, 2002). The conceptual framework tries to interlink the main market players with the marketing activities for both local cluster and global market segments as shown in Table 2.1. Efficient market brings benefits to all market players and there is no need of imposing barriers as was experienced by export ban of raw nuts in 2008 and 2009 which is contrary to the World Economic Triangle concept (Gereffi, 2011 and Messner, 2002).

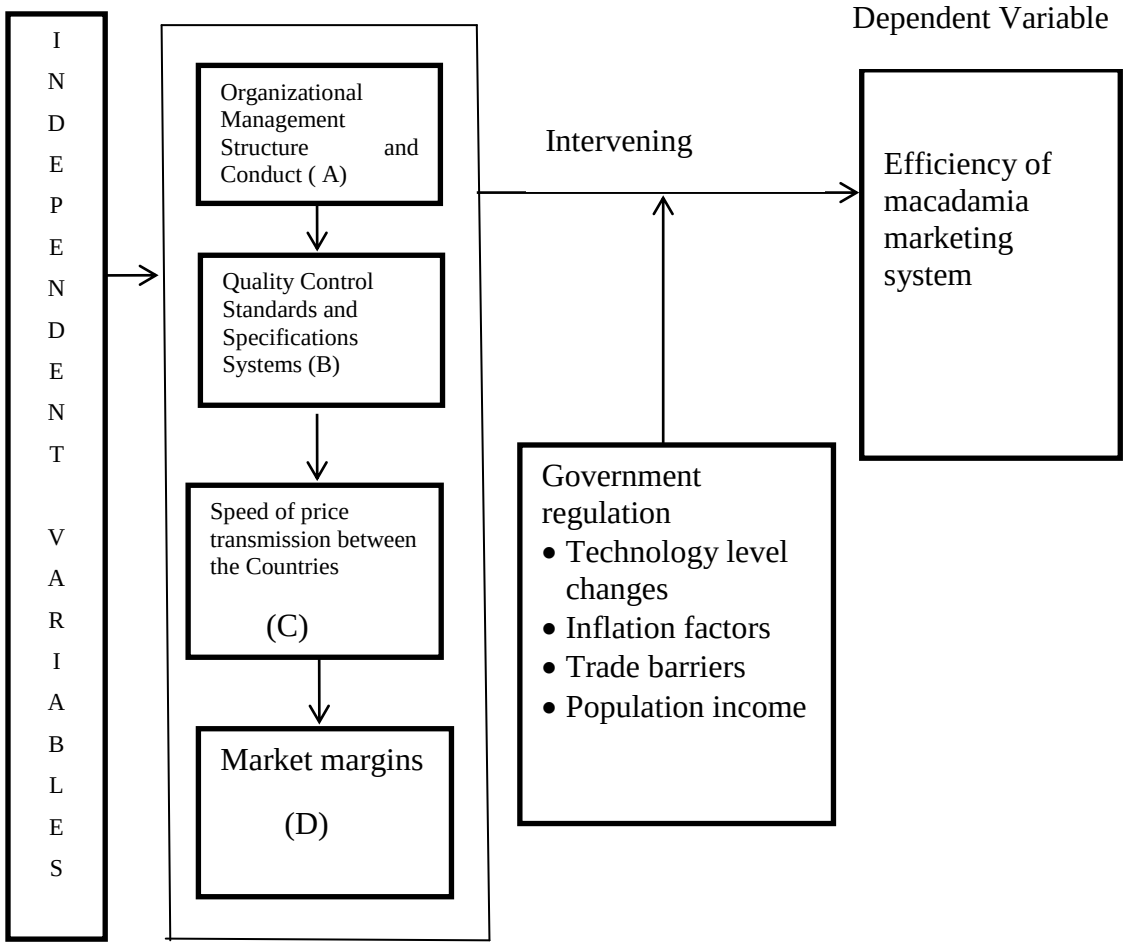


Figure 2.1: Conceptual Framework

Source : Adapted and Modified From (Porter , 2000 And Day,2008)

2.9.2 Theoretical Framework

This study assessed and investigated the marketing efficiency system value chain of macadamia nuts in Kenya and relied on social marketing theory (Day, 2008), to elucidate its concerns and interests. The study also relied broadly on world economic triangle concept as explained by (Gereffi, 2011; Messner, 2002; Stigliz, 2000).

The social marketing theory analyses markets by focussing on global value chain and by organizing marketing activities in ways that fit the implementation requirements of a

business strategy that enhances performance to fit in the transnational networks and meet global standard settings (Porter, 2000; Dola and Humphrey, 2000). The theory has often been used by scholars to assess complex, multi-dimensional phenomena implied to fit or congruence relationships in ways that are more consistent with the framing of global strategic management and marketing. It is hoped that a combination or synthesis of global value chain, global standard settings, transnational networks as explained in the social marketing theory (Porter, 2000) and (Day. 2000) would yield an effective or successful market organisation leading to efficiency in the marketing of macadamia in Kenya as indicated by Figure 2.2.

Porter (2000) and Schmiz (2000) have noted that regions which have closely related quality with local linkages and global business networks in developing marketing resources have succeeded in optimising their inter-cluster relationships and therefore achieve collective efficiency of resources to yield maximum efficiency.

Global markets impact on efficiency of local market organizational structures

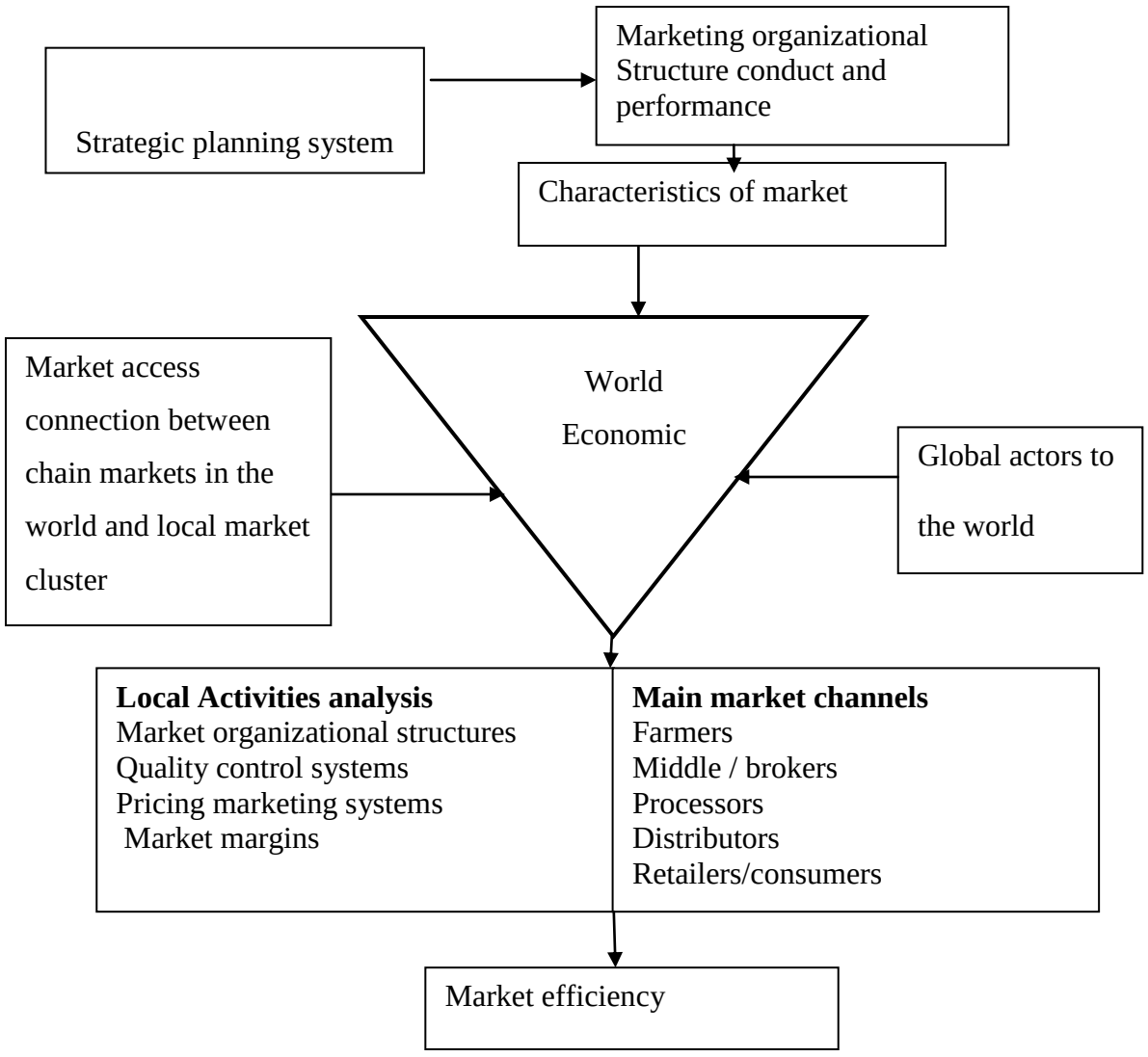


Figure 2.2: Theoretical Framework on Market System Efficiency Characteristic and Organisation Structures.

Source: Adapted and modified from the Social marketing theory (Porter, 2000, Day, 2008) interlinked with World Economic Triangle concept (Gereffi, 2011; Messner, 2002)

The typology shown on Figure 2.2 is an adoption and interlinking of the world economic triangle concept and social marketing theory. It has focused on outside-in capability such as the ability to understand and act on the emerging markets and also networking

capability such as the ability to work effectively with partners in order to develop and improve the marketing system of macadamia industry.

The development and acquisition of specific resources is guided and adopted from the World Economic Triangle concept, (Gereffi, 2011) and the social marketing theory, (Day, 2008) to achieve marketing system efficiency. The key marketing factors addressed in this study are customer-based such as relationships with customers, supply chain such as unique distribution system and internal process such as downward feedback and forward feedback in form of intelligent information flow.

Marketing's organizational characteristics are the many important structural and task characteristics that together constitute the way marketing activities are organized within the business (Day, 2008). The structural characteristics of the marketing organization pertain to how marketing activities and related decision-making authority are arranged (Doty, Glick and Huber, 1993).All these marketing factors are important and are considered in the current efficiency marketing study.

Marketing efficiency is the ratio of marketing performance outcomes achieved to resource inputs consumed (Bonoma and Clark, 1988; Morgan, Clark and Gooner, 2002). The social marketing theory suggests that for each efficient business strategic type, there exists an ideal marketing organization in which the structural and task characteristics enables the implementation of the business strategy in a way that leads to superior marketing efficiency (Jennings and Seaman, 1994; Milgrom and Roberts, 1995). For example, deploying available resources more productively in simplifying marketing

activities, increasing structural formalization and centralization, and developing a narrow range of marketing capabilities will help attain efficiency in marketing. More focused resource deployment in capability building, greater control of decisions involving future resource allocation, and the efficiency benefits of increased routinization and increase efficiency (Walker and Ruekert, 1987).

Social marketing theory is a knowledge-based discipline that is of increasing relevance in market research. Social marketing, refers to the design, implementation, and control of programmes seeking to increase the acceptability of a social marketing idea, behaviour or practice in a target group involving considerations of product planning, pricing, communication, distribution and market research, (Kotler and Zaltman,1986). They expand this definition further when they add that social marketing "utilizes concepts of market segmentation, consumer research, idea configuration, communication, facilitation, incentives, and exchange theory to maximize target group response".

Therefore, in social marketing, the intervention is developed from a solid base of communication while marketing techniques are used to supplement message development and programme implementation. Social Marketing theory is also based on the "marketing philosophy" that people will adopt new behaviours or ideas if they feel that something of value is exchanged between the customer and the social marketer (Day, 2008). Thus, one of the goals of a social marketer should be to meet consumer needs and wants.

In the current study, social marketing theory was used in investigating the flow of information, quality control, price policies, barriers, margins, promotion, advertisement, and the market structures of macadamia to determine how they can be improved to increase the efficiency level. The social marketing theory and the World economic triangle concept were interlinked and applied in the analysis and interpretation of the findings of this study. The approach based on the two tiers agrees well on earlier study Murioga, (1988) where he used 8ps to analyse effective marketing of daily products in Kenya. He added promotion & advertising, packaging, public relations and personnel Development & Training as an extension of social marketing to the common 4ps to analyse the marketing effectiveness in Kenya Co-operative Creameries Limited.

2.10 Summary

To summarize the literature review, it was the contention of this study that the value addition on agrifood sector would be greater when its marketing organization characteristic were similar to those of the efficiency- maximizing ideal profile in which activities were arranged to fit the implementation requirements of the business strategic type in ways that minimized the resources consumed. Social marketing theory and World economic triangle concept were used in exploring how the various components and elements that constitute the agrifood marketing system would be co- aligned to achieve maximum efficiency at both local and global market levels, Figures 2.1 and 2.2.

The world economy is marked by competition between local clusters, export market and global value chain (Messner, 2002). Marketing no longer knows national boundaries hence the need for considering and adopting the World Economic Triangle Concept,

(Nadvi and Schmiz, 1999; Gereffi, 2011) and social marketing theory (Porter, 2000). Previously, scholars have concentrated in their respective localities and have not tried to relate their studies to current world marketing development, which is a missing gap. Scholars have also assessed market efficiency systems in disaggregated series but the current study may be said to be an integrated market system where cross functional relationship for all the objectives were correlated in both horizontally and vertically.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodology and procedures adopted in conducting the study on assessment of macadamia marketing systems and their efficiency in the Central Kenya Highlands. The chapter also includes location and description of the study area, research design, target population, sample size, sampling procedure, source of data, data collection instruments and data analysis procedures.

3.1.1 Location and Description of the Study Area

The study was carried out in five counties, namely, Kiambu, Muranga, Kirinyaga, Embu and Nyeri of the Central Kenya highlands which were purposively selected because they are the counties where macadamia farming was widely practised (HCDA, 2011). These five counties contribute more than 64% of Kenya's annual recorded macadamia total production volume in the year 2011 (HCDA, 2011) hence their purposive selection. A brief description of the five counties is given below. The location of the study area is shown in Figure 3.1.

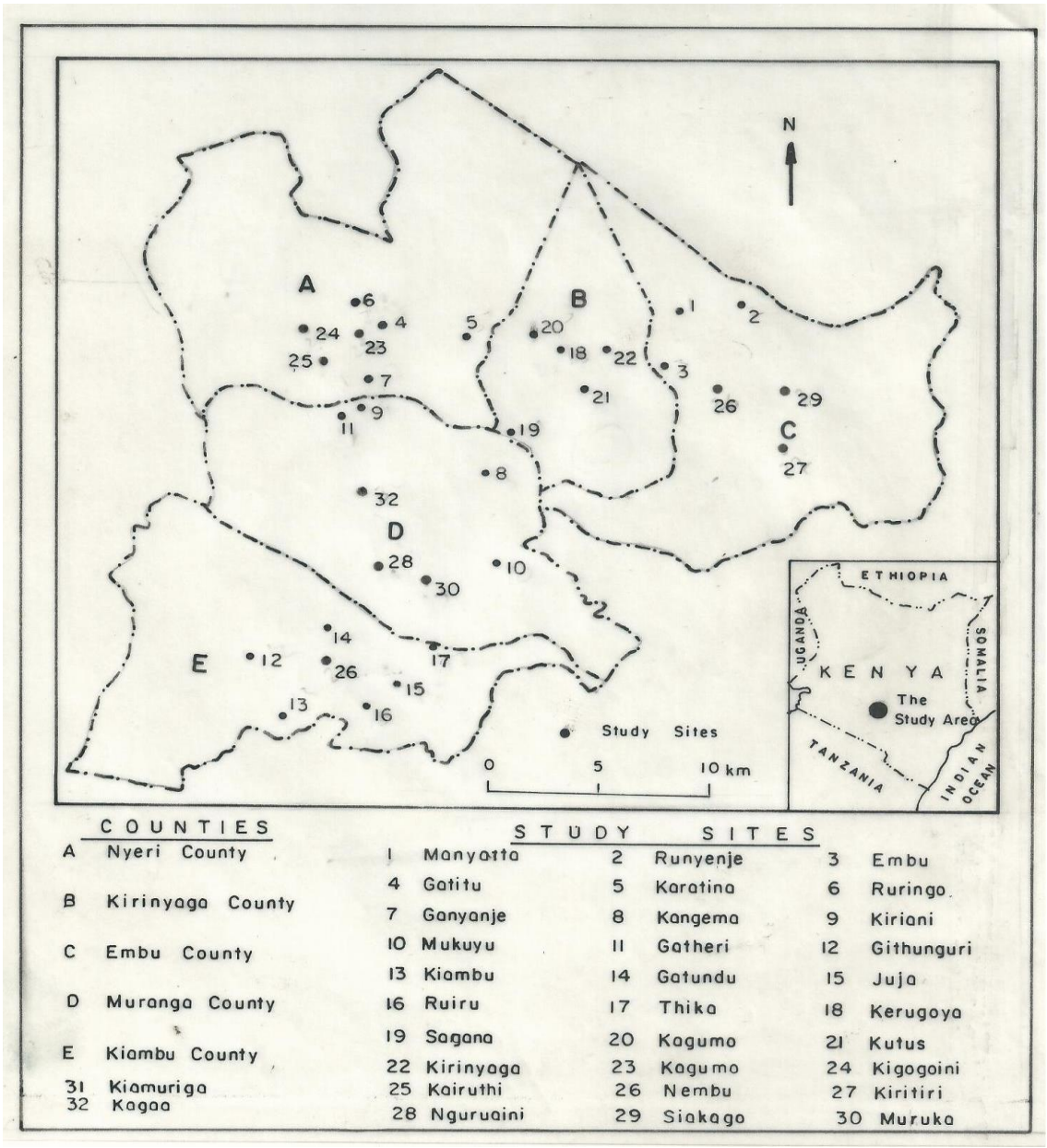
Embu County is located in Eastern Kenya. The county has temperature ranging between 12°C to 27°C with an average annual rainfall of 1495 mm. The county's administrative capital is Embu Town and is served by four local authorities (Embu and Runyenjes Municipal Councils, County Councils of Embu and Mbeere). The county produced 48.3% of all macadamia produced in Kenya in 2011 as per HCDA (2011).

Kiambu County is located in central Kenya; it borders Murang'a County to the North and North East, Machakos County to the East, Nairobi and Kajiado counties to the South, Nakuru County to the West, and Nyandarua County to the Northwest. The county produces 11.1% of all macadamia produced in Kenya (HCDA (2011)

Kirinyaga County is a county in the former Central Province of Kenya. Its capital town is Kerugoya town. It has three local authorities (Municipal Council of Kerugoya, County Council of Kirinyaga, and Town Council of Sagana). Like most of neighbouring counties, agriculture is the backbone of Kirinyaga's economy with a mix of agrifood and livestock farming as per HCDA (2011).

Murang'a County is located between Kiambu County to the South, Nyeri County to the North, Nyandarua County to the West and Kirinyaga County to the east. It is, therefore, in Central Kenya with most of its land being mountainous. It is breath-taking with hills, forests, rivers and valleys. The county produced 4.7% of all raw macadamia nuts in 2011 as reported in validated HCDA (2011).

Nyeri County is situated about 150 km North of Kenya's capital Nairobi, in the country's densely populated and fertile Central Highlands, lying between the eastern base of the Aberdares (Nyandarua) Range, which forms part of the eastern end of the Great Rift Valley, and the western slopes of Mount Kenya validated HCDA (2011) .



Source: Survey of Kenya, GoK, (1991)

Figure 3.1: Study Site

3.2 Research Design

The study adopted an exploratory approach using a descriptive survey design because it describes the state of events based on the responses from the respondents. Descriptive research design relied on both qualitative and quantitative methods of data analysis in describing phenomena.

Table 3.1: Target Population

Target Population	Number
Farmers	1620
Middlemen	280
Processors	7
Distributors/retailers	30
Consumers	650
Total	**2587**

Market traders from each of the above categories were distributed across the five counties purposively selected for this study based on a selection formula outlined in the sample selection technique.

3.3 Target Population

The targeted population was all macadamia marketing traders, farmers and consumers. The target population of the study included the following: 1620 macadamia farmers, 280 middlemen, 7 macadamia processor, 30 distributors and 650 consumers. This target population helped in the assessment of the level of efficiency of macadamia marketing system in Kenya. The size of the target population was derived from secondary data obtained and extracted from Nyeri and Embu Towns which were provincial Headquarters then, as indicated in Table 3.1. The secondary data extracted from Nyeri and Embu were

verified later in Ministry of Agriculture and Livestock Development and Kenya National Bureau of Statistics annual returns in their respective Head offices in Nairobi. Macadamia traders from each of the five market channel levels were distributed across the five counties in this study.

3.4 Source of Primary Data

Data for this study were collected from both primary and secondary sources. The secondary data were collected from documentary annual and quarterly reports from ministry of agriculture and empirical finding by scholars. Primary data were collected from the macadamia traders and consumers by the research assistants in the 32 stratified market centres by use of structured questionnaires as indicated in Appendix iii.

3.5 Sample Size Selection and Technique

The study employed multistage random sampling techniques to draw the sample of macadamia traders in the stratified counties. The sample size was drawn from the five stratified counties of Kiambu, Muranga, Nyeri, Kirinyaga and Embu, for the purposes of this study. The respondent to this study included systematic randomly sampled farmers, middlemen, and consumers as presented in Table 3.2. For processors and distributors (supermarkets) who were 7 and 30 respectfully, all respondents targeted were interviewed because they were too few to use samples. To arrive at the figures for the sample for the other three levels, farmers, middlemen and consumers, the study relied on sample size required for a descriptive study (Kothari, 2004):

Formula $n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq}$ Where;

n=desired sample

Z= 1.96 the value of the standard bivariate at 95% confidence interval under normal curve

P=sample proportion, assuming a conservative sample where q=1-p=0.5 and

N= the estimated population in the five selected counties.

Using multistage random sampling technique, a total of 292 macadamia marketing traders, farmers and consumers in 32 market centres were selected. The actual sampling distribution is indicated in Table 3.2.

