Efficiency of Agrifood Marketing Systems in Kenya "The Case Study of Macadamia Nuts in the Central Kenya Highlands"

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Abstract: *The objective of this study was to analyse the marketing barriers in the efficiency macadamia marketing systems that affect the market efficiency of agrifood industry, the case study of macadamia nuts in the central highlands Kenya. This was achieved by analysing and revealing strengths and weaknesses of policy makers deliberating on corrective measures, challenges and opportunities that facilitate the developments of collaborative relationships in the industry. The study also looked at Value chain analysis used for promotion of enterprise development, Enhancement of food quality and safety. The coordinated linkages among the five market channels, which were identified as farmers, middlemen, processors, Retailers and the consumers were used in the case study. The focus of value chain was on the analysis of the organisation and performance of the macadamia sector as a whole and not on any particular macadamia level of chain within the sector. To engage in the research on the efficiency of agrifood marketing value chain systems, practitioners face different constraints represented by human financial and time resources available to conduct the analysis. Therefore, the efficiency systems analysis followed a broader and general orientation approach which can be adapted in analysing the agrifood sector. The analysis looked at he Conduct of firms and long term strategies, pricing policies and advertising policies that in turn would define performances indicated by criteria that include operational efficiency, technical efficiency and financial efficiency in resource allocation. The systems approach takes into consideration properties such as interdependency, feedback and feed forward systems and synergy which are particularly relevant for analysis of agrifood chains. To measure the efficiency of agrifood marketing systems a research on macadamia nuts was carried in the five counties in central Kenya Highlands. Five independent variables, market integration, quality control systems, price control systems, management organisational structures and margins were used as indicators of efficiency which reflected a very low positive contribution on market efficiency.*

I. The Background of the Study

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 percent of the county's Gross Domestic Product and employs about 75 percent of the population. The sector is a major source of revenue, with agricultural produce export accounting for nearly two thirds of total export as indicated by Economic Review of Agriculture, 2015 (GOK 2O15). Majority of this population (80%) live in the rural areas and about 56% of them live below the poverty line (GOK, 2011). 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). Macadamia nuts are included in the horticulture sub sector in agricultural sector in the Kenyan economy. 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.

According to Ministry of Agriculture (2011) survey done showed that macadamia nut industry contributed 38% of overall nut value produced in Kenya and employed more than 100,000 people at the time of that survey. This is vital in the transformation of Kenya into a rapidly industrializing middle-income nation as envisaged in Kenya Vision 2030 (GOK, 1999). For instance, in the year 2013, the domestic value of production in the horticulture sub-sector had amounted to Kshs 177 billion occupying an area of 605,000 Ha with a total production quantity of 132 million MT., compared to 2012 the total value and area increased by 17% and 19% respectively (Horticulture Development Authority, 2013). The leading nuts grown in Kenya by value are coconuts (54%), Macadamia (15%) Cashew nuts (12%), Peanuts (16%) and Bambara nuts (3%) . The sub sector contributed 7.4 billion, which was 5% of total value of the Horticulture sector in 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 and advertising 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 is necessary.

1.1. The Statement of the Problem

Kenya's global ranking in Macadamia production has dropped from position 2 in the 1990s to position 5 in 2013 against a background of high global prices of macadamia .Locally, although, Macadamia and cashew nuts are close substitutes and the prices of the two products are almost at par, the percentage of domestic consumption significantly varies. Consumption of Macadamia is only 1% while cashew nuts are 10%. Studies on the macadamia have mainly focused on production and processing (Wasilwa,2004).This implies that there is a gap in literature on agrfood marketing systems in Kenya.

1.2. The Broad Objective of the Study

The aim of this study was to assess the efficiency of macadamia marketing system in Central Kenya highlands to assist in formulation of operational, technical and financial management organizational structures.

1.3. The specific objectives were to:

Assess the impact of existing organizational management structures on the efficiency of the macadamia marketing system. Assess the technical efficiency level of quality control standards and specifications and their impact on efficiency in macadamia marketing system in Kenya Evaluate the gross margin levels earned by traders and their impact on efficiency of macadamia marketing system in Kenya Evaluate market integration between the five counties to determine the level of efficiency of macadamia marketing system in Kenya.

