SPATIAL ANALYSIS OF CONSTRAINTS AND OPPORTUNITIES IN BANANA VALUE CHAIN IN MERU COUNTY, KENYA

Susan Wanjiru Mbuthia

C82/20950/2010

A THESIS SUBMITTED TO THE SCHOOL OF HUMANITIES AND SOCIAL SCIENCES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY (AGRICULTURAL GEOGRAPHY) OF KENYATTA UNIVERSITY

November, 2018

DECLARATION

This thesis is my original work and has not been presented for any degree or for award in any other university.

Signature _____ Date_____

Susan Wanjiru Mbuthia (C82/20950/2010)
Department of Geography

Supervisors

We confirm that the work reported in this thesis was carried out by the candidate under our supervision.

Signature _____ Date_____

Dr. Calvine Kayi
Department of Geography
Kenyatta University

Signature _____ Date_____

Prof. Stephen K. Wambugu
Department of Geography/Agribusiness
Chuka University

DEDICATION

To those who are hopeful in life.

ACKNOWLEDGEMENT

First, I am thankful to the Lord Jesus Christ for enabling me to successfully undertake this research. Secondly, I sincerely appreciate my supervisors, Dr. Calvine Kayi and Professor Stephen Wambugu. You have mentored me and through your advice and guidance, I have been able to accomplish this task. I am indebted to all my colleagues at the Department, who gave constructive guidance in developing this thesis.

I am grateful to my employer, Kenyatta University for awarding me a scholarship. I am also grateful to the office of the Dean, School of Humanities and Social Sciences, specifically, Professor Chris Shisanya for the partial funding that was used in conducting field work.

I sincerely thank my husband, Cyrus Muchiri, for his understanding even at times when I took on a "screen saver" mode. You supported me towards achieving this goal. I thank our daughters; Grace Wambui, Magdaline Nyakio, and Mercy Nungari for coping with an "absent" mum.

Special thanks go to Imenti Central Horticulture Officer, Mr. Julius Mwangi; Imenti South Horticulture Officer, Mr. Robert Sakora; Igembe South Agribusiness Officer, Mr. Peter Mwangi; and Igembe South Agribusiness Officer, Mr. Daniel Mburugu. Your assistance in accessing the farmers, who were part of my respondents, is highly appreciated.

I extend my appreciation to Ms Jane Kiome, Kenneth Muriungi, Alex Muthengi, Stellah Kaari, and Pandora Kathambi for their immeasurable help during fieldwork. I also wish to thank all the respondents; farmers, traders and key informants who provided the data that shaped this thesis. Sincere thanks to all other individuals who in one way or another contributed to the accomplishment of this task.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ABBREVIATIONS AND ACRONYMS

ACU – Acceleration of Cassava Utilization

AFC – Agricultural Consultative Forum

AGRA – Alliance for a Green Revolution in Africa

ANOVA – Analysis of variance

BXW – Banana Xanthomonas Wilt

BIL – Banana Investment Limited

CATISA – Cassava Transformation in Southern Africa

COMESA – Common Market for Eastern and Southern Africa

EU – European Union

FGDs – Focus Group Discussions

GDP – Gross Domestic Product

GPS – Global Positioning System

Ha – hectare

JKUAT – Jomo Kenyatta University of Agriculture and Technology

KAPAP – Kenya Agricultural Productivity Project

KARI – Kenya Agricultural Research Institute

KENFAP – Kenya National Federation of Agricultural Producers

KNBS – Kenya National Bureau of Statistics

Ksh – Kenya shilling

LPUPAP – Local Partnerships for Urban Poverty Alleviation Project

MBFC – Meru Banana Farmers Cooperative

MGH Ltd – Meru Greens Horticulture Ltd

MOA – Ministry of Agriculture

MOALF – Ministry of Agriculture, Livestock and Fisheries

NACOSTI – National Commission for Science, Technology and Innovation

RS – Rank Sum

SAP – Structural Adjustment Programme

SCAO – Sub County Agricultural Officer

SHG – Self-Help Group

SHoMaP – Smallholder Horticulture and Marketing Programme

SPSS – Statistical Package of Social Sciences

SWOT – Strengths, Weaknesses, Opportunities and Threats

TC – Tissue Culture

UNDP – United Nations Development Program

OPERATIONAL DEFINITION OF TERMS AND CONCEPTS

Actor is used to refer to banana farmers, wholesalers, village collectors, brokers, retailers, Meru Banana Farmers' Cooperative, Meru Green Horticulture Ltd, and Solar Processing Firm.

Banana Value chain refers to addition of value to bananas through acquisition of seedling, planting, use of inputs (e.g., manure, fertilisers, pesticides, and irrigation) application, weeding, pruning, preventing crop toppling, sorting, cleaning, and packaging.

Marketing refers to selling and buying methods used by farmers and buyers of bananas.

Non motorised transport refers to wheelbarrows and oxen used to ferry bananas from one location to another.

ABSTRACT

The changes such as increases in urban dwellers and demand for high quality and safe products being witnessed in agrifood systems around the world present opportunities for farmers to orient production to meet the emerging needs. To this end, governments in Sub-Saharan Africa have been reconstituting new trading policies. In Kenya, banana farming is a prospective activity through which small-scale farmers could exploit the emerging opportunities. This study examines the banana value chain in Meru County in order to determine the constraints and opportunities therein and the farmers' responses. Although agricultural value chain studies are strongly recommended as possible intervention strategies of increasing the farmers' competitive position in their activities, past studies on banana farming in Kenya mainly focused either on production or marketing. This study focused on the following objectives; profiling the demographic-socio-economic characteristics of farmers and traders, determining the constraints and opportunities in banana value chain, and evaluating the spatio-temporal distribution of periodic banana markets. A survey design and mixed method approach were used in data collection. Research instruments included: (i) Questionnaires administered to 384 farmers and 384 traders who were purposively selected. (ii) Interview guide used for 8 key informants. (iii) Focus group discussion guide used for 2 groups. Data processing and analysis was done using excel and SPSS. Quantitative data was analysed using analysis of variance, *t* test, Pearson correlation coefficient and nearest neighbour index. Qualitative data analysis was guided by SWOT and Scoring cards. Results showed that: women dominated production (52.6%) and marketing (57.6 %); a significant ($p < .000$) difference existed between earnings by men (Ksh 16,770) and women (Ksh 14,249) farmers; farms were small (1.9 acres) and significantly ($p = .032$) different in size across the sub counties; and 177stools were harvested monthly but significantly ($p < .001$) varied across locations. Wholesalers dominated banana trading. Pests and diseases (23.2 %), and high marketing costs (24.2 %) were the leading constraints. Opportunities included; short distances (3.3 kilometres) between farms and markets which significantly ($p < .000$) varied with locations, and unmet demand for bananas and high prospects for value additions. Markets with a closer time dimension did not have a wide spatial distance and vice versa ($r = -0.530$, $p = .076$); and the banana markets were not uniformly distributed ($Rn = 0.31$). The study concluded that: (i) some demographic-socio-economic characteristics of farmers and traders influenced their activities in the chain. (ii) The chain is characterized by several interdependent constraints (iii) Banana value chain has enormous potential to benefit farmers (iv) Markets do not meet the needs of the farmers equally. It is therefore recommended that: (i) community training on production and entrepreneurship targeting women to be conducted. (ii) Meru County government to partner with private firms in helping farmers address constraints and exploit existing opportunities. (iii) Banana traders to curve out a niche market in order to promote banana value addition, and (iv) the County government to either reorganise market in synchronised way or establish new ones in areas not optimally served.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study Problem

Agricultural value chains are important devices that could enable farmers to maximize profit from farming activities within a global market system (Kaplinsky & Morris, 2000; Mangnus & Piters, 2010; Mitchell, Keane, & Coles, 2009; Royal Tropical Institute [KIT], Faida Mali, & International Institute of Rural Reconstruction [IIRR] 2006). The global market system is mainly driven by market forces with reduced government control. The main consumers along the global market system are urban populations with relatively high disposable income (Irungu, 2011; Nenev, Reardon, Chege, & Wang, 2006; Satterthwaite, McGranahan, & Tacoli, 2010).

Urbanization is projected to increase to a ratio of 3:2 urban to rural dwellers globally by the year 2025 (Satterthwaite et al., 2010). Rising urban population implies increased demand for food. Besides, the high disposable income acts as an incentive for consumers to diversify their diets as well as demand higher-value livestock products, fruits and vegetables, and relatively less food staples (Hazell & Wood, 2008; Ngigi, Okello, Lagerkvist, Karanja, & Mburu, 2011; Satterthwaite et al., 2010). Moreover, consumers demand high quality and safe products, more processed, and pre-cooked foods (Maertens & Swinnen, 2012; Minot & Ngigi, 2004; Muendo, Tschirley, & Weber, 2004). Despite the changing consumption patterns, the source of food will largely remain in the hands of the small-scale farmers in rural areas (Alliance for a Green Revolution in Africa [AGRA], 2013; Schaffnit-Chatterjee, 2014). The changing consumption patterns present opportunities for the farmers to exploit.

In order to seize the emerging opportunities, nations have resorted to value chain developments (Jaeger, 2010; Kaplinsky & Morris, 2000; van Melle, Coulibaly, & hell, 2007). Value chain developments are undertaken with an aim to improve quality, increase system efficiency, and develop differentiated products (Agriculture and Food Council of Alberto, 2004).To enhance participation of farmers in the global market system, governments have been reconstituting or formulating new trading policies (Keleman, Raño, & Hellin, 2009; Mangnus & Piters, 2010).

Countries in Sub-Saharan Africa are responding to changes prompted by the global market system by setting up production targets for value chains and providing support, both at country and regional level, for such initiatives (Haggblade & Nyembe, 2007; Jaeger, 2010; Schaffnit-Chatterjee, 2014; van Dijk, & Trienekens, 2012; van Melle,Coulibaly, & Hell, 2007). For example, Haggblade and Nyembe (2007) noted that Zambia's Agricultural Consultative Forum (AFC) encouraged and facilitated the private sector by initiating an Acceleration of Cassava Utilization (ACU) Task Force beginning August 2005. The ACU Task Force hoped to increase cassava-based farm and food processing income as well as improving Zambia's food security (Haggblade & Nyembe, 2007). Similar outcomes were expected at the regional level through concerted effort between the Cassava Transformation in Southern Africa (CATISA) and Common Market for Eastern and Southern Africa (COMESA) regional food staples initiative (Haggblade & Nyembe, 2007).

In Kenya, value chain developments related to legumes (e.g., peas), cut-flowers, vegetables (e.g., French beans), and fruits (e.g., passions) have been undertaken (Jaeger, 2010; Otieno & Knorringa, 2012). The participation in value chain activities by the small-scale farmers has, however, been limited to domestic markets (Jaeger, 2010).

While stringent export requirements (Ashraf, Ginè, & Karlan, 2009; Jeckoniah, Mdoe & Nombo, 2013; Ngigiet al., 2011) and inadequate capital to invest in agriculture (Jaeger, 2010; Narayan & Gulati, 2002) may explain the small-scale farmers' confinement in domestic markets, inefficiencies of the chains partly ensuing from constraints therein could also be playing a role (Halewood & Surya, 2012). Inefficient agricultural value chains have the following features: high income disparity between farmers and sellers, several actors, weak relationships among and between actors due to lack of collaboration, lack of delivery promptness, commodity wastage, and poor flow of information (Dent, Macharia, Aloyce, 2017; Li & O'Brien, 1999).

Banana is among the most important tropical food staples after rice, wheat and maize in terms of gross value production (Pillay, Tenkouano, & Ortiz, 2012).Globally, banana production is at 130 million tonnes per year and continues to grow steadily (Domaingue, Lewicki, This, Bakry, Horry, Braconnier, Pot, & Trouche, 2017). Most of the world's banana (98%) is produced in developing countries (Pillay et al., 2012). In such countries bananas form part of source of food and income.

Nutritionally, bananas are a source of vitamins A, B, and C (Pillay et al., 2012; Horticultural Validated Report, 2014; Samson, 2003). In addition, bananas provide potassium, magnesium, fibre, are low in fat and sodium, and are cholesterol-free (Fruit Production Technical Handbook, 2011; Pillay et al., 2012). As Pillay et al. (2012) observed, the nutritional features of bananas appeal to health conscious consumers. Despite their economic importance and the nutritional value, bananas' chains are described a slumbering giants with feet of clay (Domaingue et al., 2017).

In Kenya, banana is one of the important fruits with a market share of 35.6 % followed by pineapples (20 %), mangoes (17 %), avocados (6 %), pawpaws (6 %), passion fruits (3.6 %),

oranges (3 %), water melons (3 %), and tangerines (2 %)(Horticultural Validated Report, 2014). Banana production has nutritional, economic and cultural importance for rural households, particularly in Nyanza, Eastern, Coastal and Central parts of the country (Africa Harvest Biotech Foundation International, 2007; Kenya National Federation of Agricultural Producers [KENFAP], 2008; TechnoServe, 2009; Miriti, Wamue, Masiga, & Murithi, 2013).Nutritionally, the cooking banana variety serves as part of staple food and the ripening type is the most popular dessert in the Country (Nzioka, 2009).Although banana has traditionally been produced as a subsistence crop, farmers are taking it up as a cash crop, overtaking conventional ones such as coffee (Miriti et al., 2013; Murithi, 2011; Mwangi & Mbaka, 2010; Republic of Kenya, 2013a).Thus, banana farming is a prospective activity that can improve the livelihood of small-scale farmers in Kenya by broadening their income source.

In spite of its emerging economic importance, banana farming faces a number of constraints (Karembu, 2002; Miriti et al., 2013; Mwangi & Mbaka, 2010). Some of the identified constraints include: pests and diseases, lack of clean planting material, exploitation by middlemen, lack of extension services, inadequate manure, insufficient water, and poor infrastructure (Karembu, 2002; Mbaka, Mwangi &Mwangi, 2008; Mwangi & Mbaka, 2010).Although the constraints encompass spatial aspects that could well be examined from a value chain perspective, previous studies documented them by adopting a narrow view through either focusing on production or marketing alone.

The constraints facing banana farming in Kenya have prompted interventions from the government. Past efforts in addressing the constraints have mainly been on production. Such efforts stressed on enabling farmers to access healthy planting materials and enhancing their capacity to manage pests (Jogo, Karamura, Kubiriba, Tinzaara, Rietveld, Onyango & Odongo, 2011; Karembu 2002; Mwangi & Mbaka, 2010).

Recent studies (e.g., Jogo et al., 2011; Muchui, Gatambia, Kamau, Thuranira, Miruka, Wasilwa, Gitau, & Gitau, 2013), however, indicate that solely production-geared interventions have hardly been successful. For instance, the adoption of the tissue cultured bananas (i.e., healthy planting materials)by farmers in Kenya upon their introduction in the 1990s and 2000s was limited by such factors as; high cost of plantlets, water scarcity, inadequate land, insufficient distribution system for plantlets, unorganized marketing of the banana fruit, and lack of a collective mechanism to modulate the production-distribution-marketing chain (Karembu 2002). Furthermore, some farmers who adopted the tissue culture (TC) technology later reverted to use of conventional suckers (Mbaka et al., 2008). Thus, there is need to reconsider the past approaches of addressing the constraints.

One way of rethinking such approaches is to assume a spatial perspective encompassing banana production, distribution, and marketing. Value chain analysis offers an ample perspective capturing spatial aspects of production, distribution, marketing and consumption. Thus, an analysis of banana value chain in Meru County was undertaken. The County is one of the main regions with a high gross banana production in the recent past (Table 1.1) (Ministry of Agriculture, 2013; Ministry of Agriculture, Livestock and Fisheries [MOALF], 2015; Murithi, 2011; Muchui et al., 2013). Furthermore, the County produces more desert varieties which are in high demand in Kenya compared to the banana cooking varieties (Birumaet al., 2007; Mbaka et al., 2008).

Table 1.1: *Main Counties and National Banana Production, 2010 – 2014*

	2010		2011		2012		2013		2014	
County	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)
Meru	5,027	124,793	5,925	169,913	6,241	315,720	6,493	307,013	6,146	215,580
Kirinyaga	4,089	140,195	3,915	153,742	4,148	160,606	3,627	209,601	3,768	192,231
Tharaka Nithi	388	11,595	1,980	142,248	2,077	149,811	2,138	75,920	2,148	79,823
Muranga	5,188	91,973	8,442	103,341	5,754	113,415	5,820	99,737	5,876	101,753
Kisii	4,573	101,540	3,749	88,652	4,146	66,889	3,795	85,022	3,962	85,780
Entire Country	61,384	1,253,494	64,130	1,290,795	58,175	1,394,412	50,719	1,437,566	52,103	1,430,217

Source: Extracted from Ministry of Agriculture (2013: 41-42); MOALF(2015: 25)

1.2 Statement of the Research Problem

Banana is both nutritionally and economically important commodity for small-scale farmers in Meru County. The farmers are therefore, taking up banana farming as a commercial activity. However, the endeavour faces a number of constraints. The constraints include: pests and diseases, lack of clean planting material, exploitation by middlemen, lack of extension services, inadequate manure, insufficient water, and poor infrastructure. Although, the constraints cut across banana production and marketing, previous studies documenting them focus on either production (e.g., Mwangi & Mbaka, 2010) or marketing (e.g., Mbaka et al., 2008).Lack of linkage between production and marketing limits the benefits derived from banana farming in a global market system.

The global market system is characterised by increasing urban consumers demanding high quality and safe products. On one hand, the demand for high quality and safe products presents opportunities that farmers may exploit. On the other hand, the emerging demands present additional and diverse constraints.

Agricultural value chain studies are strongly recommended as possible intervention strategies of increasing the farmers' competitive position in order to increase their economic benefits from the products and services they deliver (Dent et al., 2017; Kaplinsky & Morris, 2000). Nevertheless, a banana value chain in Meru County has not yet been conducted and documented systematically. To this end, an analysis of banana value chain in Meru County was conducted to determine the constraints and opportunities therein.

1.3 Research Objectives

1.3.1 Broad Objective

The broad objective of this study was to evaluate the constraints and opportunities in the banana value chain in Meru County.

1.3.2 Specific Objectives

The specific objectives of this study were:

(i) To profile farmers' and traders' demographic-socio-economic characteristics that influence their participation in the banana vale chain in Meru County.

(ii) To determine the constraints faced by banana farmers and traders in Meru County.

(iii) To determine the opportunities that exists in banana value chain in Meru County.

(iv) To evaluate the spatio-temporal distribution of periodic banana markets in Meru County.

1.4 Research Questions

This study sought to answer the following research questions.

(i) What are the demographic-socio-economic characteristics of farmers and traders that influence their participation in banana value chain in Meru County?

(ii) What constraints are faced by banana farmers and traders in banana value chain in Meru County?

(iii) What opportunities exist in banana value chain in Meru County?

(iv) How is the spatio-temporal distribution of periodic banana markets in Meru County?

1.5 Research Hypotheses

Ho_1: There is no significant difference between the average age of farmers and traders in Meru County.

Ho_2: There is no significant difference in the average income earned by banana men and women farmers in Meru County.

Ho_3: There is no significant difference in average farm sizes owned by banana farmers in different locations of Meru County.

Ho_4: There is no significant difference in the number of banana stools on farms in different locations of Meru County.

Ho_5: There is no significant difference in average distances travelled between banana farms and banana markets by farmers in different locations of Meru County.

Ho_6: There is no significant relationship between mean spatial distance and the temporal separation of periodic banana markets in Meru County.

Ho_7: Periodic banana markets in Meru County are not uniformly distributed.

1.6 Justification and Significance of the Study

There is an on-going increase in urban dwellers locally, regionally and globally. It is projected that globally, 3 people will be living in urban areas against 2 rural dwellers by the year 2025 (Satterthwaite et al., 2010). In Kenya, 26.7 % of her population live in urban areas and the number is projected to exceed 36% by 2030–2040 (Hope, 2012; World Population Prospects, 2017).Increases in urban populations present a potential high demand for bananas. However, constraints in banana farming are possible hindrances for small-scale farmers to exploit the emerging fruit's demand. It is therefore, important to

understand the nature of constraints in the banana value chain. The understanding of the nature of constraints in the value chain would inform development of appropriate holistic interventions by decision and policy makers.

On one hand, the changing consumption behaviour (reducing staples and increasing fruits intake as well as high demand for quality) presents opportunities for small-scale farmers to exploit. By targeting to meet the emerging demands, farmers would reap benefits from their activities. They however, need to align their production to demands. On the other hand, the emerging consumption demands present extra constraints that farmers must reckon with. Exploitation of the emerging opportunities and overcoming the existing and upcoming constraints demands a broader perspective such as the one presented by a value chain analysis. Thus, the importance of analysing the opportunities and constraints in the banana value chain in Meru County.

Banana farming supports between 556,083 and 813,780 (41 % and 60 %) of the total population of 1, 356, 300 in Meru County (MOALF, 2016; Kenya National Bureau of Statistics [KNBS], 2014).Given the importance of bananas in supporting the livelihood of Meru people, it is important to examine the opportunities and constraints in the crop's value chain with the hope that the outcomes of the study would be applied by stakeholders at county and national level to improve this important source of livelihood.

Farmers in Meru County are experiencing uncertainties regarding conventional cash crops, coffee and *miraa* (khat).Earnings from coffee have been declining over the past two decades due to drop-off in the international prices (Keleman et al., 2009).Some countries such as United Kingdom that have been importing khat from Kenya have banned its exports (Klein, 2013; Riak, 2014). It is therefore, important to support alternative sources of income. Banana farming is one such alternative in the study area.

1.7 Scope and Limitations of the Study

The study focuses on examining banana value chain within Meru County and the Kenyan market. Focusing on the domestic market is informed by the time and resources available to undertake the study. By not considering the value chain beyond the domestic market means that the applicability of the results remains limited to the Kenyan market.

Although this study addressed banana production and consumption, it mainly confined itself to the marketing component of the value chain. This is because value chains are a market-oriented approach (Bressler & King, 1978; Mitchell et al., 2009). All activities in the chain are directed towards the market. Furthermore, as Minot and Ngigi (2004) noted, the success of horticultural sector partly relies on the efficiency and flexibility of the marketing system. Thus, markets and marketing systems are central in the value chain. They provide a backward linkage (to the producer) and a forward linkage (to the consumer). As Tschumi (2008) observed, markets stimulate choice and competition so that producers are continually pressed to improve their efficiency and products and, in doing so, offer better value to more consumers (Tschumi, 2008).

Only bananas are considered in this study. Other agricultural commodities may influence the farmers' decision making along banana value chain. For instance, fruits such as mangoes and avocados can readily act as substitutes for bananas. Failure to consider other agricultural commodities limits the understanding of the interrelationships of bananas with such crops.

The purposive sampling method used in selecting the area of study presents a limitation to generalisation of the findings. The data collection was restricted to only four of the nine sub counties comprising Meru County (Table 3.2). This sample may not have been wholly representative given that other sub counties produce bananas even though on small scale.

The experiences of the farmers and traders in such sub counties may have been different. However, purposive sampling was deemed suitable in this study that targeted banana producers and traders.

CHAPTER TWO

2.0 LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

This chapter presents a review of literature related to the objectives of this study. The chapter begins by providing a discussion on demographic-socio-economic characteristics of the respondents that influence their participation in agricultural value chain. It is followed by a discourse on constraints and opportunities in agricultural value chains. Next, a discussion on spatio-temporal distribution of markets is provided. Then a discourse on theoretical frameworks guiding this study is given. On the basis of the theories and literature reviewed, a conceptual framework is developed.

2.2 Demographic-socio-economic Characteristics influencing Actors' Participation in Agricultural Value Chains

The understanding of demographic, social and economic characteristics of actors' in agricultural value chains may guide the actors' response to constraints and opportunities existing in the chain. For instance, Miriti et al. (2013) found that married women banana farmers in Imenti South could not expand orchards before consulting the husband. The knowledge is also important in informing interventions by other stakeholders. For instance, the level of education for actors may guide in formulating interventions related to training. In this study, the understanding of demographic, social and economic characteristics of banana farmers and traders is important on both cases (i.e., actors' response and informing interventions). Thus, this section presents a review of literature on agricultural activities.

Miriti et al. (2013) in a study on gender concerns in banana production and marketing in Imenti South in Kenya observed that 24% of men compared to 15% of women grew

bananas. Men were involved in land preparation, de-suckering, harvesting and to some extent marketing. Women were involved in weeding, ripening and marketing activities. Majority of the men (96%) possessed the title deeds.

Dibba (2011) in a study on banana value chain in West Coast Region, North Bank Region, Lower River Region, Central River North, Central River South, and Upper River Region of Gambia profiled various socio-economic characteristics of producers and traders. The banana producers' characteristics included; 80 % of the were small-scale farmers with less than 1 ha, their mean age was 47 years with a range of 16 to 88 years, production was dominated (85%) by men, 27% had attained formal or primary education while 44% had non-formal education (i.e., adult literacy training and informal Arabic schooling), and 84% and 11% had their main occupation in farming and civil service, respectively. Dibba (2011) further noted that to a large extent production was dominated by the Mandinka (40%) and Sarahuli (27%) communities. The Mandinkas form the majority of the inhabitants of Gambia and occupied the Central River Region(Dibba, 2011). The Sarahulis were mainly occupying the Upper River Region (Dibba, 2011).

Traders' characteristics included; women controlled (88 %) the marketing, their age ranged between 18 and 37 years,75% had no formal education and only 8% had attained primary education, and they were mainly retailers whose main occupation was business (96%) (Dibba,2011). The study also observed that marketing was dominated (79%) by the Fula community from Guinea.

Tesfay et al (2016) in a study analysing banana value chain in Asgede-Tsimbila and Tahtay Adyabo districts in Northern Ethiopia observed the following demographic, social and economic features of the respondents. The mean age of respondents was 45 and 45.25 years in Asgede-Tsimbila and Tahtay Adyabo districts, respectively. A few of the banana producers (10.57 % and 6.9 %) in Asgede-Tsimbila and Tahtay Adyabo districts respectively, were females. The dominance of banana production by males was explained in terms of harsh conditions that put off females.

The study further revealed that 90 % of the respondents in the two districts could read and write but none had acquired tertiary education (Tesfay et al., 2016). In northern Ethiopia, bananas were cultivated on small farm sizes as indicated by means of 1.12 ha and 1.34 ha in Asgede-Tsimbila and Tahtay Adyabo districts, respectively (Tesfay et al., 2016). However, all bananas produced in both districts were sold.

Tesfay et al (2016) revealed that all banana wholesalers were males while retailers were females in both Asgede-Tsimbila and Tahtay Adyabo districts in Northern Ethiopia. The mean age of wholesalersand retailers in Asgede-Tsimbila and Tahtay Adyabo districts was 35.5 and 36, and 42 and 47.67 years, respectively. The study further observed that while all wholesalers could read and write, 40.85 % and 31.28 % of the retailers in Asgede-Tsimbila and Tahtay Adyabo districts, respectively could not. This observation on literacy was explained in that the wholesalers needed higher capital and relatively higher management skills than retailers.

Muendo et al. (2004) in a study aimed at improving Kenya’s domestic horticultural production and marketing systems profiled the socio-economic characteristics of fresh fruits and vegetables (bananas, cabbages, *sukumawiki* or kales, carrots, tomatoes, onions, oranges, avocado, French beans, and macademia nuts) traders at the country’s border points

with Tanzania (Lunga Lunga, Taveta, Oloitoktok, and Namanga)and Uganda (Isabenia, Busia and Malaba). The study used 51 respondents and noted that 75 % were female who were on average younger (31years) than their counterpart males (36 years). Majority of the traders (67 %) had some primary education, 18 % some secondary, 6 % some post-secondary, and 10 % had no formal schooling.

Muendo et al. (2004) further noted that 63 % of the respondents were Kenyan citizens residing at the border towns, 12 % were foreigners who also occupied the Country's border towns, 23 % were Kenyan traders living within 20 kilometres of the town and commuted daily to the market. More than half of the respondents (53 %) were retailers, 39 % combined small scale wholesale and retail, and 8 % were pure wholesalers. Forty five per cent of the respondents were members of trading groups and 83 % of these traders reported that the groups rendered them some small loans.

Karembu (2002) observed that 95% of banana farmers were literate, their age bracket ranged from 18 to over 80 years, and an average income of Ksh 4,800 with 40% of farmers in Central Province recording higher income of Ksh 5,000 and 45% in Kisii District registering the lowest income of Ksh 2,000. Twenty two percent of farmers who had higher incomes were not only able to make contacts with sources of information such as researchers but also accessed inputs, mainly water and manure (Karembu, 2002).

2.3 Constraints in Agricultural Value Chains

Several constraints are well documented and analysed in banana farming studies (e.g., Bandyopadhyay, 2013; Dibba, 2011; Karna et al., 2010; Karembu, 2002; Kiiza,Abele, & Kalyebara, 2004; Match Maker Associates Ltd, 2012; Mbaka, Nakato, &Odero, 2009; Mbakaet al., 2008; Miriti et al., 2013; Mwangi & Mbaka, 2010; Muchui et al., 2013; Ouma & Jagwe, 2010). The constraints include; pests and diseases, inadequate improved

seedlings, inadequate inputs such as fertilisers and water, limited knowledge on crop husbandry, lack of market awareness, postharvest losses, quality control, and poor pricing. These constraints cut across the production and marketing of bananas. Although production and marketing activities form important components of a banana value chain, a number of studies on production and marketing mainly focus on these segments in isolation (e.g., Dubois et al., 2013;Karembu, 2002; Kiiza et al., 2004; Mbaka et al., 2009; Mbaka et al., 2008; Mwangi & Mbaka, 2010).

Dubois et al. (2013)analyses the socio-economic impacts of adopting the TC technology in East Africa (Kenya, Uganda and Burundi).The study established that of the 385 respondents in the study in Kenya, a substantial share of the population was aware of TC banana and only a few have had a chance to fully understand its performance and requirements. In addition, Dubois et al. (2013) further found that the more banana TC adopters there were in the personal network, the less likely it is that the farmer also adopts TC banana. Farmers in high-potential banana areas are less likely to adopt TC. Female-headed households are more likely to adopt TC technology as bananas are predominantly managed by women in Kenya.