Table 3.2: Sample size in the five counties

	Kirinyaga	**Kiambu**	**Nyeri**	**Muranga**	**Embu**	**Population Frequency**
Farmers	44	41	33	28	16	162
Middlemen	7	7	6	5	3	28
Processors	1	4	0	1	1	7
Distributors	5	7	7	5	6	30
Consumers	10	14	14	15	12	65
Total	67	73	60	54	38	292

Source: Field data 2012

3.6 Data Collection Procedures

Questionnaire forms (Appendix III) attached to consent form (Appendix II) which were given to research assistants earlier were handed back on the third week to the researcher for analysis and presentation as explained below. Data were collected from the primary sources through the use of structured questionnaires. After carrying out pre-test survey and verifying reliability and validity of the equipment to be used, the five research

assistants were trained. The training of the research assistants took four days followed by a field day where a group of sampled macadamia traders in the five market channels were interviewed. The whole process took five days. Multistage random sampling was used to select macadamia market trader's samples. The researcher met on third day with all the five research assistants (one for each county) to review the whole process after which the research assistants were given research instruments with time framework of two weeks and given proper working instructions after which all the fully completed questionnaires were returned.

The primary data for analyses was obtained from the macadamia traders through the use of questionnaires and individual interviews. The interviewer pursued in-depth information around the topic. Interviews were useful in follow-up to ascertain that market traders understood the questionnaires. Five sets of questionnaires were developed in order to obtain as much information from the respondents.

3.7 Research Instruments

The questionnaires were tailored to cover the five market channel levels of macadamia traders as indicated in appendix III. Questionnaires were preferred because they were more objective hence the responses gathered were standardized in some way. Hughes (2002) argues that standardized questions make measurement more precise by enforcing uniform definitions upon the participant because questionnaires are used to ask people about their experiences, behaviours or attitudes which were very relevant and applicable to the current study.

Material and equipment used in the research were based on their known reliability and validity. The equipment and material used in the data collection process included the Global Positioning System (GPS) and Topographic digitised county Maps showing all the 32 market centres. Questionnaires indicated in appendix III, a laptop and its accessories were supplied and used.

3.7.1Reliability of the Instruments

Reliability was used to measure how consistent the results from the pre- test were. The researcher employed test-retest method to test reliability. All categories of the respondents were selected from the area of study and questionnaires were distributed to the respondents to fill the questionnaires and the responses were scored manually. After ten days, the same questionnaires were distributed to the same respondents. Their responses were scored and comparisons made between the first and second scores. The results from the two tests were correlated using the Spearman-Brown formula which gave correlation coefficient as 0.89. Reliability was therefore calculated using the Spearman-Brown formula as shown:

Reliability $(R) = \frac{2}{1+r}$Where r = the actual correlation between the halves of the instrument. According to Mugenda & Mugenda (2012), a coefficient of 0.80 or more implies that there is high degree of reliability of the data.

3.8 Data Analysis and Presentation

In this study, inferential statistics and measures of central tendency distribution and percentages were applied. This enabled the assessment of multifactor variable activities

and main factors that contribute to the efficiency of macadamia marketing system in central Kenya highlands. Data analysis involved examining of the coded data critically and making inference. Data from the questionnaires were analyzed in the following process;

Step1: Data collected were inspected thoroughly for their completeness, to identify mistakes such as inappropriately answered questions and wrongly spelt words.

Step 2: Data cleaning process was carried where the data were sorted into various categories such as gender, level of education and age.

Step 3: Data were coded, processed, analyzed and tabulated in form of graphs, tables and pie charts by Statistical Package for Social Sciences (SPSS) version 20.

3.9 Empirical Models

Various models were used to analyse market efficiency which included: Correlation analysis, Asymmetric price transmission, market structure, marketing margins and index of marketing efficiency. These were all used as explained in the remaining part of this chapter.

3.9.1 Market Organisational Structure and Conduct Analysis

Market organisational structure and conduct was assessed on the bases of management organisational systems. From the analysis the market concentration refers to the percentage of total transactions accounted for by a number of macadamia traders for the given markets in the county. A competitive market was expected to have a low

concentration due to many buyers and sellers (Collins and Bia, 2012). The approach was used to assess efficiency on management organisational structures. Using a correlation analysis, the study sought to find out whether there was a relationship between macadamia production/sales and the market centres in an area.

3.9.2 Multiple Regression Analysis

Multiple regression technique was used for set of data to find out the relationship between variables. The model was run in SPSS version 20 for the data analysis. It was important to start with different number of variables and pruning them by selecting the few that commonly correlated to each other. Every marketing problem involved set of variables and the researcher was typically interested in one of the variables which could explain the causes of its variation over time and space.

Multiple regressions analysis techniques were used to show contribution of independent variables to variations in the dependent variables. When two or more independent variables are involved, the procedure is called multiple regressions. Kotler, (1986) in his statistical analysis, expresses sales of Q as a dependent variable and tries to explain sales as function of a number of independent demand variables X_1 X_2…….. X_n that is

$Q = F (X_1 X_2 \ldots\ldots X_n)$

Using multiple regression analysis, various equation forms can be statistically fitted to find the best predicting factors and equation. In the study, the value of produce as dependent variable fitted in area Hectare and production Metric ton (MT) to find out the

predicting factor. This was done by application of computer programmes (SPSS) version 20. This procedure was very ideal for the application to macadamia efficiency study.

3.9.3 Regression Model

A regression model was used to show the relationship between various variables to ascertain the causal effect of one variable upon another. Regression analysis was used to show the relationship between various variables to ascertain the causal effect of one variable upon another. The regression was calculated using the basic regression model.

$$Y=\beta_0 +\beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X4+ \beta_5 X5+e$$

Where Y – is the dependent variable i.e. sales volume

X1-X4 –Are the independent variables

X1 –Marketing organizational structure and conduct

X2- Quality control standards and specifications

X3- Price transmission in the five counties

X4-Market margins

3.9.4 Quality Control System Model

The value discipline theory puts it across that organizations may not be in a position to offer every aspect that leads to attraction and retention of customers. In this case, the theory suggests that it would be in order for the organizations to select one of the aspects based on their ability and level of expertize out of which they are able to attract and retain customers. If an organization chooses to focus on product leadership, it should have the channels to offer high-quality products which exceed the customer expectations (Fishbach, Ratner and Zhang, 2011).

However, if the firm feels that the system it has does not allow for quality improvement, it is necessary to focus on other aspects such as customer intimacy and operational excellence. If the firm chooses operational excellence as the aspect to focus on, then it should be ready to have its operations streamlined in a manner that they are able to attract more customers and retain the existing ones. Through efficient operations whereby the services offered are well tailored and through a focus on the timelines given by the customer, then the relationship between the firm and the customer will be enhanced (Fishbach, Ratner and Zhang, 2011).

3.9.5 Correlation of Price Levels

Measurement of pricing efficiency involves comparisons of price series, for example, the zero correlation of price series at different markets is related to the idea that integrated markets indicate and reflect relationship of moving together. The magnitude and significance of the correlation coefficient were used to measure the level of market integration.

This technique looked at the partial correlations of prices through intervening time series. Variables were looked at to determine how the prices were fixed for example, was it monopoly or collusion by the market participants. It was proper to determine whether it was the demand and supply which determined the efficiency of the market or other forces which were not market-oriented or related. Correlation of price levels as measure of efficiency involves comparisons of price series, for example, the one correlation of price series at different markets was related to the idea of integrated markets which indicates and reflect relationship of moving together. The magnitude and significance of the

correlation coefficient were used to measure the level of market integration. Correlation analysis remains the most common method for measuring market integration (Goletti & Christina, 1995).

3.9.6 Assymetric Price Transmission Model

The study proposed to use asymmetric price transmission model through the concept of co-integration as formulated by Von Cramon-Taubadel and Fahlbusch (1994). This approach involves error correction model (ECM) which is extended by the incorporation of asymmetric adjustment terms. The procedure involves estimating a relationship between prices (for example retail and farm-level) by ordinary least squares (OLS) and testing for the presence of a spurious regression. If the prices can be referred to as being co-integrated the estimated coefficient of the OLS is an estimate of the long-term equilibrium relationship between them. Further to this, an ECM can then be estimated. The model includes error correction term which measures deviations from the long run equilibrium between the two prices, for this study, changes in prices of macadamia. This allows the estimated price to respond to the changes in the explanatory price and also to correct any deviations from the long run equilibrium. The ECM takes to following form:

$$\Delta P_t^1 = \alpha + \sum_{j=1}^{k} \beta_j \Delta P_{t-j+1}^2 + \gamma^+ \nu_{t-1}^+ + \gamma^- \nu_{t-1}^- + e_t$$

Where P^1_t and P^2_t are two vertically related prices (retail and farm-level), Δ is the difference indicator (P_{t-l}-P_t), β_j and Υ are the estimated coefficients and V^+_{t-l} and V^-_{t-l} are the positive and negative deviations from the equilibrium

3.9.7 Spatial Price Model and Market Integration

Spatial pricing examines how prices in different markets over space are related, especially through transportation and other movement costs. The understanding of spatial pricing is important in reducing the probability of losses through risks of produce failure in one region which is shared over a larger market area hence helping to stabilize prices. An important step toward improving the functioning of markets in this case is to understand the nature and effects of transaction costs including input supplies, facing farmers, food retailers, and/or consumers (Goetz, 1995). This study employed the model of spatial price relationship developed by Hays and McCoy (1977) as shown below and further expounded in the results section:

$$PP_{ij} = P_i - (HC_{ji} + TC_{ji} + AS_{ji})$$

Where: PP_{ij} = the calculated price of one ton of macadamia from the *i*th market in relation to the *j*th markets.

P_i= the actual wholesale price of one ton of macadamia at the *i*th market.

HC_{ij} = Handling costs involved in moving one ton of macadia from the *j*th to the *i*th market.

TC_{ij} = Transport cost for moving one ton of macadamia from the *j*th to the *i*th Market.

AS_{ij} = the charge for the assemblers' service (middlemen and government levies) in moving one ton of macadamia from the *j*th to the *i*th market.

The actual price spread between any two markets would be:

$$PS_{ij} = PP_{ij} - P_j$$

W here:

PS_{ij} = the price spread for one ton of macadamia between the *i*th and the *j*th market.

P*j* = the actual sale price of one-ton macadamia in the *j*th market.

3.9.8 Market Margins

A common measure of market efficiency was by evaluation of marketing margins in various market channels and the five stratified counties. The market margin percentages in different levels were compared and conclusions made.

Where P1 = Farmers price, P2 = Brokers price, P3 = Processor price, P4 = Distributors price and P5 = retail price

Marketing margin for farmer= p2-p1

Marketing margin for broker=p3-p2

Marketing margin for processor=p4-p3

Market margin for distributor=p5-p4

Various margins were computed to compare the efficiency in the market for example, farmer's margins, and middlemen margins. Initial cost price figures were used to determine the price spread but the percentage on margins when used gave better results.

Value added costs differ in each market with time and space of one-year period broken down into monthly and weekly series applied time series analysis had a weakness. A further analysis on various intervening market variables was considered. It was suggested that in most African countries, traders' market margins amount to less than 10% of the price (Sandford, 1983). Howeve, Goosen, (1995) argues that margins of 5% are acceptable for storable goods in Africa context. Macadamia traders' margins were

analysed to determine whether they were excessive which was a measure of performance and efficiency of macadamia marketing system.

3.9.9 Analysis of Variance

The analysis of variance examines the differences in the mean values of the dependent variable for several categories of a single independent variable or factor (Clewer and Scarisbrick, 2001). The analysis of variance was used to determine whether there are significant differences between the various factors that influence farmers in marketing of their macadamias. The ANOVA model used was defined as:

$Y_{ijk}=\mu+\alpha i+\beta j+\varepsilon ijk$

Y_{ijk}-effect model

μ- Overall mean

αi- Effect of the *i*th level of factor A,

βj- Effect of the *j*th level of factor B

εijk:-Interaction between A and B

3.9.10 Multifactor Analysis

Factor and component analysis techniques were used when there were many variables in the data collection, with no one variable forming a major important role. The objective was to reduce the number of variables to a fewer underlying concepts with a common shape or size. In this study, the data collection had very large data of different sizes and shapes and the data analysis was to factor primary data to common and acceptable sizes and shapes. This was a more complex technique which applied appropriate computer package (SPSS) version 20. Pair wise correlation matrix was to be used to test various

variables to indicate whether correlation coefficients (r) are significant at various confidence levels.

3.10 Marketing index Efficiency

Empirical assessment of marketing efficiency was carried using marketing index efficiency. The marketing efficiency along the five counties was carried using index formula (Shepherds, 1965). Five market actors namely farmers, middlemen, processor, distributors and retailers were used as market channels. Buying and selling prices were assumed to include all the elements of marketing costs.

Shepherd formula:

Ratio of output to input E = (O/I) x 100

E = Index of marketing efficiency

O = cost of goods including value added cost

I = input is the real cost of marketing (including some fair margin of intermediaries)

The ratio of the total value of goods marketed to the marketing cost may be used as a measure of marketing efficiency. This method eliminates the problem of measurement of value added. An increase of the ratio represents improved efficiency and a decrease denotes reduced efficiency. Applications of Shepherd formula in the market efficiency for the four channels were:

Market Index $$\text{Farmer channel} = \frac{\text{Farmer sales price}}{\text{Total cost of goods}}$$

Market Index $$\text{Processor channel} = \frac{\text{Processor sales price}}{\text{Total cost of goods}}$$

Market Index $$\text{Middleman channel} = \frac{\text{Middleman sales price}}{\text{Total cost of goods}}$$

Market Index $$\text{Retailer channel} = \frac{\text{Retail sales price}}{\text{Total cost of goods}}$$

3.11 Description and Justification of Variables

Practical situations for data analysis involve relationships among more than two variables which was also applicable in the efficiency of macadamia marketing system study. The relationship analysis between variables involves different techniques and could be simple or in some cases very complex, (Mugenda and Mugenda, 2012). It is necessary to arrange variables in common factor which is a cluster to make interpretation of data. They have identified eight different clusters of variables that exist but only three of these clusters were very relevant to the current study as indicated in Table 3.3.

Table 3.3: Multifactor variables in the macadamia marketing chain

Independent variables	**Intervening / exogenous**	**Dependent variables**
Level of quality control standardand specifications Price transmission from one market to another Organisational management structures conduct and performance Market Margins	Government regulations – levies and information flow Technology level changes Market structures and infrastructures Inflation factors Trade barriers e.g. by (GoK) population change and income	Efficiency of Marketing System Sales volume

A positive relationship is said to exist between two variables when larger values of one variable are associated with larger values of another variable. This may be affected by third force of exogenous variable and may not be directly pinpointed or determined but in long-term affects the relationship of the independent and dependent variables. Changes in independent variables are believed to cause changes in dependent variables.

CHAPTER FOUR

RESULTS

4.1 Introduction and Data Description

This chapter presents the empirical findings of macadamia marketing system in the Central Kenya highlands. The objective of the study was to assess the efficiency of marketing chain of macadamia nuts in Kenya. Codes were developed to represent the identified themes which were applied and linked to raw data as summary markers for later analysis. The findings therefore are grouped into various themes, subthemes and clusters followed by the analysis and discussion of each of the themes identified and guided by the four objectives of this study.

4.2 Demographic Information of the Respondents

This section presents demographic information of respondents considered crucial for subsequent discussions such as gender, age, and educational levels.

Table 4.1: Gender and age of market traders

	Gender							
	Male	Female	Percent (%) Distribution by Age group					
			≤20 Yrs				>50	
Designation	%	%		21-29	30-39	40-49	Yrs	%
Farmers	55.6	44.4	2.5	9.9	27.2	24.7	35.8	56
Middlemen	75.0	25.0	0	32.1	42.9	17.9	7.1	10
Processors	57.1	42.9	0	14.3	71.4	14.3	0	2
Retailers	56.7	43.3	0	70.0	23.3	6.7	0	10
Consumers	52.3	47.7	12.3	40.0	21.5	16.9	9.2	22

Source: Field data 2012

4.2.1 Gender of the Respondents

The gender of the respondents was an important component of this study as it revealed the categories of people involved in the macadamia business. Table 4.1 shows the gender of the respondents alongside their designation. The above analysis above shows that out of the 162 farmers who took part in this study, 56% were men while 44% were women. Among the 30 retailers, 56% were male while 43% were women. The rest of the gender across designation was as indicated in the table 4.1. The analysis indicates that the macadamia trade is controlled by men 52 % compared to women 48%

48%.

4.2.2 Age of the Market Traders

The age of the respondents was also considered as a crucial element in this study. Scholars have noted that age may influence participation of activities and access to resources (GoK, 2007). The researcher, therefore, asked the respondents to indicate their age bracket and the results are presented in the Table 4.1. The findings indicated that 36% of the farmers were over 50 years, 43% of the middlemen were 30 – 39 years old, 71.4% of processors were 30 – 39 years of age, 70% of retailers were 21 – 29 years while 40% of the consumers were 21 – 29 years of age. None of the middlemen, processors and the retailers was below 20 years of age.

These findings indicated that 36 % of farmers were well experienced in farming and marketing of macadamia nuts and hence they were suitable for this study. Macadamia industry was mainly dominated by men as shown in table 4.1. The 56% of the farmers, 75% of the middlemen, 57% of the processors, 52% of the consumers and 56.% of the

retailers were male which were higher than for female in all the market channels. The macadamia trade may be concluded to be controlled by men.

4.2.3 Education Level of the Market Traders

Education affects the level of participation and implementation of extension program services and logistics of handling agricultural technologies. The findings are shown in Table 4.2.

Table 4.2: Education level of market traders

	Designation					
Level of Education	**Farmers**	**Middlemen**	**Processors**	**Distributor**	**Retailer**	**Chi value**
	%	%	%	%	%	
None	-	-	-	-		
Primary	29	21	-	-	6	
Secondary	46	57	-	30	37	
College	14	11	43	67	35	χ^2=74.20
University	4	7	14	3	20	df 16,
No response	8	4	43	-	2	P=0.283
Total	**100.**	**100**	**100**	**100.**	**100**	

4.3 Analysis of factors influencing management organisational structures that affect the market efficiency.

4.3.1 Management Organizational Structure and Conduct

The market organisational structure and conduct model suggests that there exists relationship between characteristics of the market and the behaviour of the market players

and that their behaviour in turn affects the market efficiency (Roy, 2006). The explanation is also expanded and supported by social marketing theory used in the theoretical framework (Porter, 2000) as explained in literature review.

4.3.2 Market Outlet

The objective in this study was to establish the effect of management organisational structure on macadamia marketing efficiency systems. To this end, the study sought to analyse various independent variables that play part in this area, one of them being the effect of efficiency by market outlets. In this regard, this study held the view that the number of market outlets of a particular product, directly or indirectly affects the market efficiency. The results figure 4.1 indicates that brokers have a big effect on macadamia marketing efficiency in the central Kenya highlands.

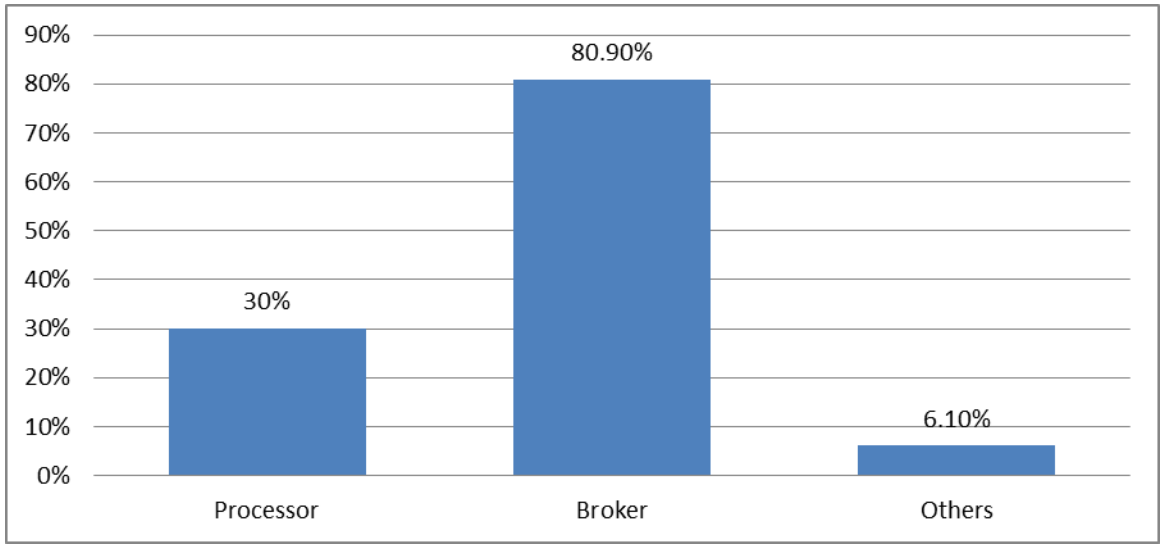


Figure 4.1: Farmers' main market outlets

Source: Survey data 2012

The findings show that majority of the farmers (80.9%) rely on the brokers to market their produce while 13% rely on the processors. This shows that brokers play a big role in the marketing of macadamia as they negotiate with the farmers and look for markets for macadamia products. The popularity of brokers among farmers could be attributed to the fact that the brokers pay immediate cash to farmers hence doing away with the long wait by farmers to get their money after supplying their produce to processors. The effect of broker in the macadamia marketing was to reduce transport costs and indirectly increase market efficiency. The fact that 80% of farmers produce is controlled by brokers means that there is marketing inefficiency because of monopoly caused by the existing functional marketing relationship.

4.3.3 Market Information for Macadamia Traders

In analysing information flow as an independent marketing variable, the study considered that for efficiency in macadamia marketing to be realized, the flow of information to individuals and organizations involved in macadamia marketing, and how this information was managed was very important. Information plays a critical role in so many aspects of the macadamia business as it affects and influences decisions and actions of the people involved. Therefore, information-processing systems should be properly integrated, and that both forward and backward information must be ensured to flow within the market environment and was being supplied to the right people and organizations at the right time. Results for this marketing variable are presented in Table 4.3.