II.   Literature Review

Value addition shifts the market from local to international or global market (Barrietons, 2007). Therefore, there is need of analyzing both local clusters and global markets. Putting together the two tier systems was necessary in the assessment of efficiency of macadamia marketing system . 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 leads to a challenge because Kenya's Sound Kernel Recovery (SKR) which averages between 18% and 22% is relatively very low compared to South Africa and Australia which is 33% and 30% respectively. The SKR levels negatively affects the international market value of Kenya's Kernel which reduces the demand further and prices go down too (KARI, 2007). Noleen and Wilma, (2005) used Decision Support Model (DSM) designed for Thailand and Belgium respectively which was used to identify South Africa's high export potential for agrifood sub-sector. The same model can be used to identify Kenya's agrifood export market potential. The model may be further used to research, establish and confirm whether Kenyan macadamia products have high market potential in relation to export market as stated in various GoK and KARI reports. This was a missing gap which required to be looked at in the current market study. According to Kenya Nut Company (2007) competition is good when it is healthy but it has not been the case because farmers pluck nuts from trees which do not comply with the normal practice.

2.1. Historical Overview of the 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. Roduner (2004) noted that the Economic Triangle Theory links horizontal (cluster development) and vertical approaches (value chain). 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. Porter (2000) developed the value chain analysis as an instrument for identifying the the customer value that exceeds the cost of activities resulting in a profit margin. 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. 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 concept of value chain is utilized as a conceptual framework that enterprises can use to detect their sources of competitive advantage. 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 which are relevant to current study. This study focused on agrifood marketing system using macadamia nuts value chain system in five selected countries of Central Kenya highlands as case study. The current study was therefore expanded to cover macadamia marketing system which has not been covered in any previous study. A third concept, the "Global Commodity Chain (GCC)," was introduced in the mid-1990s by Gereffi and others.

Gereffi utilized the framework of value chain to examine the ways in which firms and countries are globally integrated.

To summarize the literature review, it is the contention of this study that the value addition on agrifood sector will be greater when its marketing organization characteristics are similar to those of the efficiency maximizing ideal profile in which activities are arranged to fit resources consumed. Therefore, this study sought to investigate, assess, and analyze the current macadamia to fit the implementation requirements of the business strategic type in ways that minimise marketing strategies. In this regard, both social marketing theory and World economic triangle concept were used in exploring how the various components and elements that constitute the agrifood marketing system can be co- aligned to achieve maximum efficiency at both local and global level.A marketing system consists of a number of different channels and segments through which commodities are marketed (Mullins, 2012). This study has identified five main intervening variable activities to be assessed as a measure of efficiency in serving the five macadamia market channels. For an efficient macadamia market to exist, proper structures, conduct and performance must exist in the specified industry .Efficiency in marketing system brings benefits to all market players and there is no need of imposing barriers as was experienced by export ban of raw nuts in 2008,2009 and from 2010 to date which is contrary to the World Economic Triangle concept (Messner, 2002).

Global markets Impact on Efficiency of local market Organisational Structures.

Figure 2.1 Theoretical Framework

Adapted from Social Marketing theory (Porter, 2000) and interlinked with World Economic Triangle concept (Messner, 2002 and Schmitz, 2000).

