

**AN ASSESSMENT OF MANGO FARMERS' CHOICE OF MARKETING CHANNELS
IN MAKUENI, KENYA**

BY

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Declaration

This thesis is my original work and has not been presented for the award of a degree in any other academic institution.

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Dedication

With sincere appreciation, I dedicate this thesis to my family, my university supervisors, and friends for the unwavering support.

Acknowledgement

I give thanks to almighty God, for the gift of life and good health, without which this work would not have been possible.

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May the Almighty God bless you abundantly

ABSTRACT

Improving market access for small-holder farmers is important in helping towards raising rural incomes and reducing poverty. The Millennium development goal number one is to eradicate poverty. Most of the poor are small scale farmers in rural areas of Africa and Asia. The Comprehensive Africa Agriculture Development Program (CAADP) anticipates that improving access to market for these farmers will help towards reducing poverty. Small scale farmers in developing countries are excluded from markets due to long value chains, lack of transparency, and presence of too many players. Mangoes are produced in the Eastern and Coastal areas in Kenya. Farmers in the Makueni have taken up mango farming quickly, making Makueni the leading producer of mangoes in Kenya. Marketing is however not organized. Despite the presence of several mango buyers in the country, mango farmers are experiencing up to 30 percent post-harvest losses, and gross margins are low at Kshs. 1.70 per piece. Profit should guide farmers' choice of market channel, yet this is often not the case, it is not clear what drives farmer decision of the channel to sell to. There is no study that has actually been carried out to determine the factors that influence farmers' decision to participate in the available market channels; this is the literature gap that this study sought to fill. The aim of this study was to assess the factors that influence mango farmers' choice of market channels in Makueni County. The study used data collected in 2014 from a sample of 227 farmers using multistage and random sampling techniques. Analysis of Variance was used to determine the difference in the prices offered by the different channels, while Multinomial logit model was used to quantify the factors affecting channel choice. Results of the study show that farmers sold to three major channels, which are brokers, exporters, and direct market. Majority of the farmers (58 percent) sold to brokers, 30 percent to export, while the rest sold to direct market. Price analysis results

show that farmers selling to direct channel earned the highest average prices, while brokers offered the lowest prices. Analysis of Variance (ANOVA) results find sufficient evidence that prices offered by the channels are different. The multinomial logit results show that farmers who were members of producer marketing groups, had attended training, and had a large number of mango trees were more likely to sell to exporters relative to brokers. In addition, farmers who owned a vehicle, were closer to the tarmac road, and had access to market information were more likely to sell to direct market relative to brokers. Results of this study provide insights for the ongoing efforts to transform agriculture from subsistence to market oriented activity for farmers in Kenya. There is need to assist farmers link with organized and formal markets to bolster their incomes. The study recommends that interventions aimed at providing market information, as well as training and extension to farmers should be reinforced. Producer marketing groups can fill the gaps left by marketing boards through linking farmers with buyers, and assisting farmers attain quality and safety requirements of especially export market. These quality and safety requirements are a major impediment to access to niche markets. In addition, it is more effective and cheaper to offer training and extension services to farmers through the groups. The study recommends further research on the marketing side, to determine the constraints and challenges faced by marketers would also be beneficial for policy and/or practice.

Keywords: Mango farmers, Market channels, Multinomial logit, Makueni County

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List of Acronyms

ABD	Agricultural Business Development
ANOVA	Analysis of Variance
ASALs	Arid and Semi-Arid Lands
CAADP	Comprehensive Africa Agriculture Development Programme
CE	Choice Experiment
COMESA	Common Market for Eastern and Southern Africa
CSTI	Centre for Science and Technology Innovation
FAO	Food and Agriculture Organization (of the United Nations)
IIA	Independence from Irrelevant Alternatives
KACE	Kenya Agricultural Commodity Exchange
KARI	Kenya Agricultural Research Institute
MCFPCS	Makueni County Fruit Processors Cooperative Society
MDG	Millennium Development Goals
MNL	Multinomial Logit
NASEP	National Agriculture Sector Extension Policy
NEPAD	New Partnership for Africa's Development
RUM	Random Utility Model
RPL	Random Parameter Logit
PMGs	Producer Marketing Groups
SAPs	Structural Adjustment Programs
SPSS	Statistical Package for Social Sciences
UN	United Nations

CHAPTER ONE

INTRODUCTION

1.1 Background

The United Nations (UN) millennium development goal (MDG) number one is to eradicate extreme poverty and hunger. Over 70 percent of the hungry and poor people live in rural areas, particularly in Asia and Africa. For most of the rural poor, agriculture is critical to the successful attainment of MDG number one. Immediate gains in poor households' welfare can be achieved through a more productive and profitable agricultural sector (World Bank, 2006).

On the African front, the second pillar of the Comprehensive Africa Agriculture Development Program (CAADP) aims to accelerate growth in the continents' agriculture by among other ways, increasing market access (NEPAD, 2003). According to Food and Agriculture Organization (FAO, 2014), tropical fruit orchards in developing countries targeting export market earned 12.8 billion dollars in 2010. Small scale tropical fruit farmers have however been excluded from value chains due to lack of economies of scale, difficulty in complying with market access requirements, poor linkages to market and inadequate market information and dissemination. Despite the supermarket revolution which is creating market for horticulture farmers in Africa, Neven et al (2009) find that a 'threshold capital vector for entrance' in this channel hampers small, rain-fed farms. Consequently, majority of super-market suppliers are an emerging crop of fairly-educated farmers who own commercial and medium sized farms targeted at supermarkets. Promoting participation of small scale farmers in the agricultural value chain can improve their livelihoods and food security, and hence facilitating achievement of MDG number one.

Horticulture (fruits, flowers and vegetables) is a key agriculture sub-sector in rural Kenya. A report of the Horticultural Crops Development Authority (HCDA) shows that major fruits produced in Kenya in terms of volumes are bananas, mangoes, and pineapples (HCDA, 2010). Mangoes, however, seem more versatile than all others for their ability to thrive in low rainfall (500-1000mm) and a wide range of temperature (10-42 degrees Celsius) which makes it suitable even for the Arid and Semi-arid lands (ASALs). The area under mango cultivation in Kenya has been rising in the last decade as shown in Table 1 below.

Table 1: Mango production trends in Kenya

	2001	2002	2003	2004	2005	2006	2007	2008
Hectares (ha)	16,542	17,673	17,268	18,094	17,738	17,264	23,730	28,790
Volume (MT)	179,648	176,504	183,486	183,440	168,663	163,726	396,461	448,572
Value (Million KShs)	1,345.7	1,078.8	1,208.4	1,360.4	1,046.4	1,157.1	5,867.5	6,398.4

Source: Agricultural Business Development, 2011

Makueni County is located in the semi-arid lower Eastern region of Kenya. Majority of the residents (64 percent) are poor, a case that is attributed to the frequent drought that occurs in the area (Centre for Science and Technology Innovation, 2009). The Kenya Agricultural Research Institute (KARI) introduced mango farming in the county a decade ago to help mitigate the effects of the frequent droughts. Farmers in the County have taken up mango farming rapidly making Makueni the leading Producer of mangoes in the country as shown in Figure 1.