Table 4.3: Source of market information for the macadamia traders

Source of information	Farmers (N = 162)	Distributors (N = 30)	Middlemen (N=28)	Processor (N=7)	Consumers (N=65)	Chi value
	%	%	%	%	%	
Internet	1	17	14	57	19	$\chi 2$ =73.281
Radio/TV	26	30	18	14	55	df =20
Barazas	66	13	57	-	10	P = 0.200
Newspapers	1	20	11	-	14	
Others	-	13	-	-	-	
Non-committal	6	17	-	29	2	
Total %	**100**	**100**	**100**	**100**	**100**	

Source: Survey data

***indicate a significant at 95 %**

Table 4.3 above shows that information about the market dynamics was often received by the farmers mainly from public barazas 69% and radio/TV 26%.However, other sources of information are newspapers, and the internet. Like farmers, majority of the middlemen 57.1% rely on public barazas as their source of information while 14% get information through internet, 18% through radio/TV., and 11% through% newspapers. Both the retailers and processors relied also on public barazas as a source of information. The bulky of their source of information is the mass media with retailers relying mainly on radio/TV 33.3% and internet 17% while processors mainly get their market information from the internet 57%. On their part, consumers' main source of information was the mass media with radio/ TV taking majority share of 55%, and newspapers coming in second with 14%. From the analysis it can be concluded that all traders with exception of

processors most likely receive out-dated and unreliable information which may be not be very helpful in marketing decision making which affect and lowers market efficiency.

4.3.4 Cross Relationship between Information, Age and Education Level

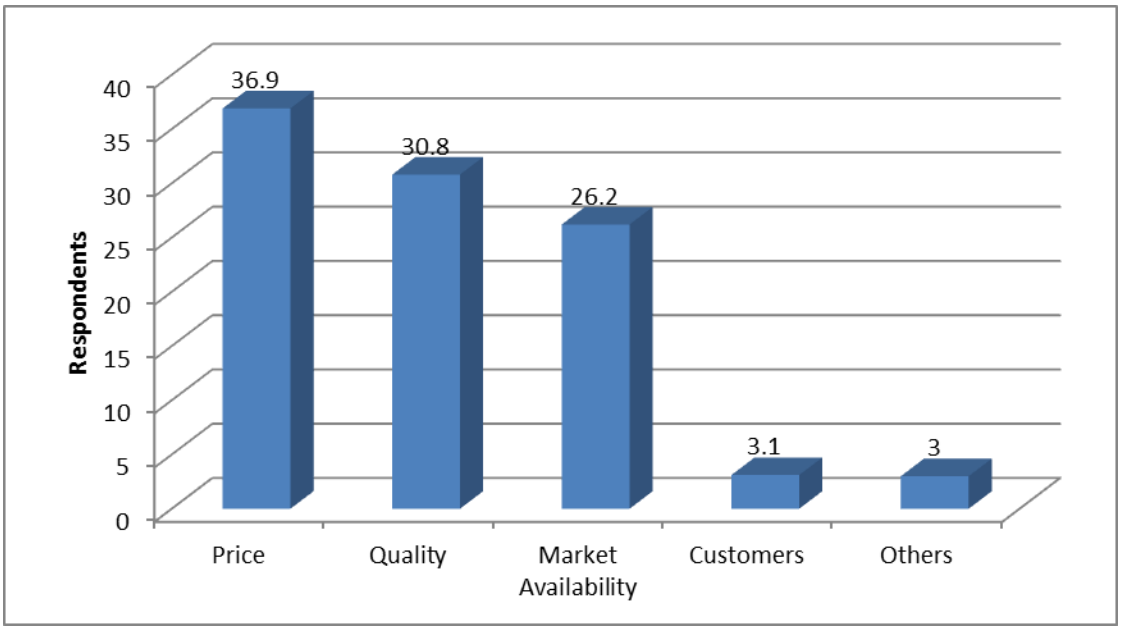
Considering the fact that adequacy of information flow is a determinant factor in the efficiency of macadamia marketing. Using multifactor analysis against the traders' views on the adequacy of market information flow, the findings are presented in Table 4.4.

Table 4.4: Market information according to age and education levels

Education	Farmers	Middlemen	Processors	Consumers
	% age	% age	% age	% age
No education	9	0	0	0
Primary	27	15	0	12
Secondary	44	69	0	44
College	20	15	40	24
University	1	0.0	60	20.
Chi- value (χ^2)	15.08	2.78	3.733	27.107
P-value (p)	0.057	0.426	0.155	0.001*
Age (Years)	Percentages	percentages	Percentages	Percentages
Below 20 years	3.1	0	0	8
21 – 29	8	36	0.0	36
30 – 39	26	50	80	20
40 – 49	26	14	20	24
Over 50 years	38	0.0	0	12
Chi- value(χ^2)	6.682	3.09	3.080	6.89
P-value (p)	0.571	0.377	0.214	0.548

***indicate a significant at 95 % CI of age and education**

The analysis on 8 on the market information with the consumers' education levels was significantly different (χ^2 = 27.107, P = 0.001). The findings show that the age and educational level play an important role in attaining information flow which may affect the efficiency of macadamia marketing as shown by table 4.4.



Source: Primary data 2012

Figure 4.2: Preferred Information type

4.3.5 Nature of Market Information

Other than establishing the sources, flow and adequacy of information, the study also sought to establish the nature of market information that respondents preferred to receive. To this end, an open-ended question was posed to the respondents aimed at eliciting information from them regarding the market information of macadamia that they are interested in as indicated in Figure 4.2. The findings show that there were variations of what kind of information that the respondents were interested in depending on their

category. The respondents preferred forms of information ranged from price, quality of the product, availability of market as well as customers. Respondents, for example, would like to receive information mainly on price (36%), quality (30.8%) and availability of macadamia markets and products in the market. These findings indicate that the flow of macadamia information should be improved to cover all levels of traders to increase market efficiency as indicated by figure.

4.3.6 Importance of Promotion and Advertisement

When the traders were probed to state why they thought promotions and advertisement were important, most of them indicated that there were benefits such as repeat orders which is an indication of satisfaction. This is an indirect way of showing the level of quality satisfaction by analysing retailers and consumers levels in the Central Kenya highlands as indicated in Table 4.15.

4.3.7 Levels of Macadamia Traders Involved in Macadamia Marketing

The study posed a question that aimed at establishing the level of traders involved in macadamia marketing starting from the lowest, sole trader, partnership to company level in that order, as indicated by Table 4.5 below.

Table 4.5: Traders' Level of involvement

	Processors	Middlemen	Retailers	Farmers	Chi value
Type of trade	**%**	**%**	**%**	**%**	
Sole trader	29	86	27	94	
Company	71	-	10	1	$\chi^2 = 33.00$
Partnership	-	14	64	3	df=9
Others	-	-	-	2	P= 0.323
Total	**100**	**100**	**100**	**100**	

Source: Primary data 2012.

4.3.8 Reasons Why Traders Were Not in Collective Buying and Selling

This study sought to establish why majority of the farmers, middlemen and retailers in macadamia marketing were not involved in the collective buying and selling of macadamia products. The findings are as indicated in figure 4.3 below.

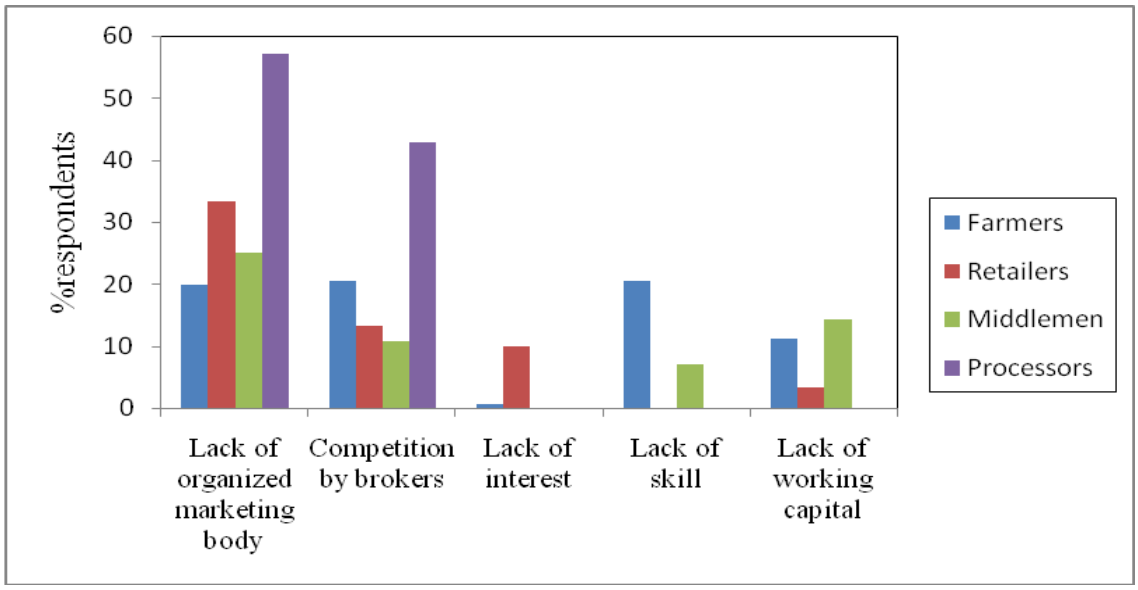


Figure 4.3: Reasons for non-involvement in collective buying and selling

The findings show that majority of the farmers were not involved in collective buying and selling of macadamia nuts due to fear of competition from brokers (20%) and lack of adequate skills (20%) on their part, majority of the retailers (33%) pointed out lack of an organized marketing body as the major reason for not being involved in the collective buying and selling of macadamia products as indicated by figure 4.3. The results indicated there was a problem in management organisational structure which impacted on macadamia marketing efficiency in stratified area.

4.3.9 Storage Mechanisms of Macadamia

The study sought to establish the storage mechanisms for macadamia. To this end, a question was posed to farmers aimed at finding out how and why they stored macadamia. The findings were as shown in figure 4.4. Nuts are stored after harvesting when the farmers are waiting for the buyers, waiting to get a market, when drying the nuts, when requested by the brokers, waiting for the customers and when waiting for the stock to increase to an economical transportable sales volume.

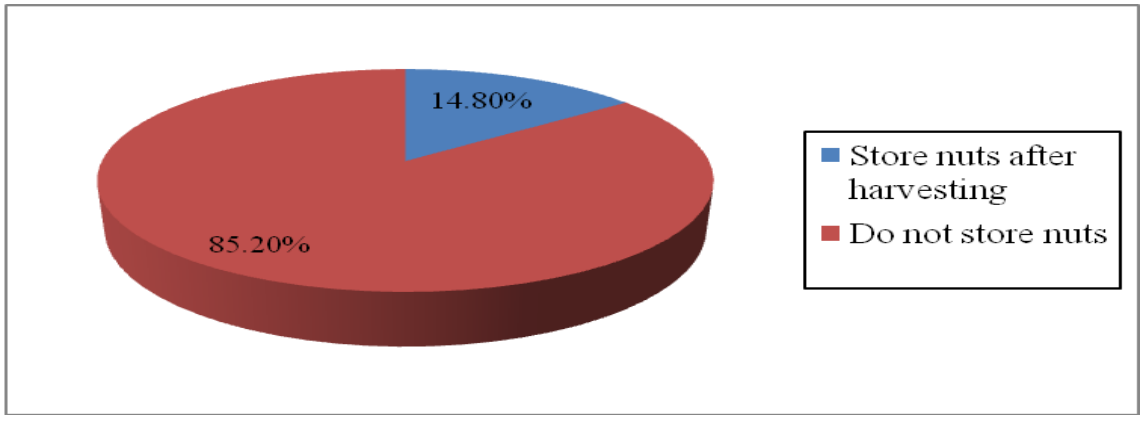


Figure 4.4: Farmers storing nuts after harvest

The findings in figure 4.4 indicated that majority of the farmers 85.2% did not store macadamia nuts after harvesting while 14.8% of the farmers stored them after harvesting.

Table 4.6: Nut storage span

Duration the farmers store their nuts	Percentage
One day	1
7 days	2
1 month	2
Over one month	3
Non-committal	92
Total %	**100%**

Source: survey Data

The findings on table 4.6 indicate that about 3% of farmers stored their nuts for shorter periods of less than a month and 5% of the farmers stored their nuts for over one month as indicated in Table 4.6. When the farmers were probed further to indicate where they stored the nuts, 8% of the farmers reported that they stored them in stores and granaries in their homes. The storage problem noted by these farmers was when waiting for price to change and when there was no transport available.

4.3.10 Effect of Storage Time and Space on Macadamia Nuts

The study sought to find out whether there were effects on storing macadamia nuts over a certain period of time. The findings are as shown in figure 4.5 below.

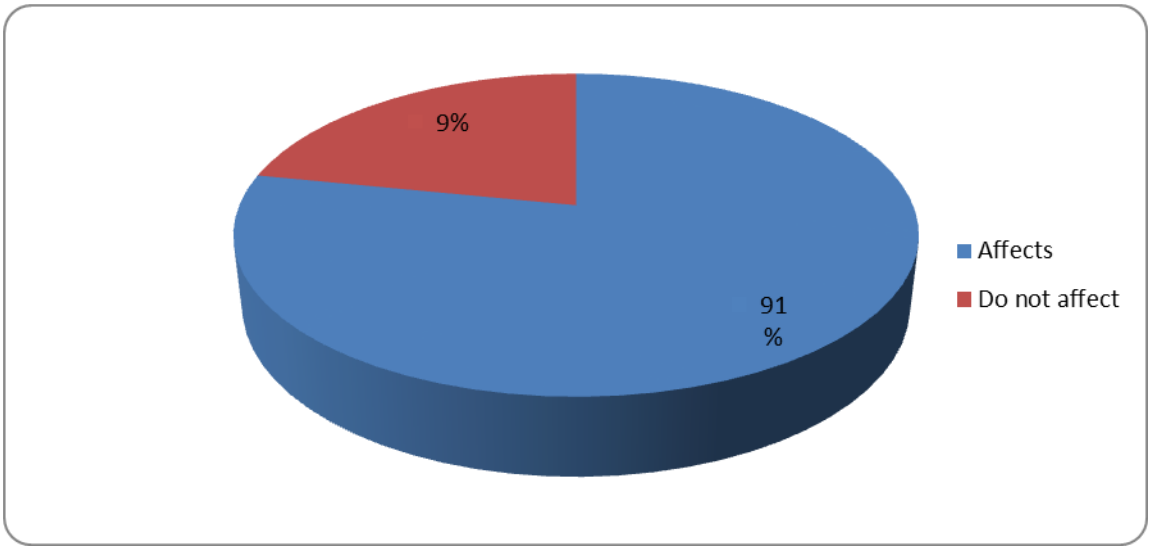


Figure 4.5: Effect of post-harvest storage on nuts

Farmers noted that the storage time and space affects the quality of the nuts. The effects experienced by the farmers included; reduction of nuts weight, spoilage, attack by moulds and loss of market. The other players in the macadamia market who experience storage problems are retailers and middlemen. When the two groups of respondents were asked about the storage problems they experience, the findings were as shown in Figure 4.5 above.

4.3.11 Market Location and Concentration

This study posed a question aimed at determining the market location which affected the value of macadamia products. Findings are as shown in the table below.

Table 4.7: Views on market location

Opinion	Farmers percentage	Retailers percentage	Chi value
Location affects value	69	67	
Market location do not affect value	17	30	
None committal	14	3	χ^2 = 6.00, df = 2, P = 0.306
Total	**100**	**100**	

Source: survey data, 2012

When the farmers were further probed to indicate the specific effects of market location, they pointed out that there were higher prices at the market places than at the farm gate, there were reduced transport costs and availability of buyers, less price if the market was far; brokers buy lower prices at home and prices would be better with factories nearer the farmers.

When retailers were asked to state the effects of market locations, they noted there were various effects which included, Fluctuation of price and demand; forced increase of prices; Companies in the rural area could not access macadamia and high cost of transport and low grades hence low price

4.3.12 Distribution of Road Network in the Five Counties

Table 4.8 shows that a high percentage of roads are dry weather seasonal roads, which are impassable during the rainy season. This results in heavy losses due to inability to deliver the produce to the market at the right time.

Table 4.8: Road network Distribution

	Farmers	Middlemen	Processors	Retailers	Chi value
Type of roads	**%**	**%**	**%**	**%**	
All weather	18	39	59	17	$\chi^2 = 44.00$
Dry weather	31	54	43	3	df =9,
Tarmac	18	3	8	70	p = 0.268
Others	33	4	0	10	
Total %	**100**	**100**	**100**	**100**	

Source: survey data

Horticultural products are highly perishable and require fast transportation to market outlets. The findings from the study showed that the road network, which all macadamia traders rely on, was not in fair state. As indicated in Table 4.8 the 31% of the famers, 54% of middlemen, while 43% of processors use dry weather roads which are impassable during rainy season. This resulted in heavy losses due to delay in delivery of produce in time which affected the quality of the produce and prices too due to poor handling.

4.3.13 Market Loss Caused By Lack of Assistance by GoK

The study further wanted to establish whether there was a relationship between the losses that the various categories of respondents experienced and market facilitation by GoK organisation structure

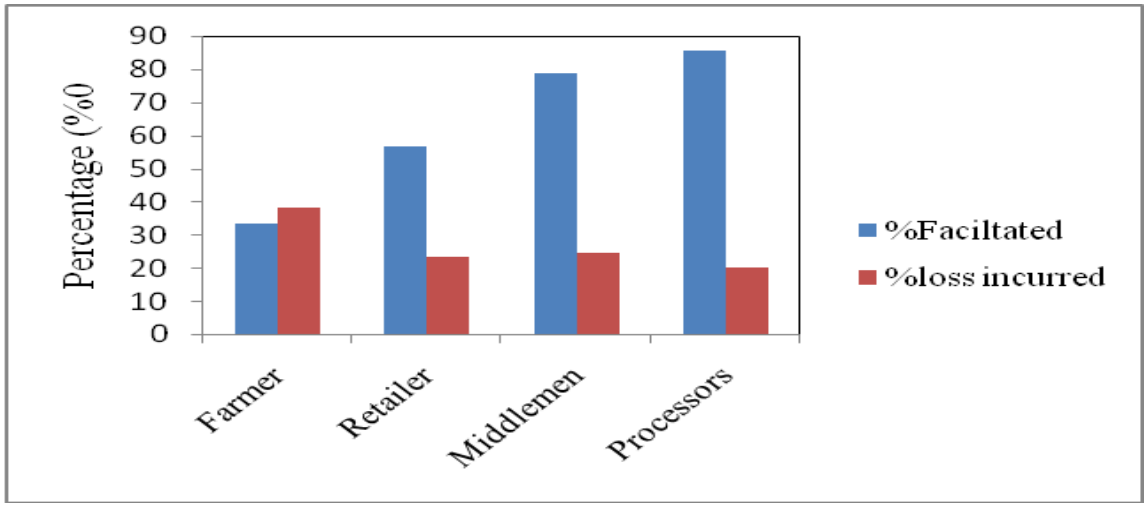


Figure 4.6: Loss due to lack of government assistance

The figure 4.6 above shows losses incurred by traders because of lack of proper market assistance. Farmers make highest loss due to lack of market assistance.

4.3.14 Traders Value for Markets

Traders were asked to indicate whether there was need of improving markets and their views are analysed in table 4.9.

Table 4.9: View on Market Improvement

Opinion	Farmers %	Retailers %	Processors %	Middlemen %	Chi value
Should be improved	86	83	71	89	χ^2=16.00
Not need to improve	14	17	29	11	df=3, P = 0.313
Total	**100**	**100**	**100**	**100**	

Data source: Survey data

The analysis on Table 4.9 indicates that 89.3% of the traders were on opinion that there was need of improving marketing systems and when the he traders were further asked to suggest ways on how to improve the markets they suggested various ways. These included improvement of roads to bring the market nearer to the customers, Creating awareness and reducing the cost of production, offering better prices and lowering the cost of processing, producing high quality products, carrying more advertisements, sensitizing the public on consumption and proper packaging. They further suggested that markets can be improved by educating and training the farmers and processors to buy directly from farmers.

4.3.15 Market Concentration

This study also aimed at establishing the concentration of marketing centres of macadamia in the five counties. The findings are as shown in Table 4.10.

Table 4.10: Market centres Relationship

County	Traders	Number of Centres	Production (MT)	Macadamia Price	Selling Price
Embu	38	5	5,058	72.00	88.30
Kirinyaga	67	7	14,000	54.86	63.60
Kiambu	73	7	12,948	74.86	96.70
Nyeri	60	7	10,521	70.30	84.20
Muranga	54	6	8,725	62.60	68.80
r – value			0.883	0.978	
P value			0.047	0.004	

Source: Primary Data

Using a correlation analysis, the study sought to find out whether there was a relationship between macadamia production and the market centres in an area. The findings revealed that there was a significant relationship in the macadamia production with the number of market centres in a given county where r = 0.883, P = 0.047. This confirmed that a county having more marketing centres had more production. This could be seen in Kirinyaga and Kiambu counties, similarly, there was a significantly relationship where r = 0.978, P = 0.004 in the number of centres to the macadamia prices in the counties as indicated in table 14. The high positive value of r=0883 and 0.978 indicates a good market integration.

4.3.16 Market Integration

These studies was interested in finding out how market location impacts on the value and price of macadamia products, hence the necessity of determining the location and concentration of macadamia traders, markets and factories. Market location was determined by existence of trading centres in the five counties namely Embu, Kirinyaga, Kiambu, Nyeri and Murang'a, while market integration level was determined by the number of the traders in each county as indicated in Table 4.11 in terms of the volumes of macadamia they handle, the distance from one market to another in the county, number of factories and number of markets in counties.