2.3 Conceptual Framework

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 Figure 1.1 which correlates well with theoretical framework figure 2.2 for better efficiency of agrifood marketing in Kenya. The conceptual framework figure 1.1 is a broad and proper characteristic analysis of vertical and horizontal coordination of independent and dependent variables which impact on efficiency of macadamia marketing system Kenya to develop macadamia industry.
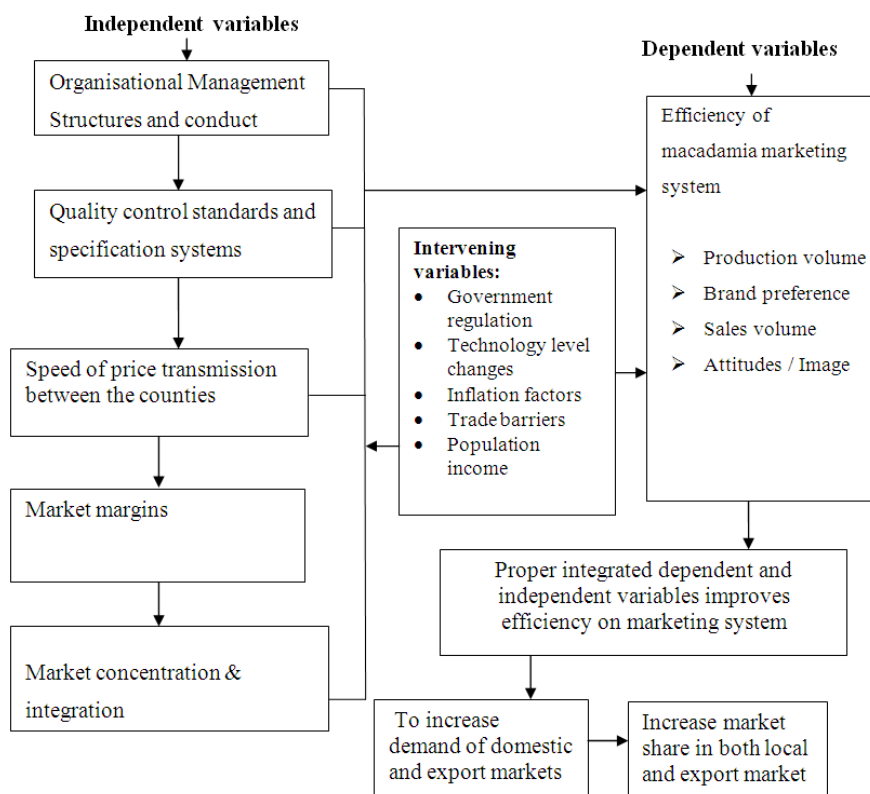
Figure 1.1: Conceptualized Relationship between dependent and independent Variables which were moderated by intervening variables
Source: Compiled by the Researcher

III. Research Methodology

3.1. 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. In this study, inferential statistics and measures of central, dispersion, distribution and percentages were applied. This method enabled the researcher to assess and study multifactor variable activities and main market channels that contribute to the efficiency of macadamia marketing system in central Kenya highlands.

3.2 Target Population

The targeted population was 2587 macadamia traders. The target population of the study included the following: 1620 macadamia farmers, 280 middlemen, 7 macadamia processors, 30 distributors and 650 consumers. This target population helped the researcher to assess the level of efficiency of macadamia marketing system in Kenya. The size of the target population was computed from secondary data obtained and extracted from Nyeri and Embu Towns which were provincial Head quarters then and verified later in Ministry of Agriculture & Livestock Development and Kenya National Bureau of Statistic annual returns in their respective Head offices in Nairobi. Respondents from each of the five stratified levels were distributed across the five counties in this study

3.3. Sampling procedure and sample Size

The study employed both stratified and multistage random sampling technique to draw the sample of respondents. Simple random sampling helps to avoid bias and all the units of targeted population had an equal chance of being selected (Orodho, and Kombo, 2004).According to Mugenda & Mugenda (2012) sampling is a process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group and further argue that for descriptive study 10% of the accessible population is adequate. The sample size was drawn from the five stratified counties for the purposes of this study based on the same principle. The actual sampling distribution is indicated in table 3.1.

Table 3.1: Sample Size and Data Collection in the five Counties

	Kirinyaga	Kiambu	Nyeri	Muranga	Embu	Population Frequency	% of the Population
Farmers	44	41	33	28	16	162	10%*
Middlemen	7	7	6	5	3	28	10%*
Processors	1	4	0	1	1	7	100%
Retailers	5	7	7	5	6	30	100%
Consumers	10	14	14	15	12	65	10%*
Total	67	73	60	54	38	292	_

*Shows random samples percentage taken from total targeted population from the five levels of traders.

3.4. Data Collection Instrument

The primary data for analyses was obtained from the respondents through the use of questionnaires and individual interviews. The interviewer pursued in-depth information around the topic. Interviews were developed in order to obtain as much information from the respondents as possible.