Karembu (2002) examined the factors that influenced the adoption of TC by small-scale farmers in Central, Eastern and Nyanza provinces in Kenya. The study found out that the most pressing problems facing banana farmers were pests (moles, weevils, and nematodes), diseases(panama, sigatoka, and cigar-endrot), and lack of clean planting material (uninfected). Farmers used infected suckers acquired from one another in banana propagation mainly due to lack of clean ones. These actions led to multiplication of pests and diseases and ultimately to low banana yields.

Kiiza et al. (2004) devoted themselves to the question of banana marketing in Uganda. They argued that the constraints of banana farming in Uganda lie in marketing rather than in production systems because the country has high potential in production (Kiiza et al., 2004). Mbaka et al. (2009) examined the status and spread of Banana Xanthomonas Wilt (BXW) in Western Kenya. They established the presence of the disease in Busia, Bungoma, Teso, and Nyamira districts and noted the danger of its spread as farmers replaced wilted mats with suckers acquired from bananas assumed to be uninfected on the same orchards or from neighbours.

Mbaka et al. (2008) assessed banana farming and the potential impact of BXW in Central (Maragua and Kirinyaga districts) and Eastern (Meru District) Provinces from Kenya. They found out that the bananas in the study area were uninfected with BXW but noted that there was a potential risk of infection due to trading interaction between these provinces and Western Province where the disease was prevalent. They further noted that 50 % of the respondents were not aware of the threats diseases and pests posed to bananas and the use of TC as an intervention measure. Similar findings were reported by Mwangi and Mbaka (2010). The 50 % of farmers that were aware of the threats had been trained by Kenya Agricultural Research Institute (KARI). The trained farmers had adopted tissue cultured bananas but abandoned them after four years due to nematode and pests infections. This indicates the adverse effects constraints may have on farmers' decision making in agricultural activities. As a variant from the preceding studies, this study links production and marketing by adopting a value chain approach.

A growing body of banana value chain related studies (e.g., Bandyopadhyay, 2013; Dibba, 2011; Karna et al., 2010; Kiiza et al., 2004; Match Maker Associates Ltd, 2012;Muchui et al., 2013; Ouma & Jagwe, 2010; Tesfay et al., 2016) have also identified constraints along

the chain. Such constraints include; poor market plans, long value chains, weak relationships among actors, poor information flow along the chain among others. Both production and marketing related constraints pose a major threat to food and income sources to banana farmers and traders.

Tesfay et al. (2016) found that inappropriate use of inputs, sub-optimal agronomic practises, diseases and pests, poor harvesting and postharvest techniques, and lack of a market plan caused banana farmers along Tekeze River in Asgebe-Tsimbela and Tahtay Adyabo districts of Northern Ethiopia to have low production and income. In addition, lack of appropriate storage facilities and marketing know-how exposed traders to challenges related to ripening, transportation and storage, handling, and selling. For instance, banana retailers did not shield their merchandise from sunlight leading to over ripening and decay. This study goes beyond identifying constraints in banana value chain and discusses the farmers' and traders' efforts in addressing the constraints.

Some studies on banana value chains cover either national (e.g., Dibba, 2011; Bandyopadhyay, 2013) or both national and international (e.g., Kiiza et al., 2004) spatial units. Other studies (e.g., Karna et al., 2010) focus on a range of crops. Such studies give over-generalized information on the region and crops covered. Thus, conclusions drawn from such studies may be misleading given that constraints to a crop's value chain emanate from a number of factors that may vary widely even within a locality. Furthermore, a crop's attributes such as perishability partly influence the type of constraints along its value chain. Therefore, this study attempted to provide more specific information by examining the constraints and opportunities in banana value chain at a local level.

Fromm and Dubön (2006) revealed that small-scale coffee farmers in Honduras had no direct interaction with coffee toasting companies (serving the domestic market) and

exporting firms. The exporting firms bought from middlemen while the toasting companies mainly bought from exporting firms. Traders operating in the end market (selling to the final consumer or institutions) are usually informed of status of demand – quantity, quality and prices. Consequently, in spite of their important production role, farmers lack negotiating power.

Research show that the more the number of actors along a chain, the little the profits accrued to the producers from their participation (Keleman et al., 2009; KIT et al. 2006; Piper, 2007). Piper (2007), for instance reports that the banana value chain in Kenya and Uganda were long (involved producers, transporters, 1 to 3 brokers, wholesalers and retailers), but through TechnoServe's intervention the chain had been shortened by ensuring that producers undertook transport activities and sold directly to the wholesalers. Piper's observations are too generalised and at variance with recent researches (e.g., Miriti, 2011) that established that middlemen were still a menace in banana marketing in Meru County in Kenya. This study therefore, provides empirical data on the prevailing structure of banana value chain in Meru County.

2.4 Opportunities in Agricultural Value Chains

A number of opportunities in banana farming studies are well documented(e.g., Bandyopadhyay, 2013; Haggblade & Nyembe, 2007; Karna et al., 2010; Kiiza et al., 2004; Match Maker Associates Ltd, 2012;Ouma & Jagwe, 2010; Tesfay et al., 2016;Zamil & Cadilhon, 2009). The opportunities cut across the value chain and exist at local, national and international levels. Tesfay et al (2016) identified four opportunities in banana value chain in Asgede-Tsimbila and Tahtay Adyabo districts in Northern Ethiopia. The opportunities included; irrigation sourced from Tekeze River, suitable soils and climatic condition and availability of local markets in Ethiopia. Tesfay et al (2016) hypothesised

that banana value chain could provide a great employment opportunity in Ethiopia that could be initiated with lower capital.

Haggblade & Nyembe (2007) in a study on commercial dynamics in Zambia's cassava value chain revealed that the crop's market held significant potential growth. This observation was explained in that farmers were already involved in some value addition on cassava whereby they soaked, peeled and dried the crop for selling along the roads. Therefore, potential growth existed as cassava would be processed to products such as *gari*, cassava-based *maheu* and ethanol.

Match Maker Associates Ltd (2012) found out that several opportunities existed in banana value chain of Arusha Municipality and Arumeru district in Tanzania. The opportunities included; existence of Banana Investment Limited (BIL) that was supplied by farmers, offered services for farmer group clients and assisted farmers to organise to groups; BIL offers credit; adaptability of international processing technologies in the local context; and the prevailing government policy of enhancing processing and value addition. The study, however, aimed at developing a learning material for a course on value chain development offered by Match Maker Associates Ltd, a consultancy firm (Match Maker Associates Ltd, 2012). Besides being business oriented, the methods used in data collection are not explicit. The case study was developed through consultations and interviews with various stakeholders in the banana subsector within Arusha Municipality and Arumeru district as well as internet and subsector actors.

Karna et al.(2010) found out that the demand for bananas from Bandarban, Khagrachari and Rangamati districts of Chittagong Hill Tracts (CHT) in Feeringhibazaar market outstripped supply. This finding indicated a local and domestic marketing opportunity. Karna et

al.(2010) further observed that the October-November period was a favourable banana planting season.

Bandyopadhyay (2013) noted that there is a growing potential for fresh and processed bananas in India and world markets presenting an opportunity for bananas. The study argued that in order to benefit from such opportunities, the banana growing states have to concentrate upon procurement and infrastructure development.

Zamil and Cadilhon (2009) revealed that there existed potential opportunities of using private traders as important partners for smallholder producer in agri-food marketing chains. Using a case study, Zamil and Cadilhon (2009) found out that by linking small-scale oyster mushroom farmers in Mymensingh City with a private trader, Abdul Kadir, the contracted producers had no problem in marketing their crop. In addition, farmers could make a minimum profit of US$ 1.94 for every bag of spores they purchased at US$ 0.21. Apart from buying the oyster mushroom from farmers, Abdul Kadir provided technical support on production, harvesting, and quality issues through hand-on training and regular follow-up. Whereas Zamil and Cadilhon (2009) study is on mushroom and urban agriculture, the current study is on bananas and rural based. Zamil and Cadilhon (2009) theme is on linking farmers to markets and not analysing the constraints and opportunities in the mushroom marketing chain.

2.5 Spatio-Temporal Distribution of Market Places

An understanding of the distribution and spatial interaction of markets is important in that the spatial-temporal distribution of markets reveal functioning of economic systems in a given region (Abu, Ajake, & Okpilia, 2013).Moreover, rural markets enhance the exploitation of the resources by local communities. As such there is a growing body of

literature on the theme (Abu et al. 2013; Hill & Smith, 1972; Matteis, 2006; Musyoki, 1986; Mwithiria, 2010; Wambugu, 2005, 1995, 1994, 1990).

Abu et al. (2013) sought to identify and explain the order that existed in the pattern of distribution of rural markets in space, time and function as well as commodities offered for sale and spheres of influence of markets in Bekwarra Local Government Area of Cross River State of Nigeria. The study found out that markets in Bekwarra Local Government Area were randomly distributed; same-day markets were widely spaced than adjacent-market day markets; markets in the region operated a 5-day market calendar; over 11 different types of commodities (e.g., yams, palm wine, palm oil, palm kernel, cassava, fermented cassava, rice and groundnut) are traded; and the spheres of influence of Bekwara markets transcend local and state boundaries.

Hill and Smith (1972) examined the synchronisation of markets and importance of day of meeting in four Emirates (regions) in northern Nigeria. The study concluded that a seven-day market week occurs over a large part of West Africa, Friday was an important market day for Sokoto and Katsina, and that spatio-temporal sequencing of Katsina Emirate periodic markets favoured consumers more than itinerant traders.

Musyoki (1986) analysed the spatio-temporal distribution of markets in Machakos District. The study found that markets were reasonably integrated in that they formed market rings. However, the markets served itinerant traders and consumers better than producers due to prohibitive distances and poor roads in the district.

Wambugu (1990) examined the spatio-temporal efficiency of rural markets in Nyeri District. The study established that: the markets had a uniform spatial and temporal distribution; there was a high positive correlation between population density and market provision; and there was a high inverse relationship between the mean spatial distance and

the temporal separation of market place. These findings led to a conclusion that the daily and periodic system in Nyeri District served consumers better than the travelling traders.

Wambugu (1994) examined the spatial distribution patterns of market places and market days in Nyeri District, Kenya. The study found out that although the markets were spatially organized to serve the people, most of them did not have the basic infrastructure.

Wambugu (1995) examined whether or not the spatio-temporal location of periodic markets in Nyeri District in Kenya served the market players adequately. The study also tested models and analytical techniques developed by other scholars. Wambugu (1995) established that the spatio-temporal synchronization of the periodic markets favours the consumer and not the itinerant trader.

Although Abu et al. (2013), Hill and Smith (1972),Musyoki (1986), and Wambugu (1995, 1994, 1990) focus on the geographical, spatial and temporal, aspects of periodic markets in space, time and function, this study went a step further to consider the constraints and opportunities associated with spatio-temporal distribution of banana markets in Meru County, Kenya. The studies reviewed here showed that various markets had diverse distribution patterns: for instance; random (Abu et al., 2013), uniform (Wambugu, 1990), and different market week lengths – 7 day (Hill & Smith, 1972), and 5 day (Abu et al., 2013). This study was undertaken against such a background with an aim to establish the prevailing situation in Meru County and thus contribute to the existing body of knowledge.

2.6 Summary of Existing Knowledge Gaps

Some of the studies reviewed on socio-economic characteristics of participants in agricultural activities have different themes from the one at hand. The theme of this study is spatial aspects of constraints and opportunities in banana value chain. For example,

Karembu (2002) focused on adoption, Miriti (2013) on gender, and Muendo et al. (2004) on improving fruits and vegetables production and marketing systems in Kenya.

A number of studies identifying constraints in banana farming either stress on production (e.g., Karembu, 2002) or marketing (e.g., Kiiza et al., 2004) in isolation. This is so despite the fact that, production and marketing are main segments of value chains. Consequently, interventions to address such challenges are limited. This study adopts a comprehensive perspective of a value chain.

Studies on agricultural value chains mainly focus on international operations (e.g.,Gereffi, Humphrey, Kaplinsky, and Sturgeon ,2001;Ponte and Gibbon, 2005; Raikes et al., 2000), others on regional (e.g., Mather, 2008; Vagneron and Roguigny, 2011& van Dijk,2012). Such studies overlook the genesis of value chains which is at a local level. This is a gap this study attempted to fill.

2.7 Theoretical Framework

This study was guided by agricultural land use location theory and Porter's strategic models. The study could not, however, comprehensively be explained within the discussed theoretical issues. Thus, a conceptual model was deduced and presented.

2.7.1 Agricultural Land Use Location Theory

The agricultural land use location theory was developed by Heinrich von Thünen in 1826(Waugh, 2002). The theory is based on the six assumptions namely: (i) existence of an isolated state that had no connection with other regions. (ii) Dominance of only one market in which farmers received ahomogeneous price for a particular product at any one time. (iii) The stateoccupied a broad, flat, featureless plain which was uniform in soil fertility and climate and over which transport was equally easy in all directions.(iv) Transport was

offered only through a horse-drawn cart. (v) The costs of production were equal for all farmers and only cost of transport varied (directly proportional to distance).(vi) Farmers had equal knowledge of the needs of the market and they acted rationally in order to maximise their profits.

Based on these assumptions, von Thünen demonstrated that: (i) each parcel of land use occupies an area for which its marginal revenue is higher than that of its transportation cost. (ii) The spatial distribution of land uses depends on comparative rent paying ability of different land uses. (iii) As distance increases from the market, intensive agriculture plays a progressively small part in land use.(iv) Concentric zones of land use develop around the market centre.

Von Thünen explicitly examined the role of transport cost as a key factor in decision-making by farmers on land use. He also observed that bulky crops and perishable commodities should be produced closer to the market. Transport and the nature of a commodity as elaborated by von Thünen are advanced in this study. Transport, perishability and bulkiness of bananas are some of the key factors expected to influence the farmers in decision-making along the value chain. For instance, farmers need to transport their bananas to markets soon after harvesting due to their perishability. Besides, transport is an important support activity linking production, marketing and consumption components of banana value chain. However, von Thünen's theory could not be wholly adopted to this study because of the following reasons: (i) apart from transport and nature of bananas, other factors such as capital, technology, and government may influence farmers' decision making.(ii) Banana value chain analysis study violates the assumptions of the classical theory. For instance, von Thünen assumed the use of a horse-drawn cart in

transporting agricultural produce to the market. However, several means of transport exist today.

2.7.2 Porter's Five Forces and Value Chain Models

Porter's five forces model is an industry and business strategy model. The model consists of five variables or forces namely; the threat of substitutes, the threat of new entrants, the bargaining power of buyers, the bargaining power of suppliers, and the rivalry among existing competitors(Porter, 1980, 1985). The model links each of the five forces to the market player as depicted in Figure 2.1.

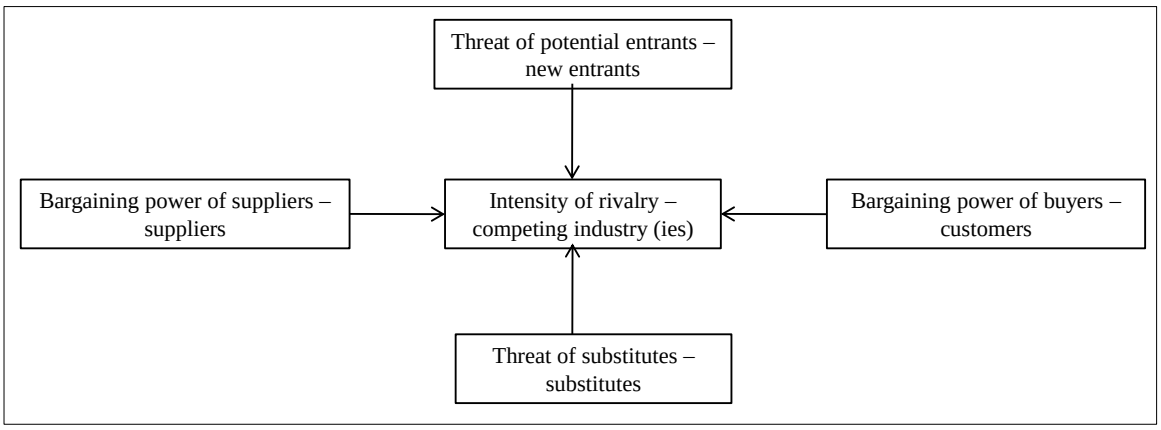

Figure 2.1. Five Forces Model
Source: Porter (1980)

The five forces work collectively to determine the attractiveness of an industry or business to potential entrants (Porter, 1980, 1985). Porter however, noted that competitive advantage could not be understood by looking at the firm as a whole. Nevertheless, some concepts used in the five forces model were advanced in this study. For instance, increases in prices of bananas or lack of sufficient bananas may cause customers to switch to an available close substitute. Value additions on bananas may put the banana industry at a better position against its rivals. This is because value addition promotes differentiation of products that the competitors may not have.

Porter's generic value chain model enhances the understanding of competitive advantage of a firm by focusing on its various components rather than the entire chain (Porter, 1985). The value chain model is based on the proposition that every firm is a synthesis of activities performed to design, produce, market, deliver, and support its products (Kotler & Keller, 2006). Porter identified nine value-creating activities, categorising them as primary and support activities (Gereffi et al., 2001; Kotler & Keller, 2006). The primary activities are as follows; (i) inbound logistics - materials handling, warehousing, inventory control, and transportation.(ii) Operations - machine operating, assembly, packaging, testing and maintenance. (iii) Outbound logistics - order processing, warehousing, transportation and distribution. (iv) Marketing and sales - advertising, promotion, selling, pricing, and channel management. (v) Service - installation, servicing, and spare part management.

The support activities include; (i) firm infrastructure - general management, planning, finance, legal, and investor relations. (ii)Human resource management - recruitment, education, promotion, reward systems. (iii) Technology development - research and development, information technology, product and process development. (iv) Procurement - purchasing raw materials, lease properties, supplier contract negotiations. Porter noted that support activities provide an enabling environment to primary activities contributing to the performance of the firm (Kotler & Keller, 2006). The model posits that by performing the strategically important activities more cheaply or better than its competitors, a firm gains competitive advantage.

Porter further noted that development of a competitive advantage depends not only on the firm-specific value chain, but also on the value system of which the firm is a part (Porter, 1980; 1985). Thus, the firm's value chain is embedded in a larger stream of activities or value system (Porter, 1985). Therefore, suppliers have value chains that create and deliver

the purchased inputs used in firm's chain. Moreover, products pass through value chains of channels on their way to the buyer. Channels perform additional activities that affect buyers as well as influence the firm's own activities. A firm's product eventually becomes part of its buyers' value chain. As such suppliers, channels and buyers value chains influence the performance of the firm.

Porter's ideas of primary and support activities models are advanced in this study. In this study, the primary and secondary activities of banana value chain are identified. Primary activities in banana value chain include production, marketing and consumption of bananas. Support activities include such variables as transport and information flow. Both primary and support activities work hand in hand in influencing the functionality of the chain. By mapping the banana value chain, opportunities and constraints engrained within the various segments of banana value chain were identified.

The adoption of the generic value chain model is however not wholly feasible in the current study. This is because the model is well suited for manufacturing firms of which banana farming is not.

2.7.3 A Conceptual Framework of Constraints and Opportunities in Banana Value Chain in Meru County

As Kaplinsky and Morris (2000) noted, a value chain is an instrument that allows for better description of the world. Thus the functioning of a value chain entails an understanding of the spatial dimension therein. Apart from operating within the local or national environments, agricultural value chains are influenced by global policies. A conceptual framework showing the relationship between demographic-socio-economic characteristics of farmers and traders, constraints, opportunities, spatio-temporal distribution of banana markets and outcomes of these interactions in Meru County is presented in Figure 2.2.

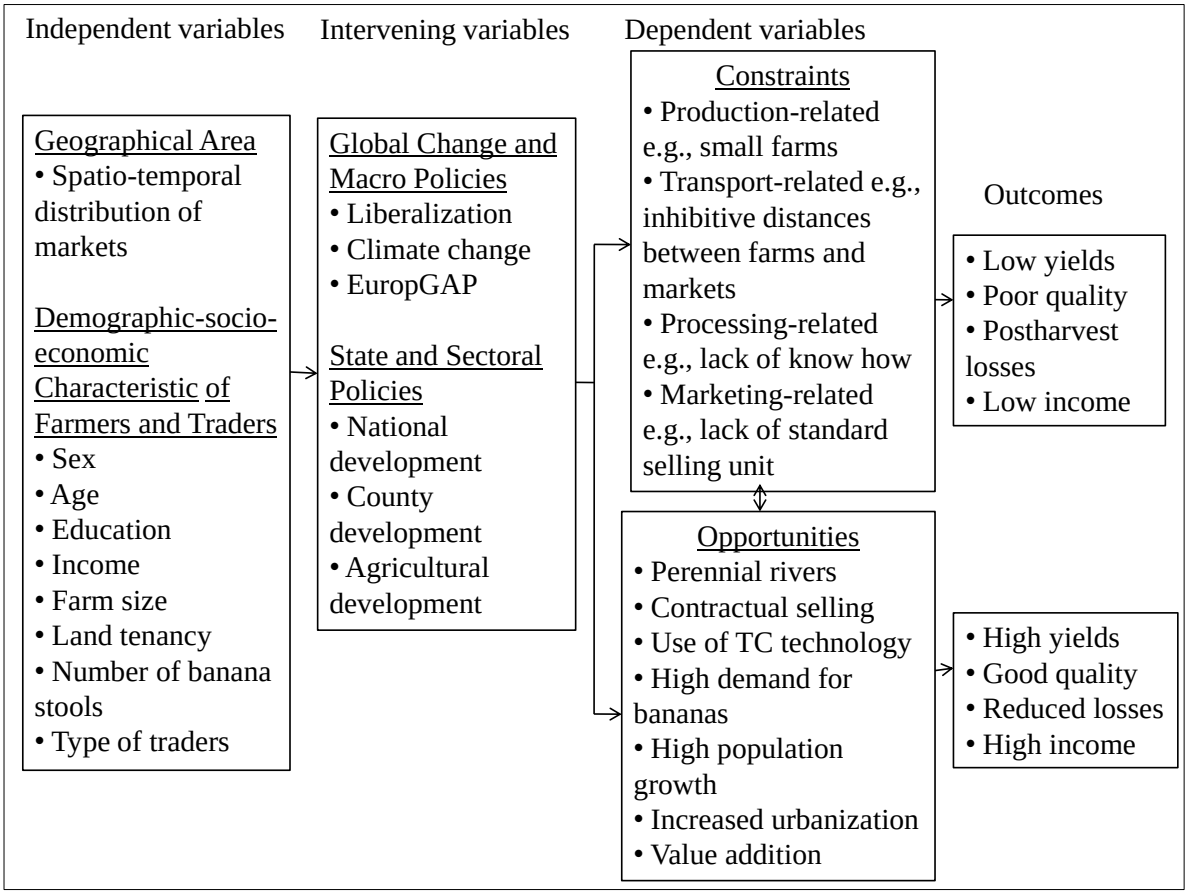

Figure 2.2: Demographic-socio-economic Characteristics of Farmers and Traders, Constraints, Opportunities, Spatio-temporal Distribution of Banana Markets and Outcomes in the Value Chain in Meru County
Source: Synthesized from Reviewed Literature

The demographic-socio-economic characteristics of farmers and traders and the distribution of banana markets may influence the actors' response to constraints and opportunities existing in the value chain. Small-scale banana farmers face varied constraints in their farming endeavours. Farmers may encounter challenges in input acquisition, production and marketing of bananas. Banana seedlings, fertilisers, pesticides, and irrigation are the major inputs that determine banana production (Fruit Production Technical Handbook, 2011; Karembu, 2002; Wambugu &Kiome, 2001). Constraints trigger reactions by the farmer. The responses by the farmers may be influenced by their demographic-socio-economic characteristics as well as accessibility of banana markets. For instance, married women banana farmers who do not own the title deeds for the family land may have to

consult the husbands in order to replace or expand an orchard of traditional bananas with tissue cultured ones. Such women may also consider the logistics of selling the improved varieties by answering the questions of where and how as TC bananas are more vulnerable to damage than traditional types (Dubois, 2013). For instance, if there exists a banana market near their farms, women may opt to take the bananas there and sell using the weighing method. The argument being that covering short distances may not cause damages on bananas and therefore, could qualify for weighing method which is keen on quality. Otherwise the farmers may sell at the farm-gate using either the bunch or weighing method where they allow the buyer to undertake harvesting and transporting of bananas.

As the farmers carry out their activities, opportunities present themselves. Opportunities arise across the entire banana value chain. For instance, at production level, the government may supply farmers with fertilisers at subsidized prices. Farmers initially limited by high fertiliser prices are then enabled to buy and apply it on the farm, increasing their banana yields. At marketing level, demand for bananas may be higher than production. When this happens, it is expected that the farmer will invest banana farming more and capitalise in meeting this demand.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, variables, the study area, target population, sampling techniques and sample size, research instruments, pilot study, reliability and validity, data collection procedures and challenges encountered in data collection. A discourse on data analysis procedures and data management and ethical considerations is also presented.

3.2 Research Design

A survey design guided this study. This design is best suited to evaluate the constraints and opportunities in banana value chain in Meru County. Unlike the experimental and quasi-experimental research designs that require three (manipulation, control, and randomization for experimental) or two (either control or randomization, and manipulation for quasi experiment) conditions, survey design does not require such conditions (Kothari, 2004). In a survey design, the study is carried out in natural settings and phenomena are observed as they occur. A natural setting is important in a value chain analysis study in that besides avoiding manipulating respondents for ethical purposes, it enhances validity of the research. In the survey design a description and explanation of the variables (e.g., actors, prices, distances etc.) in this study is given.

The study used a mixed method approach. This approach entails concurrent use of methods of data collection yielding both qualitative and quantitative data. On one hand, data collection methods such as key informant interviews and focus group discussion yielded qualitative data. On the other hand, structured questionnaires provided quantitative data.

The qualitative and quantitative data complement each other. Qualitative data provides the basis for discussions as it answers the question 'why' and 'how' which quantitative does not.

3.3 Variables

A description of variables analysed under each objective in this study is presented in Table 3.1.

Table 3.1: *Description of Research Variables*

Objective	Variable Specification	Measurement
i) To profile the demographic-socio-economic characteristics of banana farmers and traders in Meru County	• Age • Sex • Education • Income • Farm size • Amount of bananas on farm • Type of traders	• Years • Male/Female • Primary, secondary, college • Shilling • Acres • Stools • Wholesaler, retailer, broker, village collector
ii) To determine the constraints faced by banana farmers and traders in Meru County.	• Distance from farm to market • Means of transport used	• Kilometres • Motor vehicles, motorcycles, human porterage, wheelbarrows
iii) To determine the opportunities that exists in banana value chain in Meru County.	• Value addition	• Snacks, juice, wine, ripened bananas
iv) To evaluate the spatio-temporal distribution of periodic banana markets in Meru County.	• Spatial distance between markets • Temporal dimension between markets	• Kilometres • Days

Source: Field data(2015)

3.4 The Study Area

The study was conducted in Meru County. This is one of the 47 counties of Kenya. It borders Isiolo County to the north, Nyeri County to the south west, Tharaka-Nithi County to the east and Laikipia County to the west. Meru County is made up of nine administrative sub-counties. These are; Imenti South, Imenti Central, Imenti North, Igembe South, Igembe North, Igembe Central, Tigania East, Tigania West and Buuri (Figure 3.1). The County lies within 0^o6' North and about 0^o1' South, and latitudes 37^o West and 38^o East. It has a total area of 6,936.2 km^2(Republic of Kenya, 2013a).