Table 4.11: Structural Market Integration

Counties	Sales volume	No of traders	Number of markets	Number of factories	Market Concentration density (Km)
Embu	5058	38	5	1	3.5(Rank (1)
Kirinyaga	14000	67	7	1	3.75(rank (2)
Kiambu	12948	73	7	4	5.2(Rank (4)
Nyeri	10521	60	7	0	4(Rank (3)
Muranga	8725	54	6	1	6.6(rank(5)
r-value	0.001	30.60	20.882	0.453	7.51
P –value	0.780	0.008	0.020*	0.549	0.022*

***Significant at 95% confidence level**

Ranking for market concentration (1) was the highest market concentration.

4.3.17 Market Organizational Structure and Conduct

From the results on market organisational structures, indicted in Table 4.11 it is clear that on average every county has six trading centres totalling to 32 buying centres. The mean distance between markets within counties were: Kiambu, 5.2 km; Embu, 3.5 km; Nyeri, 4 km; Kirinyaga, 3.75 km and Murang'a, 6.6 km. These results imply that macadamia markets were more concentrated in Embu (3.5 km) which had the highest ranking (rank 5) followed by Kirinyaga, Nyeri, Kiambu and Murang'a in that order as shown in table 15 . Using ANOVA for market concentration in the five counties there were significant differences in: Distance (density) r= 7.51, P=0.022; number of markets r=20.882, p=0.020 and number of trader's r=38.600 p=0.008.

4.4 Factors Impacting on Quality Conrol Management

To access quality of raw nuts used by the farmers, the brokers determine the quality of the nuts. They prefer nuts which are bigger in sizes, weights and colour. They crack nuts, open and assess the content to establish the quality. They are the people to do the sorting and grading of the nuts. During assessment, they look at the colour of the nuts, insect infestation, shell colour patterns, dryness and moulds, sizes and taste of the nuts. Farmers sell macadamia nuts in mainly three grades. The grading depends either on the sizes (small and big size nuts) or weights (heavy and light nuts) or compactness (thick and thin nuts) or hybrid and indigenous nuts.

4.4.1 Importance of Quality

When the farmers and middlemen were asked why they thought quality control was important, the findings were as shown in table 4.11.

Table 4.12: Quality control importance

	Farmers	**Middlemen**
Opinion	%	%
Important	63	86
Not important	37	14
Total	**100**	**100**

Data Source: Field survey 2012

When they were further asked why they felt quality control was important, majority of the farmers (63%) indicated that, good quality fetches better prices and encourages them to grow more nuts; Some nuts are too big and some are too small; it is good to high

quality products to avoid destroying the market; it is good to grade to have different prices as even tea is graded; grading improves prices and avoids fall in prices; Products rejected by buyers do not have any where to be sold once left by the brokers , traders do not differentiate the bad and the good nuts; rejected nuts are good except for the sizes and farmers should first be trained on the various grades before the start of the harvest season.

4.4.2 Feedback on Quality Control Systems

Regarding feedback on quality, majority of the traders (68.3%) reported that they did not receive feedback from customers on quality of the product as indicated by table 4.13.

Table 4.13: Opinion on quality control

Feedback	**Farmers**	**Middlemen**	**Processors**	**Retailers**
	%	%	%	%
Received	20	64	100	47
Did not receive	80	36	0	53
Total%	100	100	100	100
Satisfaction of quality				
Yes	66	86	57	80
No	34	14	43	20
Total%	100	100	100	100
r-value	Satisfaction vs feedback = 0.556			
P-value	Satisfaction vs feedback = 0.095			
Training on quality				
Necessary	83	93	100	-
Not necessary	17	7	0	-
Total %	100	100	100	
r-value	Training vs feedback = 0.615			
P-value	Training vs feedback = 0.105			

Data source: primary data.

Considering relationship in the traders' feedback to their satisfaction in quality, the result showed that there was no significant relationship ($r = 0.556$, $p = 0.095$). Similarly, there was no significant relationship in feedback and quality ($r = 0.615$, $p = 0.105$ as indicated by table 4.13 this implies that traders did not get adequate feedback on quality and satisfaction information to assist in making informed decisions of the markets.

The types of feedback the traders received were on the sizes of the nuts when the nuts are broken, when the brokers return the nuts and do not pay for them, comments made on the tastes of the nuts, when the nuts are rotten and how to determine mature nuts, how to avoid harvesting when the nuts are not fully grown and how touse pests control by putting ash on tree roots.

Table 4.14: Problems in quality control of traders

	Middlemen	**Farmers**	**Total**
Quality Problems	%	%	%
Yes	57	33	36
No	43	67	64
Total%	**100**	**100**	**100**

Data source: Primary data

4.4.3 Problems Experienced in Quality Control

When the respondents were **a**sked whether they experienced quality control problems, majority of the traders (63.7%) had no problems in quality control while 36.3 of the traders had problems in quality control as indicated in Table 4.14.

Table 4.15: Traders with repeat orders

Repeat orders	Consumers	Retailer	Total
	%	%	%
Yes	39	67	47
No	61	33	53
Total	100	100	100
r-value	0.010		
P-value	0.990		

***Significant at 95% confidence level**

4.4.4 Traders Having Repeat

The above analysis indicated that 47.4% of the traders had repeat orders while 52.6% of the traders had no repeat orders. A correlation analysis between advertisement and repeat orders was conducted and the results showed that there was no significant repeat orders relationship between retailers and consumers where r = 0.010, P = 0.990 as shown in table 18.

4.4.5 Analysis of Quality Control Standards and Specifications

Traders were asked to indicate whether they used quality control standards and specifications to assess the value of their produce. They indicated they did not use control standards or specifications. They used different methods to assess the quality as indicated in the figure 4.7.

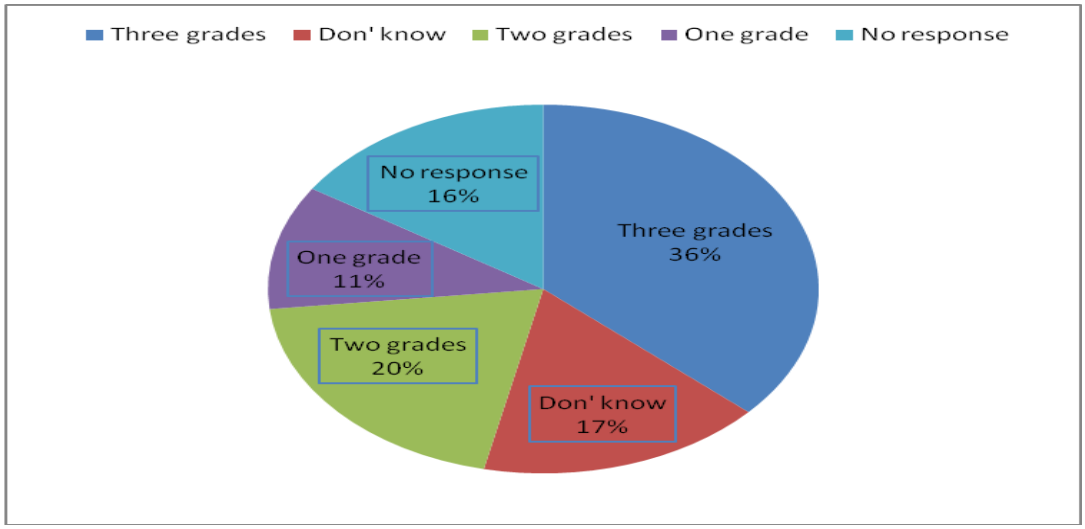


Figure 4.7 : Quality Grading

4.4.6 Quality Control System in the Macadamia Markets

The middlemen/brokers determine the quality of raw nuts from the farmers by cracking the nuts open and assessing the content to establish the quality and thereby sorting out the various quality grades. The middlemen prefer nuts which are generally big in size, and white in colour. During assessment, they look at the colour of the nuts, insect infestation, shell colour patterns, dryness and moulds, sizes and taste of the nuts. According to the findings, farmers indicated that they sell macadamia nuts mainly in different grades with no set standard specifications. The 36% of traders identified three grades, 20% identified two grades, while 11% sold one grade of raw macadamia nuts in the market, 16% indicated that they do not know about the grading system used while 17% of the respondents did not provide any response. The findings indicated a total breakdown of quality control system in macadamia marketing which impact on efficiency of macadamia marketing as indicated in Figure 4.7.

4.4.7 Satisfaction Levels of Respondents on Processed Nuts

Chi -square test was used to determine differences in respondents' level of satisfaction with the brands of processed macadamia products Table 4.6.

Table 4.16: Quality satisfaction level

	Satisfaction with overall quality %				**Chi value(χ^2)**
Respondents	**Very satisfied**	**Satisfied**	**Not satisfied**	**Don't know**	
Processors	-	14	72	14	χ^2=18.395
Middlemen	29	54	13	4	df = 9
Retailers	50	36	10	4	Sig(p)==0.031*
Retailers	50	36	10	4	
Consumer	14	9	2	2	
Total	27	62	8	.3	
	Satisfaction with taste %				
Respondents	Very satisfied	Satisfied	Not satisfied	Don't Know	
Processors	29	71			χ^2=9.630
Middlemen	42	5		4	df = 9
Retailers	39	54	7		Sig.=0.381
Consumers	40	60			
Total	40	58	2	1	
	Satisfaction with availability %				
Respondents	Very satisfied	Satisfied	Not satisfied	Don't Know	
Processors	14	71	14		χ^2= 24.469,
Middlemen	18	14	64	5	df = 9
Retailers	4	68	29		Sig. 0.004*
Consumers	8	33	59		
Total	.3	41	49	1	
	Satisfaction with packaging %				
Respondents	Very satisfied	Satisfied	Not satisfied	Don't Know	
Processors	29	57	14.		χ^2=7.828,
Middlemen	21	33	42	4	df = 9,
Retailers	11	64	21	4	sig. 0.552
Consumers	18.0	48	26	8	
Total	16	50	28	6	

*Significant at 95% confidence level

The chi-square test results indicated significant difference in level of satisfaction with overall quality, availability and nutritional value. As regards to overall quality, significantly (p<0.05) more retailers indicated higher levels of satisfaction in comparison to the other groups of respondents. In relation to availability, middlemen and consumers expressed higher levels of dissatisfaction in comparison with the processors and retailers. For nutritional value, a significantly (p<0.05) larger proportion of processors and consumers indicated satisfaction.

4.4.8 Effect of Macadamia Sound Kernel Recovery on Market Efficiency

Sound Kernel recovery level is taken as a measure of quality performance in the market quality system. This follows after analysing structures and conduct in the quality control systems. This shows the correlation quality levels in the five stratified counties as indicated by Table 4.17, which is a measure of market efficiency of macadamia as indicated as one of four objectives.

Table 4.17: Sound Kernel Recovery Variance

County	Sales Volume Kg	High peak	Off-peak	Average skr
Kiambu	12948	22.20	19.10	20.67
Murang'a	5028	22.70	19.30	21.00
Kirinyaga	14000	21.90	18.10	20.00
Nyeri	10521	22.70	18.00	20.35
Embu	5058	21.4	18.3	19.85
Pearson Correl.(r)	0.051		-0.287	
P-value	0.936		0.639	

*Significant at 95% confidence level

It was established that average macadamia SKR varies from season to season. Table 4.16 shows average sound kernel recovery (SKR) as determined by Jungle Factory, one of the processors in the study area. The result shows that there was no significant difference in quality both between the seasons and mean average and also between the counties as shown in table 4.17 where r=0.287 and p=0.639. Controlling the quality of macadamia appeared to have been a big challenge for the producers as there was a big quality difference between seasons and from one county to another. This might have been due to the lack of set quality standards and/ or absence of a quality control system.

4.5 Empirical Analysis Results Impacting on Price Systems

Results of factors that impact on management of pricing systems which affects the efficiency of macadamia marketing systems in central kenya highlands.

4.5.1 Price as a Measure of Efficiency in Marketing Systems

The assessment of price as a measure of market efficiency required systematic analysis of price structure and conduct which was finally measured by performance on price transmission and market index, using buying and selling price to compute market efficiency index.

4.5.2 Price Transmission of Macadamia Products

The price of a product is an important variable in establishing the efficiency of macadamia marketing systems in Kenya. This study contends that the price of macadamia products determines their performance in the market compared to other nuts. To this end, the study sought to investigate how fast price change to affect demand of

macadamia products in the market. The findings are shown in figure 4.8. Price as a measure of efficiency is commonly used and price policies assist to guide the marketer to determine the way the market is moving. The rate of transmission is often used to measure the market efficiency. Often traders do not notice change on price of macadamia in good time which is a sign of market inefficiency in the central Kenya highlands.

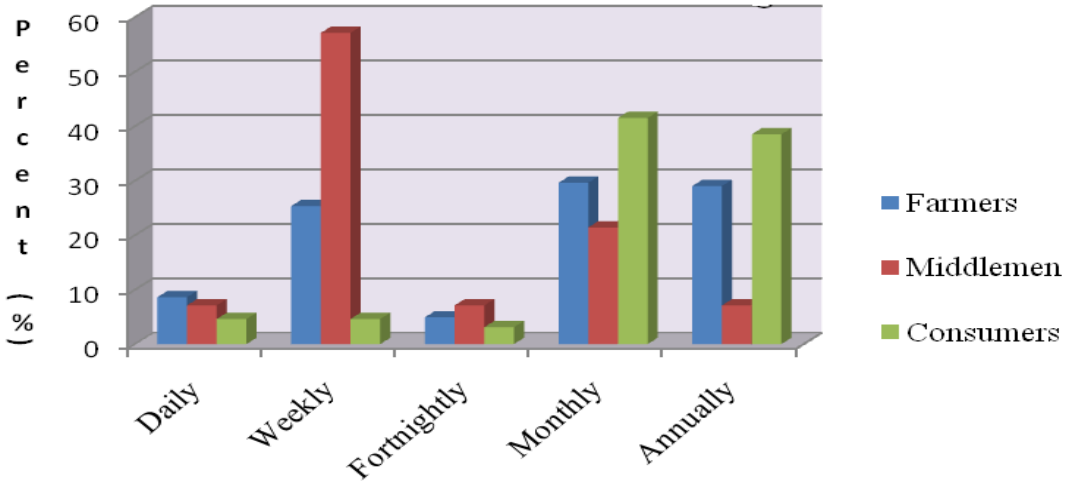


Figure 4.8: Farmers, middlemen and consumer price change rate

4.5.3 Price Transmission Rate of Macadamia Products

The findings indicate all the respondents are in agreement that macadamia prices are always fluctuating. This fluctuation as pointed out is either daily, weekly, fortnightly, monthly and annually. On the one hand, 29.6% of the farmers indicated that the price of macadamia changes monthly, 29.0% noted the price changes annually, and 25.3% indicated the price changes weekly. On the other hand, 57.1% of middlemen noted that macadamia price changed weekly and 21.4% noted that the prices changed monthly as shown in Figure 8.

The county with high information flow (where macadamia market information was on average obtained for example weekly) had high price fluctuations compared to those

where information was accessed on fortnightly. These findings show that farmers are either resonating with the market trends and thus benefitting or are out of tune in which case they are likely to make loss as the middlemen will take advantage and buy macadamia at rates far below actual prevailing market rate as the middlemen obtain market prices fairly faster (weekly/57.1%) as compared to 25.3% of farmers receive market price changes weekly as indicated in figure 4.8 above.

4.5.4 Price Transmission between the Counties

Price as a measure of efficiency is commonly used and price policies assist to guide the marketer to determine the way the market is moving. The rate of transmission is often used to measure the market efficiency. Price transmission ratios are also used to assess and measure market efficiency as indicated by table 4.18.

Table 4.18: Market pair and season price transmission

	Price Transmission Between 2 Mkt Pairs by Ratio of % change							
County Mkt	Season	Average Price	% change	Embu	Kirinyaga	Kiambu	Nyeri	Murang'a
Embu	1**	64.60	9.30	1				
	2**	70.60	9.30	1				
Kirinyaga	1	58.30	13.60	1.11	1			
	2	66.20	13.60	0.94	1			
Kiambu	1	60.70	18.30	0.94	1.04	1		
	2	71.80	18.30	1.02	1.08	1		
Nyeri	1	64.50	5.90	0.94	1.11	1.06	1	
	2	68.30	5.90	0.97	1.03	0.95	1	
Muranga	1	58.00	13.80	0.90	1.00	0.96	0.90	1
	2	66.00	13.80	0.93	1.00	0.92	0.97	1

Price Transmission Between 2 Mkt Pairs by Ratio of % change

***1 and 2 stands for season one and two respectively.**

The assessment revealed that the level of transmission of the macadamia prices between the counties was relatively high as indicated in table 4.18. These results indicated a relatively integrated market system. The results indicated that there were no large variances in price between market pairs.

4.5.5 Price Transmission in 2011

Price transmission ratios are also used to assess and measure market efficiency. Table 4.18 gives the summary of ANOVA analysis buying prices in the year 2011. This simply means that prices fluctuate from one month to the other in a way that earnings projections are difficult.

Table 4.19: Macadamia prices 2011

Months in the year 2011	Price of macadamia (Mean ± SE)
January	52.50 ± 2.50c
February	55.0 ± 0.00c
March	60.67 ± 2.96c
April	67.50 ± 2.50c
May	82.33 ± 4.33bc
June	97.67 ± 1.86b
July	89.00 ± 16.0 b
August	118.0 ± 0.00 ab
September	105.0 ± 5.00 ab
October	129.25 ± 1.49a
November	126.25 ± 8.75a
December	77.50 ± 7.50bc
F – value	22.70
P-value	0.00

Source: Jungle Factory Thika

Mean values denoted by similar letters are not significantly different at 95% confidence level, a is different from b.

ANOVA analysis indicates significant differences in the prices of raw macadamia from the farmers between the counties in the year 2011, F =22.70; and P = 0.000 table 4.19. There was also a significant ($p<0.5$) difference in the buying price between the counties. The prices were significantly high in the months of October and November 2011 and the lowest price in the month of January 2011 as indicated by Table 4.19.

4.5.6 Spatial Price Transmission

This study employed the model of spatial price relationship developed by Hays and McCoy (1977) as shown below. The *i*th market was taken as Kirinyaga:

$PP_{ij} = P_i – (HC_{ji} + TC_{ji} + AS_{ji})$

Where:

PP_{ij} = the calculated price of one ton of macadamia from the *i*th market (Kiriyaga) in relation to the *j*th markets (Kiambu, Embu, Nyeri and Murang'a).

P_i= the actual wholesale price of one ton of macadamia at the *i*th market.

HC_{ij} = Handling costs involved in moving one ton of macadamia from the *j*th to the *i*th market.

TC_{ij} = Transport cost for moving one ton of macadamia from the *j*th to the *i*th Market.

AS_{ij} = the charge for the assemblers' service (middlemen and government levies) in moving one ton of macadamia from the *j*th to the *i*th market.

In a market which is perfectly competitive marketive, PP_{ij} and therefore actual price spread would be equal to zero.

A positive price spread would provide a potential opportunity for middlemen to realize excessive profit, while negative spreads indicate losses. The results of the correlation and Pearson test indicate a positive correlation (Table 4.20).

Table 4.20: County average market price margins per kilogram

County	Buying price	Selling price
Kiambu	72.86	96.70
Embu	70.00	88.30
Nyeri	68.30	84.20
Kirinyaga	52.86	63.60
Muranga	60.60	68.80
Pearson Correlation	χ^2= 0.348	
	p= 0.566	

Significance at 95% confidence level

There was a weak non-significant correlation (r=0.348, p=0.566) between average buying price per county and average selling price as indicated on Table 4.20 above. This suggests that the buying price may have not singly influenced the selling price of macadamia, though it may have been one of the factors considered.

4.6 Factors that Impact on Traders Margins Levels

Margins are used to measure performance of market system. The level of market efficiency is reflected by margins made by traders which could sometimes be too small or too high. Margin variances between markets may show the trend of market performance and market efficiency.

Table 21: County average market margins per kilogram

County	Buying price	Selling price	Margins Kshs	Margin %
Kiambu	72.86	96.70	23.84	32.72
Embu	70.00	88.30	18.30	26.14
Nyeri	68.30	84.20	15.90	23.28
Kirinyaga	52.86	63.60	10.74	20.03
Muranga	60.60	68.80	8.20	13.53
Pearson	r= 0.348		r=0.848	
Correlation	p= 0.566		p=0.070	

4.6.1 Percentage Margins by County

In four counties, Embu, Kiambu, Kirinyanga and Nyeri the average margins were over 20% while Murang'a had the lowest margin of 13.53%. On average, the gross margin for the five counties was 25% as shown by table 4.21. There was a-significant correlation(r=0.848, (p=0.070) between average margins per county as indicated on Table 4.21 above.

It should be noted that the marketing margin analysis was based on gross figures since costs of macadamia traders in the management of macadamia value chain were not accurate and they were often estimates. Table 4.22 show traders' gross margins between buying price and selling price during the study season where all traders were included in the analysis. However, the table does not tell us what net profit for trading in each county is since this will require variables regarding trading costs. High prices of consumers and low prices of producers were indicators of imperfect markets. The study further sought to determine marketing margins realized by the various traders (Table 4.22). The marketing margins calculated for each marketing channel showed that there is

a large difference in the consumers' price spread along the marketing chain. Wider marketing margin indicates existence of imperfect markets. The differences of buying prices and margins are not significant as indicated in table 4.22.

Table 4.22: Middlemen and retailers marketing margins

	Variable	County				
Market Player		Embu	Kirinyaga	Kiambu	Nyeri	Murang'a
	Average buying price (*c)	70	52.86	72.86	68.30	60.60
Middle-men	Average selling price	88.30	63.60	96.70	84.20	68.80
Gross Marketing Margin%		26%	20%	33%	23%	14%
	Average buying price	158	154	148	170	154
Retailers	Average selling price(*p)	175	176	185	188	180
Gross Marketing Margin%		11%	14%	25%	11%	17%
r=value	0.406					
P-value	0.498					

Note: *C indicates producer price, and *P indicates consumer price

4.6.2 Marketing Margins of Traders

The study further sought to determine marketing margins realized by the various traders (Table 4.22). The marketing margins calculated for each marketing channel showed that

there is a large difference in the consumers' price spread along the marketing chain. Wider marketing margin indicates existence of imperfect markets. Table 22 shows that middlemen generally made higher profits (over 20% with an exception of Murang'a) as compared to retailers who made less than 17% with an exception of Kiambu whose retailers made 25%.