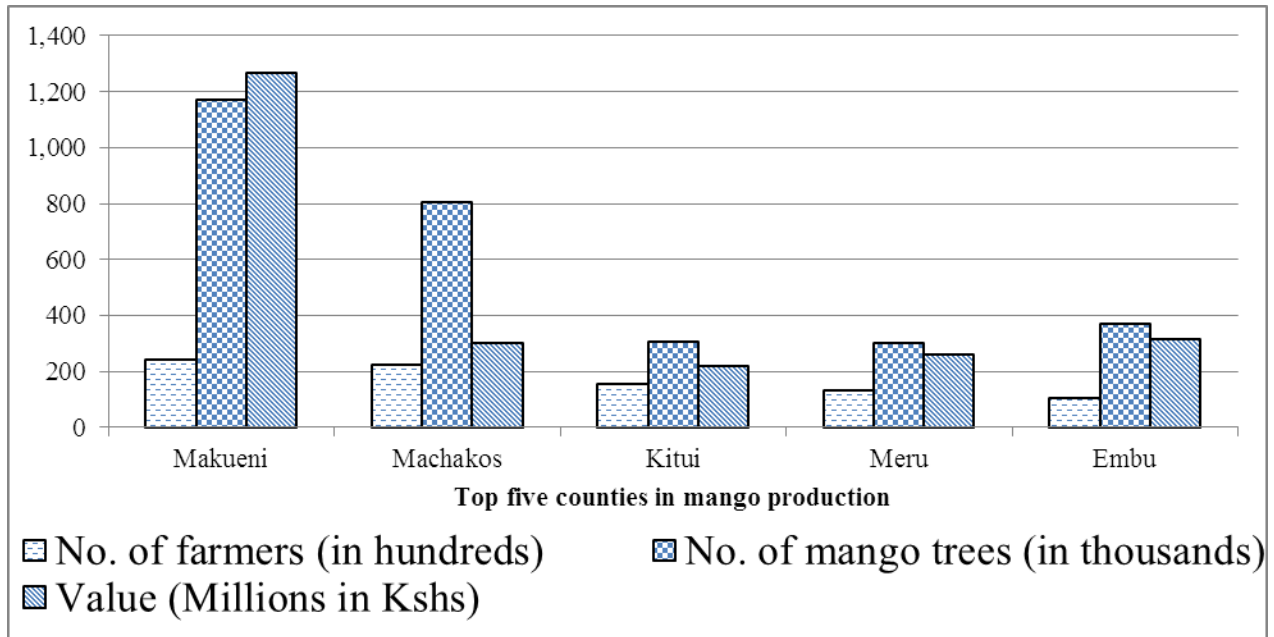


Figure 1: Selected statistics from top five mango producing counties in Kenya

Source: Agricultural Business Development, 2011; Msabeni et al. (2010)

From figure 1, Makueni County has a higher value relative to number of farmers and trees, compared to other counties. This can be attributed to the large proportion of apple mangoes which fetch higher prices. An estimated 49 percent of mango trees in Eastern region are apple variety compared to up to 70 percent in Makueni County (ABD, 2011). According to Mwangangi et al. (2012), in February and March of every year, even when there is a total crop failure in the area, mangoes are harvested, which creates a major source of income both for the farmers and casual laborers employed at the time.

Despite the apparent versatility of the fruit, mango marketing in Kenya is not organized. It is estimated that the margin to mango farmers is very low, at Kshs. 1.70 per fruit in some channels at farm level, while post-harvest losses could be up to 30 percent which is a disincentive to production (ABD, 2011). Marketing plays a critical role both in stimulating production and accelerating the pace of economic development. According to Panda and Sreekumar (2012), an

efficient marketing system ensures a high level of producers' share of consumer price, reduced number of middlemen, low marketing charges and reduced mal-practices in the marketing chains. However, most agricultural marketing channels in developing countries are long and complex, and with high transaction costs that considerably lower the farmers' share of the consumer price (Shiferaw, 2006).

Agricultural marketing in Kenya has experienced major changes from the era of marketing boards to a liberalized and much more diversified market system owing to implementation of Structural Adjustment Programs (SAPs). Liberalization has seen marketing boards give way to private market players in the agriculture sector; hence farmers have a wider variety of buyers/channels to target. Previous studies on Kenya's mango sub-sector have identified four main marketing outlets (brokers, processors, exporters and direct selling), as shown in Figure 1.