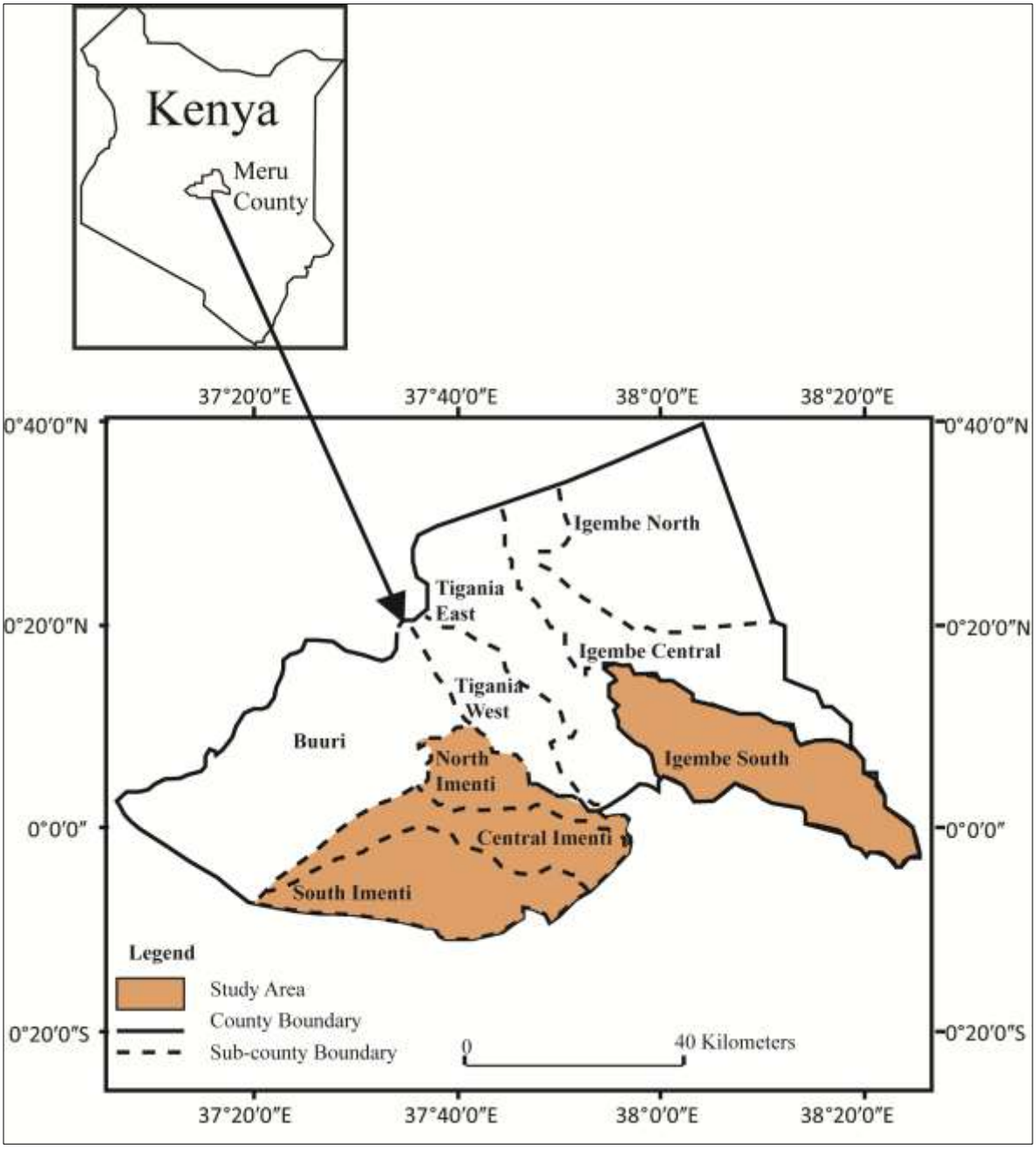

Figure 3.1. Map of Meru Showing the Sub-counties
Source: Adopted and modified from Republic of Kenya (2013a) using ArcMap 10.2

Meru County is characterized by high agricultural productivity attributed to favourable climatic conditions and fertile soils (MOALF, 2016).Rainfall ranges between 300mm and 2500mm per annum (Republic of Kenya, 2013a). The rainfall experienced in the area is bimodal. Long rains are experienced between March and May, while the short rains are received between October and December. Temperatures rise to 32^{o}C during the hottest

months and drops to 8^{o}C in the coldest months (Republic of Kenya, 2013a). Soils are fertile and well drained, majority of which are volcanic in origin especially in the high areas (MOALF, 2016). These climatic conditions and fertile soils support a wide range of crops for subsistence and commercial purposes.

Some of the crops grown include; khat, coffee, tea, bananas, maize, pigeon peas, cow peas, beans, tomatoes, French beans, among others (MOALF, 2016; Republic of Kenya, 2013a). Whereas crop cultivation is the dominant economic activity in the highland, livestock rearing dominates the lowland. Livestock commonly reared include; cattle, sheep, rabbits, chicken, and goats. Generally, agriculture is the main source of household income in Meru County. Agriculture contributes 80 % of the rural income in the County (MOALF, 2016; Republic of Kenya, 2013a).

3.5 Target Population

The target population was the banana farmers and traders forming part of between 556,083 and 813,780 people involved in banana value chain in Meru County. According to MOALF (2016), between 41 %and 60 % of the total population of 1, 356, 300 people(KNBS, 2014) in Meru County are engaged in banana value chain. The Meru County agricultural officer indicated that there were about 90,000 banana farmers in the region (Personal communication).However, the officer noted that the number kept on varying as some farmers diversified to bananas while others stopped producing the crop.

3.6 Sampling Techniques and Sample Size

Meru County is divided into nine sub counties (Table 3.2). Four of these sub counties were purposively selected for data collection. These are Igembe South, Imenti South, Imenti North, and Imenti Central sub-counties. The four sub counties were chosen because they

are leading in total banana production in the County (Table 3.2). Besides high banana production, Igembe South is one of the sub counties that relied on khat export but is currently threatened by the ban by United Kingdom (Riak, 2014). Imenti South, Imenti North and Imenti Central are relatively located closer to Meru-Nairobi tarmac road compared to other sub counties. Unlike other sub counties, Imenti South and Imenti Central are privileged with well established water projects (Miriti, 2011; J. Mwangi, Personal communication, April 27, 2015).

Table 3.2: *Banana Production Statistics of Meru County, 2011 - 2013*

	2011		2012		2013	
Sub-County	Area (ha)	Production (tons)	Area (ha)	Production (tons)	Area (ha)	Production (tons)
Imenti North	1,075	52,625	892	43,708	1,035	41,400
Meru central*	1,279	76,740	1,299	75,342	1,800	108,000
Igembe North	455	13,650	457	15,995	225	6,750
Igembe Central	0	0	0	0	545	16,350
Imenti South	1,653	94,050	1,650	94,050	1,789	101,973
Tigania west	252	2,016	264	13,200	300	15,000
Tigania East	220	1,760	250	2,500	230	1,840
Igembe South	1,364	40,920	1,380	41,400	1,104	32,000
Buuri	0	0	2	10	10	50

Note. *Meru Central is the current Imenti Central

Source: Meru County Agricultural Office Records (2015)

Although there is no agreed upon method of determining the sample size at various levels of the value chain (Mendoza, 1995), this study used the formula (equation 1) developed by Cochran (1963) for determining a sample size for a large population as applied by (Ahmed, Mahfouz & Fdul, 2011) to determine the sample size for both banana farmers and traders.

$$n_o = \frac{z^2\ pq}{e^2} \quad \text{..... (1)}$$

Where;
$n_0$is the sample size,
Z^2 is the abscissa of the normal curve that cuts off an area at the tails,
e is the desired level of precision,
p is the estimated proportion of an attribute that is present in the population and q is 1-p.

The value of Z is obtained from statistical tables which contain the area under the normal curve.

Given that the exact number of banana farmers and traders is not known but lies within the 556,083 and 813,780 people estimated to be participating in banana value chain in Meru County, the researcher assumed the maximum variability (i.e., 0.5 which represents p in the formula). The confidence level was decided at 95 % with +/- 5 % precision. By substituting the figures in Cochran's formula, the resultant answer was 384.16 (equation 2).

$$n_0 = \frac{Z^2 pq}{e^2} \quad = \frac{(1.96)^2(.5)(.5)}{(.05)^2} = 384.16 \quad \text{.....(2)}$$

Thus, a sample size of 384 banana producing households were purposively selected and interviewed. The 384 households were divided equally among the 4 sub-counties. Consequently, 96 households from each sub-county participated in the survey. The sub-counties' horticulture and agribusiness officers, who have been working with the farmers, assisted in identifying the farmers.

A sample size of 384 banana traders were also randomly selected at the markets during the market days and interviewed. Meru County has 49 trading markets, dealing with agricultural produce (Republic of Kenya, 2013a). Out of the 49 markets, only banana markets were included in the sample. These markets are; Tiira, Maua, Kanuni, Kariene, Kanyakine, Gakoromone, Miruriiri, Mitunguu, Mujwa, Kamachege, Ntharene, and

Mwichiune. Consequently, the banana traders operating in these markets were interviewed. According to Mr. Mwangi, Imenti Central Horticulture Officer, Ntharene is the leading banana market with Ksh 5 million turn-over per market day and is closely followed by Gakoromone (J. Mwangi, Personal communication, April 27, 2015).In order to determine the number of banana traders to be interviewed from each market, the size of banana markets approximated by the number of banana traders present and the cooperation of traders were used. The sample size of traders from the banana markets are summarised in Table 3.3.

Table 3.3: *Sample Size of Banana Traders at Each Market*

Market Name	Sample size
Gakoromone	70
Maua	16
Kanuni	8 *
Tiira	6 *
Ntharene	70
Kamachege	30
Mwichiune	38
Kariene	38
Mitunguu	18*
Mujwa	30
Miruiriiri	30
Kanyakine	30
Total	384

Note. *All banana traders present in those markets were interviewed
Source: Fieldwork (2015)

Eight key informants were purposively chosen. The informants included; Imenti North Sub County Agricultural Officer (SCAO), Imenti South and Imenti Central sub-counties horticulture officers, Igembe South sub-county agribusiness officer, Kaguru Training Institute crops' officer, Nkuene Ward agricultural extension officer, Meru Green Horticulture (MGH Ltd) marketing officer, and Meru Banana Farmers Cooperative (MBFC) manager.

Two focus group discussions were undertaken. One focus group discussion comprised of eight participants, five banana farmers cum traders and three banana carriers. The other focus group discussion was composed of seven banana farmers.

3.7 Research Instruments

Various instruments were used to acquire the required data. The instruments were; an interview guide, a focus group discussion guide, questionnaires, and scoring cards. Two sets of questionnaires comprising of structured and non-structured questions were used in the survey(Appendix 7.1and Appendix 7.3). The scoring cards were in two sets, one for farmers (Appendix 7.2) and the other for traders (Appendix 7.4). Both the questionnaires and scoring cards were administered to the farmer and trader respondents by the researcher and the assistants to capture those that could not read and write.

An interview guide (Appendix 7.5) was used to direct the data collection from key informants. A focus group discussion guide(Appendix 7.6) was also used to guide the two focus group discussions that were undertaken. One focus group discussion took place at Ntharene market. The other focus group discussion was conducted at Kanuni market.

In order to provide the actual locations of banana markets in Meru County (Figure 4.8), the study used a Global Positioning System(GPS) – GARMIN: *GPSmap76CS*. The GPS was used to determine the latitudes and longitudes of every banana market. The identified market locations were used to map the spatial distributions.

3.8 Pilot Study

A pilot study was conducted in December 2014 in Tharaka Nithi County. During the pilot study the research instruments were administered to 15 banana farmers and 15 banana traders. The pilot study helped establish clarity of the research tools. Where ambiguity was

noted, (e.g., questions 16 and 17, Appendix 7.3, in the piloted questionnaire read: What was the average buying price of banana in the last market? What was the average selling price of banana in the last market?), the researcher reworded the questions and reframed the instruments. The amendment on the research instruments ensured that the tools were suitable for gathering data to meet the objectives of this study.

3.9 Reliability and Validity

To ensure reliability of measurement instrument, several things were done. First, research team made sure that the same questionnaires were administered to all the respondents without effecting any changes to them in the course of data collection. Secondly, the researcher went through the questionnaires filled in by research assistants and sought clarity on responses that were not clear and immediately corrected them. Thirdly, when taking readings from the GPS, the researcher ensured that the satellite signal search halted at the lowest error margins. For all the market locations, the readings were done at +/- 3 error indicator. Validity was ensured through conducting a pilot study.

3.10 Data Collection Procedures

Primary data were collected for this study. The data were collected between March 2015 and July 2015. The primary data were collected through formal and informal interviews, focus group discussions, questionnaires, and scoring cards. The questionnaires and scoring cards for farmers were administered to the household heads or any adult member of the family to whom the household head delegated the role. The questionnaires and scoring cards for banana traders were administered to the traders during market days. The interviewers asked the respondents questions, probed them and recorded their responses.

This survey gathered information on production and marketing of banana farmers and traders.

The focus group discussions were conducted to gain insight on some banana production and marketing aspects such as challenges and opportunities. The researcher facilitated the focus group discussions while the research assistants recorded the discussion proceedings. The researcher conducted all the formal and informal interviews. Formal interviews involving key informants and informal interviews with banana traders who sold their bananas in other parts of Kenya other than Meru County were conducted by the researcher. These interviews were confined to traders who could spare time after filling in the questionnaire and the scoring card. The informal interviews were aimed at finding out, for instance, whether or not Meru was their only source of bananas, why they bought bananas from Meru, among others. Informal interviews with traders were deemed appropriate because they did not participate in focus group discussions.

In order to capture the spatio-temporal patterns of periodic banana markets in Meru County, both spatial distances and temporal dimensions were first measured. The researcher first mapped the spatial locations of markets. Next, the researcher used a measure line icon in QGIS version 2.10.1 to determine the distance (Euclidean) between all the periodic banana markets. Euclidean distances were used because it was practically impossible to classify roads and footpaths. Footpaths were important access routes at the farm level for farmers and traders who walked or used motor cycles to access farms or markets.

To determine the temporal dimensions (days) between periodic banana markets, the nearest neighbour's market day was considered. For instance, to measure the temporal dimension between say Ntharene and Kanyakine, the days between Monday (Ntharene's market day) and Friday (Kanyakine's market day), were counted. Where more than one market day took

place in a given market, the day closer to the market of interest was considered. For instance, Kariene is the nearest neighbour market to Mwichiune. Mwichiune has a market on Wednesday (day 3) while Kariene has two market days - one on Wednesday and the other on Friday (day 5). Both Mwichiune and Kariene have markets taking place on Wednesday. Thus, the nearest time spacing between Mwichiune and Kariene is 0 day.

3.10.1 Challenges Encountered in Data Collection

There were difficulties in interviewing some respondents given that they were too busy or not willing to participate. For respondents found too busy, an appointment for a time that they would be available was made. Respondents not willing to participate were exempted and substituted with others.

Language barrier particularly where the respondents could only understand and speak the local language was another challenge. To overcome language limitation, the researcher worked closely with a research assistant who could understand and speak in local language as well as English and / or Kiswahili.

Another challenge was on acquiring information that related to past experiences and sensitive issues such as income earned. Information on past experiences demanded recall on respondents as they did not keep records. For recall of past information and income issues, the questions on these items were addressed in more than one way in the questionnaire (e.g., Appendix 7.1, question 5 on average monthly income and question 36 on average monthly earnings from banana sales).

Heavy rains made the process of data collection hard and time consuming. When it rainedduring interviews, the session was stopped temporarily until the rain stopped. Rain

interruptions caused some of the respondents to leave and not return for another session. In such cases another respondent was interviewed as a replacement.

3.11 Data Analysis Procedures

Data obtained from various sources were edited to ensure that the entries and recording were appropriately done. Responses to closed-ended questions in the questionnaires were sorted and coded accordingly. Responses to the unstructured questions, recorded information during focused group discussions and interviews with key informants were transcribed. Computer application soft-wares –Excel and SPSS (version 20) were used to prepare a database and in analysis.

3.11.1 Analysis of Demographic-socio-economic Characteristics of Farmers and Traders in Banana Value Chain in Meru County

The raw data from questionnaires on demographic-socio-economic characteristics of banana farmers and traders were first subjected to computation of simple statistics such as frequencies, percentages, means and tabulations. These data was further subjected to significance tests using Student's *t* tests and ANOVA (*F* tests). The *t* test is a parametric test used to find out whether or not the differences noted in the means of samples are significant. The *t* test was computed using equation 3 (Singh, 2007).

$$t = \frac{Ia - bI}{\frac{Sa^2}{n-1} + \frac{Sb^2}{n-2}}$$ ..... Equation 3

Where;
$t$is the test statistic
a, b are the sample means
Sa^2, Sb^2 are the standard deviations of selected samples
n is the number of observations

The SPSS version 20 was used to calculate *t* values. The *t* value is expressed in terms of its probability such that when *p* value associated with it is less than .05, level of significance, the difference in the means is significant. Thus, the null hypothesis is rejected in favour of the alternative. In relation to the objective on demographic-socio-economic characteristics, *t* test was used on two hypotheses. These are; there is no significant difference between the average age of banana farmers and traders, and the average income earned by banana men and women farmers in Meru County.

The ANOVA was devised originally for agricultural use (Till, 1974) making it suitable for this study. Analysis of variance was used to examine the difference between two or more means. This was accomplished by decomposing the total variance to within and between groups component (Singh, 2007). In this study, the within and between groups component was the four sub counties from which data was collected. Although the application of ANOVA demands an observation of two conditions: the raw data to be normally distributed; and the sample variances not to be grossly dissimilar, the test is tolerant on both conditions. Therefore, the ANOVA test can be applied even when the data fails to meet one of the conditions.

The formula for calculating *F* value is described in equation 4 (Singh, 2007).

$$F = \frac{E_o}{E_w} \quad \text{..... (4)}$$

Where;
E_o is the estimate of population variance based on overall distribution
E_w is the estimate of population variance based on within sample variance

Just like in the computation of the *t* values, the SPSS version 20 was used for *F* values. In this study the *F* test was used to determine the significant difference in average farm sizes

owned by banana farmers and the number of banana stools on farms in different locations of Meru County.

3.11.2 Analysis of Constraints and Opportunities in Banana Value Chain

The transcripts from key informants, focus group discussions and in-depth interviews were coded into themes by the researcher. Analysis was done according to the grounded theory for theme and content. Specifically, one piece of data such as one statement was taken and compared to all other pieces of data. This process identified the similarities or differences between one statement and the others. By doing this, the researcher was able to come up with themes.

The SWOT analysis was performed on data transcribed from key informants, focus group discussions, in-depth interviews, questionnaires and reviewed literature to assess the constraints and opportunities in the banana value chain with an aim of identifying critical segments for strategic management of the chain in Meru County. SWOT analysis provides the decision and policy makers with information that form the basis for exploiting opportunities while combating threats. Results from SWOT analysis may provide hints towards change in policies, strategies or institutional arrangements (Pickton & Wright, 1998; Chermack & Kasshanna, 2007).

In this study, SWOT analysis involved two main steps. First, a list of strengths, weaknesses, opportunities and threats in the banana value chain matrix was prepared. Secondly, the four factors, strengths, weaknesses, opportunities and threats, were critically assessed and analysed on their interaction. The assessment and analysis was done on the basis of the following questions: (i) Do strengths in the banana value chain open any opportunities? (ii) How can the weaknessesin the banana value chain be converted to

strengths? (iii) What need to be done to use opportunities for banana value? (iv) How can threats to the banana value chain be counterbalanced?

The SWOT analysis is, however, prone to subjectivity. In an attempt to address the problem of subjectivity, a scoring analysis was used (Silva & Filho, 2007). In this study, scoring analysis was important in rating constraints experienced by banana farmers and traders in banana value chain in Meru County. The scoring analysis rates the contribution of each constraint relative to the aggregate ranking of all other constraints in the value chain. It does this on the basis of the degree of controllability and relevancy of each constraint to other constraints. Based on the scoring results, the constraints that significantly limit the functioning of banana value chain in the County were objectively discussed.

The scoring analysis in this study involved three steps. Initially, identification of the main drivers of banana value chain was done. The drivers were designated as; inputs, technology, marketing, coordination and an enabling environment. The drivers were then broken down into mini-drivers. Inputs was broken down into availability of artificial fertilizer, organic manure, farming water, labour and land utilization. Technology was collapsed into tissue culture and irrigation.

Marketing was broken down into quantity of bananas, weighing method, bunch method, selling price, licences/cess/levy, distance covered, and means of transport used. Coordination was disintegrated into training, extension services and price information. An enabling environment was collapsed into credit availability, pests and diseases eradication, and road maintenance.

In the second step, mini-drivers were classified according to their degree of controllability. For instance, those controllable by either national or county government were labelled as “CG”, those by individuals as “IC”, those that were semi-controlled as “SI”, those

controllable by organization as “OC”, and those not controllable as “NC”. For example, in this study the government was in control of licensing banana trade, charging cess and levy, and providing subsidized fertilizers. Weather changes such as dry spell were uncontrollable. Availability of irrigation water required combined control by the government and individuals. Then each mini-driver was assigned a Rank Sum (RS) weights provided by Roszkowska(2013) indicating its capacity to influence the driver it belongs to.

In the third step, the mini-drivers’ “relevance” was multiplied by its weight to give an overall evaluation value for the semi-drivers and drivers. A decision was made concerning how the functioning of the chain was affected by the constraint. This decision was made on the basis of main drivers and mini-drivers evaluation values. On one hand, if evaluation value(s) is/are negative, then the main driver or semi-driver significantly hinders the functioning of the chain. On the other hand, if evaluation value(s) is/are positive, then the main driver or mini-driver does not significantly hinder the functioning of the chain.

3.11.3 Analysis of the Spatio-Temporal Distribution of Periodic Banana Markets

The spatio-temporal distribution analysis of banana markets was done using the Pearson product moment correlation coefficient (*r)* and nearest neighbour index (*Rn*).The *r* is a measure of linear association between two variables. It varies from -1 to +1. When *r* is equal to zero, there is no correlation between variables. When *r* has a positive (+) sign, it shows that when one variable increases the other variable increases in the same way. When *r* has a negative (-) sign, it means that an increase in one variable is associated with a decrease in the other variable. According to Singh (2007), the Pearson product moment correlation is considered to be very low if *r*-value is less than 0.20. It is conceived to be low if the value ranges between 0.21 and 0.40, and moderately high when the value falls between 0.41 and 0.69. It is described as high if the value is above 0.70.

The *r* was used to analyse the hypothesis: there is no significant relationship between mean spatial distance and the temporal separation of banana markets in Meru County. It was computed using formula5(Hammond & McCullugh, 1978).

$$r = \frac{1/n\sum(a-\bar{a})(b-\bar{b})}{\sigma_a .\sigma_b} \quad \text{..... (5)}$$

Where;
n is the number of pairs (a, b) values
$\sigma_a$is the standard deviation for *a*
$\sigma_b$is the standard deviation for *b*
$\bar{a}, \bar{b}$are means for *a* and *b*

The calculated *r* was tested for statistical significance by comparing the computer generated *p* value with the significance level, .05.In case the *p* value is less than .05, the correlation is significant.

To compute *Rn* formula 6 (Henkel, 1984) was used.

$$Rn = \frac{d_o}{d_e} \quad \text{..... (6)}$$

Where;
N = number of banana market places in Meru County,
d_o = observed mean nearest neighbour distance,
d_e = expected mean nearest neighbour distance if points are placed randomly,
A = area of the study region.

d_e is obtained from formula 7 (Hammond and McCullagh, 1978)

$$d_e = \frac{1}{2\sqrt{\left(\frac{N}{A}\right)}} \quad \text{..... (7)}$$

In this study, the nearest neighbour index was used to analyse the hypothesis: periodic banana markets in Meru County are not uniformly distributed.

3.12 Data Management and Ethical Considerations

The researcher acquired a research permit (Appendix 7.7) from National Commission for Science, Technology and Innovation (NACOSTI). As authorised through the permit, the researcher reported to the Meru County Commissioner and the County Education Officer before embarking on research. From these officers letters allowing the researcher to conduct field work in Meru County were granted.

The researcher and the research assistants introduced themselves and the purpose of the research to the respondents. Respondents were assured of anonymity and confidentiality. In addition, the researcher assured the respondents that the information they provided would be used for academic purposes only. To this effect every questionnaire (Appendices 7.1 and 7.3) had a brief introduction.

In data collection, no coercion was used to get the respondents to provide the required information. All interviews and discussions were only conducted after the interviewee(s) voluntarily agreed. The questionnaires and scoring cards were prepared in as simple and clear language as possible.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents results and discussions that attempted to provide answers to the research questions considered in this study. The research questions addressed focused on: (1) demographic-socio-economic characteristics of farmers and traders that influence their activities in banana value chain (2) constraints in banana value chain (3) opportunities in banana value chain (4) spatial-temporal distribution of periodic banana markets.

4.2 Demographic-socio-economic Characteristics of Banana Farmers and Traders

A total of 384 banana farmers and 384 banana traders were interviewed in this study. The respondents comprised of both men and women. Women were, however, the majority of farmers and traders, 52.6 % and 57.6 %, respectively (Table 4.1). The observation that women were more than men farmers in Meru County may be explained by the fact that the questionnaires for farmers were administered at the homesteads. Women were mainly within the homesteads partly due to the domestic chores they handled alongside farming.

Furthermore, banana farming in Kenya and Meru in particular had, before introduction of tissue culture technology, been designated as a predominantly female activity (Karembu, 2002; Miriti et al. 2013; J. Mwangi, Personal communication, April 27, 2015). The situation has not changed for Igembe South where khat, a man's crop, is a major cash crop. Considering banana as a female crop meant that its production was mainly aimed at meeting food demands for the family.

Table 4.1: *Demographic-socio-economic Characteristics of Banana Farmers and Traders*

	Farmers (n = 384)		Traders (n = 384)	
Characteristics	F	%	F	%
Sex				
Male	182	47.4	163	42.4
Female	202	52.6	221	57.6
Age in years				
18-35	77	20.1	191	49.7
36-59	275	71.6	188	49.0
60 and above	32	8.3	5	1.3
Level of education				
Primary	197	51.3	114	29.7
Secondary	160	41.7	258	67.2
College	26	6.8	12	3.1
None	1	0.2	0	0
Average monthly income (Ksh) from banana sales				
Less than 9,999	172	44.8	125	32.6
10,000-19,999	120	31.3	183	47.7
20,000-29,999	50	13.0	37	9.6
30,000-39,999	25	6.5	28	7.3
40,000 and above	17	4.4	11	2.9
Land tenancy				
Own	375	97.7	-	-
Hire	9	2.3	-	-
Farm size (acres)				
Less than 1	98	25.5	-	-
1-2	185	48.2	-	-
2.1-3	46	12.0	-	-
3.1-4	24	6.3	-	-
4.1 and above	31	8.1	-	-
Number of Stools				
Less than 80	136	35.4	-	-
80 and above	248	64.6	-	-
Types of traders				
Retailer	-	-	30	7.8
Wholesaler	-	-	212	55.2
Village Collector	-	-	133	34.7
Broker	-	-	9	2.3

Note. n = number of respondents, - = not applicable
Source: Field data (2015)

The finding that many women were involved in banana production was in consistent with Dibba (2011). According to Dibba (2011), 85 % of men in The Gambia engaged in banana

production. The engagement of most men in banana production was explained with respect to ownership of land. Men in The Gambia owned and controlled the uplands where bananas were mainly cultivated.

The large number of women (57.6 %) (Table 4.1) in banana trading may be because the crop has not been fully considered as a commercial crop. Thus, banana is still partly regarded as a woman's crop. Consequently, apart from being food for the household, women sell bananas to acquire some income to enable them meet some financial family needs. The finding that many women were involved in banana trading concurs with observations by Dibba (2011), Muendo et al. (2004), Mwithirwa (2010), and Wambugu (2005). Dibba (2011) found out that 88 % of women in The Gambia engaged in banana marketing. This was because it was the only feasible option given that men owned and controlled banana producing land which limited women's participation in production.

Although Muendo et al. (2004) did not explain the gender disparity in marketing, the study noted that 75 % of fruit and vegetable traders in Kenya were females. Mwithirwa (2010) reported that 81 % of bean and maize traders in Meru South and Mbeere districts were women. This was because women needed to engage in micro enterprises in an attempt to meet the basic household's demands deemed to be their responsibility. Wambugu (2005) observed that women outnumbered men, 56 % versus 44 %, as traders in rural areas. The study argued that while men handled large volumes of maize in trade, women dealt with small quantities with an aim of meeting subsistence needs.

The study revealed that the farmer respondents had an age bracket of 18 to 80 years while traders had a range of 18 to 70 years. As shown in Table 4.1, majority of banana farmers (71.6 %) were aged between 36 and 59 years(Table 4.1). This observation may be explained in that after secondary school education, people have a tendency to seek for

white-collar jobs and only opt for farming when they fail to secure such employment. Almost equal percentages of banana traders (49.7 % and 49.0 %) were aged between 18 and 35 and 36 to 59 years, respectively (Table 4.1). This observation may imply that people are regarding banana trading as a business requiring skills.

The average age of farmers and traders was 44 and 37 years, respectively. In order to find out whether or not there was a significant difference between the average age of farmers and traders, the data were subjected to *t* test. The results indicated that there is a significant ($P< .000$) mean difference between banana farmers' and traders' age. This means that relatively youthful population engage in banana trading than in farming.

The involvement of the elderly [60 and above years as defined by Republic of Kenya(2014)]in banana farming (8.3 %) and trading (1.3 %) may be due to the notion that all household members residing in rural areas are expected to participate in farming activities. Furthermore, some farmers regardless of their age also engaged in banana selling. The finding on farmers' age range concurs with Karembu (2002) observation that TC banana farmers in Kenya were within the age bracket of 18 to 80 years. Karembu (2002) concluded that the TC banana technology was easy for small-scale farmers and fitted with their farming system.

Majority of the farmers (51.3 %)and all traders had acquired a basic formal education (Table 4.1). In addition, 67.2 % of traders had attained secondary level education (Table 4.1). This implies that banana trading is attracting more skilled participants. The findings on farmers' and traders' education may be explained with respect tothe national education policythat emphasises the importance of education as a basic need for every child (Republic of Kenya, 2013b). The participation of traders who had acquired secondary and college education in banana trading indicates that the business is an avenue for employment. The

finding on farmers' education agrees with that of Karembu (2002) that 54% of banana farmers had attained primary education. Results on traders' education differ with Muendo et al. (2004) who found out that while 67 %, 18 %, and 6 % of fresh fruits and vegetable traders in Kenya had attained primary, secondary and post secondary education, respectively, 10% had no formal schooling.

The study showed that banana selling formed an important part of income source for both farmers and traders (Table 4.1). Nevertheless, majority of banana traders(67.5 %)earned a monthly income of more than 10,000 and 19,999compared to32.5 % of farmers who earned less than 9,999 (Table 4.1). These results may imply that although almost all farmers (97.7 %) relied on farming to earn an income, traders got better revenue. This may be partly because traders mainly had a direct interaction with consumers and therefore understood the market behaviour. Market information enhanced traders' empowerment in the chain.

Further analysis of income earned from banana sales by farmers revealed that they earned Ksh 15,444 on average per month(Table 4.2). The income however, varied between women and men. In order to explain the observed difference, the data was subjected to a *t* test analysis.

Table 4.2: *Average Monthly Income Earned from Bananas by Men and Women Farmers in Meru County and the t test Results*

Sex	Average Income (Ksh)	*t* value	*p value*
Men	16,770		
Women	14,249		
Both men and women	15,444	23.048	**.000**

Source: Field data (2015)

The mean difference in income between men and women was statistically significant ($p<$ .000) (Table 4.2). The difference may partly be explained with respect to the shifting of

banana from subsistence to commercial crop upon introduction of TC technology. As a commercial crop, bananas are appealing to men as a source of income. Miriti (2011) and Miriti et al. (2013) observed that men in Imenti South increasingly involved themselves in banana farming because TC technology enhanced the qualities of bananas as a commercial crop and consequently, bananas fetched better prices.