The results also indicate that, Kiambu has high margins for retailers and middlemen while Murang'a has a wide difference. These big marketing margins realised by traders are statistically not significant at different market channels which are evidences for the existence of market inefficiencies although they can also arise due to high real marketing costs which was not within the scope of this study.

Macadamia market data was poorly documented and it was therefore not easy to determine total product handling costs. However, marketing margin for middlemen ranged from 32.72% in Kiambu, 26.14% in Embu, 23.28% in Nyeri, 20.03% in Kirinyaga while the lowest was in Murang'a at 13.53%. The table also shows that the maximum marketing margin for retailers was 25% in Kiambu and the lowest was 10.58% in Nyeri. This shows abnormally high trading margins for the middlemen, probably due to their monopoly in this market system. Wider marketing margin indicates high prices to consumers and low prices to producers and it is an indicator of the existence of imperfect markets (Cramer and Jenson, 1982) though markets may fail due to many other reasons. There is none positive relationship between the traders ($r=0.406$, $p>0.05$).as indicated in table 22.

4.7 The Analysis Summary of Performance of the Marketing Systems

For a system to be efficient it must have proper interface between the four objectives analysed and also have close relationship statistically with dependent variable (sales volume), which may be said to be both vertically and horizontally as expanded by tables 4.23 and 4.24.

4.8 Correlation Matrix of Tested Intervening Variables

The study also sought to determine whether pairs of intervening variables had statistically significant relationship with the others as shown in the table 4.23.

Table 4.23: Pairwise correlation matrix of tested variables

	Sales vol./ Production	# market	# traders	Factoriefs	conc./Density (Km)	Average SKR	Buying price	Selling price	Margin (Ksh)	%margins
Production	1									
# market	0.937*	1								
#traders	0.963*	0.938*	1							
#factories	0.362	0.211	0.517	1						
Market conc.	0.051	0.050	0.203	0.034	1					
Average SKR	0.172	0.249	0.353	0.318	0.828*	1				
Buying price	0.369	0.200	0.153	0.414	0.023	0.092	1			
Selling price	0.211	0.090	0.014	0.542	0.068	0.015	0.971*	1		
Margin (Ksh)	0.115	0.063	0.169	0.610	0.181	0.153	0.848*	0.950*	1	
%Margin	0.131	0.142	0.246	0.662	0.278	0.267	0.738*	0.877*	0.982*	1

NB: * Indicate the correlation coefficient (r) significant at 95% Confidence levels

The study was further focused in finding out whether quality affected the farmer's prices. To determine this, correlation model was used where prices were correlated with average SKR, table 4.23) SKR and Buying price (r=0.092), Selling price (r= 0.015), Margin (r=0.153) and percentage margin (r=0.267). This suggests that quality was not one of good predictors of price level and market efficiency hence improving and stabilizing quality of the nuts would have very little direct impact on farmers as indicated by table 4.23.

4.9 Market Performance Index for the Five Counties

The ratio of the total value of the goods marketed to the marketing cost was used (purchasing cost/selling price) as measure of marketing efficiency. The method used eliminated the problem of measurement of value added. The marketing efficiency in the five counties was carried out using index formula (Shephard1965). Five marketing outlets namely farmer, middleman, processor and distributor/retailer were used as marketing channels. Purchasing and selling prices were assumed to include all the cost elements of marketing variables incurred in the respective market channels. The marketing efficiency index for the four channels in five counties as indicated in table the below

Table 24: Marketing efficiency index

Market Channel	Embu	Kirinyaga	Kiambu	Nyeri	Muranga	Composite index
Farmer	1.29	1.22	1.08	1.63	1.25	1.29
Middleman	1.26	1.20	1.33	1.23	1.14	1.23
Processor	1.23	1.16	1.29	1.20	1.10	1.20
Distributor	1.11	1.14	1.25	1.11	1.17	1.16
Composite Index	1.22	1.18	1.24	1.29	1.17	1.22

The results indicate that farmer and middleman are the most efficient marketing channels followed by processor and retailers market channels in that order. For the counties Nyeri has the highest market index followed by Kiambu, Embu, Kirinyaga and Muranga in that order which means Nyeri was the most efficient while Muranga had the lowest efficient marketing system as indicated in Table 4.24. The method used eliminates the problem of measurement of value added. An increase of a ratio in any of the channel or county

represents an improvement of market efficiency and a decrease in the ratio denotes reduced market efficiency.

The observation from the Table 4.24 show that market efficiency decreases as the cost of value chain such as transport and other handling costs increases vertically from farmer to middleman and from middleman to processor and then from processor to distributor/retailer in that order.

4.10 Comparison of Market Efficiency Systems

Multiple regressions were conducted to estimate the coefficients of the dependent variables. Table 4.25 shows that 64.7% of the total variation in the efficiency of market system is explained by the changes in the explanatory variables. Analysis of variation presented in table 4.26 indicates that the model is significant in fitting the dependent variable and the independent variables.

Table 4.25: Model summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.804[a]	.647	.597	.285

Table 4.26: Analysis of variance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.209	4	1.042	12.838	.000[b]
Residual	2.840	158	.081		
Total	8.049	162			

The coefficient of the regression result presented in Table 4.27 shows that market integration has positive and significant effect on the market efficiency system (p-value =0.000 <0.05). Quality control has a positive relationship with market efficiency system and the effect is statistically significant at 95% level of significance (p-value = 0.0120 < 0.05). Price transmission negatively impacts on market efficiency system though the effect is statistically insignificant. The finding further shows that market margin has a negative effect on market efficiency system though the effect is not significant.

Table 4.27: Regression Summary Report

Market Efficiency	**Coef.**	**Std.Err.**	**Z**	**P>|z|**
Market Integration	0.6764	0.1516	4.4600	0.0000
Quality Control	0.1026	0.0408	2.5200	0.0120
Price Transmission	-0.1665	0.0885	-1.8800	0.0600
Market Margins	-0.0549	0.5945	-0.0900	0.9260
_cons	-8.2362	5.0112	-1.6400	0.0200

The first objective of the study was to examine the effect of marketing organizational management structures on the efficiency of the macadamia marketing systems in the Central Kenya highlands. The finding shows that a unit increase in market integration will result to 0.6764 unit increase in the efficiency of the macadamia marketing systems in the Central Kenya highlands.

The second objective was aimed at assessing the effect of existing marketing quality control standards and specifications systems on the efficiency of macadamia marketing systems in the Central Kenya highlands. The regression coefficient is statistically

significant and a unit increase in quality control will result to 0.10206 unit increases in the efficiency of the macadamia marketing systems in the Central Kenya highlands.

The study further aimed at assessing how speeds of price transmission between the counties affect the efficiency of macadamia marketing systems in the Central Kenya highlands. The result showed that the speed of price transmission has a negative impact on efficiency of the macadamia marketing systems in the Central Kenya highlands. However, the effect is not statistically significant.

The last objective of the study was to examine the effect of gross marketing margins earned by traders on the efficiency of macadamia marketing systems in the Central Kenya highlands. The estimated coefficient shows that the relationship between gross market margin and the efficiency of market systems is insignificant.

4.11 Summary of the Results on the Four Objectives

From the analysis carried, it is clear that there exists interface between the assessment analysis of the four objectives. For example the way management organisational structures are organised affects the quality level while the quality efficiency affects the prices of the products and levels of prices affect margins. The assessment of efficiency of macadamia marketing systems differs with operational market assessment applied by many scholars (Ngare, 2014 and Ngaruiya, 2012).

The market efficiency analysis in the central Kenya can be said to be inefficient based on correlation summary of table 4.24. Results indicated that there was little association

between sales volume (dependent variable) and the four independent variables, management organisational structure and conduct was an average of 0.367, quality control systems (SKR) was 0.172, average for price was 0.290 while average margins were 0.123 based on correlation coefficient.

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

5.1 Introduction

This chapter presents a summary of the study's major findings and discusses them. The discussion of findings follows the same analytical framework and the order of the objectives of the study as earlier presented in chapter four. The results are discussed in the following order: first infrastructure, mainly focusing on its role in the efficiency marketing dimension; second, market structures of macadamia, that is concentration and integration; third, information flow, that is the nature of information, sources, frequency and adequacy; fourth prices of macadamia products, that is nature of pricing, price knowledge, price fluctuations and government policies; fifth quality control, that is ways of maintaining product quality; sixth barriers and lastly seventh, promotion and advertisement of macadamia products. This discussion is a continuation of chapter four in some way, but the main objective of this chapter is to consolidate the study findings, determine whether the study objectives have been met and the questions answered analyse evaluate multiple factors that affect all the research questions and makes conclusion.

5.2 Infrastructure

Macadamia, like any other horticultural product, is highly perishable and requires fast transportation to market outlets. Findings from the study show that the road network, which all macadamia farmers and traders rely on, is in a deplorable condition. In the five selected counties for this study, traders heavily depend on dry weather roads to transport their products to the market. However, 17.9% of the farmers reported to have tarmac

roads while 17.9% reported that they relied on all-weather roads to transport their produce to the market centres. It is worth noting that the road network in the selected counties is not well developed to enable easy transport of macadamia as indicated by 43.8% of the farmers. 22.2% of the farmers however felt that the roads are not well developed.

The findings show that most roads, by virtue of being dry weather roads, are impassable during the rainy season. This results in heavy losses due to inability to deliver or untimely delivery of produce to the market. In addition, the poor state of roads significantly affects the quality of the produce due to damage. Poor roads are a major hindrance to the delivery of quality products to the market. Therefore, the poor state of roads in macadamia producing areas has led to high losses of produce due to deterioration in quality as a result of delayed delivery occasioned by poor roads.

In order to promote a speedy delivery of macadamia products to the market, it is important for the road network in the area to be improved. The Government, for instance, needs to upgrade, develop and maintain rural access roads and other roads leading to market outlets to all-weather status to facilitate timely delivery of produce to markets. There is also need to encourage and promote community and private initiatives in the construction and maintenance of rural access roads.

5.2.1 Impact of Information Flow on Macadamia Marketing Efficiency Systems

This study considered information flow as a critical factor in the macadamia marketing system value chain which impacted on all the five market channels of macadamia trade.

The study established that there were no proper feedback and feed forward mechanisms and that the flow of information between pairs of market centers and traders was not fast enough to assist in proper communication. For efficiency of macadamia marketing systems to be realized, the flow of information to individual and organizations involved in macadamia marketing, and how this information was managed was very vital. A significant driver in the formation of closely aligned value chains has been organisations' need to respond to changing consumer behaviour (Russell at el., 2010). Of greater importance is the change in consumer behaviour in seeking greater enjoyment from the foodstuffs they choose to consume (McColl-Kennedy & Kiel, 2000). Consumers are also increasingly aware of food-related health and safety matters (AFFA, 2010).

Information changes people's perspectives of the world (Downing et al, 1995) and raises their concerns regarding the safety or ethical nature of food. ICT has provided opportunities for consumers to overcome information chokepoints that previously limited their access to information pertaining to operations performed along the entire value chain (Bakos, 1991). Price and production transparency or the ability to determine whether a product is truly worth the amount a company seeks to charge and is produced according to a consumer's personal desire, is no longer a theoretical concept. More than ever before, people are better able to develop well informed perspectives of the true value of a particular product or place of purchase through having easy access to ICT (Perloff, 2010). This explains why information flow is vital in macadamia marketing system.

The findings showed that traders were in agreement that relevant information should be available and accessible to them. Further, the findings showed that various individuals

used different channels to access the information depending on the availability and educational background. The sources of information included radio, television, internet and newspapers. Availability and continual access of information allow businesses to continuously improve their competitiveness through improving their interaction with suppliers and buyers, as well as the operations that occur within their own company (Clemons, 2002).

The collection and distribution of accurate and timely information throughout the agrifood value chain can assist in overcoming the adversarial barriers that restrict organisations' performance. In fact, the collection and distribution of accurate and timely information throughout the agrifood value chain can assist in overcoming the adversarial barriers that restrict organisations' performance (Van Dalen, 1997; Wilson, 1995). Thus, the success of the macadamia business requires effective sharing of information along the entire chain to achieve a consistent level of consumer determined quality. The need for effective information flow, capture, and use to improve operations has increased consumers demand which is expressed by products possessing a widening array of attributes.

Information on macadamia products was important to all the stakeholders. The sharing of appropriate information was critical to providing unsurpassed consumer-recognised value through aligning the entire chain's operations to create consistent quality and supply (Dunne, 2001; O'Keefe, 2003). Possessing the capacity to act will not lead to long-term success unless the correct management procedures are in place. Essential to successfully

managing agrifood value chain is a series of critical success factors (Collins et al., 2002). This is not the case of macadamia marketing in Kenya.

5.2.2 Promotion and Advertisement

Product promotion and advertisement provide signals to consumers on which foods will provide them with the satisfaction they desire (Kinsey, et al., 2009). The anomaly of too much information has led to consumers wanting guidance on which food provides the tangible and intangible factors that best meet their perceptions of what constitutes value, hence the need for constant promotions and advertisements with proper and adequate information. The study findings indicated that promotion and advertisement was not adequate to spur product growth and development.

Stakeholders in the industry embarked on various promotional strategies to push and position macadamia products in the market. These activities ranged from product branding, promotion and advertising. The study held the assumption that there were no adequate promotion and advertising systems for macadamia products. Findings from the study showed that consumers were satisfied with the level of promotion of macadamia products while the other 4 market actors were not. This difference may be explained by the fact that the consumers are not aware of the range of macadamia products in the market therefore they may not have been able to give an informed assessment

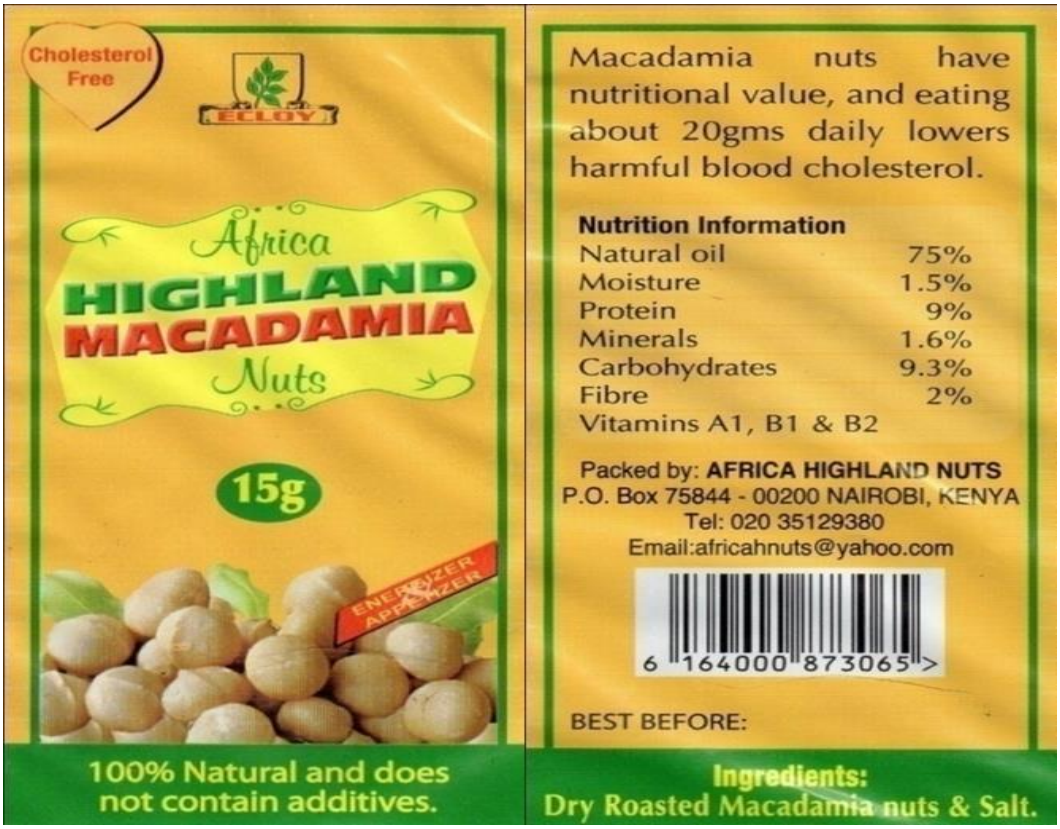


Figure 5.1: Labelling of the nuts

Today's modern consumers ask for additional information such as nutrients and taste for some consumers now consider personal health information as very important. These information attributes are based on a sense of health food safety and a longer-term attribute in the form of functional foods and nutraceuticals (Kinsey, *et al,* 2009). In response to this demand, the macadamia industry has created products tailored to meet the health information needs of its consumers as shown in Figure 5.1 and Figure 5.2.

Figure 5.2: Labelling with product literature

Source: African Highland Nuts (2012)

The above indication concurs with Hughes (2002) who points out that a brand helps communicate a product's value to consumers better than any other method. He further establishes an empathic link between a product and the consumer; which assists in attaining a superior position in the market place. Product branding helps consumers to trace the product with relative ease and in a minimal amount of time. The traceability aspect of brands is becoming an increasingly important tool for countering growing

consumer health concerns by providing quality and safety at acceptable cost. These attributes are based on a sense of food safety and a longer-term attribute in the form of functional foods and nutraceuticals (Kinsey et al., 2009). Therefore, most of the macadamia branding provides additional educative information on the value of macadamia to a person's health. This additional information has proved vital to consumers to meet their satisfaction on the level of promotion of the products.

5.3 Market Structures, Concentration and Integration

Evaluation of market structure might reveal the existence of competitive markets or of concentrated markets (da Silva and de Souza Filho, 2007). In principle, competitive markets provide the incentives for firms to seek the type of intra and inter-organizational efficiencies that favour chain performance. However, the association of performance with the degree of market concentration is not a simple issue for the chain analyst (da Silva and de Souza Filho, 2007). For some analysts, market concentration allows for economies of scale and investments in state of the art technologies, logistics, governance and other important determinant of firm competitiveness. Hence, the evaluation of market structure should not only consider the typical quantitative indicators, such as market concentration ratios or indexes, but also qualitative aspects regarding the existence of barriers to entry or the distribution of power among chain

5.4 Management Organizational Structure

In the agrifood industry, commodity prices have traditionally been used as the basis of pricing yet they are a poor indicator of a product's true value and an ineffective basis from which to develop cooperation between companies (Bradach, 1989). To ensure

efficiency, much of the agrifood industry has sought to compete through increasing productivity and reducing prices; even though business managers can be more concerned about offering lower prices than what the consumers receive (O'Keeffe, 1999).

According to Collins at el, (2002) value addition in agriculture can be increased by changing distribution channels to capture more consumers through direct marketing, vertical integration, product alliances and cooperative efforts which are lacking in macadamia marketing systems. Farmers sell more than 80% of their produce through middlemen instead of selling directly to consumers or through co-operative unions which further lowers the prices of macadamia nuts for both local and international markets hence the need for adapting new distribution channels to increase value addition of macadamia. Macadamia marketing efficiency could be raised by reducing current five marketing channels to three.

Findings from the study have shown that macadamia traders were not involved in collective buying and selling of their products with other traders mainly because of competition. Apparently, there was no cartel that controls the purchasing and selling prices of macadamia products as indicated by non-significant correlation of buying and selling prices where ($r=0.348$, $p=0.566$) in Table 4.19. Farmers are paid at a set price and brokers sell at set price. There is monopoly by middlemen who determine the buying and selling prices. New market channels and firm government policy may assist in macadamia marketing.

5.4.1 Market Organizational Structures and Conduct

The term market structure refers to the number of buyers and sellers, their distribution sizes, the degree of the product differentiation and the ease of the entry of the new firms into an industry (Collins, at el., 2002). These structure characteristics were used as a basis for classifying markets. It is also argued that price behaviour, in terms of level and frequency of change varies with the type of market structure (Onyuma, 2006) which was applicable in the current efficiency market study.

5.4.2 Evaluation of Market Organizational Structures and Conduct

Evaluation of market structure might reveal the existence of competitive markets or market concentration (da Silva and de Souza Filho, 2007). It was the contention of the study that there were no proper market structures in the macadamia industry. In principle, competitive markets provide the incentives for firms to seek the type of intra and inter-organizational efficiencies that favour chain performance. However, the association of efficiency with the degree of market concentration was not a simple issue for the chain analyst which was noted in current study. For some analysts, market concentration allows for economies of scale and investments in state of the art technologies, logistics, governance and other important determinant of firm competitiveness. Therefore, the evaluation of market structure did not only consider the typical quantitative indicators, such as market concentration ratios or indexes, but also qualitative aspects regarding the existence of barriers to entry or the distribution of power among chain participants, which was noted to exist in the current market study. For example, macadamia farmers in the study area sell over 80% of their produce to a few middlemen as indicated in Figure 4.1 analysis, thus indicating absence of health competition in the industry.

An evaluation of macadamia market concentration in the selected counties showed for instance that in Embu County, macadamia markets are within a radius of 3.5 km from one market to the other compared to other counties which have higher radius as indicated in table 4.19. Further, the findings show that farmers, retailers and consumers are faced with the problem of inadequate physical market infrastructures. The major findings of the study regarding market structures were indicated to be:

Inadequate and poor market communication infrastructures in terms of feed forward and feedback information flow impacts negatively on the quality of macadamia products leading to high levels of post-harvest losses as indicated in Tables 4.3. Inadequate storage facilities leading to deterioration of produce quality, wastages and price reductions in the markets as indicated Figure 4.5.

Long distance travelled by farmers and other traders in order to access macadamia markets increase transport costs. This is because markets are scattered and located far apart as indicated in Tables 4.7 and 4.8. This affected and lowered the market efficiency. Lack of an appropriate policy framework to guide macadamia trade for the private sector involvement as indicated by Tables 4.9; 4.11 and Figure 4.6 affected the market efficiency

Understanding market variables shows where the macadamia industry seems to be headed and pointed out key areas which have not been addressed adequately by the existing market agents. Market structure analysis provides key data, information and knowledge about the current organization's competitive environment and current position

within that environment by pointing out the direction for customer development, market development, and product development (McColl-Kennedy, et al., 2000). This shows that there was a profitable and scalable macadamia business for new entrants and wide room for the old business to grow and develop their business to higher levels if markets organisational structures are improved which would also improve market efficiency.