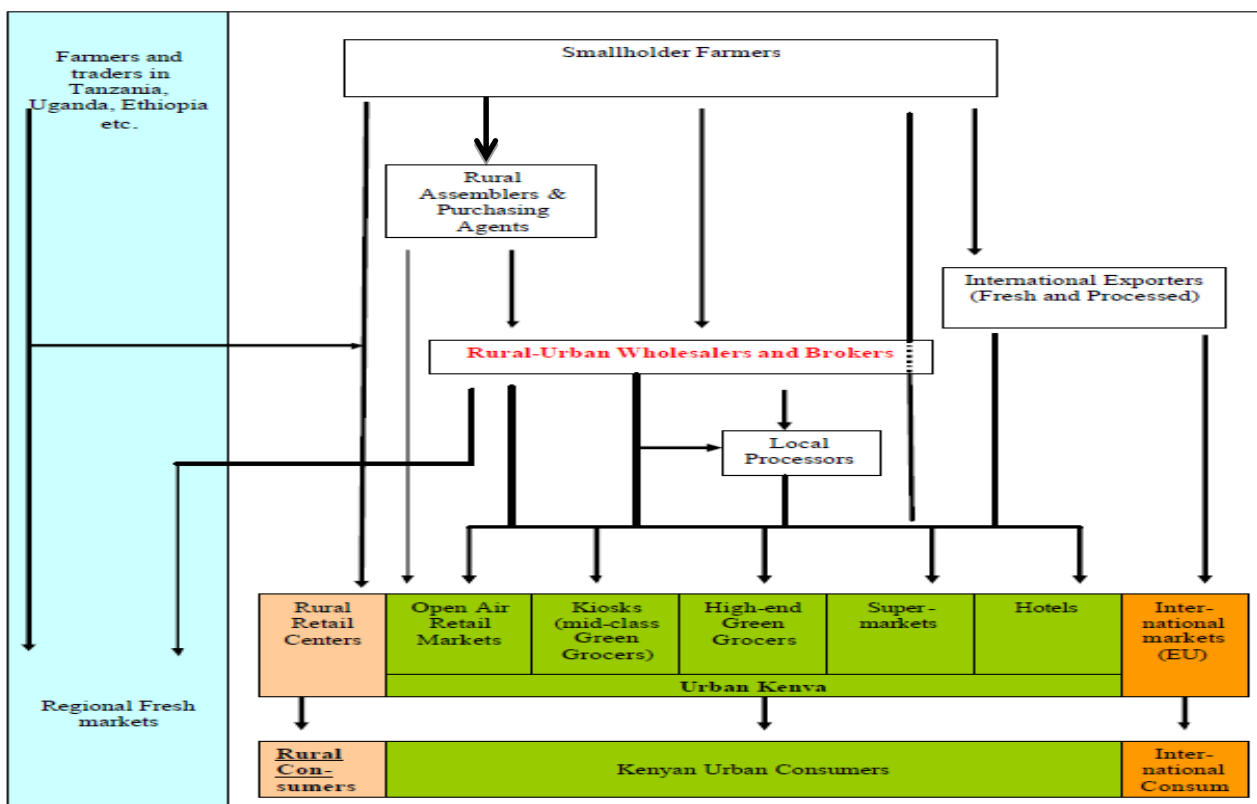


Figure 2: Mango supply chain in Kenya and regional market

Source: FAO, 2003

From Figure 2, a farmer has the option of selling to any of 4 channels, namely; intermediaries (rural assemblers, wholesalers and brokers), rural retail centers, urban retail centers and exporters. The channels vary in incentives and conditions such as prices offered, quality and quantity requirements, contracts, costs, and cash or credit payment among others. Exporters and intermediaries (mainly brokers) buy mangoes from farmers at the farm-gate, they move from farm to farm during mango season in search of mangoes. Farmers who sell to both rural and urban retail centers are classified in this study as selling to direct market; this category of farmers have to transport their produce to the retail centers either using own or hired means of transport.

1.2. Problem statement

Kenya's liberalization of agricultural markets was meant to improve efficiency by reducing costs and increasing accessibility through increased private sector participation, thereby giving producers a wider choice of marketing channels. Despite the increased private sector participation, results of improved small scale farmers' income from markets have not been achieved in majority of markets (Shiferaw et al., 2006). Generally, marketing chains for agricultural commodities in Kenya are long, not transparent, and consist of many players, making them inefficient and unresponsive to producer needs (GoK, 2010_a).

The mango sub-sector has not been spared; though mango farming has developed in the last 10 years to become a key source of income for many households in Makueni County, marketing innovations especially by farmers, have not moved at the same pace. The direct market channel and other formal channels offer better terms such as high prices. The government and other stakeholders have focused efforts at linking farmers with these channels by assisting farmers form groups and organizing forums where farmers and the buyers can link. ABD (2011) however found that majority of farmers still sell to brokers at farm-gate. This happens in spite of mistrust,

accusations of exploitation, and refusal by brokers to sign contracts; as a result, mango farmers experience heavy losses and a glut situation during peak season due to lack of access to markets. According to Tsourgiannisa et al. (2008), the marketing channel used when selling a product has a bearing on the profit farmers may make. Profit should then drive the choice of marketing channel, yet this often is not the case; it is not clear what drives the decisions of the choice of marketing channels and the actual consequences for the mango farmers in Makueni County.

There has been extensive research on choice of marketing channels; Ferto and Szabo (2002) on Hungarian fruit and vegetable sector, Ogunleye and Oladeji (2007) in the cocoa sector in Nigeria, Martey et al. (2012) on the yam sector in Ghana, among others. Results from these studies vary depending on the product being considered, number and organization of available channels, and the institutional, technical, and economic environment the farmers operate in. Channel choice studies have received very little attention in Kenya and especially the horticultural sub-sector with the available studies, (for example, Msabeni et al. 2010; ABD 2011), only focusing on other aspects of value chains and production statistics. There is lack of empirical information on the process of mango farmers' channel choice decisions and the factors affecting participation into available marketing channels. There is need to complement the apparently successful innovations in the primary production with innovations in marketing. This study therefore seeks to provide empirical information on the decision making process of farmers on market channels to sell to, and the factors that influence such decisions.

1.3 Purpose and Objectives

The purpose of this study was to analyze the factors that influence mango farmers' choice of marketing channels in Makueni County

Specific objectives

- i) To characterize the different marketing channels available for mango farmers in Makueni County.
- ii) To evaluate the factors affecting the mango farmers' choice of market channels.

1.4 Hypotheses

- i. There is no difference in the prices offered by the different channels

There are several points of interaction between buyers and sellers; they include price and price determination mechanism, payment, payment method and duration, and information transmission among others. The variation that was tested in the current study is in price, as it is the cardinal factor that determines whether or not a transaction takes place.

- ii. Socio-economic, institutional and technical factors do not affect farmers' choice of marketing channel

From literature, several factors have been variously identified as having an influence on farmers' decision on the channel to target. These include off-farm employment, group membership, household income, experience, contact with agricultural extension personnel, training, number of mango trees, years spent in school, distance to the nearest tarmac road, access to market information, and ownership of a means of transport. In the present study, the potential influence of some of these factors on farmers' choice of marketing channels was empirically tested.

1.5 Justification

Agriculture has been identified as one of the key sectors to deliver the 10 per cent annual economic growth rate under the economic pillar of Kenya's vision 2030. One of the strategies of accelerating agriculture sector growth is to improve market access for smallholders through better supply chain management (GoK, 2007). The importance of market access to agriculture

development has also been emphasized in the Agricultural Sector Development Strategy (ASDS) 2010-2020 (GoK, 2010_a). The Government aims to help farmers to access markets through developing marketing infrastructure, especially rural market facilities, ensuring that agricultural products meet international quality and safety standards, and supporting farmer organizations to play their role in providing market support services. This study provides insights into the factors, both farmer and market related, that restrict market access for farmers. The policy recommendations of the study highlight areas which need policy input from the government and other stakeholders in order to streamline markets and manage current inefficiencies.

The agriculture sector will be a key player in multilateral and bilateral trade negotiations with the objectives of expanding and diversifying agricultural markets especially to the Common Market for Eastern and Southern Africa (COMESA) and other export markets (GoK, 2010_a). There is need for better understanding of how farmers have been able to exploit the available markets, what challenges and opportunities exist, and how farmers can be assisted to target emerging niche markets that they have not been able to exploit.

This study provides insights into the interaction between farmers and traders and the factors which tilt the equilibria of interaction. The results are applicable in other sub-sectors of agriculture especially in other developing countries where farmers face similar conditions. This study therefore adds to the body of literature that explains the structure of agricultural markets after liberalization and the role of institutional factors in influencing transactions.