3.5. Reliability 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 and then questionnaires and the responses were scored manually. The results from the two tests were correlated using the Spearman-Brown formula which gave correlation coefficient as 0.89. The questionnaires contained both close-ended and open-ended questions. A questionnaire with open-ended and closed- ended questions allows every possible question to have a response (Bernard & Ryan, 2010).

3.6 . Empirical Mode

Various models were used to analyse market efficiency which included: Correlation analysis, ANOVA, Regression analysis, Asymmetric price transmission, market structure, marketing margins and index of marketing efficiency.

IV.   Empirical Findings

4.1 Introduction

This chapter analyses and presents the research findings of macadamia marketing system in Kenya. The objective of the study was to assess and analyse the efficiency of marketing chain of macadamia nuts in Kenya. In analysing the research data, thematic content analysis was employed. Thematic analysis goes beyond counting explicit words or phrases and focuses on identifying and describing both implicit and explicit ideas within the data, in terms of themes (Bernard and Ryan, 2010)

4. 2. Response Rate

Out of 162 questionnaires administered to the farmers, 160 questionnaires were filled and returned. This represented 98.8% response rate. All 28 and 7 questionnaires administered to the middlemen and processors respectively were filled and returned. This represented a 100% response rate. Out of 35 questionnaires administered to the retailers, 32 questionnaires were filled and returned. This indicates a response rate of 91.4%. Out of 65 questionnaires submitted to consumers, questionnaires were filled and returned. This represents a response rate of 93.4%. The observed response rates were considered satisfactory to make conclusions for the study.

4.2.1.   Demographic Information of the Respondent

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 Respondents

Designation	Gender				Percent (%) Distribution by Age group					
	Male		Female							
	Freq.	Perc.	Freq	Perc	<20 Yrs	21-29	30-39	40-49	>50 Yrs	Freq
Farmers	90	55.6	72	44.4	2.5	9.9	27.2	24.7	35.8	162
Middlemen	21	75.0	7	25	0	32.1	42.9	17.9	7.1	28
Processors	4	57.1	3	42.9	0	14.3	71.4	14.3	0	7
Retailers	17	56.7	13	43.3	0	70.0	23.3	6.7	0	30
Consumers	34	52.3	31	47.7	12.3	40.10	21.5	16.9	9.2	65

4.2.2. 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 analysis above shows that out of the 162 farmers who took part in this study, 90 (55.6%) were male while 72 (44.4%) were female. Among the 30 retailers, 17 (56.7%) were male while 13 (43%) were female. The rest of the gender across designation was as indicated in the table 4.1.

4.2.3 Age of the Respondents
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. The age of the respondents was also considered 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 above. The findings indicated that 35.8% of the farmers were over 50 years, 42.9% of the middlemen were 30 – 39 years old, 71.4% of proc s indicated that the respondents were well experienced in farming and marketing macadamia nuts and hence they were suitable for this study. Macadamia industry was mainly dominated by men as shown in table 4.1 above. 55.6% of the farmers, 75.0% of the middlemen, 57.1% of the processors, 52.3% of the consumers and 56.7% of the retailers were men.

4.2.4. Education Level of the Respondents
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 for Respondents

Level of Education	Designation									
	Farmers		Middlemen		Processors		Retailers		Consumer	
	F	%	F	%	F	%	F	%	F	%
None	-	-	-	-	-	-	-	-	-	
Primary	47	29	6	21.4	-	-	-	-	4	6.2
Secondary	74	45.7	16	57.1	-	-	9	30.0	24	36.9
College	23	14.2	3	10.7	3	42.9	20	66.7	23	35.4
University	1	0.6	2	7.1	1	14.3	1	3.3	13	20.0
No response	4	2.5	1	3.6	3	42.9	-	-	1	1.50
Total	162	100.	28	100.0	7	100.0	30	100.	65	100.0

Source: survey Data

The table above indicates that 45.7% of the farmers, 57.1% of the middlemen and 36.9% of the consumers had secondary level education while 66.7% of the retailers and 42.9% of processors had college level education. These findings show that macadamia marketing agents are fairly well educated to understand the marketing system of macadamia nuts.