Results of this study revealed that 97.7 % of the farmers owned the farms on which they produced bananas (Table 4.1). Given that banana is perennial, private land ownership partly encouraged farmers to invest in its husbandry due to security of tenure. Importance of land tenure in influencing investment in agriculture has been reported by other banana farming studies (e.g., Karembu, 2002). Karembu (2002)found out that where farmers were below 40 years and did not own the land, they did not plant TC bananas but rather cultivated short term crops like beans and vegetables.

Banana farmers own relatively small farms (Table 4.1). Majority of the farmers (48.2 %) owned between 1 and 2 acres(Table 4.1). The average farm size varies by sub counties as follows: 2.3 acres in Imenti North, 1.8 acres in Imenti South, 1.9 acres in Imenti Central, and 1.7 acres in Igembe South. The ANOVA results indicated a statistically significant (p = .032) variance between farms sizes in the four sub counties (Table 4.3). Thus, the hypothesis could not be rejected.

Table 4.3: *ANOVA Results on Farm Sizes*

Source	Sum of squares	Degrees of freedom	Means squared
Between Sub Counties	23.87	3	7.0
Within Sub Counties	1018.60	380	2.7
F-ratio	2.969		
F-probability	**.032**		

Source: Field data (2015)

Farm sizes influences the degree of land use and crop choice. Where farms are small, intensive use of the land may be made. In Meru County, the intensive use of land can partly be attributed to the farm size. About three quarter (75.3 %) of the farmers cultivated crops and reared livestock. Most of the farmers (82 %) produced bananas among other crops such as khat, coffee, maize, and beans among others. Only 18 % of farmers had pure banana orchards. Intercropping meant that bananas competed with other crops not only for nutrients but also for farmer's attention in management. Farmers who reared livestock (e.g., cows, chicken, goats, sheep, pigs and rabbits) used the animals' manure for crop production. The finding on small farm sizes concurs with observations of Piper (2007) that banana farming in Kenya tended to be on small-scale on land mainly of less than 1 hectare.

The average number of banana stools on each farm was 177 (Table 4.4). The number of stools however, varied by sub counties as follows; 151 in Imenti North, 230 in Imenti South, 181 in Imenti Central, and 147 in Igembe South. The ANOVA test results indicated significant (p = .001) difference in number of banana stools on farms in different sub-counties of Meru County.

Table 4.4: *Number of Banana Stools on Farm and ANOVA Results*

	Imenti North		Imenti South		Imenti Central		Igembe South		Entire study area			
Stools	F	%	f	%	f	%	f	%	f	%	*F* ratio	*F* probability
Less than 80	41	42.7	9	9.4	28	29.2	58	60.4	136	35.4		
80 and above	55	57.3	87	90.6	68	70.8	38	39.6	248	64.6		
Total	96	100	96	100	96	100	96	100	384	100		
Average Stools	151		230		181		147		177		5.249	**.001**

Source: Field data (2015)

This difference in banana stools in the four sub counties may be partly due to availability of irrigation water. Water shortage problem was more prevalent in Imenti North and Igembe South. Some parts of Imenti North and Igembe South sub counties have a hilly terrain

which hinders gravitational flow of water from rivers to farms. Imenti South sub-county has well established water projects such as Mitunguu and Ciomujogia and bananas were produced under irrigation.

Furthermore, 42.7 % and 60.4 % of the farms in Imenti North and Igembe South, respectively had less than 80 stools on their farms (Table 4.4). This meant that banana production in the 2 sub counties was low and did not break even in line with Qaim (1999).Qaim (1999) observed that with 80 banana stools, a farmer could reap profits from banana farming. The finding on low banana stools in parts of Meru County concurs with findings of earlier studies in Kenya (Karembu, 2002; Qaim, 1999).

A further investigation on quantity of banana produced monthly revealed that on average the banana bunches harvested per month for the entire sample was 44 (Table 4.5). The average amount of bunches, however, varied by sub-counties as follows; 35 in Imenti North, 57 in Imenti South, 43 in Imenti Central, and 42 in Igembe South. An ANOVA test results indicated a non significant (p = .063) difference in the amount of banana bunches harvested monthly in the four sub counties of Meru County. This may be partly due to the small farm sizes owned by farmers across the four sub counties.

Table 4.5: *Average Amount of Banana Bunches Harvested Monthly in the Sub Counties and ANOVA Results*

Sub Counties	Mean	*F* ratio	*F* probability
Imenti North	35		
Imenti South	57		
Imenti Central	43		
Igembe South	42		
Entire sample	44	2.449	**.063**

Source: Field data (2015)

The banana traders comprised of retailers, wholesalers, village collectors, and brokers. Wholesalers were the majority (55.2 %) followed by village collectors (34.6 %), retailers

(7.8 %) and brokers (2.4 %) in that order. Wholesalers and village collectors demand high quantities. Periodic banana markets in Meru County mainly acted as bulk building points in readiness of transporting the commodity to deficit regions in the country. Both wholesalers and village collectors were informed about banana prices as they were closer to the consumption end of the chain than farmers. Furthermore, they sometimes changed roles to retailing. These results do not concur with findings by Mwithirwa (2010) and Wambugu (2005) who reported that retailers in maize and beans were more than wholesalers.

The study found out that traders would at times switch roles (e.g., a wholesaler could at times operate as a retailer and the vice versa). The combined role of wholesaling and retailing meant that the number of actors along the chain was reduced. Reduced number of actors would imply that benefits accrued along the chain would be shared among a few actors. However, it was not obvious that the farmer would benefit particularly where they did not interact with final consumers. Similar observations were made by Mwithirwa (2010) who found out that most of the maize and beans traders in Meru South and Mbeere were not exclusively wholesalers but they also engaged in retailing transactions.

Majority of banana traders (74.5 %) were full-time business people (Table 4.6). Furthermore, 55.1 % of the part-time banana traders involved themselves in farming (Table 4.6).

Table 4.6: *Period of Engagement in Banana Trade by Traders in Meru County*

Period of trading	f	%
Full time	286	74.5
Part time	98	25.5
Total	384	100

Source: Field data (2015)

Having majority of part-time banana traders engage in farming activities partly implies that farmers are taking up marketing roles. This would enhance the income derived from farming. The high percent of full-time banana traders meant that there was a ready market outlet for bananas. It may also mean that banana farming provides full time employment and thus dependable source of income that may contribute to uplifting livelihoods. These results concur with Mwithirwa (2010) who found that majority of the maize and beans traders (56% and 51 % in Mbeere and Meru South districts, respectively) were fulltime business people.

4.3 Constraints in Banana Value Chain of Meru County

The study revealed that both traditional and tissue cultured bananas were produced in Meru County. The traditional varieties included; *Israel*, *Nyoro*, *mutahato*, *Muraru*, Uganda greens (*Kiganda*) and Sweet bananas. Tissue cultured varieties included; Gros Mitchel (*Kampala*), Grand Naine, Williams hybrid, Cavendish Giant, Cavendish Dwarf, and Phia 17-23 (*Mkia wa chui*). The choice of types of bananas to produce by farmers in Meru County was partly influenced by the constraints in the crop's value chain. A summary of the constraints is given in Table 4.7.

Table 4.7: *Activities, Actors and Constraints in Banana Value Chain in Meru County*

Value Chain Section	Type of Inputs/Activities	Actors	Constraints
Primary Activities			
Input provision	• Suckers/Plantlets, Water, Artificial fertilizers, Organic manure, Pesticides	• JKUAT, Individual Farmer, Farmers' SHG, KARI, Kaguru Training Institute, MGHC Ltd, MOAL	• Lack of improved seedlings • Expensive plantlets • Inadequate irrigation water
Production level	• Land preparation, Planting, Weeding, Irrigation, Pruning, Staying, Harvesting	• Farmers	• Small farm sizes (1.9 acres on average) • Limited extension services • Pests (nematodes, termites) • Diseases (sigatoka, *ura*) • Monkeys • Theft • Banana topple • Inadequate of labour • Soil erosion
Processing level	• Sorting, Cleaning, Ripening, Peeling, Slicing, Homogenizing, Digesting, Dearating, Solar drying, Packaging	• Meru Banana Farmers' Cooperative, MGHC Ltd, Solar Processing firm,Farmers, Traders	• Limited knowledge on value addition • Rudimentary / traditional ripening methods

Value Chain Section	Type of Inputs/activities	Providers	Constraints
Marketing level	• Selling raw bananas, Selling processed banana products (e.g., snacks, juice)	• Farmers, Traders, MGHC Ltd, Solar Processing firm	• High wastage of bananas • Lack of standard grading system and sell unit • Low bargaining power by farmers • High levy costs • Low prices • Unpredictable prices • Fewer customers • Low quality and quantity • Inadequate capital
<u>Support Activities</u> Storage	• Keeping bananas	• Farmers, Traders, MGHC Ltd, Solar Processing firm	• Inadequate and poor storage structures
Transportation	• Moving inputs to farm and bananas to markets	• Farmers, Traders, MGHC Ltd, Solar Processing firm	• Poor roads • Lack of means of transport • High transport costs (cess, freight) • Traffic jam
Information	• Communicate banana availability and banana prices	• Farmers, Traders, MGHC Ltd, Solar Processing firm	• Limited information

Source:Field data (2015)

4.3.1 Input Provision and Production Level

More than half of the farmers (51.3 %) produced both TC and traditional types, 24.2 % pure TC banana, and 24.5% traditional types alone. The TC bananas were mainly grown in Imenti South sub-county under irrigation. Traditional bananas were prevalent in Imenti North and Igembe South where water shortage identified as a major problem. Inadequate water for irrigationwas reported by 13.7% of the farmers. The water shortage problem in the study area became more pronounced during dry seasons when the demand went up. The study found out that 9 % of the farmers had reduced the number of banana stools on their farms in order to cope up with the problem of water shortage. This finding was attested by Imenti North Sub-county Agricultural Officer in highlighting the challenges facing banana production (C. Kirito, personal communication, April 5, 2015). Approximately 11 % of the farmers suggested that the government should increase water supply through methods such as digging boreholes and constructing dams.

Farmers pointed out that unlike the TC varieties, traditional types have the capacity to withstand water stress for some period. In Igembe South, the traditional banana variety particularly *mutahato*, was predominant. In addition to withstanding water stress, this variety was reported to be useful for cultural purposes such as dowry payments and feeding nursing mothers and babies. However, the growing of mixed types of bananas led to lack of uniformity and homogeneity in finger size and fruit maturity. Non-uniformity and lack of homogeneity may partly explain why farmers were hardly involved in banana processing. Similar findings have been reported by agricultural studies (e.g., Karembu, 2002; Keleman et al., 2009). Karembu (2002) reported that traditional banana types lacked uniformity and homogeneity in maturing. Keleman et al (2009) found that maize farmers in Mexico grew

criollo varieties with different densities and textures which were practically difficult to separate for storage and processing.

The results of this study revealed that inputs, specifically suckers were of poor quality and plantlets were expensive (Ksh 120 or $ 1.2 per seedling). The high prices of plantlets are partly explained with respect to the seedlings scarcity in Meru County. The government institutions such as JKUAT and KARI that were actively involved in distributing plantlets in Meru County in the early 2000s had backed off (Karembu, 2002; Muchui et al., 2013). The high prices of plantlets partly contributed to the high (96.4 %) use of suckers. Farmers acquired suckers from older banana stools on their farms or were given by neighbours. However, they did not establish whether or not the orchard was infected. This exposed them to the risk of pests and diseases transmitted through suckers. In an attempt to solve the problem of unavailability of plantlets in the study area, farmers with the assistance of sub counties horticulture and agribusiness officers established plantlet hardening nurseries on their farms (Plate 1).

Plate 1. Plantlet Hardening Nursery at a Farmer's Farm in Igembe South
Source: Field data (2015)

High prices of plantlets and extensive use of suckers have been reported in other banana studies (Dibba, 2011; Dubois et al., 2013; Karembu, 2002;Mwangi & Mbaka, 2010; Wambugu & Kiome, 2001). Dibba (2011) observed that banana farmers in The Gambia entirely used suckers. The study found out that 51 % of the farmers acquired the suckers from their respective villages as it was easy, 42 % from another village within the country and 5 % from producers from other countries. Dubois et al. (2013) noted that adoption of TC plantlets was expensive for farmers in East Africa (Uganda, Burundi and Kenya). Wambugu and Kiome (2001) reported that farmers in Kenya could only afford 10 to 20 plantlets due to their high prices ranging between Ksh 60 and 150 or $ 0.8 – 2.0. Karembu (2002) found out that the price of a plantlet in Kenya was Ksh 75 or $ 1.5 per seedling. The study explained the high costs of plantlets in the early 2000s with respect to the period of introduction of the TC technology in Kenya. In the early 2000s, the TC technology in the country was just beginning and sources for the seedlings were not widely distributed. Mwangi and Mbaka (2010) posited that farmers in Kenya continued to largely plant conventional suckers partly because of high TC seedling costs and the perceptions that improved banana stools demanded more management.

Pests and diseases was the most (23.2 %) reported constraint by farmers in Meru County. The banana diseases were *ura* (a bacteria wilt) and sigatoka, and pestsincludednematodes, termites and weevils. Unlike sigatoka, nematodes and weevils that infected bananas only, farmers had a lot of concern on *ura*. Apart from causing bananas to wilt, the disease infected other crops mainly maize and beans. This implied that the disease posed a threat to food sources for the households given that maize and beans are important food crops in the county. The problem of *ura* was affirmed by the agricultural extension officer who pointed out that the disease had no cure. Pests and diseases reduced the quality and quantity of bananas. Infected bananas fetched less prices or were not sold at all.

In an attempt to address the challenge of pests and diseases, farmers applied various strategies including; 1.6 % applied ash around banana stool, 3.9 % sprayed, 0.3% pruned and 1.6 % uprooted plants and burnt them. The farmers also made two suggestions of addressing the problem as follows; (i) 15.6% suggested that the government should provide a cure for pests and diseases. (ii) approximately 3 % were of the opinion that agricultural extension officers should train farmers on curing the pest and diseases. The challenge of pests and diseases is not unique to Meru County as it has been reported in other studies on banana farming in other parts of Kenya (Karembu, 2002; Mbaka et al., 2009;Fruit Production Technical Handbook, 2011).

The results of this study showed that a few farmers(3 %)did not have adequate know-how on banana production. However, only a few (5.5%) farmers adhered to the right spacing of4 x 4 m, 4 x 3 m, and 3 x 3 m for tall, medium and short varieties respectively, in planting (Fruit Production Technical Handbook, 2011). Inadequate know-how and failure to observe the right spacing may partly be explained with respect to the limited extension services in Meru County. The research found 83.6 % of the farmers had not received any services from extension officers on banana farming. This observation concurs with findings by Miriti (2011) that majority (64 %) of banana farmers in Imenti South had not received extension services for a period of one year.

Banana toppling was reported by 2.4 % of the farmers. Tall banana variety required stays upon fruition. Without the support, this variety was prone to tumble before maturing or harvesting. Toppled bananas acquired broken and bruised fingers. This meant that a farmer could not sell the banana or fetched low prices because of the defacement. Crop toppling, therefore, reduced the quality and quantity of bananas. In an attempt to overcome this problem, 0.8 % of the farmers used wooden stays or props to shore up banana plants. In

addition, 0.5 % of the farmers opted to plant short and medium varieties. Use of wooden stays implied an added cost on banana production. Planting of short and medium varieties disadvantaged farmers in bunch selling as the sizes of bunches they harvested were smaller than the tall varieties.

Labour availability was a challenge to a few farmers (0.5%) in Meru County. Inadequate labour meant that farmers strained to perform farming activities when required. These results may be explained in context of education policy in Kenya. The policy advocates for compulsory basic education (Republic of Kenya, 2013b). Thus, children who have traditionally been expected to provide labour were instead in schools. Farmers applied two strategies in addressing the problem of labour. The strategies were; hiring of workers, and selling bananas at farm-gate where the buyer assumed all the harvesting, loading and transportation responsibilities.

Theft of bananas was a concern to a few farmers (2.2 %) in Meru County. The farmers reported that bananas were stolen on farm before harvesting. Theft reduced the yields for farmers. In an attempt to overcome this challenge all the affected farmers hired guards. Hiring of guards meant an added cost on banana production.

A few (0.8 %) farmers whose farms abutted forest fragments faced the challenge of monkeys. Although the problem may seem insignificant, monkeys interfere with banana quality and quantities. In addressing the challenge of monkeys, farmers made scarecrows in the orchard. However, farmers pointed out that the monkeys roamed freely despite the scarecrows' presence. Ineffective methods of warding off wild animals call for redress because such strategies do not safeguard farm yields. Wildlife-crop damage has been identified as a constraint for farmers in Africa and Asia by Sitati and Walpole (2006) who

reports on elephants' persistent crop raiding in Transmara District, present Narok County in Kenya.

4.3.2 Processing level

Approximately 42 % of bananas from Meru County were processed. A few of farmers (0.5 %) and 41.7 % of traders ripened bananas. All the respondents who ripened bananas indicated that they used the traditional method. The traditional method involved wrapping bananas plus a few avocados or passion fruits in a polythene paper for 3 or 4 days. At the end of these days, the polythene paper was removed and bananas were put on a dry place to ripen completely. The traders reported that this method did not achieve a homogenous ripening of all bananas and that some started rotting at the finger tips. The problem of rotting was more pronounced during cold months of July and August. Rotting lowered the quality of bananas and consequently the prices they attracted in the markets.

Use of poor methods of ripening bananas is not unique to Meru farmers and traders. Berhe, Puskur, Teka, Hoekstra and Tegegne (2008) noted that farmers in Metema District in Ethiopia used a trial and error method in ripening bananas. Initially, farmers put bananas in open wooden boxes leading to change of colour to black that put off consumers. To overcome the setback, farmers dug holes where they placed banana hands arranged in layers separated with green grass to cushion and hasten ripening for 5 days. Although better than the first method, bananas remained green in colour. To attain the yellow colour upon ripening, farmers applied a third method where bananas were kept above the ground in sacks and crates under shade. The sacks and crates were covered with hay, dry banana leaves and sometimes plastic sheeting for 5 to 6 days.

4.3.3 Marketing Level

The results of this study revealed that 59 % of the farmers sold their bananas when green and plump. The selling of bananas in Meru County took place either at farm-gate or roadside market places. Majority of the farmers(47.4 %) sold their bananas at the farm-gate, 18.8 % at the roadside markets, and the rest at both farm-gate and roadside markets (Table 4.8). Farmers reported that they preferred selling at the farm-gate because it relieved them from the burden of harvesting, post harvest handling and transporting the crop to the market.

Table 4.8: *Type of Market and Average Selling Price per Bunch and t test Results*

Market type	f	%	Average Selling price (Ksh)	*t* value	*p* value
Farm-gate	182	47.4	157		
Roadside markets	72	18.8	223		
Both farm gate and roadside markets	130	33.8			
Total	384	100		29.135	**.000**

Source: Field data (2015)

An analysis of the prices fetched at the farm-gate and markets revealed that on average farmers earned Ksh 157 and Ksh 223 at farm-gate and market place, respectively (Table 4.8). A *t* test results a significant (p = .000) difference in mean prices at farm-gate and markets. These findings imply that farmers earn less from banana sales at farm-gate compared to sales at the market.

Two methods (i.e., bunch or *githukio* and weighing) were used in buying and selling of bananas in Meru County. The bunch method involved an arbitrary determination of banana buying or selling price by either the buyer or seller by merely considering the size of the bunch, the quantity of bananas in the market, number of buyers in the market, and the bargaining capability of the buyer and the seller. More than 70 % of farmers in the study area used the bunch method (Figure 4.1).

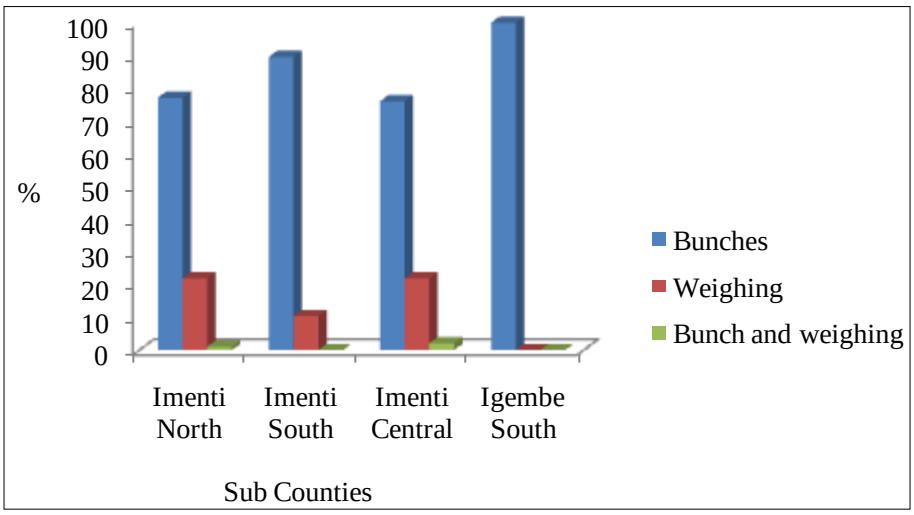

Figure 4.1. Methods of Buying and Selling Bananas
Source: Field data (2015)

The subjectivity driving the bunch selling often exposed farmers to exploitation by traders who had more bargaining power as illustrated by the following script observed at the market.

> "At Ntharene Market, a male buyer approaches a male seller who has different types and sizes of bunches of bananas. While touching different sizes of bunches, the buyer asks the seller for the selling price. The seller says Ksh 200, 300 and 500 for small, medium and large bunches, respectively. The buyer in response offers to pay Ksh 150, 200 and 400. A bargain ensues where the buyer asks the seller to add "something" arguing that the offer by the buyer is too low. The buyer insists that he is only able to pay that amount and threatens to move to a nearby seller. At this point the seller signs *basi leta hiyo pesa lakini ni kidogo* (bring that money although it is little)". The deal is closed.

The choice of the selling method by farmers was guided by several factors (Table 4.9). Farmers were mainly concerned with effort and time used in banana selling as well as method buyers were using. The farmers pointed out that the bunch method saved time and effort and it was famous with buyers. Thus farmers were able to sell all they had harvested

within a short time, usually a day. This safeguarded them from crop loss that would emanate from delays in selling. The observation that farmers were concerned about saving time and effort may partly be explained with respect to a myriad of other activities that they are involved in that compete for the time available. For instance, most banana farmers (75.3%) were involved in livestock rearing (e.g., goats, cows, chicken) alongside growing other crops (e.g., khat, coffee, maize, beans, kales).

Table 4.9: *Reasons for* Choice *of Bunch and Weighing Method by Farmers*

Reasons	f	%
Bunch was easy, fast and saved time	246	64.1
Few buyers used weighing method	41	10.7
Bunch fetched better prices than weighing	18	4.7
Bunches involved little or no wastage	12	3.1
Buyers preferred bunches	10	2.6
Weighing scales were fudged	3	0.8
Weighing had a fixed price thus no bargaining	20	5.2
Weighing fetched better prices than bunches	19	4.9
Weighing is faster and saves time	14	4.6
Bunch and weighing are both profitable	1	0.3
Total	384	100

Source: Field data (2015)

Only a few farmers, 4.7 % and 4.9 % using bunch and weighing methods, respectively were guided by the earnings they would make (Table 4.9). The study observed that 1 kg of bananas was on average sold at Ksh 30. Thus, a farmer selling a small sized sweet banana weighing 10 kg could earn as high as 300 compared to Ksh 150 that would be gained if the bunch method was used. These results raise concerns about the profits that farmers were reaping from producing bananas, particularly because 53.6 % of the farmers indicated that they sold all their bananas. The results seem to indicate that although farmers are producing bananas for sale, they are not keen on profit margins. Thus, farmers are likely to be exploited by banana buyers.

Farmers who sold through the bunch method at the farm-gate used two procedures as follows. Firstly, the farmer provided the potential buyer with a price per bunch of a banana after which he or she gave the buyer the go ahead to harvest bunches that he or she judged that could cost that price. Once the buyer cut the banana down, he or she transported them to a central point where the farmer counter-checked the quantity, and a transaction occurred.

In the second procedure, a buyer paid for the bananas even before they were fully developed and mature. This arrangement transferred bananas 'ownership' to the buyer. Such buyers, however, waited for the banana fruit to mature on the farmer's land. The buyers' 'temporal' ownership of the bananas on the producer's farm denied the farmers the control over the land. In addition, the farmers could not benefit even when prices rose.

The farmers who sold at the farm-gate using weighing method negotiated the price per kilogram of bananas with the buyer. If the buyer and seller came to a consensus, the buyer cut down the banana bunches, gathered them at a central point, and weighed them. After weighing the bunches, the buyer cut them into hands, washed them with clean water, drained or dried them, packaged them in crates, and loaded them to a vehicle for transport.

The weighing method at the market place differed slightly from that of on-farm. At the market, the buyer set the buying price while the farmer carried out the harvesting and transportation of the bananas to the market. The buyer inspected for quality (e.g., plump and green, not broken) of bananas before buying. Once satisfied with the quality, he or she chopped off the small hands, weighed the bunch and paid for the quantity as per the set price. The other procedure of cutting into hands, washing and packaging were similar to those at the farm-gate. Thus, the weighing method of buying demanded quality bananas. Quality demands has been reported in other agricultural studies (Asfew, Mithöfer, &

Waibel, 2010; Bolo et al., 2011; Zamil & Cadilhon, 2009). Asfew et al. (2010), for instance, points out that there are stringent quality measures (EuropGAP) that must be observed by farmers in order to participate in European Union market.

The trading of bananas without standard grading system and sale unit in Kenya has been reported in studies such as Miriti (2011), Miriti et al. (2013) and Nzioka (2009). Nzioka (2009) observed that banana farmers in three divisions of Kiambu East District - Githunguri, Municipality and Kiambaasold a bunch at Ksh 172, 180 and 216, respectively. These prices were determined through physical observation. Miriti (2011) and Miriti et al. (2013) noted that *Kibuchio* (selling by luck to any buyer) was the common method used by women in Imenti South.

The bargaining power of a farmer was further compromised by their individual rather than group selling. Majority of the farmers (97.4%) sold their bananas individually. Both farmers and traders who sold individually pointed out that issues concerning income were personal and considered them private. A previous study on bananas in Kiambu County indicated that individual selling leads to huge losses for farmers (Nzioka, 2009). Nzioka (2009) observed that selling of bananas by individual household in Githunguri, Kiambaa and Municipality divisions of East Kiambu District, on average earned them: Ksh 22,569; 21,345 and 10,065 per year, respectively. These figures were low compared to average results of: Ksh 65,848; 104,487; and 35,175 per year for Githunguri, Kiambaa and Municipality divisions in a simulated group marketing scenario (Nzioka, 2009).

A few traders (1.4 %) indicated that bananas were sometimes stolen. The traders reporting theft operated in regions outside Meru County. These traders noted that stealing occurred at their selling location and not in Meru markets. Theft reduced bananas consignment for the trader. A few traders (1.3 %) suggested that the government should provide security.

Low selling price of banana was a concern for both farmers and traders. About 10 % and 4% of farmers and traders respectively, indicated that banana selling prices were low. An interview with the MBFC's manager revealed that between April and May, and November to February, avocados and mangoes are in season. During these months, avocados and mangoes competed with bananas leading to banana prices drop to Ksh 150 from 500 (S. Gikokunda, personal communication, April 21, 2015).

Traders observed that the customers they sold to bought at low prices. Majority of the traders (61.1%) sold within the range of Ksh 300 and 700. Farmers and traders indicated that prices dipped more when buyers were few and a lot of bananas were available in the markets. Low selling prices deter farmers and traders from devoting themselves to banana farming and trading. For example, 46.2 % of the traders indicated that they sold other commodities particularly fruits in an attempt to make up for low banana prices.

To address the problem of low prices, at least 47 % of the farmers sold at the farm gate. In their opinion, selling at the farm gate enabled them to negotiate for better prices when the banana was still on the stump. Farmers were concerned about banana spoilage and so when cut they had to sell. However, as expressed in a foregoing discussion, selling in the market earned better prices than at the farm gate. A few farmers (11.3 %) suggested that a banana cooperative should be established. The suggestion of establishing a cooperative society implied that such farmers were not aware of the already existing Meru Banana Growers Cooperative. This raises concern about information flow within the County. A few of the farmers (2.3 %) and traders (2.1 %) suggested that the government should regulate banana prices. Government price control may however, not be a viable intervention given that liberalisation concerns limiting such interferences. Perhaps interventions meant to address

the causes of low banana buying prices may be better. For instance, such causes may be related to the quality of bananas.

Results from this study revealed that 8.4 % and 24.2 % of farmers and traders respectively experienced high marketing costs. Farmers indicated that they always paid a levy of Ksh 10 regardless of the size of the load. In addition, where farmers could not carry their bananas to a collection point of the buyer after selling, they hired a carrier to do so at a negotiable cost of Ksh 10 to 20 per load. Although banana buyers did not pay a levy at Meru County, they incurred on-load costs within the market, cess cost as they transported their cargo to the area of their operation, off-load once at their destination, and a levy in their markets of operations. Banana traders who wrapped their bananas or packaged in *Mutumba* (Plate 2) hired labour to do so. Wrapping and packaging cost between Ksh 10 to 50. These marketing costs increased the financial burdens farmers and traders incurred in accomplishing their activities. Such costs reduced their profits. In addressing this problem, more than one trader used one vehicle in order to share the cess charges. Farmers opted to reduce marketing costs by selling at the farm-gate. In addition22.1 % and 6.8 % of the traders and farmers, respectively suggested that the government should reduce the levy and cess charges.