1.7 Organization of the thesis

Chapter one of the thesis provides general overview of the role of Agriculture, specifically horticulture and in particular mangoes in poverty reduction, especially among poverty stricken rural farmers in developing countries. The problem being investigated and objectives of the study

are also discussed here. The rest of the thesis is organized as follows: Chapter two is a review of literature on the mango sub-sector and studies on market channel choices. Chapter three is a description of the methodology, which includes the conceptual, theoretical, and empirical frameworks. In these sections, the theory on which the study is based is discussed, as well as a description of the analysis methods used in the study. Sampling procedure and data collection methods are also discussed in Chapter three. Chapter four presents the results of the study, while chapter five presents summary, conclusions and highlights policy recommendations from the study.

CHAPTER TWO

LITERATURE REVIEW

This section provides a review of the literature in the mango sub-sector as well as other studies that have focused on choice of market channels by producers.

2.1 An overview of the mango sub-sector in Kenya

In Kenya, mangoes are produced by both large scale and small scale farmers for both export and domestic consumption. The bulk of the mangoes (over 98 percent) are for domestic markets and about 1-2 percent with a value of approximately Kshs. 150 million per year is exported (Msabeni et al. 2010). Middlemen, individual farmers or farmer groups sell approximately 5 percent of the fresh mangoes to processing industries such as Kevian Kenya Limited, Sunny Mango Processors, and Milly Processors. Mangoes account for 26 percent of fruit exports, second to avocados at 62 percent. The major destinations for export mangoes from Kenya are presented in Figure 3.

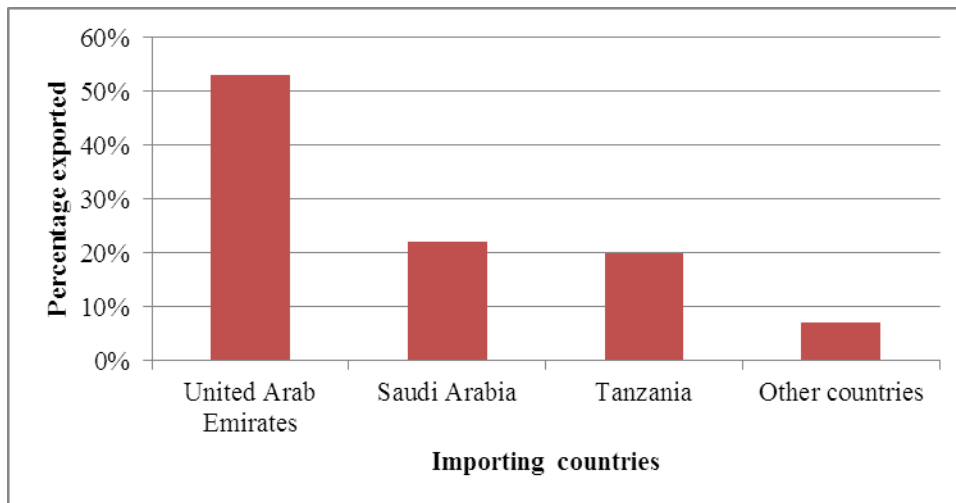


Figure 3: Major mango export markets for Kenya

Source: HCDA, 2010

Eastern Region leads in mango production in Kenya, with over 3 million trees planted in over 42,000 hectares, followed by coast region with 1.4 million trees. Mango farming generates over

Kshs. 2.4 billion at farm level annually, which accounts for 22 percent of farm household income in the region. At county level, Makueni County with approximately 1,172,636 trees with annual value of Kshs. 1.3 billion leads in mango production, second is Machakos County with 803,533 trees and annual value of Kshs.300 million (ABD, 2011). There are about 32 mango varieties grown in Kenya, but only a few are grown on commercial scale, these include; Ngowe, Boribo, Apple, Kent, Dodo, Tommy Atkins and Van Dyke. Approximately 70 percent of mango trees grown in Makueni County are apple variety. The apple variety is preferred because it fetches higher prices compared to the other varieties.

ABD (2011) summarizes key constraints facing mango farmers in Kenya as un-assured markets, unreliability of buyers, and a poorly organized value chain generally dominated by brokers. FAO (2003) identified four areas of concern in the mango sub-sector which are classified in 4 stages; production stage, marketing stage, processing stage and the export stage. At the farm-level, farmers lack clean planting material, adequate technology, and adequate post-harvest handling facilities. Constraints at the marketing stage include poorly developed transport infrastructure and prohibitive transport and shipping costs both within and outside the country. Supply is not well organized and farmers often lack the necessary information on alternative marketing possibilities and other options for value addition leading to poor market access and high transaction costs to both producers and buyers. According to Jayne et al. (2002), the problem of market access is linked to farmers' inability to meet market standards, low volumes of produce, wide dispersion of producers, presence of middlemen and perceived low prices, gender, education levels and information asymmetry. This study was therefore an attempt to enumerate the specific constraints faced by mango farmers in accessing their markets of choice. This should

help in coming up with crop specific policy and/or practice measures for mango farmers in this case to enable them better overcome the constraints and increase benefits from mango farming.

2.2 Review of Kenya's mango marketing channels

Brokers account for the largest portion of mango sales in Kenya (ABD, 2011). They operate in a climate of uncertainty but are not willing to enter into formal contracts with farmers; hence farmers do not trust them (Msabeni et al., 2010). Panda and Sreekumar (2012) argue that in cases where markets have been heavily infiltrated by brokers, farmers would be better off by organizing themselves into Producer Marketing Groups (PMGs) or cooperatives. This would give the farmers better bargaining power for their produce over brokers, who manipulate and control the price in the marketing system.

Over 90 percent of smallholder farmers in almost all regions of Kenya produce horticultural crops, but only less than 2 percent do so directly for export (Muendo and Tschirley, 2004). The export market offers better prices but requires reliable supply which should meet the stringent quality and safety standards required in the world market. Exporters normally buy mangoes from PMGs and individual farmers through formal and informal contracts.

Some farmers transport their produce to the local markets or major urban centers using own or hired vehicles or even public transport vehicles that are locally known as “matatus”. Most of these farmers transport the mangoes in gunny bags which affect quality and price, (Msabeni et al. 2010), but they still earn higher prices than those who sell at farm-gate. Only a small proportion of farmers target direct market and they operate individually due to lack of organized marketing groups, the farmers do not engage one of them to transport product to the market for this channel. Fafchamps and Hill (2005) attribute this behavior to lack of trust among the farmers and fear of being cheated as prices are continually changing. According to Matin et al. (2008),

farmers who sell their produce directly to the ultimate consumers get more benefit. However, in an environment of information asymmetry as is the case of most agricultural markets in developing countries, it is difficult for risk-averse farmers to transport their produce to the market. Faced with choice between waiting for the buyers in the farm-gate, and transporting the produce to the market where they will get a higher price but must incur transport costs; the former will be more likely. Fafchamps and Hill (2005) observe that selling directly to the market is more likely when the quantity sold is large and the market is near. This study therefore sought to characterize the different channels specifically used by farmers in Makueni County and assess the factors that influence farmers in accessing the channels. Understanding these factors would complement efforts to assist farmers' access especially to niche market outlets that offer higher profitability.