Findings from the study have shown that macadamia traders were not involved in collective buying and selling of their products with other traders mainly because of competition. Apparently, there was a cartel that controls the purchasing and selling prices of macadamia products as indicated by correlation of buying prices and selling prices. Farmers are paid at a set price and brokers sell at set price. There is monopoly by middlemen who determine the buying and selling prices. New market channels and firm government policy may assist in macadamia marketing.

Barriers are viewed as challenges, obstacles or hindrances that a particular product faces in market penetration (Motamed, et al., 2008). Findings from the study show that marketing of macadamia products has experienced a wide range of barriers. Macadamia products from Kenya experienced such trade barriers when the USA and Chinese governments banned the importation of its kernel. In the local front, macadamia products suffered a setback when the government of Kenya imposed a ban on the export of raw nuts from 2008 to date. These trade barriers have led to low demand of macadamia and loss of both local and international markets.

The flow of information was another barrier that has affected the marketing efficiency of macadamia products. Findings from the study show that the traders involved in macadamia production and marketing used various channels for receiving market information on macadamia. As shown by analysed data, most of traders for example, the 68.5% of farmers and 57.1% of middlemen rely on public barazas as their source of information as indicated by Table 4.3. Often, market knowledge available in these public barazas was based on personal experience and *ad hoc* discussions with colleagues, friends, and customers lacked intelligent information. Such information was usually unreliable, inadequate and insufficient. This in turn affected the efficiency of macadamia marketing since the traders involved did not receive correct intelligent information at the right time.

Infrastructure was another barrier that greatly affected the efficiency of macadamia marketing systems. Findings from the study show that 30% of farmers rely on dry weather roads and most of these roads were impassable during the rainy season, which leads to transport delays during wet season. Delayed delivery of macadamia produce to the market lowered the quality of the produce; as a result low profit margins were made from the sales.

Macadamia market locations also posed a great challenge to the farmers. Findings from the analysis show that macadamia markets were scattered and located far apart. Except in Embu County where macadamia markets were located within a radius of 3.5 km, macadamia markets in the other four counties were scattered at a radius above 3.5 km. Accessibility to these markets were a great challenge to farmers since they had to endure

impassable roads and long distances to reach the markets which affected the efficiency of macadamia marketing systems.

5.5 Quality Control System

It was the contention of this study that there were no proper quality control systems governing the agrifood industry in Kenya. Findings from the study revealed that the quality of macadamia was affected from the production stage as a result of lack of the right knowledge on how to assess and retain the quality of the produce by the majority of the farmers. There were no common standardised ways and means of assessing the quality levels of macadamia nuts. There were more than three deferent ways of assessing quality standards.

Improving the quality of macadamia should start right from harvesting stage. For example, the findings showed that macadamia farmers had storage problems which resulted to losses as the nuts go to waste due to lack of proper storage facilities. It was important to improve storage facilities to avoid such wastages and eventual nut contamination. Bradach, (1989) recommends use of active bags storage technology for macadamia storage which prolongs horticultural fresh produce shelf-life. He explains further that active bags have been shown to possess an anti-microbial effect that reduces post-harvest disease leading to prolonged shelf- life thus raising quality level and increasing farmers' income, since macadamia prices have been shown by this study to depend on the quality of produce to a certain level.

The legal and regulatory framework governing produce quality standards for both domestic and export markets are contained in local statutes, subsidiary legislation, Global Good Agricultural Practices and to a lesser degree, international protocols (Lutting, *et al*, 1998). Market demands on particular quality specifications, arising out of increased consumer awareness, also play a role in determining quality of produce targeting those markets.

In Kenya, the guiding regulatory framework for the agrifood markets is contained in various statutes and subsidiary legislations. These include the Public Health Act, the Local Government Act and the Horticultural Crop Authority Orders. An example of regulatory permit is shown on appendix v which may not help in development of quality standards and in most cases regulatory bodies treat this to be a means of generating income. Findings from the study showed that there was no coordinated self-regulation mechanism among producers on product quality and health safety. Macadamia products destined for domestic and international markets were therefore not effectively regulated to guarantee quality and health safety. This can partly be attributed to ineffective enforcement of legal and regulatory provisions or lack of a single organised body that deals with the quality control of macadamia produced in the country for both domestic and international markets.

Macadamia farmers also admitted that they lacked the right knowledge on the quality standards expected of them. The findings also showed that there was lack of cooperation between macadamia traders such as between farmers and processors. The findings also showed the presence of with-holding among custodians of information which had

negatively affected the development and progress of macadamia industry. Thus available information on prices, production, yields, consumption trends, markets, farm sizes, area under crops and crop suitability maps was insufficient and unreliable (KEBS, 2009 and GAIN, 2009). This study also established that consumers are sensitive to macadamia taste and flavour. Consumers may judge the attributes of the product they intend to buy by taste, smell, sometimes size, all used to judge texture and taste. These requirements if followed my eventually lead to product development as required by the customers which was not the case which indicated market inefficiency.

5.5.1 Value of Quality Control Systems

Sound kernel recovery was used to assess level of quality of macadamia. Murang'a County had the highest average SKR of 21.00 while Embu County had the lowest SKR of 19.85 and the average for the county was 19.85 as indicated in Table 4.17. This is against the world average of 30.00 which affects the market efficiency of macadamia. The study tried to assess the cause of the low quality levels.

Norwood and Lusk, (2007) argue that, grade standards are usually established by government agencies in consultation with producers, consumers and marketing firms. A grading system can make markets work more efficient, where all buyers and sellers would have equal access to available information, and each transaction would price the item correctly. Appropriate grading improves the information available to potential buyers and sellers. Contracts can be based on grade specification and buyers need not personally inspect specific commodity before consummating a transaction. Thus, grades potentially reduce marketing costs.

The efficiency of marketing system of any product aims at reducing the cost of production of the product and realizing the highest yield in terms of profit. In this broader sense, efficiency refers to the accomplishing of the greatest amount of work in the best possible manner with the least expenditure of time and resources. Its goal in business is to secure the greatest possible output of the highest quality, with the least expenditure of material, energy, and time (Albu & Griffith 2005). Therefore, efficiency in the marketing of a product aims at minimizing the costs of production and marketing a product while maximising the margins realised from the sale of the product.

The study aimed at investigating the macadamia efficiency marketing system in five selected counties from central Kenya highlands. In this, the study sought to examine the efficiency of macadamia marketing and the factors that contribute or influence the profitability of macadamia. Findings from the study showed that margins from macadamia products have been on the decline in Central Kenya Highlands unlike 1970s. For the past few years, proceeds from macadamia exceeded those of coffee. Poor performance of macadamia is as a result of fluctuating prices of macadamia products and low margins, inadequate and unreliable flow of information, poor infrastructure and low quality standards of macadamia products, trade and government barriers and inadequate market structure.

This study was of the view that in order for the margins from macadamia sales to improve, the factors identified above have to improve. The government, the private sector and all other stakeholders involved in macadamia production and marketing have to

address the issues of quality control systems raised above to make macadamia as profitable as other horticultural products.

5.6 Price Determination

The term market structure refers to the number of buyers and sellers, their size, distribution, the degree of the product differentiation and the ease of the entry of the new firms into an industry (Porter, 2000). These structure characteristics may be used as a basis for classifying markets. Price behaviour, in terms of level and frequency of change varies with the type of market structure. Other market or product characteristics that may affect pricing decisions include the durability of the commodity, the adequacy of grade descriptions (where relevant) bulkiness of the product relative to its value, the ratio of fixed to variable costs in the industry, and the continuity and length of the production process (Brosen and Fofana, 2001).

5.6.1 Government Price Policy and Price Transmission Analysis

This study established that there is no government policy to assist in pricing mechanism of macadamia nuts for both local and international markets for the benefit of both traders and consumers. This finding resonates well with that of Norwood & Lusk (2007) who argues that commodity prices, in agrifood industry have traditionally been used as the basis of pricing yet they are a poor indicator of a product's true value and an ineffective basis from which to use in developing growth of companies. The findings showed the speed at which each market trade level receives information differs. The analysis shown by Figure 4.8 indicates that middlemen receive information on average daily/weekly while the farmers take about month. The middlemen therefore easily took advantage of

the vacuum in information flow among the producers to set market prices. The speed with which markets adjusted to price change was determined by the actions of market brokers/middlemen who were involved in the transactions that link various market channels: wholesalers, distributors, processors, retailing firms and the consumers. These results are supported by Capps and Sherwell, (2005) who argue that when adjustment is costly or is otherwise subject to many other constraints, price signals passed from agent to agent may take place only with delays where lags may be significant. That is, increases or decreases of other costs in one end of the chain are not transmitted instantaneously but instead distributed over time thus lowering efficiency which is akin to macadamia marketing system in the central Kenya highlands.

5.6.2 Prices of Macadamia Products

In the agrifood industry, commodity prices have traditionally been used as the basis of pricing yet they are a poor indicator of a product's true value and an ineffective basis from which to develop cooperation between companies (Bradach, 1989). To ensure efficiency, much of the agrifood industry has sought to compete through increasing productivity and reducing prices; even though business managers can be more concerned about offering lower prices than what the consumers receive (O'Keeffe, 2003). For these reasons, the study established that there was no government policy to protect and change price of macadamia nuts for both local and international markets. This left traders to operate under different cartels who included middlemen and processors who are relatively well informed with better organised companies which impacted on marketing efficiency

These findings imply that there were no similar market forces that drive the dynamics of prices in the system of markets, possibly due to lack of efficient information flow (Motamed, *et al.,* 2008). In this way, macadamia prices in the producer and consumer levels drift apart widely in the long run. It's not likely that price fluctuation was due to macadamia seasonal production because the inter-market prices do not adjust immediately to achieve long-run market equilibrium in the five counties. Since a fairly good quality dry weather road connected the markets under study, communication may not have being the cause of inefficiency concluding that common domestic macadamia marketing system efficiency can be achieved in the five counties may be delusive for all cases unless the problem of integration was solved.

5.7 Traders Margins

A common measure of efficiency is by evaluation of marketing gross margins in various levels of a market system. Maples and Harri, (2013) explained the application of the market margin where it is stated that market margin is simply the difference between farm gate price and the price received on retail sale. The findings from this study revealed that there were no constant prices for macadamia products. This implies that the profit margins accruing from the business were also fluctuating depending on market performance. Further, a partial correlation of market prices for a period of three months was conducted. Using buying and selling prices of macadamia products to carry out correlation analysis, the findings showed that there was a significant relationship between the buying and selling prices of macadamia among traders. The study also found out that the buying and selling of macadamia was controlled by middlemen who purchased over 80% of all nuts produced.

The study aimed at investigating the macadamia efficiency marketing system in five selected counties from central Kenya highlands. In this, the study sought to examine the efficiency of macadamia marketing and the factors that contribute or influence the profitability of macadamia. Analysis from the study showed that margins from macadamia products have been going down in Central Kenya Highlands unlike in the 1970s. For the past ten years, proceeds from macadamia exceeded those of coffee. Poor performance of macadamia is as a result of: fluctuating prices of macadamia products and low margins, inadequate and unreliable flow of information, poor infrastructure and low quality standards of macadamia products, trade and government barriers and inadequate market structure.

This study was of the view that in order for the margins from macadamia sales to improve, the factors identified above have to improve. The government, the private sector and all other stakeholders involved in macadamia production and marketing have to address the issues raised above to make macadamia as profitable as other horticultural products.

5.7.1Margin between Pairs of Market Traders

The findings from this study revealed that there were no constant prices for macadamia products. This implies that the profit margins accruing from the business were also fluctuating depending on market performance. Further, correlation of market prices for a period of 12 months was conducted using buying and selling prices of macadamia products. The findings showed a significant relationship between the buying and selling prices of macadamia. The study also established that the buying and selling of

macadamia is controlled by middlemen who purchased more than 80% of all nuts produced by farmers. 58% of farmers indicated that their main problems originated from middlemen who dictated prices of their produce.

The findings have shown that macadamia farmers and retailers were not involved in collective buying and selling of macadamia which is also the case with middlemen which means that macadamia trade was organised at lowest level of trade, at sole trade level. There was monopoly by middlemen who determined the buying and selling prices which was a trading barrier. This was supported by the fact that producers were poorly informed about market trends at any given time. The results showed that, on average the margin made by middlemen for the five counties was 25% which was far above 10% suggested by Sandford (1983) for agricultural food in Africa, thus indicating abnormal high margins. It was also established that both middlemen and retailers from the five counties made a trading margin of over 50%. This margin was too high even though it could have been brought about by the high cost of trading.

Efficiency of marketing system of any product aims at reducing the cost of production of the product and realizing the highest yield in terms of profit. Its goal in business is to secure the greatest possible output of the highest quality, with the least expenditure of material, energy, and time (Albu and Griffith, 2005). It was therefore necessary to examine other operational marketing costs incurred in macadamia value chain for the selected counties from central Kenya highlands to improve margins, but lack of proper records made it hard to assess the efficiency of macadamia marketing systems.

After examining the price movements over time, average prices and margins between markets, the study sought to determine whether price movements at different markets correlated well with each other. Statistical approaches indicated wide differences between buying and selling prices in the stratified markets. In theory smaller market margins indicate a better pricing and marketing efficiency. The finding from this study indicated Central Kenya macadamia marketing system as an inefficient market system where margins are excessive (Goossens, 1995 and Sandford, 1983).

Using analytical analysis to compare buying prices across the selected five counties, the findings showed that in the four counties, Embu, Kiambu, Kirinyanga and Nyeri the average margins was over 20% while Murang'a had the lowest margin of 12.2%. On average, the gross margin for the five counties was 25% which was above 10% (Sanford, 1983 and Goossen, 1995).

5.8 Dimension of Value Chain Analysis and Market Efficiency Measures

Four main market efficiency measures were used to analyse the market chain: Operational market efficiency which involved SCP, management organisational structure and market integration; Technical marketing efficiency involved analysis of quality control systems in the chain analysis where sound kernel recovery levels were analysed; Price coefficient and regression analysis were used to analyse the efficiency and Financial marketing efficiency involved analysing of margins and market index.

From the market analysis the industry can be concluded to be inefficient because the industry is not able to offer macadamia products competitively in both domestic and

export market segments. This was demonstrated by the dropping of Kenya export market from 2nd to 5th position in world (GAIN, 2009). Locally macadamia consumption is only 1% compared to 10% of cashew nuts whose prices are almost at par. The share of macadamia domestic market is only 15% compared to 54% of coconut which is also a sign of inefficiency.

5.9 Index of Macadamia Marketing Efficiency

The index of the four channels, farmers, processors, middlemen and distributors were computed using Shepherd (1965), the index is an indicator of market efficiency and performance. The market index showed that middlemen and processor were most efficient while retailers had the lowest efficiency. For the counties, Kiambu was the most efficient while Embu had the lowest efficiency. All analyses are indicated in table 4.25

5.10 Performance Indicators of Marketing Efficiency

To assess efficiency, various indicators were analyzed which included; i) Marketing costs, and quality systems and Margins of each of four channels; ii) Deviations of prices in counties and seasonsand Peak period seasonal prices and iii) Communication on feedback and feed forward information flow.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This chapter presents conclusion and recommendations arrived at from the research findings. The study was a broad assessment of efficiency of agricultural food marketing system, a case study on macadamia nuts in Kenya. The study was within agrifood sub sector in the horticulture sector of agriculture industry which is the main stay economy of Kenya (HCDA, 2011).

The study found out that the market activities analyzed which included, market organisational systems, quality control systems, prices, margins, infrastructures, flow of information, promotion and advertisement to have a close relationship and a direct impact on the efficiency of macadamia marketing system in the central Kenya highlands.

From the study findings, it was concluded that the four independent variables which were management organisational structure and conduct, quality control system, price transmission system and traders margin systems affected the five market channels, farmers, brokers, processors and retailers as indicated by the research results.

From the analysis of the study findings it was found that the flow of information, for example, has a ripple effect on the macadamia marketing system which affected the efficiency. The failure of the feed forward information to reach the intended players at the right time impacts directly on the supply of macadamia, its quality, demand, price, promotion strategy and the overall margins. The same applies to other variable activities

such as organisational structures and integration of markets. It can therefore be concluded that it is important for the four main marketing activities analysed to be kept in check, reorganised and be efficiently managed in order to improve the efficiency of macadamia marketing system and the value chain.

Results findings of the study showed that various players involved in macadamia marketing system play a positive or negative role in its efficiency. It was clear from the findings that farmers, middlemen, processors and distributors contributed directly in the value addition and to the efficiency of macadamia marketing system. For instance, when farmers harvest immature raw nuts, and fail to observe the hygiene in storing the nuts after harvesting, they lowered the quality of the produce reducing value addition hence reducing the market efficiency of macadamia value chain. The consumer makes an independent judgement and gives verdict on the product to continue or stop selling and trading in macadamia which is a measure of market efficiency.

Institutional challenges have also impacted negatively on the efficiency of macadamia marketing system. Government institutions such as the Ministries in charge of Agriculture and commerce have over the years failed to sensitize and help develop the macadamia industry. For instance, the Ministries in charge of Agriculture and commerce over the years have not been able to provide the necessary support to farmers in order to develop the industry.

Having assessed the performance of the five market channels, and using the four main independent activities to determine the market efficiency it can be concluded that

efficiency marketing of macadamia is relatively very low. The failure to identify and address market system efficiency problems was clearly reflected in the data analysis in chapter four which was explained in chapter five. This affected the prices and margins of all the Kenya traders and also explains the cause of loss of market share in the international market where Kenya has moved from 2nd to 5th position from 1990s, in world macadamia production and sales volume figures.

A second example was reflected by failure to address communication .Lack of proper feed forward information to local consumers about macadamia nutrition value and lack of proper advertising & promotion made consumers believe that macadamia products were relatively very expensive. This explains why only 1% of macadamia produced in Kenya was sold in domestic markets compared to 10% of cashew nuts whose prices were equally high. A third example was reflected by lack of proper organisational structures and conduct where 74% of all farmers operate as sole traders who sell over 90% all of their produce to middlemen/brokers who are able to make excessive margins of over 25% as reflected in the market findings analysis.

With proper organisational structures and conduct farmers would own and manage their own factories which would address problem of margins and raise efficiency. Failure to address price policies was also another example where inefficiency originates and a cause of concern. From the market analysis it was clear that quality control systems are inefficient, which was reflected by both low levels of sound kernel recovery (SKR) (20.67). Gross margins were relatively very high ranging from 13.53% to32.72% for

Muranga and Kiambu respectively which were far above the average of 10% and 5% recommended by Sandford (1983) and Goosen (1995) which is a sign of inefficiency.

6.1.1Policy Recommendations

On the basis of research findings and conclusions of this study, the following recommendations are made to improve the efficiency of macadamia marketing system and value chain:

6.1.2 Formation of Efficient and Operational Farmer's Organizations

Farmers to be organised to form companies which would own factories and have professional managers run them as their agents/employees which would reduce the market channels to three levels (farmer/factory, broker/agent and distributors, consumers) from current five market channels (farmer, middleman, processor, retailer and consumer levels). Brokers would be appointed as agents of famers to sell dried nuts to international buyers and also buy as appointed agents for global buyers in auction room. The premises of having auction room were to increase the value chain by improving efficiency. The system of auction is applicable in tea industry and also in coffee at Mombasa and Nairobi respectively which could be replicated in macadamia marketing in Kenya.

6.1.3 Development Policy

a) The government should prioritize organisation and construction of market centres for macadamia, in areas where they are produced. Establish a body that is directly charged with maintaining the quality standards and specifications of macadamia products for both local and export market. Setting up of Macadamia Board of Kenya

to be managed independently by nut traders, is recommended just like in case of the tea industry where there is a Tea board of Kenya. There are also milk board and coffee boards which are all established and registered by GoK to regulate relevant industries.

b) The government should encourage public-private partnerships and institutions of higher learning on the training and promotion of quality standards for macadamia products. Quality control circles are recommended to be introduced in the macadamia industry. This method has done well in Japan, Europe, and USA as reported in IMCB, (Amrik and Keith, 1988).

c) The government should improve the road networks in macadamia producing regions to foster speedy delivery of macadamia products to the markets and build storage facilities to assist farmers at the level of National Cereal board which assist maize farmers in marketing and storage facilities.

6.2 Recommendation on Quality Control System

Based on the research findings and the conclusion made, this study was of the opinion that the main marketing inefficiency was quality control systems. In order to guarantee quality in the macadamia value chain, there is need to develop quality assurance programs, tailored to serve all stakeholders in the macadamia industry to assure and certify the attributes of a product, through normative documentation covering its production and processing. These programs include inspection procedures ensuring

implementation, while the overall process may result in a label or certification proving the conformance of the attributes to the relevant documents (appendix v and vi).

Quality assurance programs can be either compulsory, legislating on the safety requisites of products; or voluntary, through third party certification on quality management, ethical concerns, certification of organic production and private certifications involving various quality, safety, ethical and environmental concerns. Complying with these certifications common in macadamia importing countries like USA and China will go a long way in enhancing efforts being made to capture new market openings, or often, just to remain in business. There is need of forming a national body specifically concerned with the standardization, specification and accreditation of the quality of macadamia products to assist in development of quality control systems.

6.3 Recommendation for Further Studies

A comparative study on the efficiency of agrifood marketing system in Kenya and other agricultural food producing countries such as South Africa, China, USA and Australia may be conducted to establish points of confluence and divergence, and in the process, suggest ways of improving macadamia marketing structures in Kenya. It proper to find why is Kenyan's average (sound kernel recovery) is so low which averaged at 20. 67% in year 2012 compared to SA and Australia 33% and 30% respectfully.