Plate 2. Wrapped Banana Bunches and Banana Hands Packaged in Jute Sacks
Source: Field data (2015)

Results from this study revealed that there were poor and congested market structures in Meru County. Seven per cent and 14 % of farmers and traders respectively, mentioned the problem of poor and congested market structures. Interviews with key informants disclosed that there were markets such as Kariene under construction within the small holder horticulture marketing programme (SHoMaP) in Meru County. The SHoMaP was a development progamme of the Ministry of Agriculture (MOA) initiated in the year 2007, focusing on input supply and horticulture marketing in 15 districts cutting across 5 provinces, Nyanza, Western, Rift Valley, Central and Eastern in Kenya (SHoMaP, 2008). In Meru County,SHoMaP was working within Imenti North, Imenti Central and Imenti South (SHoMaP, 2008). An interview with the Nkuene ward extension officer revealed that in Meru County, SHoMaP was focusing on bananas, mangoes and irish potatoes. SHoMaP's objectives include; reducing into – farm unit cost of inputs, improving the quality of inputs and services that input suppliers provide to smallholder, raising the quality of horticultural produce traded in the domestic market, and increasing and stabilising farm gate prices(SHoMaP, 2008).

The markets constructed as part of SHoMaP programme were small in size and could not adequately meet the needs of all farmers. Such markets were designed to address the domestic demand for various horticultural crops (e.g., bananas, avocados, mangoes). Besides, the study established that there were political-related challenges limiting the use of markets. This was because the SHoMaP programme was initiated before the devolution system of administration. Upon devolution, administrative boundaries changed leading to political concerns of which department would oversee the operations of the development projects (J. Mwangi, personal communication, April 27, 2015).

Poor and congested market facilities partly contributed to development of banana markets along major roads. Apart from Gakoromone, all the other eleven banana markets considered in this study operated along a roadside. The roadside markets lacked important infrastructure such as shelter, toilets, water points, and stalls. Farmers (9.9 %) and traders (13.8 %) suggested that the government should construct more markets and improve the infrastructure of those already in operation. Similar results on poor market infrastructure in Kenya were reported by Mwithirwa (2010) and Wambugu (2005). For instance, Mwithirwa (2010) found out that poor state of stalls in most open air markets subjected maize and beans to theft and damage by rainfall. Wambugu (2005) noted that most of the periodic open air markets had no stalls, sanitation, drainage, perimeter fence, were either muddy or flooded during rainy seasons and dusty during the dry season.

Results from this study revealed that there were inadequate banana buyers. A few farmers and traders (5.9 % and 6.0 %, respectively) expressed their concern on few number of banana buyers. The farmers argued that the few buyers were not able to buy all their bananas. They reasoned that the presence of few buyers compared to sellers provided an opportunity for traders to lower buying prices. Perhaps, this occurrence may explain why some traders only relied on the situation in the market in deciding the amount to buy. Traders felt that banana customers were not enough to promote them to increase their consignments. The availability of banana traders and consumers may partly be explained with respect to seasons and availability of alternative fruits for the dessert varieties. In-depth interviews with traders revealed that July and August months were usually cold discouraging consumption of bananas. An interview with the MBFC's manager disclosed that between April and May, and November to February, avocados and mangoes are in season and therefore, banana traders decreased as some shifted to trading in such fruits (S. Gikokunda, personal communication, April 21, 2015).

This study found that banana prices were unpredictable. A few traders (1.6 %) reported the problem of price volatility. This problem was mainly related to bunch selling. A focus group discussion revealed that farmers were not eager to produce Phia variety, locally identified as *mkia wa chui* due to its huge size – it weighed between 75 kg and 80 kg on average (S. Gikokunda, personal communication, April 21, 2015). A bunch of *mkia wa chui* was expected to always sell at least Ksh 500. Farmers expressed doubts as to whether or not buyers would be willing to pay such amounts. Lack of predictability in prices meant that farmers and traders could not plan for their money in advance. As noted by Miriti et al. (2011), bunch selling is unreliable and unpredictable leading to uncertainty in sales returns.

The problem of low quality bananas produced in Meru County was reported by 0.8 % of the traders. Traders who bought such bananas offered low prices. The challenge calls for redress if the banana value chain has to have a competitive advantage in both domestic and international markets. This is because as Asfew et al (2010) observed, quality is paramount in the global market system. The challenge of meeting quality demands has been reported in other agricultural studies (Bolo et al., 2011; Keleman et al. 2009; Zamil & Cadilhon, 2009). Bolo et al. (2011) found out that dairy farmers in Kenya either used poor milk jars that easily got contaminated with bacteria or sold through brokers who diluted milk leading to failure to deliver quality milk to cooperatives. This observation was explained in farmers' lack of knowhow on dairy farming.

Keleman et al. (2009) established that buyers of criollo maize variety required that it should have 12 % moisture, white- or cream- coloured, no insects, mould, or other signs of rot. The requirement that maize be either white or cream coloured meant that farmers could not sell criollo of other colours though such varieties were readily produced. Zamil and Cadilhon(2009) noted that Mr. Abdul Kadir, the owner of Konika Mushroom Ltd, based in

Mymensingh in Bangladesh demanded that mushrooms supplied to his company be fresh and clean, packaged in polyethylene bags bearing the label, 'This mushroom is a product of the FAO-supported group Jhinuk Mushroom producer Group and marketed by Abdul Kadir of Konika Mushroom, Mymensingh' and a date of packaging (Zamil & Cadilhon, 2009). At times farmers harvested mushroom that were not fresh and Mr. Kadir advised them to dry for dry-mushroom market. Failure to meet the requirement for fresh mushroom costs the farmers a lot. For instance, a farmer needed "10 kg of fresh mushroom to make 1 kg of dry ones" as well as repackage to sell toKonika Mushroom Ltd (Zamil & Cadilhon, 2009).

Rotting and spoilage of bananas before selling was the second most (20%) reported constraint by traders. All the traders who identified this constraint were involved in ripening of bananas. Traders attributed the rotting and spoilage to use of fertilisers by farmers in banana production, ripening process, and cold seasons. As already discussed elsewhere both farmers and traders used traditional methods. Farmers related postharvest losses to the weighing method of selling bananas where the buyer cut off the small hands from the tip of a bunch. Rotting and spoilage of bananas compromised the appearance of bananas and consequently their acceptability by buyers and consumers. Such bananas were sold at a throw away price. To overcome postharvest losses, 9.9 % of traders who ripened bananas indicated that theybought less quantity during cold seasons, 5.2 % used banana leaves for cushioning and 1.1 % lowered the selling prices to attract buyers. Buying less and lowering banana prices by traders affected the farmers' activities in that they could not sell all their supplies and the selling price declined. A few (3.3 %) of the traders were of the opinion that farmers should stop using fertilisers.

Results of this study revealed that the amount of bananas in the markets was not sufficient. Although only 6 % of traders indicated that the quantity of bananas was inadequate, these

results partly indicate that there was low supply of bananas compared to demand at the local markets in Meru County. To address the problem of insufficient bananas in the market, traders used two strategies. The strategies were; travelling to Meru on the eve of a given market day to enable them to start buying bananas as early as possible during the actual day. Itinerancy entailed buying of bananas by traders in one market and leaving them along the road over night and proceeding to another market to purchase more. The itinerancy strategy was carried out where the markets operated in succession. Besides the two strategies, traders suggested that farmers should increase production.

4.3.4 Distribution Channels

Fifty nine percent of the farmers sold their bananas when green and plump. Selling bananas in this state was preferred since the crop was mature and firm. They appealed to buyers and attracted better prices. In addition, farmers and traders reported that compared to ripe bananas, green and plump ones could easily be managed on transit because they withstand instantaneous damage. Ease in transporting bananas was important in that long distances were travelled to some banana selling destinations from markets in Meru County (Figure 4.2). Whereas all the brokers and majority of retailers and village collectors (90%) covered distances of up to 50 kilometres, 30 %of the wholesalers travelled between 251 and 300 kilometres (Figure 4.2).

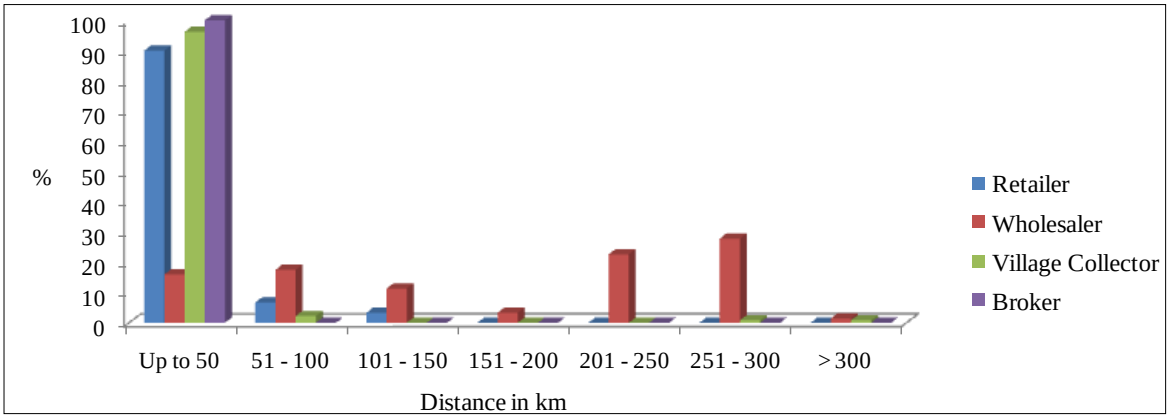

Figure 4.2. Distance between Traders Operating Location and Banana Markets in Meru County
Source: Field data (2015)

Banana traders were involved in intra- and inter-regional (county) transactions. Bananas originating from Meru County were transacted within at least 12other counties in Kenya. The counties included; Laikipia, Mombasa, Nyandarua, Nairobi, Nakuru, Isiolo, Tharaka Nithi, Kirinyaga, Nyeri, Embu, Muranga, and Kiambu. Meru County had the highest (60.7%) number of operations. This observation may be partly because some traders doubled as banana farmers who exploited their close proximity to local markets. On one hand, bananas originating from Meru County were sold in counties where banana farming has not thrived (e.g., Laikipia, Mombasa, Nyandarua, Nairobi, Nakuru, Isiolo). These counties are banana deficit and therefore provide a ready market. Apart from being banana deficit, Nairobi's population of over 4 million promotes the market. On the other hand, Meru bananas were also sold in counties where production has flourished (e.g., Tharaka Nithi, Kirinyaga). The wholesalers were the main distributors of bananas from Meru to markets in other counties.

Most (7) distribution channels of unprocessed bananas from Meru County were long comprising of 5 or 6 actors (Figure 4.3).As shown in Figure 4.3, only 2 channels were short being made up of 2 or 3 actors. The longer the marketing channel, the more disadvantaged

the farmer is. This is because the profits are shared among many actors and the farmers lack the bargaining power as they do not directly deal with consumers.

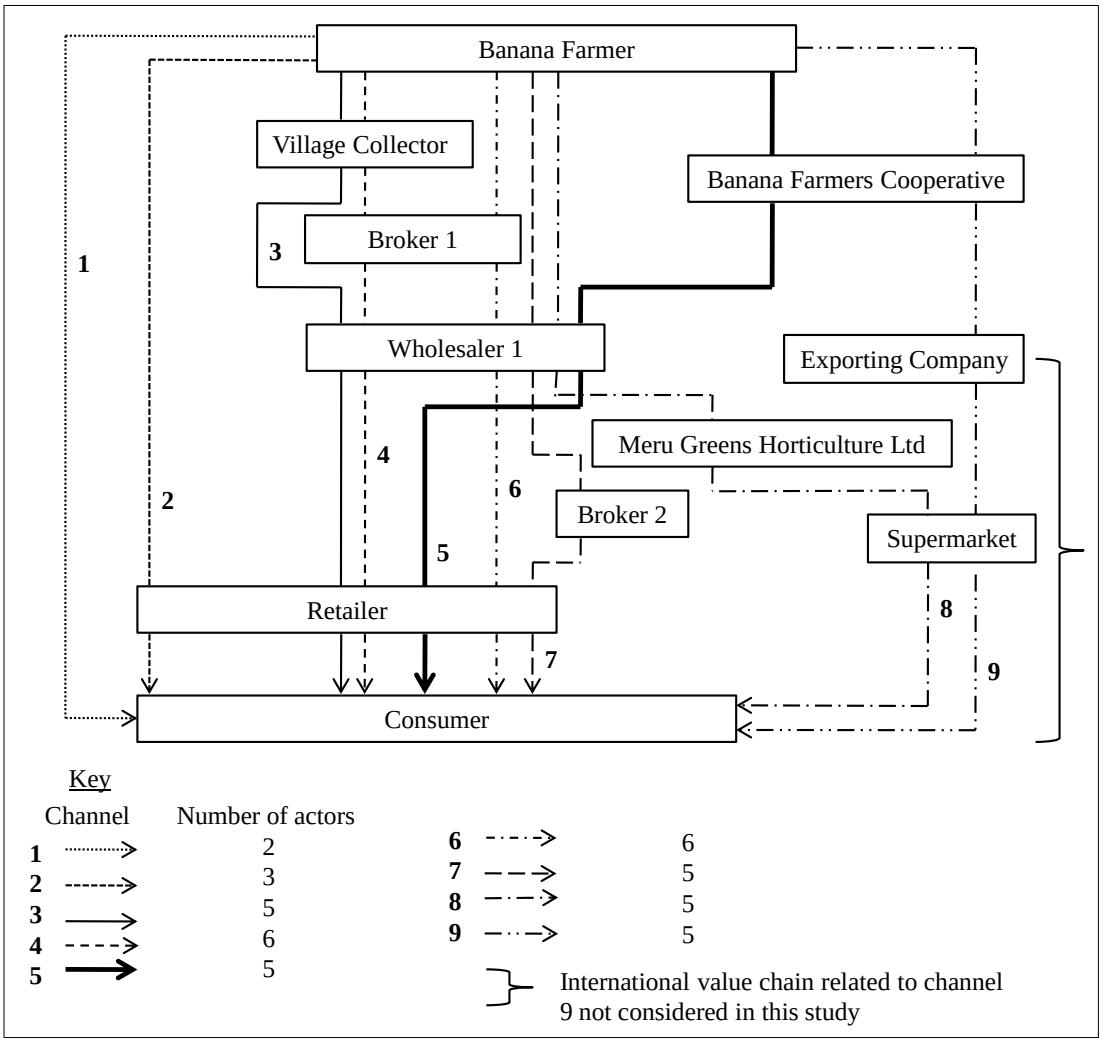

Figure 4.3. Marketing Channels of Unprocessed Bananas
Source: Field data (2015)

Similar findings have been reported by Ouma and Jagwe (2010) and Piper (2007). Ouma and Jagwe (2010) reported that the low placement of banana farmers in Central Africa partly compromised their profitable participation along the chain. Piper (2007) found out that banana value chain in Uganda and Kenya was long; involving transporters, multiple brokers, wholesalers and retailers.

Channel 1 involved farmers and consumers (Figure 4.3) and operated at the local level where farmers sold to consumers either at the farm gate or at the local markets using *githukio* or bunch method. This distribution channel was not prominent in Meru County given that the region acted as a banana source and farmers mainly (49.5 %) produced bananas for both commercial and subsistence purposes, thus formed an important part of consumers.

Farmers, retailers and consumers comprised Channel 2 (Figure 4.3) and this was important at the local level. Retailers mainly bought bananas from farmers at the markets during market days through haggling. These traders bought a few bunches (ranging between 1 and 6) of bananas and eventually sold them in small units (hands and fingers). Apart from selling green bananas, retailers also undertook ripening of dessert varieties for sale. Retailers played an important role of linking farmers to consumers at the local level.

Producers, village collectors, wholesaler 1, retailer and consumers made up the third marketing channel (Figure 4.3). Village collectors played an important role of assembling bananas from individual farmers at farm gates. They bulked bananas at local markets where they were easily accessed by wholesaler 1. The wholesaler 1 transported their consignment to distant markets where they sold to retailers. Transactions between farmers, village collectors, wholesaler 1 and retailers were all on bunch method. Retailers were important in de-assembling and selling to consumers in hands and fingers.

Channel 4 comprised of farmers, village collectors, broker 1, wholesaler 1, retailers and consumers (Figure 4.3). Along this distribution channel, broker 1 traded within local markets. He or she bought bananas from village collectors and sold to wholesaler 1 in the same market. Broker 1 bought the bananas from village collectors at lower prices (ranging from Ksh 20 to 100 per bunch depending on size of banana) than they sold to wholesaler 1.

The price offered to the village collectors was arrived at through haggling. Broker 1 could buy a number of bananas from a village collector because their consignments were large. Just like in channel 3, the wholesaler 1 sold to retailers in far situated markets.

A few (0.5 %) farmers reported the operations of brokers in Meru County. Farmers indicated that brokers bought from them within the markets and mainly sold to other traders at higher prices. Interviews with the agribusiness officers in the study area revealed that farmers were exploited by brokers who not only bought at the markets but also at the farm gate. The officers indicated that some farmers sold their bananas when still immature to such brokers. Such arrangements may have negative effects on banana value chain given that the negotiated prices depended on the size of the banana. The broker, however, waited for the banana to mature in order to harvest. Consequently, brokers reaped more income from bananas than the farmers. Contrary to the views of agribusiness officers, no farmer who sold at the farm gate identified the traders they sold to as brokers. The farmers referred to such traders as "banana buyers from Nairobi". All the farmers facing the challenge of brokers were of the opinion that the government should ensure that brokers are eliminated from the marketing channel.

Farmers, Banana Farmers Cooperative, wholesaler 1, retailers and consumers made up the fifth channel (Figure 4.3). Farmers sold directly to Banana Farmers Cooperative at the local markets. The Banana Cooperative bought bananas from farmers twice per month through weighing. The buying and selling price was Ksh 14 and 15, respectively. The cooperative sold to wholesaler 1 who bought bananas at the cooperative's premises at Ntharene shopping centre in Meru. Wholesaler 1 sold to retailers in Kangemi open market in Nairobi. The cooperative played an important role of bulking bananas and linking farmers to

markets located in far distances in Kenya. The prices offered by the cooperative were low given that prices of up to Ksh 40 per kg were observed in the markets.

Farmers, broker 1, wholesaler 1, broker 2, retailers and consumers formed the sixth channel (Figure 4.3). In this distribution channel, broker 1 bought from farmers and sold to wholesaler 1within local markets. Just like in channel 4, Broker 1 bought the bananas from farmers at low prices (ranging from Ksh 50 to 150 per bunch depending on size of banana). The price offered to the farmers was arrived at through bargaining. Unlike village collectors who seemed to be better in haggling, farmers easily settled on the offered prices. Involvement of broker 1 in this marketing channel disadvantaged farmers who received a low deal. Upon transporting to other markets, wholesaler 1 sold to broker 2 who in turn sold to retailers who sold to consumers.

The seventh channel was made up of farmers, wholesaler 1, broker 2, retailers and consumers (Figure 4.3). Farmers sold directly to wholesaler 1 at the local markets. Wholesaler 1 then transported the bananas to other markets where they sold to broker 2 who in turn sold to retailers. The bunch method was used in all transactions along this marketing channel.

Channel eight consisted of farmers, wholesaler 1, Meru Green Horticultural Ltd, supermarkets and consumers (Figure 4.3). Farmers sold to a contracted wholesaler 1 in the local markets. This wholesaler bought dessert banana varieties through weighing at Ksh 40 per kilogram. The wholesaler 1, inspected bananas for quality (e.g., plump and green, not broken) before buying, weighed them, cut bunches into hands, cleaned, dried and packaged in crates ready to transport (Plate 3) to the Meru Green Horticulture Ltd premises at Gatimbi (Equator) trading centre in Meru. Wholesaler 1 reported challenges of acquiring

quality bananas from farmers. The Meru Green Horticulture Ltd repackaged the bananas and supplied to high-value markets such as supermarkets.

Plate 3. Buying, Washing and Packaging of Bananas for Transport
Source: Field data (2015)

Farmers, Banana Farmers Cooperative, exporting company, supermarkets and consumers made up the ninth channel (Figure 4.3). Farmers sold directly to Banana Farmers Cooperative in Meru. The cooperative undertook the ripening of dessert bananas and supplied them to an exporting firm in Nairobi. This channel demanded that the cooperative supply quality bananas when needed. On-time delivery was a major challenge to the cooperative which had led to the termination of a supply contract. Meanwhile the cooperative had reduced the consignment they bought from farmers as the management searched for alternative. This meant that farmers had to use other outlets to market their bananas.

The MBFC manager, Mr. Gikokunda and the KAPAP project coordinator, Mr. Muthee noted that marketing of processed bananas (juice and snacks) were in the initial stages and not well established(S. Gikokunda, personal communication, April 21, 2015; G. Muthee, personal communication, May 6, 2015). For instance, the juice by MBFC was still within their premises and not yet distributed to the markets. The solar processing firm proprietors were looking for a market for their first batch of snacks.

4.3.5 Support Activities

Storage, transportation and information flow heightened input supply, production, distribution, marketing and consumption of bananas. At least 50 % of the traders did not store bananas (Figure 4.4) and this may partly be explained with respect to the perishable nature of bananas. Farmers and traders needed to sell when the crop was still fresh. Among the traders who stored bananas, retailers stored for the longest period.Whereas6 days was the maximum length indicated for storage, most of the traders (6.8 %) who stored bananas did so only for a day (Figure 4.4).

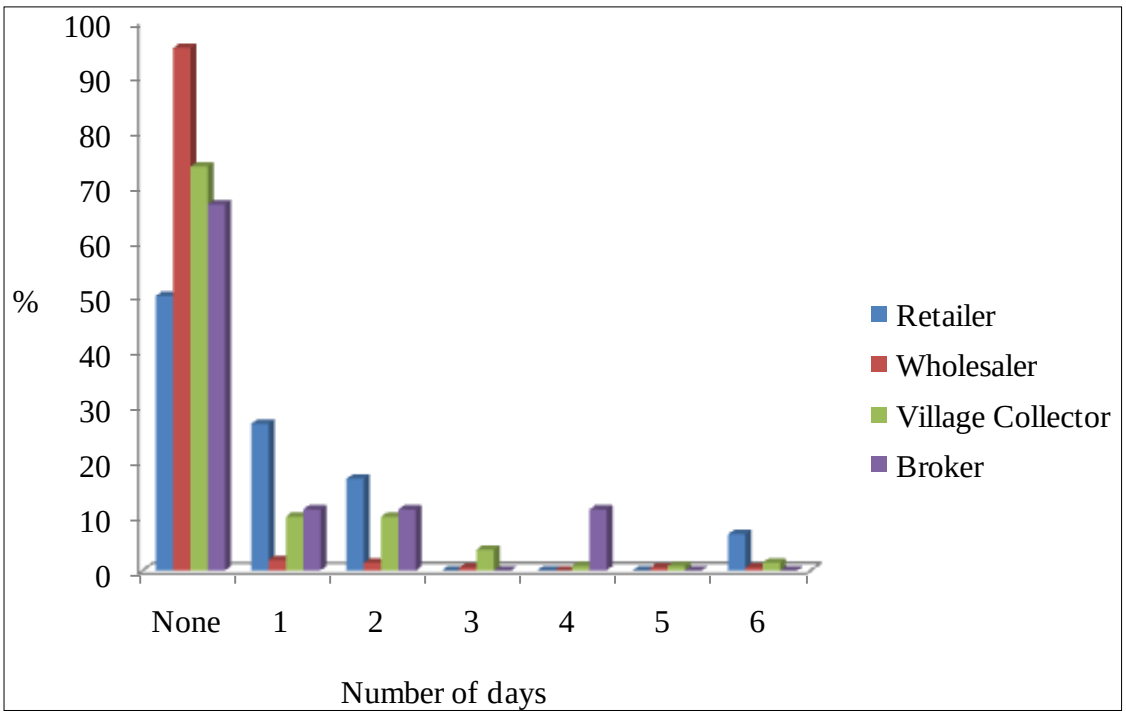

Figure 4.4. Length in Days of Banana Storage by Traders
Source: Field data

Three reasons were given for storing bananas: (i) to ensure that all the bananas a farmer or a village collector intended to sell in a given market day were all transported to the market; (ii) to accumulate a sizeable banana load for sale; (iii) to ripen. While the first reason has implications on transportation, the second relates to availability of bananas, and the third on value addition. The importance of a store for agricultural commodities has been reported in

other studies (Jeckonia et al., 2013; Mwithirwa, 2010; Wambugu, 2005). For instance, Jeckoniaet al. (2013) found out that the longer the period farmers in Tanzania stored onions, the better the prices they fetched. However, due to lack of an alternative source of income, only a few farmers stored the onions. Wambugu (2005) observed that traders stored maize for bulking and to a wait price rise. Mwithirwa (2010) noted that majority of traders (61 %) and (40 %) in Meru South and Mbeere districts, in that order stored their maize and beans to await higher prices. Other reasons given by traders in the Mbeere and Meru South were; bulking (21% and 18 %), bulk-breaking (17% and 7%), and lack of transport (7 % and 25%). While both Mwithirwa (2010) and Wambugu (2005) observed that grains could be stored in price speculations, this was not the case for bananas.

Apart from retailers within local markets in Meru County who stored bananas within the market premises, other traders kept them in the open spaces along the roads. Whereas the stores in Meru County were not enough for all the traders, they were also not designed to take care of the perishable nature of bananas. For instance, there were no coolants. Therefore, bananas were mainly sold immediately after harvesting and markets acted as transition points from Meru to deficit regions. Selling immediately after harvesting provided opportunities for farmers to be exploited by traders who dictated prices. Problem of banana storage is not unique to Meru as it has been reported in Uganda (Kiiza et al., 2004; Spilsbury, Jagwe,& Ferris, 2002).Kiizaet al. (2004) found out that due to lack of storage facilities, bananas in Uganda were sold on the spot exposing farmers to exploitation by traders. Spilsbury et al. (2002) reported that storage of bananas in Uganda was improved through drying and alcohol production.

4.3.6 Banana Availability and Price Information Flow

The study revealed that 35 % of the farmers did not seek information on banana prices (Figure 4.5). Having farmers ignorant on the prevailing prices in banana markets meant that farmers were likely to be taken advantage of by traders as they would accept whatever prices were offered to them. Such a scenario meant that as main actors along banana value chain, farmers were not reaping benefits for their activities.

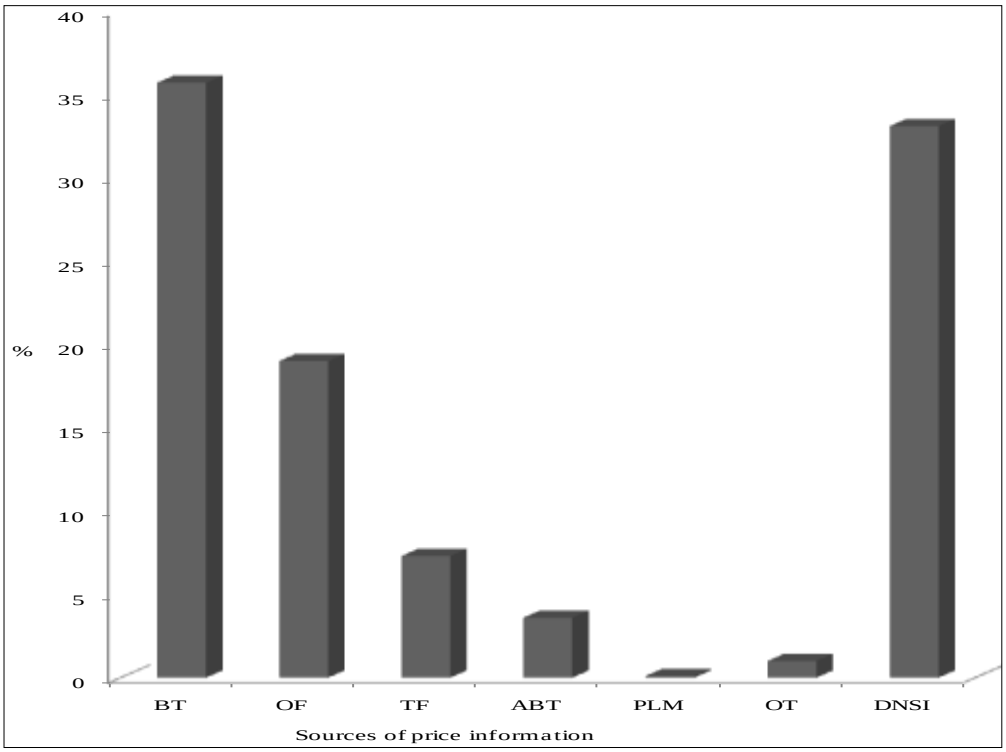

Figure 4.5. Sources of Market Price Information by Farmers. BT - banana traders, OF - other farmers, TF - traders and farmers, ABT - amount of bananas and traders at the market, PLM - prices of bananas in the last market, OT – other such as agribusiness officers, DNSI – do not seek for information.
Source: Field data (2015)

This finding agrees with other agricultural studies in developing nations (e.g., Jaeger, 2010; Jeckoniaet al., 2013; Piper, 2007).Jeckoniaet al. (2013) found out that onion farmers in Tanzania lacked reliable information on prices and availability of onions creating a chance to be exploited by brokers and middlemen. Piper (2007)and Jaeger (2010)note that farmers in developing nations lacked adequate knowledge on market information.

Although majority (66.9 %) of the farmers searched for price information, the methods they used to acquire it delivered limited information (Figure 4.5).Contacting traders was the most (35.7 %) used source, followed by other farmers, traders and farmers, amount of banana and traders in markets, prices of the previous market and others in that order. Use of banana traders would allow farmers to have an idea of the prevailing markets at the national level because wholesalers were widely travelled. Contacting other farmers indicates the importance of social ties in farming activities. Nevertheless, the information shared was likely to be limited to the local area given that a substantial number (more than 25 %) of farmers did not seek for information. Apart from being a time-intensive process, information acquired during market visits was confined to local markets. This meant that such farmers were guided by narrow (local) rather than broad (national and international) sources of information in determining selling prices.

Similar methods of acquiring market information have been documented in other studies (e.g., Muendo et al., 2004; Mwithirwa, 2010; Onumah, Davis, Kleih, & Proctor, 2007). Muendo et al. (2004) established that market information around the boarder markets in Kenya was mainly (92 %) by word of mouth from friends, relatives and fellow business people.Mwithirwa (2010) noted that 60 % and 71 % of traders in Meru South and Mbeere, respectively relied on other traders.