2.3 Institutional factors in Agricultural marketing

According to Kirsten et al. (2008), African agricultural markets do not always function in the best interest of the society because of poor communication and transport facilities. Markets are highly segmented and restricted, leading to market failure and missing markets in some instances. Janvry et al. (1991) define market failure as when the cost of transacting through market exchange creates disutility greater than the utility gain that it produces, with the result that the market is not used for transaction. When such happens, either a surrogate institution will emerge to allow the transaction to take place or the transaction will simply not occur. Market failures eventually give rise to institutional arrangements. However, lack of clear definition of property rights and information asymmetry leads to high efficiency costs of these arrangements; this is the case in developing countries. There is therefore the need for balance between merits of

improved market performance and the efficiency costs brought by the new institutional arrangements.

There are many definitions of what institutions are, the most commonly used is by North (1990); institutions are a set of formal (laws, contracts, political systems, organizations, markets) and informal (norms, traditions, customs, value systems, religions, sociological trends) rules of conduct that facilitate coordination or govern relationships between individuals or groups.

Institutions facilitate low cost coordinated exchange, resource management, and encourage trust, thereby providing incentives for exchange and resource management by creating profitable investments and exchange (Kirsten et al., 2008). Transaction costs, information flows, and collective action are the major aspects of institutions in Agricultural marketing.

With the low profit margins reported among mango farmers in Makueni County, it is not clear whether institutional factors play a part in influencing where the farmers sell and ultimately the profits they earn. This study therefore incorporated institutional factors such as information access, collective action and transaction costs. These factors are discussed in depth in the subsections that follow below.

2.3.1 Transaction cost and imperfect information

Transaction costs are defined as any other costs, other than cash price, that are incurred during trading or exchange of goods and services. Transaction costs impede exchange and hence reduce markets' ability to reach efficient prices leading to multiple possible price equilibriums in the market for a similar product. The market equilibrium eventually depends on institutional arrangements governing that particular market. Kirsten et al. (2008) argue that the assumption of perfect and free market information by neoclassical economists may not be all that practical.

Information is most of the times costly, and when so, various activities related to exchange of property rights between individuals gives rise to transaction costs. Transaction costs are incurred in; the search for information on prices and quality of products, bargaining, and the making, monitoring and enforcement of contracts. Mangisoni (2006) notes that Smallholder farmers find it difficult to penetrate formal markets due to, among other factors, high transaction costs, high risks, missing markets and lack of collective action. There is need to define precisely the situation in Makueni County, if the farmers have to be helped overcome the marketing challenges they face.

Lack of perfect and free information leads to risk and uncertainty in transactions; sellers have more information than buyers about the availability and characteristics of the products they are selling, while buyers have more information than sellers about the nature of their demand and their ability and intentions to pay for products that they purchase (Kirsten et al., 2008). Searching for and obtaining information about products and sellers and about demand and buyers is then necessary for both parties involved in the transaction in order to reduce the risks of transaction failure. However, searching and obtaining information is not costless; it is an important source of transaction costs (Kirsten et al., 2008). Better information can improve farmers' bargaining position, reduce search costs, and give them the choice to travel to farther markets if prices there are higher (Zanello et al., 2001). In addition, farmers relying on informal networks for market information are at risk of getting biased information due to opportunistic behavior of the more informed group. For instance, Mangisoni (2006) explained that smallholders usually accept low prices for their crops when the buyer informs them that their produce is of poor quality because they are unable to negotiate from a well-informed position. More distant markets may have better infrastructure, more buyers, and potentially higher profits; reasons that can urge

households to transport their product to be sold there (Shilpi and Umali-Deininger, 2008). However, Zanello et al. (2001) argue that distance would increase proportional transaction costs and possible information on prices may be unreliable adding uncertainty and risk to the transaction.

Farmers in Makueni County, being in a developing country, are likely to be faced with high transaction costs due to information asymmetry and poor infrastructure. Transaction costs are a major aspect of trade in agriculture and especially for small scale farmers, this study therefore sought to find out the types of transaction costs mango farmers incur, the source of such costs, and how the transaction costs affect their choice of market outlet. Further, the importance of market information in market channel decision making has not been adequately documented in literature. This study sought to find out the sources of market information for mango farmers and how access or otherwise of the information affects choice of where to sell.

2.3.2 Collective action

Collective action arises when people come together because of common constraints to take joint action and decisions to accomplish an outcome, the activities affect the interests or wellbeing of a group (Sandler, 1992). According to Kirsten et al. (2008), collective action among producers in African countries can help lower transaction costs and empower producers to hold service providers and buyers accountable for the types and quality of service they deliver. In addition, Poulton (2014) notes that committed farmers working together can perform some of the monitoring functions required for traceability at lower cost than can the employees of buying firms. Fischer and Qaim (2012) found that marketing through a group yields a higher price than selling individually among banana farmers in Central Kenya; similar results were also found by Wollni and Zeller (2006) among coffee farmers in Costa Rica. However Fischer and Qaim

(2012) noted that prices between the channels cannot be used as proxy for profitability because farmers selling through groups incurred extra costs of transporting produce to collection centers.

Most smallholder farmers lack collective action in markets; individual marketing of small quantities of produce weakens the smallholder farmers' bargaining power and exposes them to price exploitation by traders (Kherallah and Minot, 2001). Lack of PMGs makes it difficult for smallholder producers to participate in formal markets. Frank and Henderson (1992) found that the greater the degree of organization in the market, the smaller the transaction costs are likely to be and the easier it is to benefit from an exchange opportunity. According to Shiferaw et al. (2006), producer marketing groups have the potential to simplify and shorten the marketing chain by directly connecting small producers to markets, coordinating production and marketing activities and facilitating farmer access to production inputs at fair prices.

The effectiveness of PMGs especially in semi-arid Eastern Kenya is however hampered by lack of credit, price variability due to seasonal production, low volumes, lack of buyers, and their lack of cash capital to pay for produce deliveries by farmers. Brokers who normally pay cash on delivery are still the dominant market channel in majority or rural markets. Shiferaw et al. (2006) note that due to this factor, cash constrained farmers find it very difficult to sell through PMGs, even when the PMGs would eventually be in a position to pay prices significantly higher than other buyers. Hence many small scale farmers choose to sell their produce to other channels although this may mean receiving lower prices.