Table 4.3: Distribution of Road Network in the five Counties

Type of roads	Farmers		Middlemen		Processors		Retailers	
	F	%	F	%	F	%	F	%
All weather	29	17.9	11	39.3	4	59.1	5	16.7
Dry weather /seasonal	50	30.9	15	53.6	3	42.9	1	3.3
Tarmac	29	17.9	2	2.7	0	0	21	70
Others	54	33.3	0	0	0	0	0	0
Total	162	100	28	100	7	100	30	100

Source: survey data 2012

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. 30.9% famers, 53.6% of middlemen, while 42.9% of processors use dry weather roads which are impassable during rainy season. This may result in heavy losses due to delay in delivery of produce in time which may affect the quality of the produce due to poor handling.

4.2.5 Age and Education Level
Considering the fact that adequacy of information is a determinant in the efficiency of macadamia marketing, the study sought to establish whether age and level of education had an effect on the level of satisfaction of the information that the respondents received. Using multifactor analysis against the respondents' views on the adequacy of market information, the findings are presented in table 4.4 below

4.4 Market Information Flow According to Age and Education Level

	Farmers		Middlemen		Processors		Consumers	
Education	Freq.	%age	Freq.	%age	Freq.	%age	Freq.	%age
No education	9	75.0	-	-	-	-	-	-
Primary	26	55.3	2	40.0	-	-	3	75.0
Secondary	43	60.6	9	56.3	-	-	11	45.8
College	19	86.4	2	66.7	2	66.7	6	26.1
University	1	100	0	0.0	0	0.0	5	38.5
Chi- value	15.08		2.78		3.733		27.107	
P-value	0.057		0.426		0.155		0.001*	
Age (Years)	Freq.	%age	Freq.	%age	Freq.	%age	Freq.	%age
Below 20 years	3	75.0	-	-	-	-	2	25.0
21 – 29	8	50.0	5	55.6	0	0.0	9	34.6
30 – 39	26	61.9	7	63.5	4	80.0	5	35.7
40 – 49	26	68.4	2	40.0	1	100	6	54.5
Over 50 years	38	67.9	0	0.0	-	-	3	50.0
Chi- value	6.682		3.09		3.080		6.89	
P-value	0.571		0.377		0.214		0.548	

*indicate a significant difference at 95 % CI of the factors

The analysis on Table 4.8 above on the market information with the consumers' education levels was significantly different ($\chi2$ = 27.107, P = 0.001). The findings show that the age and educational level play an important role in attaining the efficiency of macadamia

4.3. Market Concentration
This study also aimed at establishing the concentration of market centres of macadamia. The findings are as shown in table 4.11.

Table 4.5: Market Concentration of Processing Centers in the Counties

County	Traders	Number of Centres	Production (MT)	Macadamia Price	Selling Price
Embu	38	5	5058	70.00	88.30
Kirinyaga	57	7	14000	52.86	63.60
Kiambu	73	7	12948	72.86	96.70
Nyeri	60	7	10521	68.3	84.20
Muranga	49	6	8725	60.60	68.80
r – value			0.883	0.978	
P value			0.047	0.004	

Source: Field survey Data 2012

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 to the number of market centres in a given county (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 (r = 0.978, P = 0.004) in the number of centres to the macadamia prices in the counties as indicated by table 4.11.

4.4.0 Market Integration
This study advocated that the market location affects 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 concentration level was determined by the number of the traders in each county as indicated in table 4.13 in terms of the volumes of macadamia they handle, the distance between one market and another in the county, number of factories and number of markets in counties.

Table 4.6: Market Integration structural Summary for the five Counties

Counties	Sales vol/production	Number of market	Number of factories	Market Concentration density (Km)
Embu	5058	5	1	3.5(Rank 5)**
Kirinyaga	14000	7	1	3.75(rank 4)
Kiambu	12948	7	4	5.2(Rank 2)
Nyeri	10521	7	0	4(Rank 3)
Muranga	8725	6	1	6.6(rank 1)
r-value	0.001	20.882	0.453	7.51
P –value	0.780	0.020*	0.549	0.022*

*Significant at 95% confidence level.
**Ranking for market concentration (5-Highest market concentration

4.4.1. Market Organizational Structure
From the results, 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 implies 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 4.13 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 traders r=38.600 p=0.008.