Although more than half (53.1 %) of all banana traders indicated that market information was important to them for decision making, majority of them(62.8 % and 69 %),did not seek information on banana prices and availability. An in-depth interview with traders to establish why they did not seek for market information revealed that such traders did not plan beforehand on the quantity of bananas to buy. Decisions were instead based on the prevailing prices once in the market. Traders who sought market information indicated that

they relied on other traders for the information. These findings imply that traders were better empowered than farmers in terms of controlling prices. This was because traders interacted with consumers and therefore had afore knowledge of the demand for bananas.

Seventy per cent of traders who sought information on banana prices and availability did not receive it when needed. Not getting information on time meant that traders made uninformed decisions and this hindered competitive participation not only for traders but for farmers too. Mwithirwa (2010) had made a similar observation in Meru and Mbeere districts in relation to maize and beans markets. He noted that there was poor information flow as traders (60% and 71% for Meru South and Mbeere, respectively) who relied on other traders acquired information either from markets they were currently trading with or those that they had recently traded with.

Most farmers (89.1 %) sold to any available buyer and most traders bought from any farmer (89.3 %) and sold to any buyer (87.8 %) (Table 4.10). The farmers and traders dealing with any available customers had only a brief business relationship determined by the length of a single transaction. Only a few of the farmers (10.9%) had specific buyers they sold to (Table 4.10).

Table 4.10: *Type of Customers for Banana Farmers and Buyers*

	Yes		No	
Selling / Buying Customers	f	%	f	%
Traders				
Specific customers you buy from	41	10.7	343	89.3
Specific customers you sell to	47	12.2	337	87.8
Farmers				
Specific customers you sell to	42	10.9	342	89.1

Source: Field data (2015)

Farmers and traders with specific customers related with them informally on trust basis. In such relationships quality of bananas and "fair prices" were central for the partners. Similar relationship existed with farm-gate transactions. However, in such transactions, farmers, allow banana buyers to decide prices for them, compromising the profits they earn. The finding on relationships based on mutual trust concurs with Singgih and Woods (2003). According to Singgih and Woods (2003), the relationship between banana farmers and buyers in Indonesia was founded on traditional village values comprising of trust and peasant solidarity.

4.3.7 Transportation of Bananas

Both motorized and non-motorized means of transport were used by banana farmers and traders in the study area to meet their transport needs (Figure 4.6). They included; human porterage (on either shoulder or back), wheelbarrows, ox-carts, *bodaboda (*motorcycles), and motor vehicles (*matatus*, probox, pick-ups and lorry) (Figure 4.6).

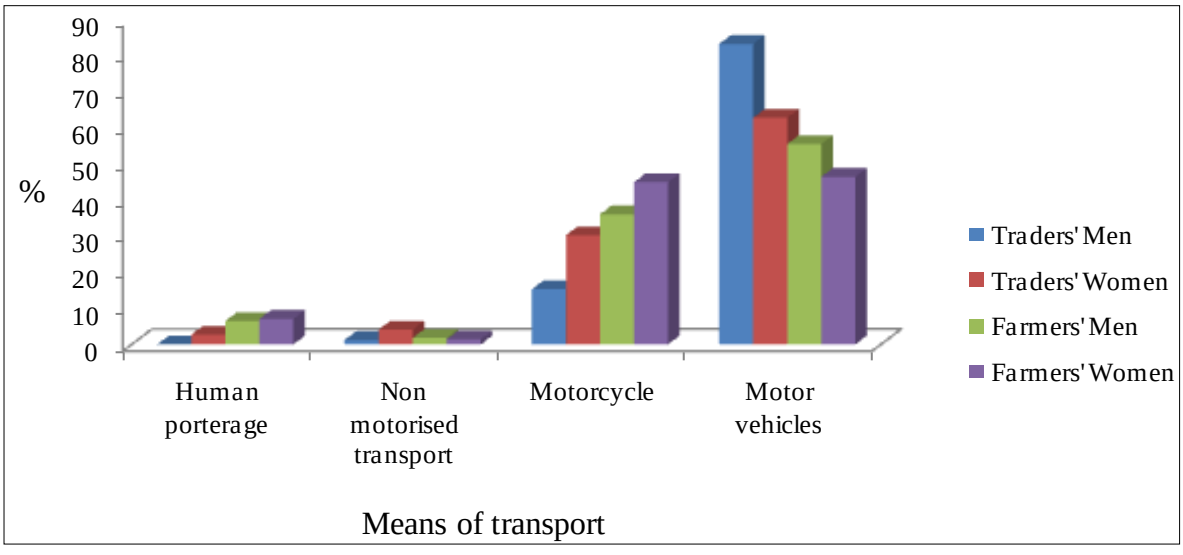

Figure 4.6. Means of Transport Used by Both Men and Women Traders and Farmers
Source: Field data (2015)

As Figure 4.6 shows, both men traders and farmers used motor vehicles more than other means to transport their bananas. The high use of motor vehicles may be explained with respect to the distances covered, bulkiness and quantity of bananas transported. More than 48 % of traders covered distances of more than 51 kilometres. The use of motor vehicles to transport bananas over such long distances enabled the traders to get the fruit to the market when still fresh. Consequently, traders enhance their banana sales as freshness is preserved. High use of motorised means of transport by agricultural commodity traders compared to non-motorised has been reported in other studies (e.g., Wambugu, 2005). Wambugu (2005) reported that 151 and 129 maize traders used motorised and non-motorised means of transport, respectively, to carry their loads.

Following the use of motor vehicles was motorcycles. Women used motorcycles more than men. Compared to motor vehicles, the load transported by motorcycles is small. Although only a small percentage of both men and women used human porterage, women were more than men. The banana load carried by human porterage was relatively small (1 to 2 bunches) compared to motorcycles. These results imply that women are disadvantaged, transporting only small consignments at a time. These findings concur with findings by Mbuthia (2003) that women in rural areas carry loads on their back more than men.

Although the use of wheelbarrows allowed an increase in the load an individual would carry, they relied on human effort to push them. Use of wheelbarrows and ox-carts were confined to areas where the terrain was relatively flat. Findings on use of both motorized and non-motorized means of transport in meeting on farm transport needs have been documented in other agricultural studies (e.g., Jeckonia et al., 2013).Jeckonia et al. (2013)

found out that farmers in Tanzania used oxen carts and small tractors to transport oninos from the farm to the households or stores.

Farmers could start a trip by carrying bananas on their shoulder or backs to a roadside where they would board matatus to the market. Where matatu terminus was not a banana market, motorcycles were used to ferry bananas to the market. Traders began their trips mainly on human porterage. For example, a wholesaler trader buying at the market required the selling farmers to transport the bananas to his or her designated collection point. Farmers or hired transporters chiefly carried the bananas on their backs or shoulders to such points. Alternatively, wheelbarrows were used. The researcher observed that there were bruises and breakages of banana fingers as the load was transferred from one means to another. Bruised and broken banana fingers lowered the quality of bananas. Buyers were occasionally seen pointing at such damages and using them to bargain for lower prices where the bunch method was used. The damages disqualified the banana from weighing selling.

Poor roads were an important challenge to banana farmers and traders in Meru County. It was the third most mentioned by both farmers (11.1%) and traders (11.4 %). Feeder roads became impassable during rainy seasons and some main roads deplorable. Muddy roads posed further challenges by limiting the use of motorcycles, a popular means of transport after motor vehicles for farmers. Slippery roads led to rise in accidents for both human porterage and motorcycle users. Apart from exposing individuals to ill health, bananas transported through these means were damaged in such accidents. During rainy seasons, farmers who in dry periods transported two to three bananas on their backs reduced the load to one. Consequently, more trips were made to transport a load equivalent in size to one during dry seasons. Otherwise, a farmer sold less. Motorcycle transporters charged more

during rainy seasons. About 9.6 % of the farmers suggested that the government should improve the roads by upgrading feeder roads and repairing the dilapidated parts of highways to make them passable in all seasons.

The problem of poor roads is in congruent with other studies on rural areas in Kenya (Mbuthia, 2003;Miriti, 2011; Mwithirwa, 2010; Wambugu, 2005). Mwithirwa (2010) found out that 95 % of the traders used poorly maintained dry weather roads to access major buying areas. Miriti (2011)reported that bad rural roads was the main constraint (highest ranked) facing bananas in Imenti South. Wambugu (2005) noted that majority of male and female (73 % and 53 %, respectively) maize traders used dry weather roads which became impassable during rainy seasons. The study further reported that other roads were dilapidated and poorly maintained. Mbuthia(2003) found out that muddy routes were highest rated (89%) farm level constraint by farmers in Mwea Irrigation Scheme.

High transport costs were reported by 4.6 % of the traders. Traders particularly, those who bought bananas in large volumes reported that the means of transport from the study area to the selling destinations were not readily available. It was only after accumulating enough consignment at the market that banana traders sought for transport services. The traders pointed out that the transport providers were either unavailable or available but demanding high pay for the service. Transport charges depended on distances covered, means of transport to be used and the load size to be carried. In an attempt to overcome this, several traders team up and approach the available transport providers and then negotiate for the service. Otherwise, the traders would have to wait, sometimes overnight until a transport provider is available.

In addressing the high transport costs, traders used two methods aimed at reducing banana volume. One of the methods involved wrapping together of two to three bunches (see Plate

2). Whereas the transport charges for an average bunch from Meru to Nairobi was Ksh 40, transporting two or three bunches wrapped together cost Ksh 70. The other method necessitated the cutting of bunches into hands and packaging them in sacks, locally referred to as *mutumba* (Plate 2). One sack comprised of 7 to 9 medium sized banana bunches and was charged Ksh 80 on average to transport from Meru to Nairobi. Some transport providers preferred to transport bananas packaged in this manner. It is however, important to note that these methods of transporting bananas are not recommended (Muchui et al., 2013). The methods compromised the quality of bananas and reduced their shelf-life.

Time wastage was reported by a few (1.1 %) traders. Time wastage related to traffic jams, banana packaging and wrapping at the buying location and unwrapping of the same at the selling point. Traders who sold their bananas in Nairobi identified traffic jam as a time waster. Although traders could not provide exact time used in traffic jam and banana "packaging" exercise, the researcher observed that at least 20 minutes were used in wrapping one load of three bananas. Such an amount of time was spent because keenness was required in arranging and cushioning the banana to ensure that none or minimal breakage of fingers occurred. The *mutumba* packaging used more time than 20 minutes given that at least seven banana bunches had to be cut into hands for packaging. Time used in traffic jam, packaging and un-packaging of bananas affected the freshness of bananas. To overcome the challenge of traffic jam, traders (0.3 %) planned to travel at night when movement was easy as road use was not high.

Other reported constraints included: lack of adequate capital (0.3 %), non-recognition of banana trade by the government (0.3 %), and non-suitability of banana trade to youths (0.3%). The three constraints were not reported by any farmer and were not dominant among traders. Nevertheless, these constraints may have impact on farmers' decision

making. For instance, the importance of capital in establishing a business and the role of the government in agricultural activities need not be overemphasized. In cases where banana traders cannot expand their business due to lack of capital, they end up buying small consignments from farmers.

Non-suitability of banana trade to youths was reported by a female trader who had completed secondary education. She was of the opinion that educated youths should have white collar jobs and not work in markets. The observation that banana trade did not befit youths implied that some agricultural activities are not attractive to young people.

4.4 Opportunities in Banana Value Chain in Meru County

Almost all the farmers (97.7 %) owned the farms on which they produced bananas. Given that banana is perennial, private land ownership partly encouraged farmers to invest in its husbandry due to security of tenure. Importance of land tenure in influencing investment in agriculture has been reported by other banana farming studies (e.g., Karembu, 2002). Karembu (2002)found out that where farmers were below 40 years and did not own the land, they did not plant TC bananas but rather cultivated short term crops like beans and vegetables.

Huge TC varieties such as *mkia wa chui* were observed and reported by the farmers. The MBFC manager reported that huge bananas would weigh between 75 kg and 80 kg on average (S. Gikokunda, personal communication, April 21, 2015). Farmers reported that a bunch of *mkia wa chui* was expected to always sell at a minimum of Ksh 500.Such large bananas indicated that quality could be achieved in production and consequently earn farmers more in selling. Production of such bananas could partly be due to the favourable soils and weather, and application of irrigation in Meru County. Favourable soils and

weather conditions, and irrigation have been accredited for flourishing of bananas in the County (Ministry of Agriculture, 2013; MOALF, 2015; 2016).

Interviews with key informants revealed that banana processing into products such as snacks and juices was on small scale. Banana processing into snacks was undertaken by the solar drying banana firm, at Mitunguu trading centre in Meru County. The solar processing firm was founded by a group of 5 banana farmers at Mitunguu trading centre. The firm was established in January 2015 and these proprietors supplied bananas from their farms for processing. By May 2015, the solar processing firm had its initial solar dried snacks in the market. The proprietors engaged themselves in marketing the snacks too. This involvement of farmers in other activities or vertical integration in the banana value chain has potentials in managing price risks for the producers in Meru County. Besides, the County has potentials to diversify banana markets through value addition. The finding on farmers' involvement in running the solar dried snack processing industry differs from results by Ouma and Jagwe (2010) that banana beer processing cottage industries in Central Africa were operated by traders. Those traders acquired bananas for processing from wholesalers who bulked from farmers.

An interview with the MBFC manager revealed that the cooperative began operating in the year 2014. Upon its establishment, the cooperative engaged itself in selling bananas on behalf of farmers either in raw form or after ripening. By the time of data collection for this study, the MBFC staff processed banana juice and were searching for a market. Furthermore, on April 2015, the MBFC management board was undergoing training on other banana value addition practices (such as making of banana jam, purée and crisps) by experts from JKUAT. The banana value addition could prolong the shelf life of bananas, create more jobs in the sector and enhance domestic and international marketing. Lack of

well established banana value addition activities along the chain has been reported in other banana studies (e.g. Mwangi & Mbaka, 2010; Ouma & Jagwe, 2010). Mwangi and Mbaka (2010) recommended that maximising banana value through improving packaging and labelling to differentiate products would promote competition. Ouma and Jagwe (2010) noted that banana beer processing in Central Africa – Rwanda, Burundi, and eastern Democratic Republic of Congo – was done using rudimentary techniques in cottage industries. Nevertheless 4 % of the banana beer was exported to the regional markets (Ouma & Jagwe, 2010).

Both banana snack and juice processing involved five similar preliminary or preparation steps (Figure 4.7). Upon harvesting, bananas were sorted to eliminate those of poor quality. After sorting, bananas were washed in clean water, dried and ripened. On ripening, the bananas were peeled and the main processing of juice and solar dried snacks' proceeded. The main steps in solar dried banana snacks processing includes slicing, sun-drying and packaging ready for consumption markets (Figure 4.7).

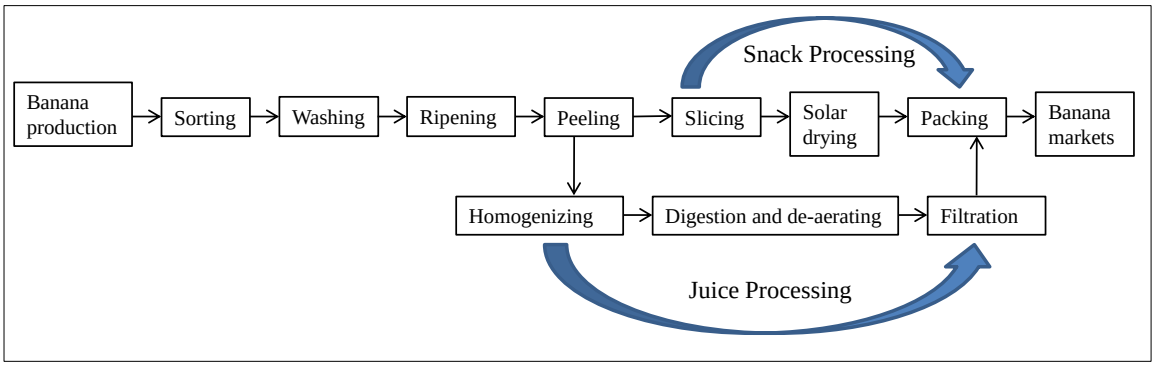

Figure 4.7. Banana Snack and Juice Value Chain
Source: Field data (2015)

As Figure 4.7 shows banana juice processing involved four main steps (homogenizing, digestion and de-aerating, filtration, and packaging in bottles). The juice processing was being undertaken by Meru Banana Farmers Cooperative. Both banana juice and snack value

chain in Meru County manifest predominance of small scale industries. Such industries have great potentials of creating differentiation in banana markets through value addition. Similar results were reported by Kiiza et al. (2004) who noted that whereas about 200 banana products such as juice, wine (*tonto*), gin (*waragi*), banana pulp based bakery (*kabalagala*) among others exist in Uganda, only a few (e.g., gin) were fully developed and industrialized. The other products were processed locally, in small scale and often in poor quality.

The research revealed that there is a demand at local and national levels for bananas produced in Meru County. At a local level, bananas produced in Meru County were sold in regions of the county that had low production (see Table 3.2). Mr. Mburugu, agribusiness officer in Igembe South, expressed the dire need for bananas in Igembe North, Igembe Central, Tigania East, and Tigania West, "our bananas are not sufficient to feed our very own" (D. Mburugu, personal communication, July 16, 2015). Igembe North, Igembe Central, Tigania East, and Tigania West have for years relied on khat as their main cash crop (Anderson & Carrier, 2009;Carrier, 2005; Riak, 2014). Dependency on khat is threatened by recent bans by importing nations (Klein, 2013; Riak, 2014).

Besides the demand for bananas at the local level, the study found that there was a national demand. Bananas from Meru County were sold in at least 12 counties in Kenya. The domestic demand is expected to continue rising in view of the ever increasing urbanisation paralleled by high demand for fruits (Hope, 2012; World Population Prospects, 2017).

An interview with the MBFC's manager revealed potential opportunities to participate in banana value chain internationally. The manager reported that the cooperative had in the year 2014 signed a contract with an exporting horticulture company based at Embakasi in Nairobi to supply ripe sweet bananas. However, the cooperative had the contract cancelled

on March 2015 as a result of failing to supply on time (S. Gikokunda, personal communication, April 21, 2015). It is important to note that in order to participate in international market, small-scale farmers must overcome several hurdles. For instance, farmers must produce quantity and quality bananas as well as supply on time. These requirements are not unique to small-scale banana farmers as other agricultural studies (e.g., Keleman et al., 2009) have made similar observations. Keleman et al. (2009) noted that small-scale maize farmers in Mexico needed to produce quantity and get information in order to compete in global markets with large-scale producers.

Meru County is endowed with perennial rivers that provide water for irrigation (MOALF, 2016). Banana farming is therefore, largely done under irrigation where terrain is favourable. Extension officers in the study area and the Crops officer at Kaguru Training Institute indicated willingness to assist farmers. Based on these strengths, the land under cultivation could further be expanded through use of irrigation techniques that conserve water.

Informal relationships (relations based not on official documents such as contracts) were prevalent between the main actors (farmers, MBFC, Solar processing firm, MGH Ltd, brokers, village collectors, retailers, wholesalers, transporters, and consumers) in banana value chain of Meru County. Transactions between such actors were on the basis of friendship and neighbourhood. For instance, majority of the farmers (84.9 %) who used suckers for propagation indicated that they were given by other banana farmers. Such relationships of mutual trust indicate the importance of social networks in farming communities. Such relationships imply that there are strong social ties in the county which are likely to promote local development. However, the information such actors share is usually limited in spatial coverage.The findings concur with Kerbaga (2010) and Singgih

and Woods (2003). Singgih and Woods (2003) ascertained that small-scale banana farmers in Indonesia and Australia relied on a trust partnership with traders. Indonesians based their trust on traditional value systems while Australians grounded theirs on past experience. Kerbaga (2010) established that traders, brokers and wholesalers, in poultry in Ethiopia had only a business relationship founded on mutual trust.

Farmers and traders who sold to MGH Ltd had a contractual partnership. Although the farmers contracted by the MGH Ltd produced without the supervision of the firm, they were guided by specified production and post-harvest handling terms, price determination rules and delivery schedules. For instance, farmers were to harvest mature bananas (fingers must be rounded and smooth), not infested by pests and diseases, not broken or damaged and prices were decided by the company. The firm, however, provided advice on crop management on need-to-know basis to contracted farmers. Such contracts points to potential opportunity of using private firms as important partners with small-scale farmers in banana value chain.

The partnership would enable farmers to acquire knowledge and skills on production and market demand enabling farmers to competitively participate in the banana value chain. Benefits of contractual operations have been highlighted by other agricultural studies including Zamil and Cadilhon, 2009. The study noted that Mr. Abdul Kadir, the owner of Konika Mushroom Ltd, based in Mymensingh in Bangladesh demanded from 20 contracted small-scale urban mushrooms farmers to supply to his company fresh and clean, packaged in polyethylene bags bearing the label, ‘This mushroom is a product of the FAO-supported group Jhinuk Mushroom producer Group and marketed by Abdul Kadir of Konika Mushroom, Mymensingh’ and a date of packaging (Zamil & Cadilhon, 2009). The business man however, trained farmers on quality mushroom production.

Besides the farmers, the MGH Ltd had contracted traders. Like the farmers, the traders were also guided by contractual rules. For instance, the trader had to ensure quality of bananas delivered to the Company. Such traders, therefore, inspected bananas before buying, washed the bananas in clean water, and used crates in transporting to the Company. Transporting bananas in crates is one of the recommended post harvest handling method (Muchui et al., 2013).

Short distances were covered by banana farmers to markets. About half of banana farms (47.7 %) were located within a distance of up to 2 kilometres from the nearest banana market, 43 % between 2.1 kilometres to 6 kilometres and only 2.9 % covered more than 8 kilometres (Table 4.11). On average, the distance covered in the entire study area was 3.3 kilometres. Short distances between farms and markets implied that farmers could easily move inputs from markets to the farms as well as transport bananas to markets with ease. Being in a position to move bananas to the markets on time would reduce post harvest waste given that the commodity is highly perishable. These distances formed the initial steps of long journeys that banana traders travelled to sell their ware in deficit regions.

Table 4.11: *Distance between Banana Farms and Nearest Banana Market in Meru County and the ANOVA Results*

Distance (km)	Imenti North		Imenti South		Imenti Central		Igembe South		Entire sample		*F* ratio	*F* probability
	f	%	f	%	f	%	f	%	f	%		
Up to 2	43	44.8	63	65.6	26	27.1	51	53.1	183	47.7		
2.1- 4	15	15.6	16	16.7	18	18.8	34	35.4	83	21.6		
4.1 – 6	21	21.9	9	9.3	45	46.9	7	7.3	82	21.4		
6.1 – 8	13	13.5	4	4.2	5	5.2	3	3.1	25	6.5		
More than 8	4	4.2	4	4.2	2	2.1	1	1.0	11	2.9		
Total	96	100	96	100	96	100	96	100	384	100		
Mean Distance	3.5		2.5		4.1		2.6		3.3		12.007	**.000**

Source: Field data (2015)

The distances however, varied from one sub-county to the other as follows; 3.5 km in Imenti North, 2.5 km in Imenti South, and 4.1 km in Imenti Central, and 2.6 km in Igembe South(Table 4.11).An *F* test results indicated a significant ($p < .000$) difference between distances travelled between farms and the markets in different locations in Meru County (Table 4.11). Therefore, the hypothesis that there is no significant difference in average distances travelled between banana farms and markets in different locations of Meru County could not rejected.

The finding on modal split concurs with findings of other studies on rural farming (Mbuthia, 2003; Mwithirwa, 2010). Mwithirwa (2010) established that traders used different means of transport as a method of coping with transport challenges. The study identified such means as wheelbarrows, head loads, *mikokoteni* (hand carts), cars, pick-ups and lorries. Wheelbarrows, head loads, hand carts came in handy in transporting small quantities of products or for moving products within the same market. Mbuthia (2003) found out that human porterage, bicycle, ox- and donkey-drawn carts contributed vastly to the bulking of goods (e.g., French beans) at the local markets after which motor vehicles were used for further transportation to national markets and exporting firms.

It was established based on the SWOT analysis that the various components of banana value chain in Meru County comprised of unique constraints and opportunities. In addition, actors in banana value chain in Meru County have unique capacities of addressing the constraints and exploiting the opportunities. For instance: at input provision level, farmers were able to harden plantlets on their farms to make up for the deficit; at production, Kaguru Training Institute was open to farmers who needed to consult on banana production; the Solar dried processing firm was already processing snacks; at marketing,

MBFC sought for buyers and sold bananas on behalf of farmers; and in transport level, various carriers and means of transport were available.

The SWOT analysis in Table 4.12 provides management options derived from criticalanalysis of strengths, weaknesses, opportunities and threats in banana value chain.

Table 4.12: *A SWOT Analysis Matrix for Strategic Management of Banana Value Chain*

Internal factors / External factors	Strengths (**S**)	Weaknesses (**W**)
	S_1Established irrigation projects **S_2**Acceptance of banana as a commercial crop **S_3**Established local banana buyer **S_4**Extensive road network **S_5**Favourable soils **S_6**Continuous supply throughout the year **S_7** Strong community ties	**W_1**Small farms **W_2**Poor irrigation method (overhead sprinkler) **W_3**Poor state of roads **W_4**Inadequate production and marketing information **W_5**Lack of technical know-how by farmers **W_6**High levy charges in markets **W_7**Expensive and inadequate inputs **W_8**Pests and diseases **W_9**Failure to honour contracts by MBFC **W_{10}**Minimal involvement in regional and international markets **W_{11}**Crop fall **W_{12}**Middlemen or brokers **W_{13}**Wildlife (Monkey) crop destruction **W_{14}**Limited banana value addition **W_{15}**Long distribution channels **W_{16}**Low bargaining power of farmers **W_{17}**Inadequate labour **W_{18}**Lack of credit
Opportunities (**O**) **O_1**Increased sales to domestic Kenya's market **O_2**Sales to international market **O_3**Research and development **O_4**Fertile land and perennial rivers coupled with favourable terrain for use of gravity irrigation **O_5**Produce high value added banana products **O_6**Farming of new banana variety	Strengths + Opportunities (**SO**) • Private institutions and farmers to work hand in hand to capture the domestic and international banana markets (**S_2, S_3, S_4, S_7,O_1, O_2, O_4, O_5)** • National and County government to collaborate with the private investors in providing plantlets and training of farmers on production and value addition (**S_1, S_2, S_3, S_4, S_5, S_6, O_3, O_4, O_5, O_6)**	Weaknesses + Opportunities (**WO**) • Set up an information centre in Meru County (**W_4, W_9, W_{10}, W_{12}, W_{14}, W_{15}, W_{16}, $W1_8$, O_1, O_2, O_5, O_6**) • County and National government to increase agricultural officers in Meru (**W_5, W_8, W_{11}, O_3, O_4, O_6)** • Encourage vertical integration of actors (**W_9, W_{10}, W_{12}, W_{15}, W_{16}, O_1, O_2, O_5** • County government to improve infrastructure in Meru (**W_1, W_2, W_3, O_3, O_4)**
Threats (**T**) **T_1**Substitutes **T_2**Competition from other regions **T_3**Weather pattern changes **T_4**High cess	Strengths + Threats (**ST**) • Combine economic and ecological development (**S_1, S_2, S_3, S_4, S_5,T_1, T_2, T_3)** • National government to lower or eliminate cess (**S_2, S_4, S_6,T_4)**	Weaknesses + Threats (**WT**) • Reduce marketing costs **(W_1, W_2, W_3, W_4, W_5, W_6, W_7, W_8, W_{11}, W_{12}, W_{16}, W_{18}, T_1, T_2, T_4)** • Enhance climate change awareness campaigns (**W_2, W_5, W_8, T_1, T_2, T_3)**

Source: Field data (2015)

Strengths and weaknesses were merged with opportunities and threats and the resultant interaction used to construct options that have potential of improving the efficiency of the value chain by addressing the constraints. Each strategy adopted makes use of the already existing strengths and opportunities to check on the weaknesses and threats facing the banana value chain.

Based on the SWOT analysis, this study suggested the following strategies for improving the efficiency of banana value chain in Meru County:

1. Private institutions and farmers to work hand in hand to capture the domestic and international banana markets
2. National and County government to collaborate with the private investors in providing plantlets and training of farmers on production and value addition
3. Combine economic and ecological development
4. National government to lower or eliminate cess
5. Set up an information centre in Meru County
6. County and National government to increase agricultural officers in Meru
7. Encourage vertical integration of actors
8. County government to improve infrastructure in Meru
9. Reduce marketing costs
10. Enhance climate change awareness campaigns

The scoring results revealed that 11of the 21 mini-drivers and three of the five main drivers of banana value chain had negative evaluation values (Table 4.13). The mini-drivers with negative evaluation values were; pests and diseases (-1.0), irrigation (-0.67), extension services (-0.5), licences/cess/levy (-0.42), training (-0.33), credit (-0.17), price information (-0.17), selling price (-0.14), availability of seedlings (-0.14), artificial fertiliser (-0.05), and weighing method (-0.04) in that order (Table 4.13). This implies that pests and diseases is a significant constraint bearing much on the functioning of banana value chain in Meru County. It is followed by irrigation, extensive services, licences/cess/levy, training, credit, price information, selling price, availability of seedlings, artificial fertiliser and weighing method.