In the case of Makueni County, Mwangangi et al. (2012) found that existing farmer groups do not operate efficiently and only meet when they need to market hence farmers do not have confidence in them. Farmers in the groups breach contracts when the middlemen offer higher prices. There is need to evaluate to what extent mango farmers have used the advantage of

collective action to access formal channels. This study therefore sought to evaluate, among other factors, the importance of collective action in choice of market channels among mango farmers in Makueni County.

2.4 Review of past studies in market channels

A number of studies on choice of market channels have been carried out, revealing institutional, socio-economic and technical factors influencing marketing channel choice decisions by farmers. Ferto and Szabo (2002), for instance employed a framework of transaction cost economics in analyzing the choice of supply channel in Hungarian fruit and vegetable sector. The Multinomial logit (MNL) model was used to assess the determinants of choice among various supply channels. The study, however, did not sample randomly as the survey targeted larger, market oriented farmers. Transaction costs impede small holder poor farmers who due to inability to afford to pay the cost are not able to participate in the formal channels. The current study employed a random sampling technique to capture farmers in all categories of wealth. Random sampling eliminates systematic bias by giving all individuals an equal chance to be chosen.

In Nigeria's cocoa industry, Ogunleye and Oladeji (2007) identified time of payment, price, distance from market, transportation cost and grading as the main factors that influenced farmers' choice of marketing channel. The study used descriptive statistics to determine the most patronized channels and factors associated with farmers in those channels. The study, however, ignored all institutional factors except grading. It is not possible to effectively discuss marketing in any developing country without recognizing the effect of institutional factors on farmer's marketing behavior. To bridge this gap, the current study has taken into consideration institutional factors such as transaction costs, social capital, collective action, contract farming, among others, which classical and neo-classical economics will often not address.

Martey et al. (2012) found that contrary to most literature, yam farmers in Ghana responded more to prices than transaction cost. The study however used ownership of a mobile phone as a proxy for access to market information which may fail to give accurate results. Given the structure of African markets where buyers withhold information with intention of exploiting farmers, owning a mobile phone may not necessarily mean that a farmer has access to market information. The study found that farmers with access to information were more likely to sell to the rural market which is contrary to expectation, an indication that use of ownership of mobile phone as proxy for access to information may have been wrong. The current study therefore used the actual variable, information, as opposed to a proxy. Martey et al. (2002) found that majority of the farmers preferred the urban market channel because it offered the highest prices. In Kenya, this may not be the case, because mango markets are located in areas faraway from farms and majority of farmers lack means of transport and information on the said markets as found by Msabeni et al. (2010). Although the farmers may be interested in selling to channels offering the highest prices, their socio-economic and institutional environment may not enable them to exploit the opportunity. However, farmers who own means of transport may be able to take their produce to markets as reported by Panda and Sreekumar (2012) among Indian vegetable farmers. Farmers' own vehicles allow them to move freely and without relying on others to participate in formal markets, which are located far off. In Kenya, only the export channel has formal structures; the exporters collect the produce at the farms hence ownership or otherwise of transport means may not be a requirement for farmers to participate in formal channels.

A few studies on channel choice have been carried out in Kenya, for instance, Mburu et al. (2007) on choice of market channels for dairy farmers and Murage and Ilatsia (2010) on use of breeding services by dairy farmers. The dairy sector in Kenya is fairly organized with many

cooperative societies and farmer groups, few large companies, and relatively few brokers. This is not the case with the horticulture sub-sector which is dominated by brokers. No other study has been done to determine the factors that affect channel choice by producers in the horticulture sub-sector, and specifically the mango sub-sector, which is faced with unique challenges; this literature gap is what this study sought to fill.

CHAPTER THREE

METHODOLOGY

This chapter reviews the research methods that were used in collecting and analyzing data from mango farmers in Makueni County.

3.1 Study area

Makueni County is located in the lower eastern region of Kenya which is mainly semi-arid. The county has experienced massive planting of new mango trees in the recent past; fruit trees (mango and citrus), are common in the farms. These are also a main and very important source of income in the area, with 46 percent of households selling mangoes (Mwangangi et al., 2012). There is a huge potential for expansion of the mango industry in Makueni because of availability of land and favorable climate. However, various issues in marketing need to be addressed if this potential is to be achieved. Despite the high concentration of mango farmers, there is no mango processing plant in the County nor in any of the neighboring Counties and only one mango farmers' cooperative exists (Makueni County Fruit Processors Cooperative Society (MCFPCS). The county was purposively selected because of its high concentration of mango farmers, and relatively high poverty levels at 64 percent compared to a national average of half of the population (Kenya National Bureau of Statistics, 2009). Figure 4 shows a map of Kenya showing the geographical position of Makueni County.

3.2 Conceptual framework

The decision of a farmer on choice of market channel by a farmer depends on the socio-economic, technical and institutional factors the farmer operates in. A schematic diagram of the framework is presented in figure five.

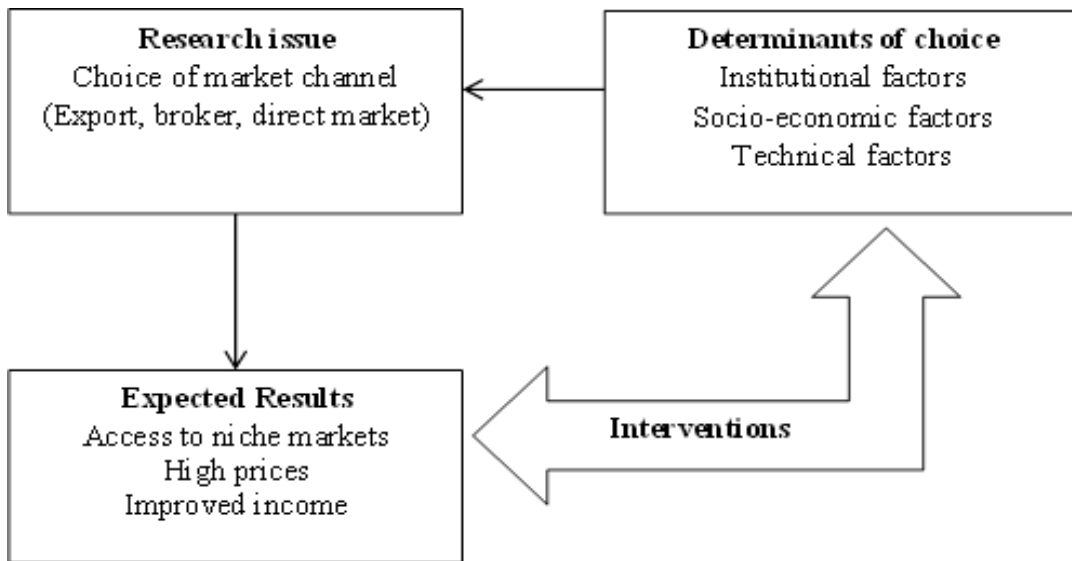


Figure 5: Conceptual framework

Source: Author conceptualization

As illustrated in Figure 3, the research issue (market channel targeted), is a determinant of the price a farmer earns and ultimately the income. This is also noted in section 1.2, that the market channel targeted affects the profit a farmer earns. It is therefore imperative that interventions be targeted at ensuring that farmers are able to access niche and formal markets to raise incomes. These interventions need to be targeted at the socio-economic, institutional, and technical environment within which the farmer operate in.