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APPENDICES

APPENDIX I.RESEARCH PERMIT

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: kubps@yahoo.com
dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: A99/13329/09 **Date:** 18th October, 2011

The Permanent Secretary,
Ministry of Higher Education, Science & Technology,
P.O. Box 30040,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR WILFRED MUCHIRI MURIOGA - REG.NO A99/13329/09

I write to introduce Wilfred Muchiri Murioga who is a Postgraduate Student of this University. He is registered for a Ph.d degree programme in the Department of Agribusiness Management and Trade in the School of Agriculture and Enterprise Development.

Mr. Murioga intends to conduct research for a thesis entitled, **"Efficiency of Macadamia Nuts Marketing Systems in the Central Kenya Highlands".**

Any assistance given will be highly appreciated.

Yours faithfully,

JOHN M. ODONGI
FOR: DEAN, GRADUATE SCHOOL

JMO/rwm

APPENDIX II: INTRODUCTORY LETTER

I am a PhD candidate from Kenyatta University in Kenya. I am conducting a study on Macadamia nuts value chain in central Kenya Highlands, in affiliation with Kenyatta University, Department of Agribusiness Management and trade

I have read the information given in attached relevant questionnaires and understood the aims of the study and the procedures to be followed.

I ----------have given consent to participate in conducting research on" assessment of marketing system efficiency" A case study on macadamia nuts value chain in central Kenya highlands.

Signature…… Date……..

I would thank you and respect your decision should you not wish to participate in this research. If you have any concerns or comments you would like to make on any of the information given in the relevant questionnaires, please contact:

Wilfred M. Murioga

P.O. Box 75 844,

Nairobi-Kenya

TEL– 07227641184, 07043131001

Email – meleeneastafrica@

OR

Chairman

Kenyatta University

Agribusiness and Trade Management

Department

P.O . Box 43844

Nairobi, Kenya.

APPENDIX III: QUESTIONNAIRE

SOCIAL ECONOMIC CHARACTERISTICS

TRADER DEMOGRAPHIC AND SOCIAL ECONOMIC AREA

A 001 Name/Optional.....

A002 County……

A003 Market centre …….

A004 Sex (tick) Male ☐ Female ☐

A005 Age of the trader

Below 20 years ☐ between 21-29 ☐

Between 30-39years ☐ between 40-49 ☐

Over 50 years ☐

A006 Education Level

Primary ☐ College ☐

Secondary ☐ University ☐

None ☐ Others ☐

A- FARMER

MARKET INFORMATION

B002 What are your main market outlets?

Consumers ☐ Processor ☐

Brokers ☐ Export ☐

Retailers ☐ Others ☐

B003 What is your source of information?

Internet ☐ Radio / TV ☐

Public baraza ☐ Newspaper ☐

B004 How often do you receive information about consumer demand for Macadamia products?

Daily ☐ Monthly ☐

Weekly ☐ Other Specify ☐

B005 What level of macadamia trade are you in?

Sole trader ☐ Company ☐

Partnership ☐ Other Specify ☐

B006 What is the major problem in the marketing?

B007 In what quantities do you sell macadamia nuts?

1 – 10kg ☐ 51-100kg ☐

11-50kg ☐ 101 – 200kg ☐

Over 2001 ☐

B008 What mode of selling do you use for your products?

Cash ☐ Credit ☐

Cheque ☐ Barter ☐

B009 Are you involved in collective buying and selling your products with other traders?

Yes ☐ No ☐

B010 If you have answered no, why?

Lack of organized Marketing body ☐ Lack of skill ☐

Competition by brokers ☐ Lack of working capital ☐ Others ☐

PRICES

B013 How often does the price of macadamia change?

Daily ☐ Weekly ☐ Fortnight ☐

Monthly ☐ Annually ☐ Hourly ☐

B016 Who purchased most of your macadamia nuts in the last season?

Processors ☐ Bicycle collector ☐

Brokers ☐ Other Farmers ☐

Processor agents ☐ Consumer/others ☐

B021 What was the average cost of the commodity last season per Kg in Ksh Please indicate ……

B022 What was your average selling price? In Kenya shillings.....

B023 What is the average distance to the market?

No Metres ☐ No Km ☐

B024 What was the average transport cost per KG of macadamia nuts? Please indicate how much money do you pay?

Kenya Shillings……..……...…….

B026 Are there any other costs you incur please specify

1…….. 3……..

2…….. 4……..……

INFRASTRUCTURE

B027 What type roads do you use to transport macadamia?

All weather roads ☐ Others specify ……....…….

Dry weather roads ☐ Tarmac…….…….…….

029 What problem do you face in transporting your macadamia? Please indicate

1…… 3…….……..

2…….. . 4…….……..

B030 Do you think something can be done to reduce these problems?

Yes ☐ No ☐

B031 If yes what is it? Please explain

1……

2……..……

STORAGE

B032 How much money do you pay for storage of a KG per month?

Kenya Shillings……

B033 Do you store macadamia nuts after harvesting?

Yes ☐ No ☐

B033 If yes for what reason? Please specify

1…….…….……

2…….…….……

B034 If yes how long do you store

One day ☐ 14 days ☐

7 days ☐ 1 Monthly ☐

Over 1 month ☐

B035 If yes where do you store them? Please specify

1……..……

2……..……

B036 Do you experience storing problems?

Yes ☐ No ☐

B037 If yes please tick as appropriately

Lack of proper transport ☐ Lack of buyers ☐

To wait for price change ☐ To improve quality ☐

No reason ☐

B038 Does storage time and space change the quality of the nuts?

Yes ☐ No ☐

B039 If yes please explain

1……..…….

2……..…….

MARKET LOCATIONS/CONCENTRATION

B040 Do you think market location affects value/price of your product?

Yes ☐ No ☐

B 041 Please explains how?

1…….

2…….

B042 What percentage do you lose because of lack of good market? Please indicate the percentage ……..……..

B043 Do these markets facilitate proper marketing?

Yes ☐ No ☐

B044 Do you think in your opinion these markets can be improved?

Yes ☐ No ☐

B045 Please explain how

1……..

2…….

MARKET INFORMATION AVAILABILITY

B046 Do you benefit in any of the following information flow?

Please tick and rank them

Radio	☐	TV	☐
Newspapers	☐	Processors	☐
Government Barazas	☐	Any other	☐
Agricultural show and exhibition		Internet	☐

B047 Do you use the information you get for market decisions making?

Yes ☐ No ☐

B048 Do you believe that the information you get is adequate to help you make decision

Yes ☐ No ☐

B049 Is the information you require available all the time?

Yes ☐ No ☐

B050 In your own opinion is the flow of market information beneficial?

Yes ☐ No ☐

B051 Please explain your answer

1……..

2…….

B052 what type of information would you like to receive?

Please tick

Price	☐	Market availability	☐
Quality	☐	Competitors	☐
Processors	☐	Others	☐

B053 how do you think information flow can be improved? Please explain

1…….

2…….

GOVERNMENT POLICY

B054 Do you require trading licenses to trade in macadamia?

Yes ☐ No ☐

B055 If yes, which licenses? Please indicate

1..... 3.....……..

2..... 4..... ……..

B056 Does the Government Policy allow free trade of macadamia?

Yes ☐ No ☐

B057 Does the Government allow export of macadamia, raw/processed nuts

Yes ☐ No ☐

B058 If yes, is export of nuts allowed throughout the year?

Yes ☐ No ☐

B059 Do you think the Government ban of export of Raw nuts is good or bad policy?

Yes ☐ No ☐

B060 If yes or no please explain

1……..……

2……..……

B061 Do you think the Government should register a body to assist in macadamia trade?

Yes ☐ No ☐

B065 Do you think the Government assists in marketing of macadamia?

Yes ☐ No ☐

B066 If yes or no please explain

1……..……

2……..……

QUALITY CONTROL

C001 How do you access quality of raw nuts you use? Please explain

1……..……

2……..……

C002 How do you grade raw nuts you sell? Please explain

1……..……

2……..……

C024 Do you think quality control is important? Yes or no.

Yes ☐ No ☐

C025 If Yes or no please explain

……

……

C026 Do you experience quality problem

Yes ☐ No ☐

C027 If Yes, please explain the main cause of quality problem

1……

2……

C028 Are you satisfied with quality level of nuts you harvest?

Yes ☐ No ☐

C029 If Yes or No, please explain.

……

……

C36 Do you receive quality control feedback from your customers?

Yes ☐ No ☐

C37 Please explain how and what feedback you receive from your customer

1……

2……

C38 Please explain how quality can be improved

1……

2……

DETAILS

C42 Do you think demand of macadamia is increasing?

Yes ☐ No ☐

C43 If yes please explain

1……..……

2……..……..……

C043 If no please explains what is causing the decrease of demand.

……

……

C44 Do you think we should promote macadamia consumption?

Yes ☐ No ☐ I don't know ☐

C45 If yes what is the best way of promoting macadamia products for both local and export consumption? Please explain

1……..…….

2…….

B067 Do you face problems related to macadamia business?

Yes ☐ No ☐

B068 If yes please explain

1……..……

2……..……

Thank you very much for taking you valuable time to fill all the questions please

Sign/optional……Date ……

B- MIDDLEMAN/BROKER

MARKETING INFORMATION

B001 What are your main sources of macadamia?

Farm gate Market ☐ Agent ☐

Middleman ☐ Bicycle collector ☐

B002 What are your main market outlets?

Consumers ☐ Processor ☐

Brokers ☐ Export ☐

Retailers ☐ Others ☐

B003 What is your source of information?

Internet ☐ Radio / TV ☐

Public baraza ☐ Newspaper ☐

B004 How often do you receive information about consumer demand for Macadamia products?

Daily ☐ Monthly ☐

Weekly ☐ Other (Specify) ☐

B005 What level of macadamia trade are you in?

Sole trader ☐ Company ☐

Partnership ☐ Other (Specify) ☐

B006 What is the major problem in the marketing?

Lack of organized marketing body ☐ Lack of reliability of market ☐

Interference by brokers/middlemen ☐ High cost of organization ☐

High cost of transport ☐ Storage ☐

B007 In what quantities do you sell macadamia nuts?

Please indicate the number in kg ……B009

Are you involved in collective buying and selling your products with other traders?

Yes ☐ No ☐

B010 If you have answered no, why?

Lack of organized marketing body ☐ Lack of skill ☐

Competition by brokers ☐ Lack of working capital ☐ Others ☐

Lack training ☐

B013 How often does the price of macadamia change?

Daily ☐ Weekly ☐ Fortnight ☐

Monthly ☐ Annually ☐ Hourly ☐

B016 Who purchased most of your macadamia nuts in the last season?

Wholesalers ☐ Retailers ☐

Processor ☐ Other agents ☐

Other (Specify) ☐ Consumer ☐

B021 What was the average buying price of the commodity last season per Kg in ksh (please indicate) ……

B022 What was your average selling price per kg?

In Kenya's Shillings .....

B023 What was the average distance from where you bought commodities to the market?

Number of metres ☐ Number of km/s ☐

B024 What was the average transport cost per kg of macadamia nuts? Please indicate how much Kenya shillings……..……

B025 How much money do you pay for storage of a kg per month?

Kenya Shillings……..…….……

B026 Are there any other costs you incur (please specify)

1……..……..…….……

2……..……..…….……

INFRASTRUCTURE

B027 What type of roads do you use to transport macadamia?

All weather roads ☐ Others specify …….……

Dry weather roads ☐ Tarmac ☐

B028 Do you think the roads are well-developed to enable easy transport of macadamia?

Yes ☐ No ☐

B029 What problem do you face in transporting macadamia? Please indicate

1……..……

2……..……

B030 Do you think something can be done to reduce these problems?

Yes ☐ No ☐

B031 If yes what is it? Please explain

1…….

2…….

STORAGE

B032 Do you store macadamia nuts after buying?

Yes ☐ No ☐

B033 If yes for what reason? Please specify

1……..…….

2…….

B034 If yes how long do you store

One day ☐ 14 days ☐

7 days ☐ 1 Monthly ☐

Over 1 month ☐

B035 If yes where do you store them? please specify

1……..……..…

2……..……..…

B036 Do you experience storing problems?

Yes ☐ No ☐

B037 If yes please indicate by ticking appropriately ☐

Lack of proper transport ☐ Lack of buyers

To wait for price increase ☐ To improve quality ☐

No reason ☐

B038 Does storage time and space change the quality of the nuts?

Yes ☐ No ☐

B039 If yes please explain

1……..……

2……..……

MARKET LOCATION/CONCENTRATION

B040 Do you think market location affects value/price of your product?

Yes ☐ No ☐

B041 Please explain how?

1……..……

2……..……

B042 What percentage do you lose because of lack of good market? Please indicate percentage……..…… %

B043 Do these markets facilitate proper marketing? Please tick

Yes ☐ No ☐

B044 Do you think in your opinion these markets can be improved?

Yes ☐ No ☐

B045 Please explain how

1……..……

2……..……

MARKET INFORMATION AVAILABILITY

B046 Do you benefit in any of the following information flow?

Radio	☐	TV	☐
Newspapers	☐	Processors	☐
Government Barazas	☐	Any other	☐
Agricultural show and exhibition	☐	Internet	☐

B047 Do you use the information you get for market decision making?

Yes ☐ No ☐

B048 Do you belief that the information you get is adequate to help you make decision

Yes ☐ No ☐

B049 Is the information you require available all the time?

Yes ☐ No ☐

B050 In your own opinion is the flow of market information adequate?

Yes ☐ No ☐

B051 Please explain your answer

1……..……

2……..……..……

B052 what type of information would you like to receive?

Price ☐ Market availability ☐

Quality ☐ Competitors ☐

Processor ☐ Farmer ☐

Others ☐

B053 How do you think information flow can be improved? Please explain

1……..……

2……..……

GOVERNMENT POLICY

B054 Do you require trading licenses to trade in macadamia?

Yes ☐ No ☐

B055 If yes which licenses? Please indicate

….……

.....……..……

B056 Does the Government Policy allow free trade of macadamia?

Yes ☐ No ☐

B057 Does the Government allow export of macadamia, raw/processed nuts

Yes ☐ No ☐

B058 If yes, is export of nuts allowed throughout the years?

Yes ☐ No ☐

B059 Do you think the Government ban of export of raw nuts was good policy?

Yes ☐ No ☐

B060 If yes or no please explain

1……..……

2……..……

B061 Do you think the Government should register a body to assist in macadamia trade?

Yes ☐ No ☐

B062 If yes or no please explain

1……..……

2…….....……

B065 Do you think the Government assists in marketing of macadamia?

Yes ☐ No ☐

B066 If yes or no please explain

1……

2……..…

B067 Do you face problems related to macadamia business?

Yes ☐ No ☐

B068 If yes please explain

1……..……

2…….……

QUALITY CONTROL

C001 How do you access and determine quality of raw nuts? Please explain

..... ……

..... ……

C002 How many grades of raw nuts do you accept? Please explain

1…….…….

2…….…….

C003 Where do you buy most of your nuts? Please tick the appropriate

Farmers ☐ Other Agents ☐

Middle ☐ Bicycle Collector ☐

C004 Please indicate the percentage of each Source?

Farmers ☐ Other Agents ☐

Middlemen ☐ From Your firms ☐

Others ☐ Bicycle Collector ☐

C024 Do you think quality control is important?

Yes ☐ No. ☐

C025 If yes or no please explain

.....

.....

C026 Do you experience quality problem

Yes ☐ No ☐

C027 If yes please explain

....

....

C030 Do you reject some nuts because of poor quality?

Yes ☐ No ☐

C031 If yes please explain why you reject and at what percentage?

1…….....

2…….....

C32 Are you satisfied with the quality level of raw nut you receive?

Yes ☐ No ☐

C33 If yes please explain

1…….....

2…….....….

C34 Do you think training on quality\grading is necessary?

Yes ☐ No ☐

C35 If yes do you think the training should be done by

Government ☐ Private Sector ☐

Any other specify ☐ Processor ☐

C36 Do you receive quality control feedback?

Yes ☐ No ☐

C37 Please explain how and what feedback you receive from your customer

1……

2……

C38 Please explain how quality can be improved

1……

GENERAL MARKETING DETAILS

C44 Do you think promotion consumption is necessary?

Yes ☐ No ☐ I don't know ☐

C45 If yes what is the best way of promoting macadamia ? Please explain

1……

C43 If no, please explain what is causing the decrease.

1……

Overall, how satisfied are you with the brands ? Please tick appropriately

	Very satisfied	Satisfied	Not satisfied	Don't know
Overall Quality				
Taste				
Availability				
Appearance/Ingredients				
Packaging				
Pricing				

Thank you very much for taking your valuable time to fill all the questions please

Sign/Optional…… Date

C-PROCESSOR

MARKETING INFORMATION

B001 What are your main sources of macadamia?

Farm gate Market	☐	Wholesalers	☐
Retailers	☐	Brokers Agents	☐
Others		Bicycle Collector	☐

B002 What are your main market outlets?

Local Market	☐	Export Market	☐
Retailers / SM	☐	Others	☐
Kiosks	☐		

B003 What is your source of information?

Internet	☐	Radio / TV	☐
Public baraza	☐	Newspaper	☐
Others	☐		

B004 How often do you receive information about consumer demand for Macadamia products?

Daily	☐	Monthly	☐
Weekly	☐	Other Specify	☐

B005 What level of macadamia trade are you in?

Sole trader	☐	Company	☐
Partnership	☐	Other Specify	☐

B006 What is the major problem in the marketing?

Lack of organized marketing body ☐ Lack of reliability of market ☐

Interference by brokers/middlemen ☐ High cost of organization High cost of transport ☐

Storage

009 Are you involved in collective buying and selling your products with other traders?

Yes ☐ No ☐

B010 If you have answered no, why?

Lack of organized Marketing body ☐ Lack of skill ☐

Competition by brokers ☐ Lack of working capital ☐ Others ☐

B011 Does middlemen add value to the Macadamia trade?

Yes ☐ No ☐

B012 If yes or no please explain

……

……

B013 How often does the price of macadamia change?

Daily ☐ Weekly ☐ Fortnight ☐

Monthly ☐ Annually ☐ Hourly ☐

B014 Who purchases the macadamia you are selling for you?

Trader ☐ Family ☐

Broker/Middleman ☐ Processors Agents ☐

Other Specify ☐

B016 Who purchased most of your macadamia nuts in the last season?

Wholesalers ☐ Retailers ☐

Brokers ☐ Kiosks ☐

Other Specify ☐ Institutions ☐

B018 Do you import macadamia you are selling? If yes from which country

Yes ☐ No ☐

B019 If yes or no please explain

1……..……

2……..…

B020 If Yes, indicate the countries

1..... ……

2..... …….……

B021 What was the average buying price of the commodity last season per Kg

Between 10 and 20 ☐ Between 31-40 ☐

Between 21 and 30 ☐ Between 41-50 ☐

Between 51 and 60 ☐ Over Shs 60 ☐

B022 What was your average margin?

Kshs..... None..... …….……

%..... ……

B023 What is the average distance from where you buy commodities to the market?

Number of Metres ☐ Number of Km ☐

B024 What was the average transport cost per KG bag of macadamia nuts? Please indicate Kshs……..……

INFRASTRUCTURE

B027 What type of roads do you use to transport macadamia?

All weather roads ☐ Others specify ……..…….

Dry weather roads ☐ Tarmac ☐

B028 Do you think the roads are well developed to enable easy transport of macadamia?

Yes ☐ No ☐ ☐

B029 What problem do you face in transporting your macadamia? Please indicate

1……..……

2……..……

B030 Do you think something can be done to reduce these problems?

Yes ☐ No ☐

B031 If yes what is it? Please explain

1……..

STORAGE

B025 How much money do you pay for storage of a KG per month?

KSHS……

B026 Are there any other costs you incur please specify

1……..……

2……..……

B032 Do you store macadamia nuts after purchasing?

Yes ☐ No ☐

B033 If yes for what reason? Please specify

1……..……..……

2……..……

B034 If yes how long do you store

One day ☐ 14 days ☐

7 days ☐ 1 Monthly ☐

Over 1 month ☐

B035 If yes where do you store them? Please specify

1……..……..……..……

2……..……..……..……

B036 Do you experience storing problems?

Yes ☐ No ☐

B037 If yes please specify

Lack of proper transport ☐ Lack of buyers ☐

To wait for price change ☐ To improve quality ☐

No reason ☐ Any other ☐

B038 Does storage time and space change the quality of the nuts?

Yes ☐ No ☐

B039 If yes please explain

1……..……

2……..……

MARKET LOCATION

B040 Do you think market location affects value/price of your product?

Yes ☐ No ☐

B041 If yes or no please explain?

1……..……

2……..……

B042 What percentage do you lose because of lack of good market? Please indicate percentage …….

B043 Do these markets facilitate proper marketing?

Yes ☐ No ☐

B044 Do you think in your opinion these markets can be improved?

Yes ☐ No ☐

B045 Please explain how

1……

2……

MARKET INFORMATION AVAILABILITY

B046 Do you benefit in any of the following information flow?

Radio	☐	TV	☐
Newspapers	☐	Processors	☐
Government Barazas	☐	Any other	☐
Agricultural show and exhibition	☐	Internet	☐

B047 Do you use the information you get for market decisions?

Yes ☐ No ☐

B048 Do you belief that the information you get is adequate ?

Yes ☐ No ☐

049 Is the information you require available all the time?

Yes ☐ No ☐

B050 In your own opinion is the flow of market information adequate?

Yes ☐ No ☐

B051 Please explain your answer

1……..

2…….

B052 How do you think information flow would be improved? Please explain

1……

2……

B053 what type of information would you like to receive

Price ☐ Market availability ☐

Quality ☐ Competitors ☐

Customers ☐ Others ☐

GOVERNMENT POLICY

B054 Do you require trading licenses to trade in macadamia?

Yes ☐ No ☐

B055 If yes which licenses? Please indicate

..... ……

..... ……

B056 Does the Government Policy allow free trade of macadamia?

Yes ☐ No ☐

B057 Does the Government allow export of macadamia, raw/processed nuts

Yes ☐ No ☐

B058 If yes, is export of nuts allowed throughout the years?

Yes ☐ No ☐

B059 Do you think the Government ban of export of Raw nuts is a good policy?