Table 4.13: *Main Drivers and Mini-drivers influencing the Efficiency of Banana Value Chain in Meru County*

Main drivers and mini-drivers	Relevancy		Weight	Drivers evaluation
Inputs				
Seedling availability	UF	-1	0.14	-0.14
Artificial fertilizer	UF	-1	0.05	-0.05
Organic manure	F	1	0.24	0.24
Water	F	1	0.29	0.29
Labour	N	0	0.09	0
Land	F	1	0.19	0.19
Total	**1.0**			**0.53**
Technology				
Tissue culture	F	1	0.33	0.33
Irrigation	UF	-1	0.67	-0.67
Total	**1.0**			**-0.34**
Marketing				
Quantity of bananas	F	1	0.25	0.25
Weighing method	UF	-1	0.04	-0.04
Bunch method	VF	2	0.18	0.36
Selling price	UF	-1	0.14	-0.14
Licences/cess/levy	VU	-2	0.21	-0.42
Distance covered	N	0	0.11	0.0
Means of transport used	N	0	0.07	0.0
Total	**1.0**			**0.01**
Coordination				
Training availability	UF	-1	0.33	-0.33
Extension services	UF	-1	0.50	-0.5
Price information	UF	-1	0.17	-0.17
Total	**1.0**			**-1.0**
Enabling environment				
Credit	UF	-1	0.17	-0.17
Pests and diseases	VU	-2	0.50	-1.0
Road maintenance	N	0	0.33	0
Total	**1.0**			**-1.17**

Note. VF - very favourable = 2; VU - very unfavourable = -2; F - favourable = 1; N - Neutral = 0; and UF - unfavourable = -1

Source: Field data (2015)

These mini-drivers negatively affect or pose limitations to the operation of the main drivers within which they operate. For instance, unavailability of seedlings and artificial fertiliser

hinder inputs effectiveness in banana production. However, unavailability of seedlings has greater effects than artificial fertilisers. Thus, any intervention intended to improve the functioning of various main drivers or components of banana value chain should prioritize mini-drivers bearing negative values.

The three main drivers with negative evaluation values were; an enabling environment (-1.17), coordination (-1.0), and technology (-0.34) (Table 4.13). This finding implies that lack of an enabling environment is the most significant challenge impeding the functioning of entire banana value chain. It is followed by poor chain coordination and finally insufficient and inadequate use of technology.

The mini-drivers and main drivers with positive evaluation values were as follows: mini-drivers - bunch method (0.36), tissue culture (0.33), water availability (0.29), quantity of bananas (0.25), organic manure (0.24), land (0.19), labour (0), distance to markets (0), means of transport used (0), and road maintenance (0) (Table 4.13). Main drivers were inputs (0.53) and marketing (0.01) (Table 4.13). Mini-drivers bearing positive evaluation values enhanced the performance of the main driver they operated in. For instance, organic manure, water availability, labour and land contributed towards enhancing inputs as the main driver. If such mini-drivers are able to neutralise the ones bearing negative evaluation values then their main driver is significant in enhancing the efficiency of the chain.

Based on the scoring results interventions for bettering the efficiency of the banana value chain in Meru County should prioritise improving the environment within which the chain operates. For instance, the challenge of pests and diseases should be addressed as well as availing credit to farmers with the hope that they would invest in banana production, processing and marketing.

In order to overcome the challenge of banana value chain coordination, lack of training of farmers and traders, inadequate extension services and poor information flow should be addressed. Efforts aimed at addressing the problem related to technology use in Meru County should focus on irrigation aspects.

4.5 Spatio-Temporal Distribution of Banana Periodic Market Places

The results of this study revealed that the distances between all the banana markets ranged from 0.9 kilometres to 68.1 kilometres(Table 4.14).While some markets are relatively closer together (e.g.,Ntharene and Kanyakine), others were widely spaced (Gakoromone and Maua) (Table 4.14). Mapping of banana periodic markets in Meru County revealed that three markets are closely located within Igembe South while the rest are within Imenti South, Imenti Central, and Imenti North (Figure 4.8). Most (8) of the markets are in Imenti South perhaps due to its high gross banana production (Table 3.2).

Table 4.14: *A Matrix showing Euclidean Distances in Kilometres between Banana Markets*

Market	1	2	3	4	5	7	8	9	10	11	12	13
1	0	7.9	9.4	68.1	67.3	61.6	63.8	65.9	62.6	62.5	61.8	62.3
2	7.9	0	2.5	67.2	67.1	61.2	64.5	64.7	62.8	63.0	62.5	60.8
3	9.4	2.5	0	64.8	64.6	59.0	62.3	61.9	60.7	60.7	60.5	58.5
4	68.1	67.2	64.8	0	4.5	7.0	7.8	5.1	10.8	10.2	12.9	9.6
5	67.3	67.1	64.6	4.5	0	5.6	4.0	9.2	6.9	6.4	9.0	13.2
7	61.6	61.2	59.0	7.0	5.6	0	4.1	8.9	5.9	5.2	7.6	10.8
8	63.8	64.5	62.3	7.8	4.0	4.1	0	11.5	3.3	3.2	1.8	15.7
9	65.9	64.7	61.9	5.1	9.1	8.9	11.5	0	14.1	13.5	16.2	4.8
10	62.6	62.8	60.7	10.8	6.9	5.9	3.3	14.1	0	0.9	2.1	16.4
11	62.5	63.0	60.7	10.1	6.4	5.2	3.2	13.5	0.9	0	1.8	15.7
12	61.8	62.5	60.4	12.9	9.0	7.6	5.1	16.2	2.1	1.8	0	18.2
13	62.3	60.8	58.5	9.6	13.2	10.8	14.3	4.8	16.4	15.7	18.2	0

Note. 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, and 13, forming the column and row headings represent Ntharene, Kanyakine, Miruriiri, Mwichiune, Mujwa, Kariene, Gakoromone,Kamachege, Mitunguu, Maua, Kanuni, Tiira, and Nkubu markets, respectively.
Source: Field data (2015)

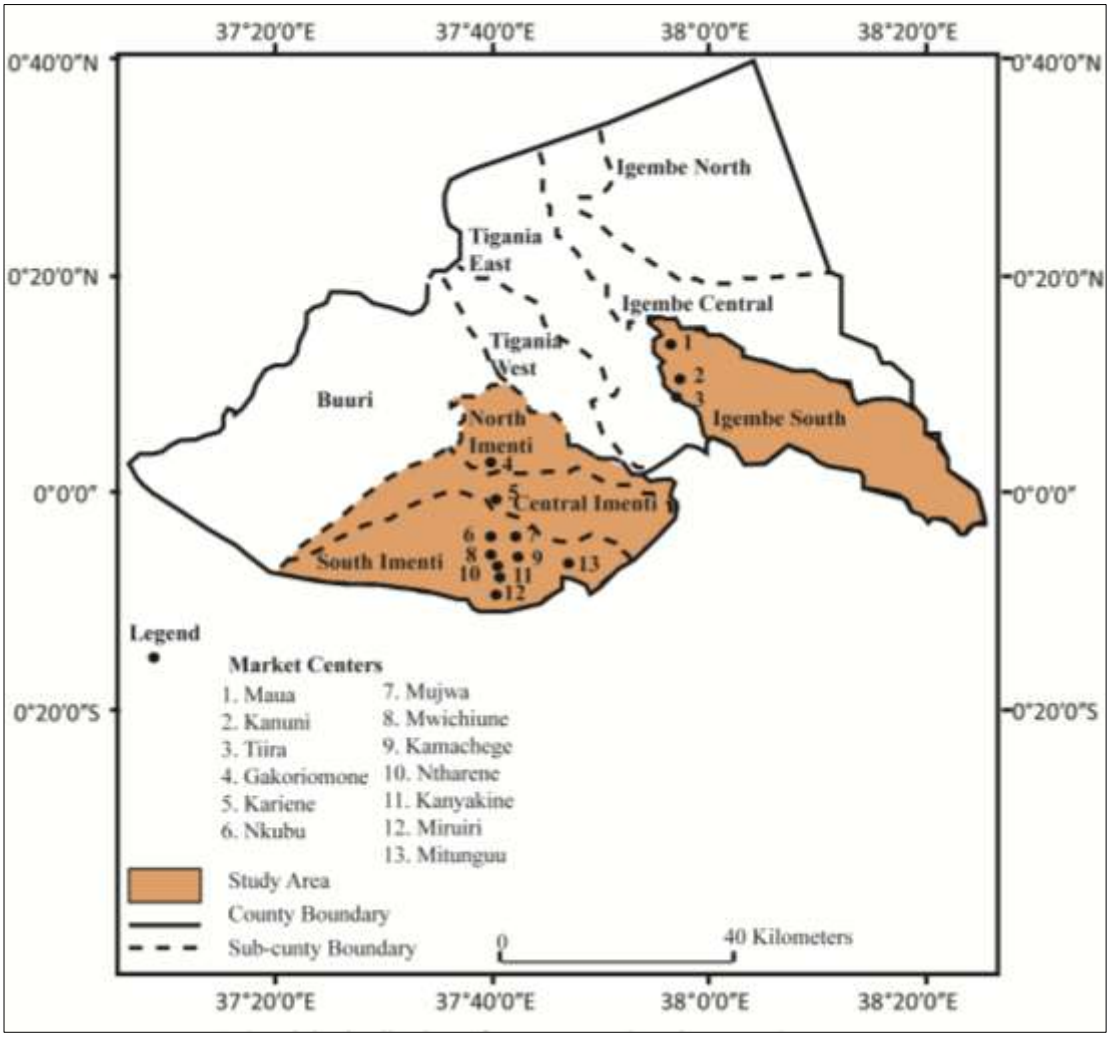

Figure 4.8. Spatial Distribution of Banana Markets in Meru County
Source: Field data (2015)

Results on aspects of temporal distribution of periodic banana markets in Meru County revealed that the markets operated in six days of the week (i.e., Monday to Saturday) (Table 4.15). Periodic banana markets did not operate on Sunday. This incomplete market cycle may be with respect to the communities' religious beliefs. Majority of the farmers in Meru County considered Sunday a sacred day in which farming activities were barely undertaken.

Table 4.15: *Periodic Banana Markets and their Respective Market Days*

Market Name	Market days					
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Ntharene	√	-	-	-	-	-
Kanyakine	-	-	-	-	√	-
Miruriiri	-	-	-	√	-	-
Mwichiune	-	-	√	-	-	-
Mujwa	-	-	√	-	-	-
Kariene	-	-	√	-	√	-
Gakoromone	√	-	√	-	√	-
Kamachege	-	-	-	√	-	-
Mitunguu	-	√	-	-	-	√
Maua	-	√	-	√	-	√
Kanuni	-	√	-	√	-	√
Tiira	-	√	-	√	-	√

Note. √ indicates the market's day(s)
Source: Field data (2015)

There was on average three markets operating on each day of the six-day week (Table 4.15). As Table 4.15 shows, there was disparity in the number of markets functioning in a given day with some having two and others five. On one hand, markets occurring close together in time (days), for instance, Tiira and Kanuni were not widely spaced in kilometres (Table 4.16). It is important to note that Tiira, Kanuni and Maua markets, operated at specific times during the same market days. Tiira market day began as early as 7 am to around 10 am. Kanuni's market day commenced at about 9am to about 12 noon. Maua market started operations after 12 noon. However, the operation times for the markets were not strictly adhered to. The study established that Kanuni and Tiira markets partly supplied bananas to Maua market. All the three markets exclusively served Meru County(i.e., Igembe North, Tigania East, Tigania West, and Igembe Central) as indicated by banana traders interviewed in these three markets.

Table 4.16: *Time and Location Distance between Periodic Banana Markets in Meru County and r Results*

Market Name	Nearest Neighbour Market	Spatial Distance (km)	Temporal dimension (days)
Ntharene	Kanyakine	0.9	4
Kanyakine	Ntharene	0.9	4
Miruiiri	Kanyakine	1.8	1
Mwichiune	Kanyakine	3.2	2
Mujwa	Mwichiune	4.1	0
Kariene	Mwichiune	4.0	0
Gakoromone	Kariene	4.5	0
Kamachege	Mitunguu	4.8	2
Mitunguu	Kamachege	4.8	2
Maua	Kanuni	7.9	0
Kanuni	Tiira	2.5	0
Tiira	Kanuni	2.5	0
Total		41.9	15
r value		-0.530	
P value		**.076**	

Source: Field data (2015)

On the other hand, markets that had wide temporal spacing such as Ntharene and Kanyakine were not widely separated in location (Table 4.16). This finding may imply a lack of synchronization of periodic banana markets. Thus, some periodic banana markets in Meru County may face unhealthy competition to serve the same population at relatively the same time. Such competition may lead to a prominence of some markets at the expense of others. This may mean that farmers located at far distances from such markets may have to incur extra costs to access the markets. For instance, depending on what means of transport the farmers use, they may spend more time as well as money in moving bananas to the markets.

An analysis of *r* yielded a moderate and negative. This indicates that an increase in spatial distance is associated with a decrease in temporal dimension. A statistical analysis of *r* indicated a non significant (p = .076) relationship between the spatial distance and the

temporal separation of periodic banana markets in Meru County (Table 4.16). Thus, the null hypothesis is could not be rejected.

To ascertain the spatio-temporal distribution pattern of the periodic banana markets, the nearest neighbour index (*Rn*) results (0.31) indicated a tendency towards a clustering pattern. This was interpreted to mean that periodic banana markets in Meru County are not uniformly distributed. This implies that the population in Meru County is not uniformly served by the banana markets. These findings disagree with findings of studies focusing on cereals (e.g., Mwithirwa, 2010; Wambugu, 2005) that such markets were uniformly distributed. This discrepancy in findings may partly be because of the perishability nature of bananas. Therefore, whereas cereals can be stored after harvesting for relatively long period, bananas spoil within two weeks.

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSIONS ANDRECOMMENDATIONS

5.1 Introduction

This chapter summarises the main findings of the study, draws conclusions and makes recommendations necessary for policy formulation.

5.2 Summary of the Main Findings

Women were the majority of banana farmers and traders, 52.6 % and 57.6 %, respectively partly because the crop has traditionally been considered as female crop. In this regard, women are expected to meet their households' food demand which entails buying what may not be available on the farms. Thus, women sell some bananas to earn money. They however, on average earned less (Ksh 14,249 per month) than their counter male farmers (Ksh 16, 770).The *t* test results indicated a significant ($P< .000$) difference between the incomes.

Most of the banana traders in Meru County were wholesalers (55.2 %) followed by village collectors (34.6 %). Wholesalers and village collectors demanded large quantities and often bought in bulk. Such traders were better informed about banana prices than farmers as they were closer to consumers and at times switched roles to retailers.

Relatively a youthful population engage in banana trading than in farming. Many young people (98.8%), aged between18 and 59 years engage in banana trading and (91.8%) in farming. This observation may imply that people are regarding banana trading as a business. The *t* test results indicated that there is a significant ($P< .000$) difference between banana farmers' and traders' age.

Banana men farmers earned more (Ksh 16,770) than women (Ksh 14,249) on average per month. The *t* test results indicated a significant ($p < .000$) difference between earnings of men and women.

Almost all farmers (97.7 %) owned the farms on which they produced bananas. The farms were however, on average small (1.9 acres) and vary from one sub-county to another. An *F* test results indicated a significant ($p = .032$) difference between farm sizes in the sub counties.

The average number of banana stools on the farm in Meru County is 177. The number of stools however, vary by sub counties as follows; 151 in Imenti North, 230 in Imenti South, 181 in Imenti Central, and 147 in Igembe South. An *F* test results indicated a significant ($p = .001$) of banana stool in the four sub counties.

Farmers harvested 44 bunches of bananas per month on average. The average amount of bunches, however, varied by sub-counties as follows; 35 in Imenti North, 57 in Imenti South, 43 in Imenti Central, and 42 in Igembe South. An *F* test indicated a non significant ($p = .063$) difference in the amount of banana bunches harvested monthly in the four sub counties of Meru County.

The majority of the banana traders in Meru County wholesalers (55.2 %) followed by village collectors (34.6 %), retailers (7.8 %) and brokers (2.4 %) in that order. The traders would at times switch roles. Majority of the traders (74.5 %) were full-time business people.

More than half of the farmers (51.3 %) produced both TC and traditional types, 24.2 % pure TC banana, and 24.5% traditional types alone. Farmers pointed out that unlike the TC varieties, traditional types have the capacity to withstand water stress for some period. The

growing of mixed types of bananas led to lack of uniformity and homogeneity in finger size and fruit maturity which may partly explain why farmers were hardly involved in banana processing.

Inputs, specifically suckers were of poor quality and plantlets were expensive (Ksh 120 or $ 1.2 per seedling). The high prices of plantlets partly contributed to the high (96.4 %) use of suckers acquired from older banana stools on producers' farms or their neighbours. This exposed them to the risk of pests and diseases, the most (23.2 %) reported constraint.

Most of the farmers (70 %) used the bunch method in selling bananas that exposed them to exploitation by buyers. Besides, majority of the farmers (47.4 %) sold their bananas at the farm-gate, 18.8 % at the roadside markets, and the rest at both farm-gate and roadside markets. Farm-gate sales on average fetched less prices (Ksh 157) than at markets (Ksh 223). A *t* test results indicate a significant ($p < .000$) difference in mean prices at farm-gate and markets.

About a quarter of the traders (24.2 %) and 8.4 % of farmers experienced high marketing costs. Farmers always paid a levy of Ksh 10 regardless of the size of the load. The farmers also hired carriers at negotiable costs of Ksh 10 to 20 per load. Traders incurred on-load costs within market in Meru County, cess as they transported their cargo to the area of their operation, off-load once at their destination, and a levy in their markets of operations. Marketing cost was the most reported by traders.

Rotting and spoilage of bananas before selling was the second most (20 %) reported constraint by traders. Traders attributed the rotting and spoilage to use of fertilisers by farmers in banana production, ripening process, and cold seasons. Farmers related postharvest losses to the weighing method of selling bananas where the buyer cut off the small hands from the tip of a bunch.

Seven of the 9 distribution channels of unprocessed bananas from Meru County were long, comprising of 5 or 6 actors. The longer marketing channel means that the profits are shared among many actors. In addition, the farmers lack the bargaining power as they do not directly deal with consumers.

Most farmers (89.1 %) sold to any available buyer and most traders bought from any farmer (89.3 %) and sold to any buyer (87.8 %). These were non contractual and lack of a commitment on either side of the transacting parties.

The distances travelled by banana farmers between farms and markets in Meru County are relatively small with an average of 3.3 kilometres. The distances, however vary from one sub-county to the other. An *F* test found the variation significant ($p < .000$). The short distances covered by farmers at the farm level presented opportunities for farmers to easily transport their bananas and inputs to and from markets, respectively.

Banana processing into products such as snacks and juices in Meru County present opportunities for differentiation of banana products that would enhance the farmers' participation in high-value domestic and international markets. This is because banana processing would improve bananas' shelf life and thus enhance participation in diversified markets both domestically and internationally. Processing would also enable producers and traders to hold for prices.

Banana markets occurring close together in time (days) are not widely spaced in kilometres and those with wide temporal spacing are not widely separated in location. An *r* test found the relationship non significant ($p = .076$). This observation may partly be explained with respect to synchronisation of markets.

An *Rn* test results (0.31) indicated that the banana markets in Meru County are not uniformly distributed. This observation may partly be explained with respect to markets bulking activities that these markets perform, enhancing trade for wholesalers who transport their consignments to far located deficit regions.

5.3 Conclusions

Based on the findings of this study, the following conclusions are drawn.

(i) Some demographic-socio-economic characteristics of farmers and traders influenced their participation in the banana value chain. For instance, women dominated both production and marketing of bananas in Meru Country probably because the crop has traditionally associated with females. As such women farmers with surpluses engage in selling it. By owning the land farmers engaged in banana growing though the crop is perennial. The fact that majority of traders were wholesalers meant they were concerned with bulk buying, the reason why they travelled to Meru prior a market day or bought from different markets.

(ii) Every component of the banana value chain of Meru County faces several constraints. The constraints are interdependent and amplify each other. For instance, pests and diseases may spread from farm to farm due to extensive use of infected suckers because of unaffordable plantlets. This eventually lowers banana quality and yields, fetching low prices for farmers.

(iii) Numerous opportunities exist for banana value chain in Meru County. For instance, there is unmet local and a potential international demand. There are private institutions such as MBFC, MGH Ltd and Solar banana drying firm that are exploring (e.g., looking for a market) and to some extent exploiting (e.g.,

processing into snacks) existing opportunities. However, only a few farmers were participants in such institutions.

(iv) The periodic banana markets in Meru County are not uniformly distributed. They cluster in some parts of the study area, particularly, Imenti South. Thus the markets do not adequately meet the marketing needs of the farmers. The markets however, serve wholesalers better as they are bulking points.

5.4 Policy Implications and Recommendations

Women dominated both farming and trading of bananas. They however, earned less than their male counterparts. It is recommended that community training on production and entrepreneurship. On one hand, training on banana husbandry would go far in enabling farmers to produce quantity and quality. On the other hand, entrepreneurship skills would empower farmers to negotiate for profitable prices with traders who are more informed about market trends because they interact with consumers. Training should involve concerted efforts of the agriculture personnel at the County and sub county levels including; extension, horticulture and agribusiness officers. The avenues for such training need to include self help groups that have women as members in order to reach them.

Interventions aimed at addressing constraints should involve several measures implemented concurrently. Thus concerted efforts from all stakeholders – farmers, traders, national and county government, and private institutions should be promoted. It is recommended that Meru County government should partner with private firms dealing with bananas such as MGH Ltd in helping small-scale farmers address constraints and exploit existing opportunities in the banana value chain. By partnering with such firms, the Meru County government would promote banana production, processing and marketing. Processing prolongs shelf life as well as adds value to bananas enabling farmers to fetch better prices

for their commodity. Banana farmers and traders should be trained on value addition which would assist them reap more benefits. Besides banana value addition, the processed products could be fortified and therefore, make them more appealing to consumers. Such partnership would not only promote production but ensure a sustainable link to markets for farmers, given that MGH Ltd contracts the farmers and has connections with high value markets.

It is recommended that farmers should partner with private institutions such as MGH Ltd which undertakes training on production and buys bananas from its contracted members. The agriculture extension officers should work with farmers to enhance the management of bananas with an aim to improve quality which is required in high-value markets. Farmers should then expand banana production by utilising the favourable soils and available water in the County.

Banana traders should curve out a niche market which may go a long way in promoting banana value addition. The government, traders and private firms should search for markets for banana products. These stakeholders would also promote the products through advertisements.

The banana markets in Meru County are clustered in certain regions and thus not serving farmers uniformly. The study recommends that: the County government should either reorganise market locations such that as spatial distance in kilometres increase, the time dimension decreases; or establish new ones in areas not optimally served. Although farmers fetch better prices at the markets than the farm-gate, most use the later outlet. Farmers should be trained on the importance of market information to enable them negotiate for better prices. In addition, the County government should improve markets to take care of the high perishable nature of bananas.

5.5 Suggestions for Further Research

This study was limited to Meru County, Kenya. A similar study should be conducted for all banana growing regions in Kenya. Other regions may have different constraints and opportunities. For instance, Kisii County is experiencing a decline in banana production and it would be important to understand why this is happening bearing in mind that the County has been for years famous for its banana farming.

This study was also limited to banana value chain within Kenya. A study focusing on international aspects is recommended. Given the changes in lifestyles among consumers worldwide, agriculture should target meeting the emerging food needs at local, national and international levels.

A follow-up study should be conducted in Meru County. Currently, there are significant marketing aspects that would be of interest to find out how they will unfold in future. For instance, the role banana processing firms and MBFC which were in the initial years of operation would play in modifying the production and marketing of bananas in the County

6.0 REFERENCES

Abu, O. C., Ajake, A. O., & Okpilia, F. I. (2013). Spatio-temporal distribution of rural markets in Bekwarra Local Government Area of Cross River State of Nigeria. *IOSR Journal of Humanities and Social Science (IOSR-JHSS), 16,*(3), 104-112.e-ISSN: 2279-0837, p-ISSN: 2279-0845. www.iosrjournals.org

Africa Harvest Biotech Foundation International. (2007). *Africa Harvest: Annual Technical and Financial Report 2007*. Nairobi: Africa Harvest Biotech Foundation International

Agriculture and Food Council of Alberto. (2004). *Value chain guidebook: A process for value chain development* (2nd ed.). Alberto, Canada: Ag and Food Council. Retrieved from www.agfoodcouncil.com

Ahmed, E. A., Mahfouz, S., & Fdul, I. O. (2011). How to determine sample size: The *design* of sample size in health studies. *Gezira Journal of Health Sciences, 7*(1), 1-19

Alliance for a Green Revolution in Africa [AGRA] (2013). *Africa agriculture status report: Focus on staple crops*. Nairobi: Alliance for a Green Revolution in Africa (AGRA)

Anderson, D., & Carrier, N. (2009). Khat in colonial Kenya: A history of prohibition and control. *Journal of African History, 50*(03), 377–397. doi: 10.1017/S0021853709990752

Asfew, S., Mithöfer, D., & Waibel, H. (2010). What impact are EU supermarket standards having on developing countries' export of high-value horticulture products? Evidence from Kenya. *Journal of International Food and Agriculture Business Marketing,* 22, 252-276. Doi:10.1080/08974431003641398

Ashraf, N., Ginè, X., & Karlan, D. (2009). Finding missing markets (and a disturbing epilogue): Evidence from an export crop adoption and marketing intervention in Kenya. American Journal of Economics, *91* (4), 973-990.doi: 10.1111/j1467-8276.2009.01319.x

Ayieko, D. M. O., Bett, E. K., & Kabuage, L. W. (2014). An analysis of the efficiency of indigenous chicken marketing channels in Makueni County, Kenya. *Journal of Agricultural Economics and Development*, 3(2), 026-034.http://academeresearchjournals.org/journal/jaed

Bandyopadhyay, S. (2013). The fresh banana industry in India – supply chain to value chain: Metamorphosis through technological innovation. *International Journal of Applied Research and Studies (iJARS), 2*(7), 1-19. Retrieved from www.ijars.in

Batt, P. J. (2004). Incorporating measure of satisfaction, trust and power dependence into analysis of agribusiness supply chains. In Johnson, G. I. and Hofman, P.J. (Eds.), *Agriproduct supply-chain management in developing countries*,(pp.19-22). ACIAR Proceedings No. 119e, Bali, Indonesia

Berhe, K., Puskur, R., Teka, W., Hoekstra, D. & Tegegne, A. (2008).Innovation in banana value chain development in Matema District, North Western Ethiopia: IPMS experiences. *International Conference on Banana and Plantain in Africa: Harnessing International Partnerships to Increase Research Impact*, October 5-9, 1-21, Mombasa, Kenya

Biruma, M., Pillay, M., Tripathi, L., Blomme, G., Abele, S., Mwangi, M., Bandyopadhyay, R., Muchunguzi, P., Kassim, S., Nyine, M., Turyagenda, L. & Eden-Green, S. (2007). Banana Xanthomonas wilt: a review of the disease, management strategies and future research directions. *African Journal of Biotechnology,6* (8), 953-962.

Bolo, A. Z., Lorika, J., & K'Obonyo, P. (2011). Effectiveness of the value chain strategy in the selected producer-owned dairy groups in Kenya. *Prime Journals: Business Administration and Management (BAM), 1*(3), 93–100. Retrieved from primejournal.org/bam

Borgström, B. (2005). *Exploring efficiency and effectiveness in the supply chain: A conceptual analysis*. Proceedings from the 21st IMP conference. https://scholar.google.com/scholar?q=borgstrom+exploring+efficiency+and+effectiveness+in+supply+chains&btnG=&hl=en&as_sdt=0%2C5

Bressler, R. G., & King, R. A. (1978). *Markets, prices, and interregional trade*. Raleigh, N. C.: John Wiley & Sons, Inc.

Brüntrup, M. & Herrmann, R. (2012). Bush-to-energy value chains in Namibia: *Institutional* challenges for the pro-poor rural development. In van Dijk, M. P. and Trienekens, J. (Eds.), *Global value chains: Linking local producers from developing countries to international markets* (pp 89-115). Amsterdam: Amsterdam University Press.

Carrier, N. (2005). "Miraa is cool": The cultural importance of miraa (khat) for Tigania and Igembe youth in Kenya. *Journal of African Cultural Studies, 17*(2), 201 – 218. doi: 10.1080/13696850500448311

Chermack, T. J., & Kasshanna, B. K. (2007). The use and misuse of SWOT analysis and implications for HRD professionals. *Human Resource Development International, 10*(4), 383–399. doi: 10.1080/13678860701718760

Cochran, W. G. (1963).Sampling Techniques, 2nd Ed., New York: John Wiley and Sons, Inc.http://onlinelibrary.wiley.com/doi/10.1002/bimj.19650070312/abstract

Dent,B., Macharia, J., & Aloyce, A. (2017). *Value chain thinking: A trainer's manual*. Taiwan: World Vegetable Center

Dibba, L. (2011). *Study on banana value chain in The Gambia*. Logo Farmer's Platform: National Agricultural Research Institute

Domaingue, R., Lewicki, S., This, P., Bakry, F., Horry, J., Braconnier, S., Pot, D., & Trouche, G. (2017). Evolution and Challenges of Varietal Improvement Strategies. In Biénabe E., Rival A., Loeillet D. (Eds) *Sustainable Development and Tropical Agri-chains* (pp141-152). Springer, Dordrecht DOI 10.1007/978-94-024-1016-7_11

Dubois, T., Dusabe, Y., Lule, M., Van Asten, P., Coyne, D., Hobayo, J.-.C., Nkurunziza, S., Ouma, E., Kabunga, N., Qaim, M., Kahangi, E., Mwirigi, P., Mwaura, P., Kisii, D., Kizito, H. and Mugisha, J. (2013). Tissue culture banana (M*usa* spp.) for smallholder farmers: lessons learnt from East Africa. *Acta Hortic. 986*, 51-59. doi: 10.17660/ActaHortic.2013.986.3
http://dx.doi.org/10.17660/ActaHortic.2013.986.3

Fromm, I. & Dubón, J. A. (2006). *Upgrading and value chain analysis: The case of small-scale coffee farmers in Honduras*. Conference on International Agricultural Research for Development (pp. 1-13). Tropentag: University of Bonn

Fruit Production Technical Handbook. (2011). *Fruit production technical handbook*. Nairobi: The Ministry of Agriculture.