Institutional aspects in marketing and economic development include transaction costs, market information flows, grades and standards, market organization, and farmers' training and education. There is need for interventions aimed at assisting farmers to come up with new kinds

of institutional arrangements such as collective action and contract farming to reduce cost and improve the bargaining power of farmers. Collective action of farmers, for example, would reduce transaction cost and increase their bargaining power and ability to meet some of the stringent conditions of some of the outlets. Technical factors such as training and production factors like number of trees a farmer has may have some influence on choice of where to sell. Farmers with fewer trees may not access export market due to lack of economies of scale, but interventions aimed at encouraging collective action for such farmers may have positive results. Socio-economic factors such as level of education and income are also hypothesized to influence choice of market channel. Interventions such as provision of training and credit facilities can improve access to market for farmers who face challenges of low levels of education and income respectively. Farmers' income and the welfare of their households could be improved through these interventions, by improving access to niche and formal markets.

3.2 Theoretical framework for analysis

This study is based on the random utility model (RUM) which assumes that the decision maker has perfect discrimination capability. A farmer decides on the marketing channel to be used based on the option which maximizes their utility, subject to internal and external factors. If the costs that are associated with using a particular channel are greater than the benefits, households will be discouraged from using it, shifting to another option that maximizes their utility. The decision maker has incomplete information and therefore uncertainty has to be taken into account. The utility is therefore modeled as a random variable in order to reflect the uncertainty. Following Greene (2003), the utility that individual i obtains in associating with alternative j is expressed as;

$$U_j^i = Z_j^i + \varepsilon_j^i \quad (1)$$

Z_j^i = deterministic part while ε_j^i is the stochastic part to represent uncertainty.

If the decision maker selects alternative j , then it is assumed that U_j^i is the maximum among j utilities. The statistical model is then driven by the probability that choice j is made, which is;

$$Prob(U_j^i > U_k^i) \text{ for all other } k \neq j \quad (2)$$

The Multinomial Logit model was used to relate the decisions to participate in the different channels and the factors that influence these choices. The Multinomial Logit model is the standard method for estimating unordered, multi category dependent variables; it allows one to analyze data where participants are faced with more than two choices (Gujarati, 2005).

The Multinomial Logit model was specified as follows;

$$Prob(Y_j = i) = \frac{\exp(X_j^i \beta_i)}{\sum_{j=1}^m \exp(X_j^i \beta_k)} \text{ where } 0 < P_{ij} < 1 \quad (3)$$

$$Prob(Y_j = i) = P_{ij}(\beta_0 + \beta_1 \dots \dots \beta_k x_k) \quad (4)$$

Where Y_j is probability of farmer j choosing alternative i

Market i : 0 = brokers, 1 = exporter, 2 = direct market

X_i = vector of household, production and marketing variables

β_i = the vector of coefficients associated with the market choice

In Multinomial Logit model (MNL), a baseline alternative, corresponding to the status quo also known as ‘do nothing’ situation is chosen. This is because one of the options must always be in the respondents’ choice set to be able to interpret the results in standard welfare economic terms (Hanley et al., 2001). A major condition that has to be satisfied in MNL is the Independence from Irrelevant Alternatives (IIA). According to Hausman and Mc-Fadden (1984), the IIA Property requires that the relative probabilities of 2 options being selected are unaffected by the

introduction or removal of other alternatives. If IIA is violated, other statistical methods which relax the assumption are used, they include; Multinomial Probit, Nested Logit (McFadden, 1981), and Random Parameter Logit model [RPL] (Train, 1998).

Gujarati (2009) argues that in cases where the dependent variable is an unordered categorical variable, as was the case in this study, multinomial logit is most appropriate, subject to not violating the IIA. The Multinomial logit has been used in many of the studies dealing with choice, not just in marketing; other case examples include use in choice of animal breeds (Murage and Ilatsia, 2010), and in determining adoption of various milk marketing channels (Mburu et al., 2007). According to Cattani et al. (2002), choice models based on the MNL formulation are standard in marketing science applications and yield optimal pricing policies which align with observed sales and pricing strategies of firms. This study therefore used MNL to determine the factors that influence farmer choice of marketing channel in the mango sub-sector.

3.3 The empirical model

Market channel choice, with three possibilities; brokers, exporters and direct market was used as the dependent variable. Brokers and exporters buy at the farm-gate while direct market is used in this study represent farmers who transport their produce to sell to retailers and wholesalers in towns. The choice 'brokers' was used as the baseline group. The specific objectives were attained through the analysis discussed in the sections below.

3.3.1 Characterization of mango marketing channels used by mango farmers in Makueni

Descriptive statistics was used to exhibit characteristics of the different marketing channels and to determine any variation in interaction between channels. The main items considered were

prices, price discovery mechanisms and sources of market information. The Statistical Package for Social Sciences (SPSS 20) was used to characterize mango farmers in Makueni County and the market channels they used to sell mangoes. Sample mean and percentage for various socio-economic factors was also computed using SPSS. One way Analysis of Variance (ANOVA) was used to test whether there was any significant difference between the prices offered by the 3 channels. Analysis of variance is a statistical method used to test the differences between two or more means. The analysis involves carrying out a variance ratio test (F-test) to determine whether all group means are the same. A non-significant F-test would indicate no meaningful differences among the means while a significant F-test suggests real differences among the treatment means, (Armstrong et al., 2000), and therefore rejection of hypothesis one.

3.3.2 Evaluation of factors affecting farmers' choice of market channel

The Multinomial Logit model was used to quantify the factors influencing marketing channel choice (brokers, exporters, direct market) by mango farmers in Makueni County. The P values were tested at 1 percent, 5 percent, and 10 percent significance level. The positive sign of the coefficient indicates an increase in the likelihood that a farmer will change to the alternative option while a negative value shows that it is less likely that a farmer will consider the alternative (Panda and Sreekumar, 2012). Marginal effects were also computed to determine the exact effect of a change in the independent variable on the dependent variable. Based on the conceptual framework and on past empirical work on market channel choice, a number of relevant and suitable independent variables likely to affect the choice of marketing channel were identified and used in the MNL analysis. Table two shows the list of the explanatory variables and their expected signs.