4.5.0 Quality Control system of Macadamia
To access quality of raw nuts used by the farmers, the brokers determine the quality of the nuts. 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 two 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.

4.5.1 Feedback on Quality Control systems
Regarding feedback on quality, majority of the traders (68.3%) below. reported that they did not receive feedback from customers on quality of the product as indicated by table 4.15

Table 4.7: Traders' opinion Feedback on Quality Control

	Farmers		Middlemen		Processors		Retailers		Total	
Feedback	F	%	F	%	F	%	F	%	F	%
Received	33	20.4	18	64.3	7	100	14	46.7	72	31.7
Did not receive	129	79.6	10	35.7	0	0	16	53.3	145	68.3
Total	162	100	28	100	7	100	30	100	227	100
Satisfaction of quality										
Yes	107	66	24	85.7	4	57.1	24	80	159	70
No	55	34	4	14.3	3	42.9	6	20	68	30
Total	162	100	28	100	7	100	30	100	227	100
r-value	Satisfaction vs feedback = 0.556									
P-value	Satisfaction vs feedback = 0.095									
Training on quality										
Necessary	135	83.3	27	92.9	7	100	-	-	169	85.8
Not necessary	27	16.7	1	7.1	0	0	-	-	28	14.2
Total	162	100	28	100	7	100			197	100
r-value	Training vs feedback = 0.615									
P-value	Training vs feedback = 0.105									

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 4.16 above. This implies that traders did not get adequate feedback on quality and satisfaction information to assist in making informed decisions of the markets.

4.5.2 Macadamia Sound Kernel Recovery in the Counties
Sound Kernel recovery level is taken as a measure of quality performance in the market quality system. This falls after analysing structures and conduct in the quality control systems. This shows the quality levels in the counties which is a measure of market efficiency of macadamia.

Table 4.8 Sound Kernel Recovery Variance Analysis

COUNTY	SALES VOLUME	HIGH PEAK SKR	OFF-PEAK SKR	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
R	0.051		-0.287	
P	0.936		0.639	

It was established that average macadamia SKR varies from season to season. Table 4.19 shows average sound kernel recovery (SKR) as determined by Jungle Macs, one of the processors in the study area. The result shows that there was a significant difference in quality between the seasons and mean average and

between the counties as shown in table 4.20. 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. The quality level inconsistence may be the cause of import ban by USA and Japan in late 1990s.

4.5.3 Pair-wise Correlation of Quality and price

The study also sought to determine whether pairs of intervening variables had any relationship with the others as shown in the table 4.20

Table 4.9: Pair Wise Correlation Matrix of Tested Variables

	Sales Production vol./	# market	# traders	Factories	Market conc./Density (Km)	Average SKR	Buyinice	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 4.20. Results indicated that there was little association between macadamia 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 4.21 above.

4.6.0. Price and Efficiency of Macadamia Marketing Systems

The assessment of price as a measure of market efficiency may require systematic analysis of price structure and conduct which may finally be measured by performance on price transmission.

4.6.1 Price Change of Macadamia Products

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

Table 4.11: Price Transmission matrix ratios between Market pairs and seasons

County Mkt	Season	Price Transmission Between 2 Mkt Pairs by Ratio of % change		Embu	Kirinyaga	Kiambu	Nyeri	Muranga
		Average Price per season	% change					
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 of farmers						

*Significant at p<0.05.*1 and 2 stands for season one and two respectively.

4.6.2 Macadamia integration and management organizational Structure

This study sought to assess the macadamia market integration level which was determined by price spread and harmonized price patterns across the market canters. When average farm selling prices per kilogram of macadamia for the year 2012 were compared across the five counties, the result indicated wide variation between the markets which reflected dissonance. The assessment revealed that the level of transmission of the macadamia prices between the counties was relatively high as indicated in table 4.21. These results indicated a relatively integrated market system. The results indicated that there were large variances in price between market pairs especially between Kiambu and Murang'a, and Kiambu and Kirinyaga as indicated by tables 4.21, 4.22, and 4.23 .