Gereffi G., Humphrey, J., Kaplinsky, R. & Sturgeon, T. J. (2001). Introduction: *Globalisation*, value chains and development. *IDS Bulletin, 32*(3), 1-8

Haggblade, S. & Nyembe, M. (2007). *Commercial dynamics in Zambia's cassava value chain*. Cassava Transformation in Southern Africa (CATISA) Start Up Task 3. Food Security Project, Lusaka

Halewood, N. J. & Surya, P. (2012). Mobolizing agricultural value chain. In The WorldBank. *Information and communications for development: Maximising mobile* (pp. 41-43). Washington D. C.: World Bank.

Hammond, R., & McCullugh, P. (1978). *Quantitative techniques in Geography: An introduction* (2nd ed.). New York, United States: Oxford University Press.

Hazell, P., & Wood, S. (2008). *Drivers of change in global agriculture*. Retrieved from rstb.royalsocietypublishing.org. doi: 10.1098/rstb.2007.2166

Hellin, J., & Meijer, M. (2006). *Guidelines for value chain analysis*. Retrieved from www.fao.org

Henkel, R. (1984). Assessing the spatio-temporal integration of periodic market systems by a new measure: (Einneues Maß zur Einschätzung der raumzeitlichen Integration

von Systemen periodischerMärkte). *Erdkunde, Bd*. 38, H. 3, 167–177. Retrieved fromhttp://www.jstor.org/stable/25644781

Hill, P., & Smith, R. H. T. (1972). The spatial and temporal synchronization of periodic *markets*: evidence from four emirates in northern Nigeria. *Economic Geography, 48*(3), 345–355. Retrieved fromhttp://www.jstor.org/stable/142913

Hope, K.R.Sr. (2012). Urbanisation in Kenya. *African J. Economic and Sustainable Development, 1*(1) 4–26.

Horticultural Validated Report (2014).Horticultural validated report, 2014, http://www.agricultureauthority.go.ke/wp-content/uploads/2016/05/Horticulture-Validated-Report-2014-Final-copy.pdf downloaded 18/10/2017

Irungu, J. (2011). Contribution of horticulture to food security in Kenya. *Acta Hortic. 911*, 27-32. doi:10.17660/ActaHortic.2011.911.1.

Li, D. & O'Brien, C. (1999). Integrated decision modelling of chain efficiency. *International Journal of Production Economics, 59* (1-3), 147-157

Jaeger, P. (2010). *Smallholders: How to involve small-scale farmers in commercial horticulture*. A paper prepared for the 6th video seminar in the series, "High Value Agriculture in Southern and Eastern Africa". Retrieved from www.globalhort.org

Jeckonia, J., Mdoe, N., & Nombo, C. (2013). Mapping of gender roles and relations along onion value chain in Northern Tanzania. *International Journal of Asian Science, 3* (2), 523-541

Jogo, W., Karamura, E.,Kubiriba, J., Tinzaara, W., Rietveld, A.,Onyango, M., and Odongo, M. (2011). Farmers' awareness and application of banana *Xanthomonas* wilt control options: The case of Uganda and Kenya. *Journal of Development and Agricultural Economics, 3*(11), 561-571.http://www.academicjournals.org/JDAE

Kaplinsky, P., & Morris, M. (2000). *A handbook for value chain research*. Prepared for the IDRC. Retrieved from http://www.prism.uct.ac.za/Papers/VchNov01.pdf

Karembu, M. G. (2002). *Small scale farmers' adoptive responses to banana* biotechnology *in Kenya: Implications for policy* (ATPS Research Paper No. 1), Nairobi, Kenya: The African Technology Policy Studies Network.

Karna, N., Sarwar, R., McCarthy, G., LED, & Value Chain Consultants (2010). Value chains analysis final report: CHT value chain portfolio #1. Retrieved from www.chtdf.org on 18/6/2016

Keleman, A., Ranó, G., & Hellin, J. (2009). Maize diversity, poverty, and market access: Lessons from Mexico. *Development in practice, 19*(2), 187-199

Kenya National Bureau of Statistics [KNBS] (2014). *Statistical abstract 2014*. Nairobi: Kenya National Bureau of Statistics

Kenya National Federation of Agricultural Producers [KENFAP]. (2008). Farmers Voice: The bi-monthly magazine for Kenya National Federation of Agricultural producers, (Vol. 1).

Kerbaga, A. Z. (2010). *Analysis of poultry market chain: The case of Dale and Alaba Special Woredas of SNNPRS, Ethiopia* (Unpublished Master's dissertation). Haramaya University. Retrieved fromhttp://scholar.google.com

Kiiza, B., Abele, S., Kalyebara, R. (2004). Market opportunities for Ugandan banana products: National, regional and global perspectives. *Ugandan Journal of Agricultural Science*, 9, 743-749

Klein, A. (2013). The khat ban in the UK. What about the "scientific" evidence? *Anthropology Today*,*29*(5), 6-8

Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Delhi: New Age International (p) Limited.

Kotler, P. & Keller, K. L. (2006). *Marketing management* (12th ed.). Upper Saddle River, New Jersey: Pearson Education, Inc.

Maertens, M., & Swinnen, J. F. M. (2012). *Gender and modern supply chains in developing countries. The Journal of Development Studies, 48*(10), 1412–1430.doi:10.1080/00220388.2012.663902

Making Markets Work Better for the Poor [M4P]. (2008). *Making value chains work better for the poor: A toolbook for practitioners of value chain analysis*. Phnom Penh, Cambodia: Agricultural Development International. Retrieved from www.valuechains4poor.org

Mangnus, E., & Piters, B. S. (2010). *Dealing with smallscale producers: Linking buyers and producers*. Amasterdam: KIT Publishers.

Match Maker Associates Ltd (2012). The banana subsector in Arusha Municipality and *Arumeru* District: Producing banana beverages. In van Dijk, M. P. and Trienekens, J. (Eds.), *Global value chains: Linking local producers from developing countries to international markets* (pp 251-272). Amsterdam: Amsterdam University Press.

Mather, C. (2008). *Value chains and tropical products in a changing global trade regime (13).Geneva*, Switzerland: International Centre for Trade and Sustainable Development (ICTSD). Retrieved from www.ictsd.org

Matteis, A. (2006). *Market functioning in Turkana District, Kenya*. Nairobi: OXFAM.

Mbaka, J. N., Mwangi, M., & Mwangi, M. N. (2008). Banana farming as a business: The role of tissue cultured planting materials in Kenya. *Journal of Applied Biosciences, 9*(1), 354–361.

Mbaka, J. N., Nakato, V. G., Auma, J.,& Odero, B. (2009). Status of banana Xanthomonas wilt in western Kenya and factors enhancing its spread. *African Crop Science Conference Proceedings, African Crop Science Society, 9,* 673–676

Mbuthia, S. W. (2003). *Farming-related transport needs and provision in Mwea Irrigation Scheme, Kirinyaga District, Kenya* (Unpublished master's thesis). Kenyatta University.

Mendoza, G. (1995). A premier on marketing channels and margins. In G. Scott (Ed) *Prices, products and people: Analysing agricultural markets in developing countries* (pp. 257-276). Boulder, London: Lynne Reinner Publishers.

Ministry of Agriculture. (2013). *Economic review of agriculture.* Nairobi: The Central Planning & Project Monitoring Unit.

Ministry of Agriculture, Livestock and Fisheries [MOALF] (2015). *Economic review of agriculture [ERA].* Nairobi: The Central Planning & Project Monitoring Unit.

Ministry of Agriculture, Livestock and Fisheries (2016). *Climate risk profile for Meru. Kenya county climate risk profile series.* The International Center for Tropical Agriculture (CIAT) and the Kenya Ministry of Agriculture, Livestock and Fisheries (MoALF), Nairobi, Kenya.

Minot, N.& Ngigi, M. (2004). *Are horticultural exports a replicable success story? Evidence from Kenya and Côte d'Ivoire* (Discussion Paper). Washington DC.: IFPRI

Miriti, L. (2011). *Gender responsiveness strategies employed in banana production and marketing Imenti South District, Meru County* (Unpublished master's thesis). Kenyatta University.

Miriti, L., Wamue, N., Masiga, C., & Murithi, F. (2013). Gender concerns in banana production and marketing: Their impacts on resource poor households in Imenti South District, Kenya. *Afr. J. Hort. Sci. (December 2013), 7*, 36–52.

Mitchell, J., Keane, J., & Coles, C. (2009). *Trading up: How a value chain approach can benefit the rural poor*. London: COPLA Global: Overseas Development Institute.

Muchui, M. N., Gatambia, E. K., Kamau, M. W., Thuranira, D. M., Miruka, M., Wasilwa, L., Gitau D., & Gitau, C. (2013, May). *Enhancing small scale banana production through the farmer field school in Eastern Kenya*. Paper presented at 2nd ST &I week at KICC, Nairobi.

Muendo, K. M., Tschirley, D., & Weber, M. T. (2004). *Improving Kenya's domestic horticultural production and marketing system: current competitiveness, forces of change, and challenges for the future* (Working Paper No. 08/2004). Nairobi: Tegemeo Institute of Agricultural Policy and Development, Egerton University.

Murithi, M. (2011). *Banana farming outputs coffee farming in Meru*. http://peakshows.wordpress.com/2011/07/05/banana-farming-outputs-coffee-farming-in-meru/.

Musyoki, A. K. (1986). *The structure of internal trade in staple food stuffs in Machakos District, Kenya* (Unpublished PhD dissertation). Howard University, Washington D.C.

Mwangi, M.& Mbaka, J. (2010, September).*Banana farming in Kenya: Options for rejuvenating productivity*. Second RUFORUM Biennial Meeting 20 - 24, Entebbe, Uganda.

Mwithirwa, K. G. (2010). *Influence of integration of open-air markets on food security in Meru South and Mbeere Districts, Kenya* (Unpublished master's thesis). Kenyatta University.

Narayan, S., & Gulati, A. (2002). *Globalization and smallholders: A review of issues, approaches and implications* (Discussion Paper No. 50). Washington DC.: IFPRI MSSD

Neven, D., Reardon, T., Chege, J., & Wang, H. (2006). Supermarkets and consumers in Africa. *Journal of International Food & Agribusiness Marketing, 18*(1-2), 103–123.

Ngigi, M. W.; Okello, J. J.; Lagerkvist, C. L.; Karanja, N. K.;& Mburu, J. (2011). Urban Consumers willingness to pay for quality of leafy vegetables along the value chain: The case of Nairobi Kale consumers, Kenya. *International Journal of Business and Social Science, 2* (7), 208-216

Nzioka, S. M. (2009). Economic efficiency analysis of banana farmers in Kiambu East District of Kenya: Technical inefficiency and marketing efficiency. *Journal of Developments in Sustainable Agriculture,* 4, 118-127.

Omiti, J., McCullough, E., Otieno, D., Madelo, M., Nyanamba, T., & Murage, A. (2006). *Participatory prioritization of issues in smallholder agriculture commercialization in Kenya* (Dp/64/2006). Nairobi: The Kenya Institute for Public Research and Analysis (KIPPRA).

Onumah, G., Davis, J., Kleih, U. & Proctor, F. (2007). *Empowering smallholder farmers in markets: Changing agricultural marketing systems and innovative responses by producer organizations*.(Working Paper No. 2). Greenwich: Natural Resources Institute, University of Greenwich. https://mpra.ub.uni-muenchen.de/25984/

Otieno, G., & Knorringa. (2012). Kenya's horticulture sector. In van Dijk, M. & Trienekens, J. (Eds.). *Global value chains linking local producers from developing countries to international markets* (pp 119-135). Amsterdam: Amsterdam University Press.

Ouma, E. & Jagwe, J. (2010). *Banana value chain in Central Africa: Constraints and opportunities*. Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, 1-13

Pickton, D. W., & Wright, S. (1998). What's SWOT in strategic analysis? *Strategic Change, 7*(2), 101–109. doi:10.1002/(SICI)1099-1697(199803/04)7:2<101::AID-JSC332>3.0.CO; 2-6

Pillay, M., Tenkouano, A., & Ortiz, R. (2012). Introduction. InPillay, M., Ude, G. & Kole, C. (Eds.). *Genetics, genomics, and breeding of bananas* (pp 1-31). Jersey: Science Publishers.

Piper, T. (2007). *Choosing between strategies: Adapting industry approaches to specific value chain analysis using three comparative commodities* (Small Enterprise Development Workshop). Gerzensee Center, Switzerland: TechnoServe. Retrieved from www.technoserve.org

Ponte, S., & Gibbon, P. (2005). Quality standards, conventions and the governance of global value chains. *Economy and Society, 34*(1), 1-13. doi: 10.1080/0308514042000329315

Porter, M. C. (1980). *Competitive strategy: Techniques for analysing industries and competitors: with a new introduction*. New York: The Free Press

Porter, M. C. (1985). *Competitive Advantage: Creating and sustaining superior performance: with a new introduction*. New York: The Free Press

Qaim, M. (1999). *Assessing the impact of banana biotechnology in Kenya* (Briefs No. 10). Ithaca, New York: The International Service for the Acquisition of Agri-biotech Applications (ISAAA). Retrieved from http://agbio.cabweb.org

Raikes, P., Jensen, M. F., & Ponte, S. (2000). Global commodity chain analysis and the French filière approach: Comparison and critique. *Economy and Society, 29*(3), 390-417. doi: 10.1080/03085140050084589

Republic of Kenya. (2013a). *Meru County development profile*. Nairobi: Government Printer.

Republic of Kenya (2013b).*Basic Education Act, 2013*. Nairobi, Kenya: Government Printer. Retrieved from www.kenyalaw.org

Republic of Kenya (2014).*National policy on older persons and ageing*. Ministry of labour, social security and services. http//www.labour.go.ke

Republic of Kenya (2015).*National irrigation policy, 2015*. Ministry of Agriculture, livestock and fisheries. http//www.labour.go.ke

Riak, M. M. (2014). Criminalising a "way of life": The human rights implications of the UK Government's ban of khat (or miraa) on the farmers of Meru County, Kenya. *Journal of Human Rights in the Commonwealth, 2*(1), 34–42

Rich, K. M., Baker, D., Nagassa, A., & Ross, R. B. (2009). Concepts, applications, and extensions of value chain analysis to livestock systems in developing countries. *A paper prepared for presentation at the International Association of Agricultural Economics Conference*, Beijing, China.

Roszkowska, E. (2013). Rank ordering criteria weighting methods – a comparative overview. *Optimum. Studia Ekonomiczne NR, 5*(65), 14–33.http://repozytorium.uwb.edu.pl/jspui/handle/11320/2189

Royal Tropical Institute (KIT), Faida Mali, & International Institute of Rural Reconstruction (IIRR). (2006). *Chain empowerment: Supporting African farmers to develop markets*. Retrieved from agris.fao.org

Samson, J. A. (2003). *Tropical fruits* (2nd ed.). Iowa: Blackwell Publishing Company.

Satterthwaite, D. McGranahan, G., & Tacoli, C. (2010). *Urbanization and its implications for food and farming*. doi: 10.1098/rstb.2010.0136

Schaffnit-Chatterjee, C. (2014). *Agricultural value chains in sub-Saharan Africa: From a development challenge to a business opportunity*. Frankfurt am Main: Deutsch Bank AG, Germany. Retrieved fromwww.dbresearch.com

SHoMaP. (2008). *Guidelines for Investment in market derived infrastructure, 1st edition*. Nakuru: Programme Management Unit.

Silva, C. A., & Filho, S. H. (2007). *Guidelines for rapid appraisals of agrifood chain* Performance *in developing countries* (Agricultural management, Marketing and finance, Occasional paper, 20). Rome: Food and Agriculture Organization (FAO) of the United Nations.

Sitati, N. W., & Walpole, M. J. (2006). Assessing farm-based measures for mitigating human-elephant conflict in Transmara District, Kenya. *Oryx*, 40(3), 279–286. doi:10.1017/S0030605306000834

Singgih, S. & Woods, E. (2003). *Banana supply chains in Indonesia and Australia: Surviving isolation from end markets*. International Management Congress: The University of Queensland, Galton 4343, Australia

Singh, K. (2007). *Quantitative Social Research Methods*. New Delhi: Sage Publications India Pvt Ltd.

Spilsbury, J.S., Jagwe, J.N.,&Ferris, R.S.B. (2002).*Evaluating the marketing opportunities for banana & its products*. Foodnet: International Institute of Tropical Agriculture

TechnoServe. (2009). Improving banana "value chain" in East Africa. *The New Agriculturalist*, WRENmedia.

Tesfay, T., Kahsay, Y., Girmay, S., & Welu, G. (2016). Value chain analysis of banana in 'Tekeze' River basin, North Ethiopia. *Journal of Biology, Agriculture and Healthcare*, *6* (21), 34-40

Till, R. (1974). *Statistical methods for the earth scientist: An introduction*. London: The Macmillan Press Ltd.

Tschumi. (2008). *Perspectives on the making markets work for the poor (M4P) Approach*. Bern, Switzerland: Swiss Agency for Development and Cooperation SDC.

Vagneron, I. & Roquigny, S. (2011). Value distribution in conventional, organic and fair trade banana chains in the Dominican Republic. *Canadian Journal of Development Studies, 32*(3), 324-338

Van Dijk, M. P. (2012). Using a partnership to achieve sustainable development of the palm oil value chain in Malaysia. In van Dijk, M. P. and Trienekens, J. (Eds.), *Global value chains: Linking local producers from developing countries to international markets* (pp 137-161). Amsterdam: Amsterdam University Press.

Van Dijk, M. P., & Trienekens, J. (2012). Global value chains: An overview of the issues and concepts. In van Dijk, M. P. and Trienekens, J. (Eds.), *Global value chains: Linking local producers from developing countries to international markets* (pp 9-30). Amsterdam: Amsterdam University Press.

VanMelle, C., Coulibaly, O., & Hell, K. (2007). Agricultural value chain development in West Africa – Methodological framework and case study of mango in Benin.*AAAE Conference Proceedings* (pp. 49–52).

Van Wijk, J., & Kwakkenbos, H. (2012). Beer multinationals supporting Africa's development? How parternship include smallholders into sorghum-beer supply chains. In van Dijk, M. P. and Trienekens, J. (Eds.), *Global value chains: Linking local producers from developing countries to international markets* (pp. 71-88). Amsterdam: Amsterdam University Press.

Wambugu, F. M. and Kiome, R. M. (2001). *The benefits of biotechnology for small-scale banana producers in Kenya*(Briefs No. 22). Ithaca, New York: The International Service for the Acquisition of Agri-biotech Applications (ISAAA).

Wambugu, S. K. (2005). *An analysis of the nature and extent of integration of Kenya's maize market in the post liberalization era* (Unpublished PhD thesis). Kenyatta University.

Wambugu, S. K. (1995). A spatio-temporal analysis of periodic markets in Nyeri District, Kenya. *Eastern and Southern Africa geographical Journal*, 6(1), 60-73

Wambugu, S. K. (1994). Spatial distribution of market places and market provision in Nyeri District, Kenya. *Journal of Eastern African Research and Development*, 24, 1-14

Wambugu, S. K. (1990). *Spatio-temporal and functional characteristics of market places in Nyeri District* (Unpublished Msc thesis). Kenyatta University.

Waugh, D. (2002). *Geography: An integrated approach* (3rded.). Cheltenham: Nelson Thornes.

Wei, S., Adar, D., Woods, E. J.& Suheri, H. (2004). Improved marketing of mandarins for East NusaTenggara in Indonesia. In Johnson, G. I. and Hofman, P.J. (Eds.), *Agriproduct supply-chain management in developing countries*,(pp. 98-106). ACIAR Proceedings No. 119e, Bali, Indonesia

Wheatley, C. & Peters, D. (2004). Who benefits from enhanced management of agri-food supply chains. In Johnson, G. I. and Hofman, P.J. (Eds.), *Agriproduct supply-chain management in developing countries*,(pp.113-123). ACIAR Proceedings No. 119e, Bali, Indonesia

World Population Prospects (2017).*World population prospects: The 2017 Revision*. WWW.worldometers.info. Downloaded on 15/3/2018

Zamil, F., Md. & Cadilhon, J. -J. (2009). Developing small production and marketing enterprises: Mushroom contract farming in Bangladesh. *Development in practice, 19*(7), 923-932

7.0 APPENDICES

7.1 Questionnaire for Farmers

I am a student at Kenyatta University. I am undertaking a study on the "Constraints and Opportunities in Banana Value Chain in Meru County" as a partial fulfilment of the award of PhD in Agricultural Geography. I am kindly requesting you to provide me with information by answering the questions in this questionnaire as genuinely as possible. Information given will be strictly used for this study purposes only.

Thank you in advance for your contributions and cooperation.

General Information

Date …… Interviewer ……Respondent's name (optional) …… Sub-county …….

Household Characteristics

1. Respondent's sex: (male)…… (female)……..

2. Respondent's age (years) ……

3. Respondent's education level: Primary Secondary College

4. House type: Permanent semi-permanent

5. What is your average monthly income (Ksh)? <10,000; 10,000-20,000; 20,000-30,000; 30,000-40,000; >40,000

6. Indicate the sources of income mentioned in question 5 above

Salary/wages farm sales (e.g., milk, fruits, vegetables, coffee, tea, etc.)

remittances other (specify)

General Agriculture

7. What is the size of your farm in acres? …….

8. Do you own this land? Yes …… No ……. If no, describe the tenancy

9. List the various crops you grow on your farm and livestock found on your farm. Indicate the purpose for each of them.

Banana Production

10. How many banana plants do you have on your farm?

11. What is the spacing between one banana plant and another?

12. What types of bananas do you grow?

13. Do you plant short, medium or short varieties?

14. When did you start growing bananas? …… (year)

15. What seedlings did you use to propagate your initial bananas? Suckers … Plantlets …

16. Where did you get your seedlings from?

17. Have you at any time replaced or expanded your banana orchard? Expanded: Yes…No….

Replaced: Yes….No….

If yes, why and what was the source of your seedlings?

18. Did you buy the banana seedlings? If yes, what was the price per seedling?

19. Indicate other inputs you use in banana production and if you buy them?

Input	Buy
Artificial fertilizers	
Organic manure	
Insecticides	
Pesticides	
Irrigation water	
Others (specify)	

20. If you irrigate your banana plants, name the source of your irrigation water.

21. Do you get any assistance from agricultural experts in banana farming? Explain

22. What amount (bunches) of bananas do you harvest in a week or a month?

Marketing of bananas

23. Do you sell your bananas? Yes ……. No ……If your answer is yes, answer the following questions

24. Do you get information on banana prices offered in different markets? Yes …. No …. If your answer is yes, explain how you get the information.

25. How often do you sell? Specify e.g. once a week, twice a week

26. Do you sell all your bananas? Yes----- No-------

27. Do you harvest your bananas for sale while plump and green, plump and ripe or when customers are available?

28. Do you ripen your bananas? Yes …… No …. If yes, describe the method used

29. Do you process (e.g., making crisps, flour etc.) your bananas? Yes (-----) No (-----) If yes, explain

30. Where do you sell your bananas? At the farm gate (----) market (-----) Both farm gate and market

31. Whom do you sell to and why?

32. Do you have a specific trader you sell to? Explain

33. What method do you use in selling? Weighing (kg) ---- Bunches / fingers. If other methods than these, please specify

34. Why do you use the method specified in question 33

35. Do you sell as an individual or you have formed a group? Explain your answer

36. What is your average monthly earnings from banana sales?

37. What was the selling price (Ksh) for your last sale? At the farm gate------ market------

38. What is the current market price (Ksh) of bananas in the nearest market?

39. How do you usually know the prevailing market price of bananas? Explain

40. What is the distance (km) between your farm and the nearest tarmac road?

41. What is the distance (km) between your farm and the nearest market?

42. How do you transport your bananas to the market?

43. How much do you pay (Ksh) for transport (on average)?

44. Describe how you take care of bananas from the time they are seedlings until you sell the fruit

Constraints

45. Highlight the challenges you face in banana production and marketing

46. Suggest ways of solving the challenges named in 39 above

7.2 Scoring Card for Farmers

The table below presents a number of factors influencing banana farming. Indicate by a tick (√) who controls these activities from the following categories; CG - controlled by government, IC – controlled by self, OG – controlled by organization, SI – semi controlled, NC – not controllable. Also indicate how they influence your banana farming by choosing any of these categories; VF – very favourable, F – favourable, N – neutral, U – unfavourable, VU – very unfavourable.

Main factors and sub-sectors	Controllability					Relevancy				
	CG	IC	OG	SI	NC	VF	F	N	U	VU
Inputs										
Improved seedlings availability										
Artificial fertilizers availability										
Organic manure availability										
Water provision										
Labour availability										
Land utilization										
Other inputs (specify)										
Technology										
TC bananas										
Irrigation										
Market										
Quantity sold										
Weighing method										
Bunches method										
Selling price										
Distance to the market										
Means of transport to market available										
Co-ordination										
Training provision										
Extension/expert services on farm										
Price information										
Enabling environment										
Source of credit										
Banana pest and disease control										
Roads maintenance										

7.3 Questionnaire for Banana Traders

I am a student at Kenyatta University. I am undertaking a study on the Constraints and Opportunities in Banana Value Chain in Meru County" as a partial fulfilment of the award of PhD in Agricultural Geography. I am kindly requesting you to provide me with information by answering the questions in this questionnaire as genuinely as possible. Information given will be strictly used for this study's purposes only.

Thank you in advance for your contributions and cooperation.

General Information

Date …… Interviewer ……

Respondent name (optional) Male (…) Female (…)

Respondent's age (years) ……

Respondent's education level: Primary Secondary College

What is your average monthly income (Ksh)? <10,000; 10,000-20,000; 20,000-30,000; 30,000-40,000; 40,000-50,000; >50,000

Background information

1. Market centre ……

2. Indicate the county from which you come from. ……

3. Type of trader: a. retailer b. wholesaler c. village collector d. Other (specify)

4. Are you a member of a traders' organization or association? Yes ….. No ……

5. If your answer to question 4 is yes, give the name of the organization?

6. State some of the benefits of being a member in the organization mentioned in 5 above.

7. Name the types of bananas you trade in.

8. Job status: a. full time b. part time

9. If you are a part time banana trader, name the other activities you engage in.

10. Which are your banana buying areas and selling areas?

11. How many bunches or kilograms of banana do you normally buy and sell per market day?

Buy ……

Sell ……..

12. Who buys your bananas?

13. Do you have a specific person(s)/farmer(s) you buy from? Explain

14. Do you have a specific person(s) you sell to? Explain

15. Describe how you take care of banana from the time you buy/acquire them until you sell them.

Banana marketing costs

16. What was the average buying price (Ksh) per bunch of banana in the last market

a. at the farm gate ……. b. at the market ……..

Banana Type/Size	Price	Banana Type/Size	Price

17. What was the average selling price (Ksh) per bunch of banana in the last market

18. What means of transport do you use to transport your bananas?

19. What is the average distance (km) from the where you are located to this market?.....

20. What was the average transport cost (Ksh) per bunch of banana on

a. all weather road ……..

b. dry weather road ……

21. Do you require a trading license?..... If yes, how much to you pay to get one?.....

How long is the license valid?

22. Name any other marketing costs you incur (e.g., levy)

23. Do you require a store for bananas for some time?..... If yes, for how many days?

24. Do you ripe bananas for sale? If yes, describe the method you use

25. What challenges do you face in banana trading?

26. Suggest solutions to the challenges you mentioned in question 11 above.

Availability of information and credit

27. Do you get information on prices and availability of bananas?

Prices: Yes …….. No …….

Availability of bananas: Yes …….. No ……

28. If your answer to question 27 is yes, explain how you get the information on banana prices and availability

29. Do you always get market information when you need it? Explain

30. Is information on banana prices and banana availability of bananas important to a banana trader? Yes …… No …… Explain your answer

31. Do you require credit in running this business? Yes …. No …… If yes, answer questions

32. Where do get you get credit from?

33. Name credit facilitators in this county

7.4 Scoring Card for Traders

The table below presents a number of factors influencing banana marketing. Indicate by a tick (√) who controls these activities from these categories; CG - controlled by government, IC – controlled by self, OG – controlled by organization, SI – semi controlled, NC – not controllable. Also indicate how they influence your banana trading by choosing any of these categories; VF – very favourable, F – favourable, N – neutral, U – unfavourable, VU – very unfavourable.

Main factors and sub-sectors	Controllability					Relevancy				
	CG	IC	OG	SI	NC	VF	F	N	U	VU
Market										
Quantity of bananas available										
Types of bananas available										
Weighing method										
Bunches method										
Buying price										
Selling price										
Distance to the market										
Means of transport available										
Marketing costs e.g. licences, levy										
Co-ordination										
Price information										
Enabling environment										
Source of credit										
Roads maintenance										

7.5 A Guide for Interviewing Key Informants

1. What varieties of bananas are grown in Meru County and why?
2. Why is Meru County leading in banana production in Kenya?
3. What are the challenges facing banana production in Meru County?
4. What are the challenges facing banana marketing in Meru County?

5. What do you think should be done to overcome banana production challenges?
6. What do you think should be done to overcome banana marketing challenges?

7. 6 Focus Group Discussion Guide

1. What varieties of bananas are grown in Meru County?
2. Why are those varieties grown?
3. What are the challenges facing banana farming in Meru County?
4. What are the challenges facing banana marketing in Meru County?
5. What farmers, agricultural officers, traders, among other stakeholders doing to overcome banana production and marketing challenges?

7.7 Research Permit

THIS IS TO CERTIFY THAT:
MS. SUSAN WANJIRU MBUTHIA
of KENYATTA UNIVERSITY, 0-200
nairobi,has been permitted to conduct
research in Meru County

on the topic: *AN ANALYSIS OF THE EFFICIENCY OF BANANA VALUE CHAIN IN MERU COUNTY, KENYA.*

for the period ending:
31st December,2017

Applicant's
Signature

Permit No : NACOSTI/P/14/3096/4136
Date Of Issue : 25th November,2014
Fee Recieved :Ksh 2,000

Secretary
National Commission for Science,
Technology & Innovation