Yes ☐ No ☐

B060 If yes or no please explain

1……..……

2……..……

B061 Do you think the Government should register a body to assist in macadamia trade?

Yes ☐ No ☐

B062 If yes or no please explain

1……..……

2……..……

B063 Do you know that you are free to export processed nuts?

Yes ☐ No ☐

B064 If yes to which countries do you export? Please explain

1.....……

2..... .....……..

B065 Do you think the Government assists in marketing of macadamia?

Yes ☐ No ☐

B066 If yes or no please explain

1……..……..

2……..……...

QUALITY CONTROL

C32 Are you satisfied with the quality level of raw nut you receive?

Yes ☐ No ☐

C33 If yes or no please explain

1……

2……

C030 Do you reject some nuts?

Yes ☐ No ☐

C031 If yes please explain why you reject and at what percentage?

..... ……

..... ……

C34 Do you think training on quality\grading is necessary?

Yes ☐ No ☐

C35 If yes do you think the training should be done by

Government ☐ Private Sector ☐

Any other specify ☐ Processor ☐

C36 Do you receive quality control feedback?

Yes ☐ No ☐

C37 Please explain how and what feedback you receive from your customer

1……

2……

C38 Please explain how quality can be improved

1……

2…….

MARKETING DETAILS

C42 Do you think macadamia demand is increasing?

Yes ☐ No ☐

C43 If yes or no please explain

1……..……

2…….……

C44 Do you think we should promote macadamia consumption?

Yes ☐ No ☐ I don't know ☐

C45 If yes what is the best way of promoting macadamia products?

1……..……

2…….……

C46 Who are your main product competitors? Please indicate

1……..…..……

2…….…..……

B067 Do you face problems related to macadamia business?

Yes ☐ No ☐

B068 If yes please explain

1…….……..……

2……..…….…..……

E032 Overall, how satisfied are you with the brands of processed macadamia

Products in the market? Please tick appropriately

	Very satisfied	Satisfied	Not satisfied	Don't know
Overall Quality				
Taste				
Nutritional(Protein, fat)				
Availability				
Appearance/Ingredients				
Packaging				
Pricing				

Thank you very much for taking you valuable time to fill all the questions please

Sign/Optional……. Date ……

D-DISTRIBUTOR/SUPERMARKET OUTLET

MARKETING INFORMATION

B001 What are your main sources of macadamia?

Farm gate Market ☐ Wholesalers ☐ Processor ☐

Brokers ☐ Others ☐

B003 What is your source of information?

Internet ☐ Radio / TV ☐ Others ☐

Public baraza ☐ Newspaper ☐

B004 How often do you receive information about consumer demand for Macadamia products?

Daily ☐ Monthly ☐

Weekly ☐ Other Specify ☐

B005 What level of macadamia trade are you in?

Sole trader ☐ Company ☐

Partnership ☐ Other Specify ☐

B006 What is the major problem in the marketing of macadamia?

Lack of organized marketing body ☐ Lack of reliability of market ☐

Interference by brokers/middlemen ☐ High cost of organization ☐

High cost of transport ☐ Storage ☐

B007 In what size do you sell macadamia nuts? Please indicate number of Kg

Under GM ☐ 76-10 GM ☐

26-50 GM ☐ Over 100 GM ☐

51-75 GM ☐

B008 What mode of selling do you use for your products?

Cash ☐ Credit ☐

Cheque ☐ Barter ☐

B009 Are you involved in collective buying and selling your products with other traders

Yes ☐ No ☐

B010 If you have answered no, why?

Lack of organized Marketing body ☐ Lack of skill ☐

Competition by brokers ☐ Lack of working capital ☐

Others ☐ Lack of inte ☐

B013 How often does the price of macadamia change?

Daily ☐ Weekly ☐ Fortnight ☐

Monthly ☐ Annually ☐ Hourly ☐

B015 Who normally sells the products to you?

Wholesalers ☐ Processors ☐ Brokers ☐

Other Specify ……

B016 Who purchased most of your macadamia nuts in the last season?

Please specify.

Wholesalers ☐ Men ☐

Brokers ☐ Women ☐

Other Specify ☐ Children ☐

B018 Do you import macadamia you are selling? If yes from which country

Yes ☐ No ☐

B019 If yes or no please explain

1……..……

2…….……

B020 If yes indicate the countries

1..... …….……..

2..... …….……

B022 What was your average margin per kg?

Kshs..... None.....

%..... …….……

B023 What is the average distance from where you buy commodities to the market?

Number of Metres ☐ Number of Km ☐

B024 What is the average transport cost per KG bag of macadamia nuts? Please

Indicate how much?

Kenya Shillings…….…….……..…

B025 How much money do you pay for storage of a KG per month?

Kenya Shilling……..…….……

B026 Are there any other costs you incur please specify

1……..……..……..……

2……..……..……..……

INFRASTRUCTURE

B027 What type of roads do you use to transport macadamia?

All weather roads ☐ Others specify …….…….….

Dry weather roads ☐ Tarmac ☐

B028 Do you think the roads are well developed to enable easy transport of macadamia?

Yes ☐ No ☐

B029 What problem do you face in transporting your macadamia? Please indicate

1……..……..……..……

2……..……..……..……..……..

B030 Do you think something can be done to reduce these problems?

Yes ☐ No ☐

B031 If yes what is it? Please explain

1……..……...……..

2……..……...……..

STORAGE

B036 Do you experience storing problems?

Yes ☐ No ☐

B037 If you have answered yes/no please tick

Lack of proper transport ☐ Lack of buyers ☐

To wait for price change ☐ To improve quality ☐

No reason ☐ Any other ☐

B038 Does storage time and space change the quality of the nuts?

Yes ☐ No ☐

B039 If yes please explain

1……

2……

MARKET LOCATION

B040 Do you think market location affects value/price of your product?

Yes ☐ No ☐

B041 Please explain how?

1……

2……

B042 What percentage do you lose because of lack of good market? Please indicat percentage.....……..

B043 Do these markets facilitate proper trading?

Yes ☐ No ☐

B044 Do you think in your opinion these markets can be improved?

Yes ☐ No ☐

B045 Please explain how

1……

2……

MARKET INFORMATION AVAILABILITY

B046 Do you benefit in any of the following information flow?

Radio	☐	TV	☐
Newspapers	☐	Processors	☐
Government Barazas	☐	Any other	☐
Agricultural show and exhibition	☐		

B047 Do you use the information you get for market decisions? Please tick appropriately

Yes ☐ No ☐

B048 Do you think that the information you get is adequate to help you make decision

Yes ☐ No ☐

B049 Is the information you require available all the time?

Yes ☐ No ☐

B050 In your own opinion is the flow of market information adequate?

Yes ☐ No ☐

B051 Please explain your answer

1……

2……

B052 What type of information would you like to receive

Price	☐	Market availability	☐
Quality	☐	Competitors	☐
Others	☐	Customers	☐

B053 How do you think information flow can be improved? Please explain

1……

2……

QUALITY CONTROL

C32 Are you satisfied with the quality level macadamia you buy and sell?

Yes ☐ No ☐

C33 If yes or no please explain

1……

2……

C36 Do you receive quality control feedback?

Yes ☐ No ☐

C37 Please explain how and what feedback you receive from your customer

1……

2……

C38 Please explain how quality can be improved

1……

2……

GENERAL MARKETING DETAILS

C42 Do you think demand of macadamia is increasing?

Yes ☐ No ☐

C43 If yes/no please explain

1……

2……

C43 If no please explains what is causing the decrease.

1……

2……

C44 Do you think we should promote macadamia consumption?

Yes ☐ No ☐ I don't know ☐

C45 If yes what is the best way of promoting macadamia products? Please explain

1……..……

2……..……

C46 What are your main product competitors? Please indicate

1……...……

2……..……

C47 How well is macadamia product attracting buyers and developing repeat buying?

1……..…..……

2……..…..……

C48 From which brands did macadamia product draw consumers? Please Indicate

1……..……

2……..……

C49 Please Indicate which products you have ever purchased any time

Health care products, ☐ Body Oil ☐

Body lotions ☐ Processed Nuts ☐

C50 Please explain why you don't purchase all the products

1……..……

2……..……

E001 Would you please indicate the type of nuts you purchase and sell

1. Macadamia %
2. Cashew nuts %
3. Ground nuts %
4. Others %

E004 How would you rate movement of macadamia nuts. Please tick.

Very fast moving	☐	Very Slow moving	☐
Fast moving	☐	Does not move	☐
Slow moving	☐	I am not sure	☐

E005 Please explain your answer above.

1_____

2_____

PRICING SECTION

E008 Do customers see macadamia prices as being in line with the value of it's

Offer? Please tick a properly

Yes ☐ No ☐

E010 How does the price of macadamia relate/ compare to price of other nuts? Please tick

1. Very High	☐	3. Abnormally high	☐
2. Normal	☐	4. I don't know	☐

E011 Do you think your customers are conscious of price?

Yes ☐ No ☐

E012 If Yes or No please explain how

.....

GENERAL MARKET INFORMATION

E013 Are your customer's conscious of flavour and taste?

Yes ☐ No ☐

E014 Please specify

1. Very conscious ☐
2. Conscious ☐
3. Not conscious ☐
4. I don't know ☐

E019 Do you think promotion and advertising of macadamia is properly and is adequate?

Yes ☐ No ☐

E021 Do you normally have repeat orders?

Yes ☐ No ☐

E032 Overall, how satisfied are you with the brands of processed macadamia

Products you have tried? Please tick appropriately

\	Very satisfied	Satisfied	Not satisfied	Don't know
Overall Quality				
Taste				
Nutritional(Protein, fat, Cholesterol)				
Availability				
Appearance/Ingredients				
Packaging				
Pricing				

Thank you very much for taking you valuable time to fill all the questions please

Sign/optional…… Date ……

E-CONSUMER

MARKETING INFORMATION

B003 What is your source of information?

Internet ☐ Radio / TVIn what siz☐do you buy macadamia please indicate

B013 How often does the price of macadamia change?

Daily ☐ Weekly ☐ Fortnight ☐

Monthly ☐ Annually ☐ Hourly ☐

B015 Who normally sells the products to you? Please tick

Wholesalers ☐ Retailers ☐

Kiosk ☐ Supermarket ☐

B023 What is the average distance from where you buy commodities to the market?

Number of Metres ☐ No Km ☐

MARKET INFORMATION AVAILABILITY

B046 Do you benefit in any of the following information flow?

Radio ☐ TV ☐

Newspapers ☐ Processors ☐

Government Barazas ☐ Any other ☐

Agricultural show and exhibition ☐

B047 Do you use the information you get for market decisions?

Yes ☐ No ☐

B048 Do you believe that the information you get is adequate to help you make decision

Yes ☐ No ☐

B049 Is the information you require available all the time?

Yes ☐ No ☐

B050 In your own opinion is the flow of market information adequate?

Yes ☐ No ☐

B051 Please explain your answer

1……..……

B052 What type of information would you like to receive?

Price ☐ Market availability ☐

Quality ☐Competitors ☐

Product range ☐Others ☐

B053 How do you think information flow would be improved? Please explain

1……..……

CONSUMERS/MARKETING DETAILS

C32 Are you satisfied with the quality level of raw nut you buy?

Yes ☐ No ☐

C33 If yes or no please explain

1……..……

C38 Please explain how quality can be improved

1……..……

MARKETING DETAILS

C44 Do you think we should promote macadamia consumption?

Yes ☐ No ☐ I don't know ☐

C45 If yes what is the best way of promoting macadamia products and which segment should be targeted? Please explain

1…….

C49 Please Indicate which products you have ever purchased any time

Health care products, ☐ Body Oil ☐

Body lotions ☐ Processed Nuts ☐

C50 Please explain why you don't purchase all the products

1……..……

E001 Would you please indicate the type of nuts you purchased

Macadamia % ☐ Cashew nuts % ☐

Ground nuts % ☐ Others % ☐

E002 Please list nuts according to your purchases demand

First ☐ Third ☐

Second ☐ Fourth ☐

PRICING SECTION

E008 Do customers see macadamia prices as being in line with the value of it's

Offer? Please tick a properly

Yes ☐ No ☐

E009 If yes or No please explain

.……..

E010 How does the price of macadamia relate to price of other nuts? Please tick

1. Very High ☐ 3. Abnormally high ☐

2. Normal ☐ 4. I don't know ☐

E011 As a customer are conscious with the price?

Yes ☐ No ☐

E012 If Yes or No please explain

GENERAL MARKET INFORMATION

E013 Are your customer's conscious of flavour and taste?

Yes ☐ No ☐

E014 Please explain

……..

E019 Do you think promotion and advertising of macadamia is properly and adequate done?

Yes ☐ No ☐

E020 If no or yes please explain your answer

……..

E021 Do you normally have repeat orders?

Yes ☐ No ☐

E025 Do you face problems in macadamia use?

Yes ☐ No ☐

E026 If yes please explain why.

……..

E030 What do you consider to be important when buying macadamia? Please Explain.……

E032 Overall, how satisfied are you with the brands of processed macadamia products you have tried? Please tick appropriately

	Very satisfied	Satisfied	Not satisfied	Don't know
Overall Quality				
Taste				
Nutritional(Protein, fat, Cholesterol)				
Availability				
Appearance/Ingredients				
Packaging				
Pricing				

Thank you very much for taking you valuable time to fill all the questions please

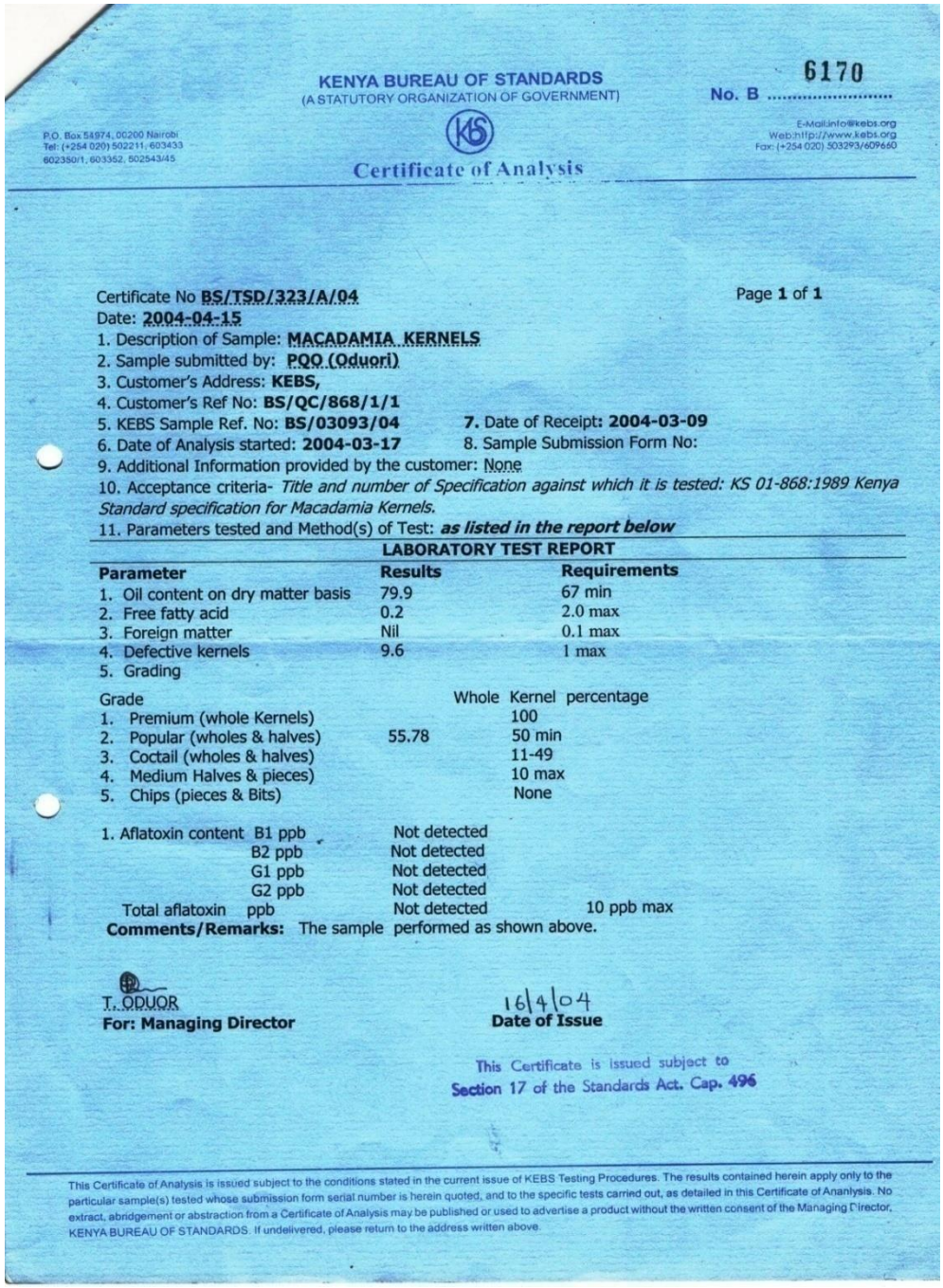
Sign/Optional……..Date…….

APPENDIX I V: QUALITY STANDARDS OF MACADAMIA

QUALITY FACTOR	**STRUCTURE OF THE STANDARD**		**DESCRIPTION**
	1. PRODUCT PACKAGING		
Standardized	Labelling of macadamia products	❖ Domestic market ❖ Export market	Display of the nutritive value, size, quantity, qualitative value to the end user
Clarify the Language of the standard	2. QUALITY REQUIREMENTS IN PACKAGING		
	a. Definitions		
	The product labels should be clearly written in a language that consumers can easily understand		
	b. General Requirements		
	Shape	There should be specific shapes for the various ranges of macadamia products for both domestic and export markets	
	Consistency	There should be a firm consistency in the branding of macadamia products	
	Sanitary	Healthy, free of insects and/or diseases that can affect the internal quality	
	Identification	The labels should easily be identifiable by the consumers	
	Filth	Free of filth	
	Safety	Free of contaminants	
	Green Field	The labels should be biodegradable	
Maturity Index, supports decision making process of actors	c. Maturity Requirements		
	Specification on conditions determining nuts maturity (inside changes as relating to outside colour, if existing).	Grading, pricing and processing be done according to the nuts maturity stages	
	Minimum requirements relating to specific criteria.	Consistency to avoid exploitation by the actors involved	
3. REQUIREMENTS CONCERNING CLASSIFICATION OF PACKAGING MATERIALS			
Size Range	Likely size range (as weight of the nut)		
	4. PRODUCT PRESENTATION REQUIREMENTS		
Uniformity of quality requirements for each packaging	Uniformity	Contents of each packaging unit must be uniform and contain only same origin, variety, quality and maturity index products. Visible contents must represent	

unit and package requirements		the whole.
	Packaging	New, clean and quality materials must be used on the inside to avoid any damage
	General packaging conditions apply is made to the appropriate standard.	Contents of each packaging unit must be homogeneous. Visible contents must represent the whole.
	5. PACKAGE LABELING OR MARKS	
	Packages for retail sale	Labelling must show: name of product, variety and commercial identification.
	Packages not for retail sale	in the shipping documents: identification, nature of the product, origin, commercial identification (size, units contained, net weight, maturity index)
	6. HYGIENE	
Safety	Hygiene	It is advisable that the product is prepared and handled conforming to the international recommended code on principles for the hygiene of foods and other relevant codex documents

APPENDIX V:CERTIFICATE OF QUALITY ANALYSIS



KENYA BUREAU OF STANDARDS
(A STATUTORY ORGANIZATION OF GOVERNMENT)

No. B 6170

P.O. Box 54974, 00200 Nairobi
Tel: (+254 020) 502211, 603433
602350/1, 603352, 502543/45

E-Mail:info@kebs.org
Web:http://www.kebs.org
Fax: (+254 020) 503293/609660

Certificate of Analysis

Certificate No **BS/TSD/323/A/04** Page **1** of **1**

Date: **2004-04-15**

1. Description of Sample: **MACADAMIA KERNELS**
2. Sample submitted by: **PQO (Oduori)**
3. Customer's Address: **KEBS,**
4. Customer's Ref No: **BS/QC/868/1/1**
5. KEBS Sample Ref. No: **BS/03093/04** **7.** Date of Receipt**: 2004-03-09**
6. Date of Analysis started: **2004-03-17** 8. Sample Submission Form No:
9. Additional Information provided by the customer: None
10. Acceptance criteria- *Title and number of Specification against which it is tested: KS 01-868:1989 Kenya Standard specification for Macadamia Kernels.*
11. Parameters tested and Method(s) of Test: ***as listed in the report below***

LABORATORY TEST REPORT

Parameter	**Results**	**Requirements**
1. Oil content on dry matter basis	79.9	67 min
2. Free fatty acid	0.2	2.0 max
3. Foreign matter	Nil	0.1 max
4. Defective kernels	9.6	1 max
5. Grading		

Grade	Whole Kernel percentage
1. Premium (whole Kernels)	100
2. Popular (wholes & halves) 55.78	50 min
3. Coctail (wholes & halves)	11-49
4. Medium Halves & pieces)	10 max
5. Chips (pieces & Bits)	None

1. Aflatoxin content	B1 ppb	Not detected	
	B2 ppb	Not detected	
	G1 ppb	Not detected	
	G2 ppb	Not detected	
Total aflatoxin	ppb	Not detected	10 ppb max

Comments/Remarks: The sample performed as shown above.

T. ODUOR
For: Managing Director

16/4/04
Date of Issue

This Certificate is issued subject to
Section 17 of the Standards Act. Cap. 496

This Certificate of Analysis is issued subject to the conditions stated in the current issue of KEBS Testing Procedures. The results contained herein apply only to the particular sample(s) tested whose submission form serial number is herein quoted, and to the specific tests carried out, as detailed in this Certificate of Ananlysis. No extract, abridgement or abstraction from a Certificate of Analysis may be published or used to advertise a product without the written consent of the Managing Director, KENYA BUREAU OF STANDARDS. If undelivered, please return to the address written above.

Certificate of quality analysis from Kenya Bureau of Standards

Source: KEBS (2004)