4.6.3. Price Transmission

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. Table 4.24 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 4.12: Macadamia Prices in the Year 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

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 as indicated in table 4.24. 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 Table 4.24. The farmer is therefore not able to project income at any given time due to unpredictable price fluctuations.
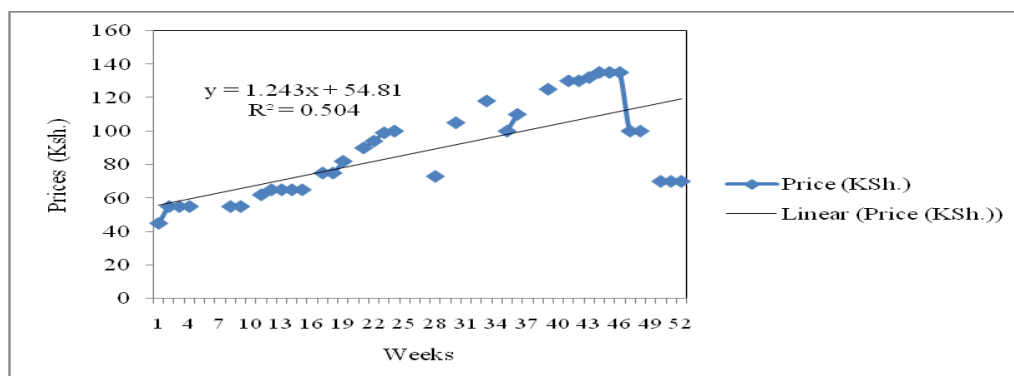

Figure 4.9: Weekly trend of macadamia prices in the year 2011(y denotes the price (Ksh) while x denotes the weeks)

Trend of macadamia prices in the year 2011 shows that there was a positive increase in the prices of macadamia in the weeks throughout the whole of the year 2011 as indicated in figure 4.11 above, (trend line of y = 1.24 x + 54.81 where R2=50.40% .

Table 4.13: Average Market Price and Percentage 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 Correlation	r= 0.348 p= 0.566		r=0.848 p=0.070	

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 4.25 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.

V. Discussion of the Findings

5.1 Introduction
This chapter presents a summary of the study's major findings under the following sub-headings:. market infrastructure and organizational structures; market barriers; market specifications; pricing policy and price transmission; margin analysis; market organizational conduct, index of macadamia marketing efficiency and performance indicators of measuring macadamia marketing efficiency.

5.1 Market Performance
The ratio of the total value of the goods marketed to the marketing cost was used (purchasing cost/selling price) as a 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 Shepherd's index formula (1965).Three marketing outlets namely 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 three channels in five counties is indicated in 4.29 below.

Table 5.1: Macadamia Marketing Efficiency Index

Market Channel	Embu	Kirinyaga	Kiambu	Nyeri	Muranga	Composite index	
Farmer	1.09	1.14	1.18	1.06	1.38	1.17	3
Processor	1.23	1.16	1.29	1.20	1.10	1.20	2
middleman	1.26	1.20	1.33	1.23	1.14	1.23	1
Retailers	1.11	1.14	1.25	1.11	1.17	1.16	4
Composite	1.17	1.16	1.26	1.15	1.20	1.19	
Index ranked	3	5	1	4	2		

The results indicate that middleman market channel is the most efficient followed by processor farmer and retailer in that order. For the counties which means Kiambu was most efficient while Nyeri had the lowest efficient marketing system as indicated in table 4.29. 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.

5.2. Performance Indicators of Measuring Macadamia Marketing Efficiency
To assess efficiency, various indicators were analyzed which included: Marketing costs Margins of the four marketing level channels Deviations of prices in counties and seasons Peak period of seasonal prices Communication on feedback and feed forward

5.3. Measures to Increase the Market Efficiency
To increase market efficiency various multi-factor variables were analysed and only a few were highlighted. This included; government barriers, market Standardization and standard weights, transportation system, consumer interest, accurate market information and the number of competitors in each market channel.

5.4. 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 efficiency, correlation coefficient and regression analysis were used to analyse the efficiency.

➢ Financial marketing efficiency involved analysing of margins and market index for the counties and the four market channels.

VI. Conclusion and Recommendation

Using pair- wise correlation analysis it was found that each of the identified independent variable impact on efficiency of macadamia marketing system in Kenya in different ways .All the four marketing efficiency measures were clearly associated with the four objectives of the study and they were all dependent to each other. From the marketing systems analysis, the macadamia marketing systems would 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 1% compared to 10% of cashew nuts whose prices are almost at par, and further the share of domestic market of macadamia is only 15% compared to 54% of coconut which is further sign of inefficiency.

6.1. Recommendations

This study posits that in order to manage price fluctuations in the market, there is need to enter into a fixed-price contract that often specifies delivery quantities and quality attributes for a specified time and space. On the basis of findings and conclusions of this study, the following   recommendations are made to improve the efficiency in marketing of macadamia value chain.

6.1.1 Recommendation on Quality Control System

Based on the above conclusion made, this study is of the opinion that 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. 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, Japan and China will go a long way in enhancing efforts being made to capture new market openings, or often, just to remain in business. This study is of the view that in order to improve the quality of macadamia products there is need to:
- Train farmers on the need to observe hygienic procedures in the harvesting of macadamia nuts, allow for maturity of the nuts and use appropriate drying methods.
- The government should establish a body that is charged with the responsibility of maintaining the accepted quality standards for macadamia.
- Encourage public-private partnerships on the training and promotion of quality standards for macadamia products.

6.1.2 Formation of Operational and Efficient 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 chain to three levels (farmer/factory, auction broker and consumer) from current five levels (farmer, middleman, processor, retailer and consumer). Brokers would be appointed as agents of famers to sell dried nuts to both local and international buyers. They can also buy as appointed agents for global buyers in auction room .The premises of having auction room is to increase the value chain by improving.

6.1.3. 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 chain to three levels (farmer/factory, auction broker and consumer) from current five (farmer, middleman, processor, retailer and consumer levels. Brokers would be appointed as agents of famers to sell dried nuts to both local and international buyers. They can also buy as appointed agents for global buyers in auction room .The premises of having auction room is to increase the value chain by improving efficiency. The system of auction is currently applicable in tea industry and also in coffee at Mombasa and Nairobi respectively.

6.1.4. Removal of Trade Barriers

Trade barriers are measures that governments or public authorities introduce to make imported goods or services less competitive than locally produced goods and services. Barriers are also created by imposing ban

of export by the Government which have impacted on market efficiency. All these barriers are recommended to be removed to improve efficiency of macadamia marketing system .Ban of export of raw nuts was imposed from 2008.

6.2.0 Policy Recommendations

The government should prioritize organisation and construction of market centres for macadamia in areas where they are produced .Establishing an independent body that is directly charged with maintaining the quality standards and specification of macadamia products for both local and export markets. The government should encourage public companies and private company's partnerships with institutions of higher learning on the training and promotion of quality standards for macadam is products. Quality control circles are recommended to be introduced in the macadamia industry. This method has done well in Japan, Europe, and USA (Amrik and Keith, 1988)

The GOK to support value addition systems in agriculture, to improve marketing of agriculture produce and facilitate the exploitation of value addition in agribusiness. The Government to assist in reducing the number of market players in the supply chain of marketing of agricultural produce. Currently we have five levels in macadamia marketing chain which could be reduced to three and this could be replicated in horticulture subsector of agriculture industry.

6.3.0 Suggestions for Further Studies

A comparative study on the efficiency of agifood 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. A future research should address the problem.

Introduction of research of quality management circles in institutions of higher learning is recommended. Quality circles bring in together small groups of between 5 to 15 management staff and the workforce who meet regularly to find solution.

Some advanced predictions of contract theory and transaction cost economics to be hypothesized and empirically tested by an overall survey in Kenya macadamia sub sector to assist in pricing and market efficiency.

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