Table 2: Table of expected explanatory variables

Variables	Description	Expected signs
GROUP_MEMBER	Membership to group (yes=1, 0 otherwise)	+
OFF_FARM	Head or spouse working off-farm (1=yes, 0 otherwise)	+
OWN_VEHICLE	Ownership of vehicle (yes=1, 0 otherwise)	+
HH_INCOME	Monthly household income in Kshs.	+
YEARS_IN_SCHOOL	Years completed in school	+
MARKET_INFORMATION	access to market information (1=yes, 0 otherwise)	+
DISTANCE_TO_TARMAC	Distance to the nearest tarmac road in Kms	-
TRAINING	Access to training (1=yes, 0 otherwise)	+
EXTENSION	Number of times of contact with extension services in the last 3 years	+
EXPERIENCE	Number of years growing mangoes	+
TOTAL_TREES	Number of mango trees in production stage	+

By fitting the variables, the model can be presented as

$$C_choice = \beta_0 + \beta_1 GROUP_MEMBER + \beta_2 OFF_FARM + \beta_3 OWN_VEHICLE + \beta_4 HH_INCOME + \beta_5 YEARS_IN_SCHOOL + \beta_6 MARKET_INFORMATION + \beta_7 DISTANCE_TO_TARMAC + \beta_8 TRAINING + \beta_9 EXTENSION + \beta_{10} EXPERIENCE + \beta_{11} TOTAL_TREES..(5)$$

Membership of a household to a marketing group increases access to information important to production and marketing decisions. Collective action of groups also reduces transaction cost incurred by farmers in searching for markets and increases their bargaining power in setting prices. If a household belongs to a farmer group, then it is likely the household will shift from selling to brokers and probably target formal channels such as exporters as found out by Panda

and Sreekumar (2012). Large buyers who are exporters tend to prefer buying from farmers in groups because of economies of scale and ease of enforcing quality standards and contracts.

Household income was expected to have a positive and significant influence on both the direct and export market channel. Wealthier farmers either own means of transport or are able to pay for transport to the market. Fafchamps and Hill (2005) found that wealthy coffee farmers in Uganda with large quantity of coffee for sale were more likely to sell it to a distant market because they are able to pay for transport.

Number of mango trees that a farmer owns was expected to have a positive and significant relationship with choice of both direct and export channel. Farmers with large farms produce more and so are likely to seek outlets/markets outside the farm-gate. In addition, Jari (2009) observed that small farmers find it difficult to penetrate the 'formal markets' due to high transaction costs, high risks, missing markets, and lack of collective action.

Another variable hypothesized to affect channel choice is ownership of a means of transport. Availability of own or hired transport is positively related to market participation as found by Panda and Sreekumar (2012). The positive relationship was also expected in Kenya because the farmers' own vehicles will not only minimize time of reaching the marketing center but also the produce is delivered fresh and undamaged which increases its marketability. The motorbike, locally known as "*boda boda*", is a major means of transport in Kenya; it is however rarely used to transport mangoes because mangoes are extremely bulky. As a result only vehicles that could be used to transport mangoes were considered as a means of transport in this study.

Off farm employment reflects off farm income. Income from other sources may enable the farmer to target channels which do not offer prompt payment especially the exporter channel (Shiferaw et al., 2012). Shiferaw et al. (2006), finds that cash strapped farmers are not able to

wait for delayed payments; they sell to buyers who pay on cash immediately to satisfy the immediate financial needs. The positive relationship was expected in Kenya because these farmers are able to purchase inputs and produce higher quality mangoes enabling them to target formal channels because they are able to meet the stringent conditions set by these channels.

Market information is an important factor when farmers are choosing where to sell, a more important factor is the source of the information that the farmer gets. Farmers with market information are expected to make more informed decision; hence the sign for variable information was expected to be significant and positive. Martey et al. (2012) says that the choice of a marketing channel depends on the information of the channel available to the participants. Distance to the nearest tarmac road was expected to have a negative effect on farmer's choice of channel; the farther the location of the farmer from tarmac road, the less likely they are expected to change from the baseline channel. Farmers farther from tarmac are poorly connected in terms of roads and communication networks; hence they are likely to be less served by formal channels due to increased transportation and transaction costs. The second hypothesis would be rejected in a situation where the respective β_i estimate is not significant

3.4 Sampling and data collection

The study used both primary and secondary data; secondary data was obtained from government sources, journals and sessional papers, previous studies and internet sources. Primary data set was obtained by use of semi-structured questionnaires administered face to face to respondents randomly selected from the study area. Respondents were the heads of commercial mango farming households selected in the study area. Interviews were also carried out on farmer group and cooperative society leaders.

Respondents were selected through multistage and systematic sampling techniques. In the first stage 3 locations (Kilili, Mumbuni and Kilala) were selected purposively from the county. The locations were selected purposively in order to capture important segments of the target population and allow data collection in areas where mango farming is prevalent in the county; there was observed concentration of mango farmers in the locations. Villages were selected based on two criteria; level of market organization and access to market. The level of market organization was based on organization of the farmers in to marketing groups while the access to market was measured by distance to the nearest tarmac road. The criteria were measured as either high or low. High was if the farmers were organized or close to tarmac road and low if the farmers were not organized or were far from the tarmac road. Purposive sampling allows selection of rich information that provides a great deal of insight into the issues of central importance to the research (Patton 1990).

Respondents, who were commercial mango farmers, were selected through systematic random sampling. Logistic regressions require larger samples than linear regression. According to Schwab (2005), the minimum number of cases per independent variable required in logistic regression is 10; the current study used 20 cases to one. With 11 independent variables, a minimum 220 cases were required, the study proposed 240 cases to cater for non-response and incomplete questionnaires. Following Kothari (2004), systematic sampling was used to select the respondents, the n th farmer (where $n = 3$) was selected along the determined routes with a random start in each of the villages to give a total of 227 respondents. This was within the project budget, timeline and market channel choice literature reviewed. The number of farmers interviewed from each village was based on the estimated total number of mango farmers in the

respective village. The selection criteria and number of respondents interviewed from each village from the three locations is presented in table three.

Table 3: Village selection matrix

High organization and low access	No. of respondents	Location	District
Kathatu	13	Kilili	Nzau
Kilumbu	20	Kilili	Nzau
Kavuliloni	8	Kilili	Nzau
Mulenyu	12	Kilili	Nzau
Itaa	13	Mumbuni	Makueni
Low organization and low access	No. of respondents	Location	District
Kilanga	12	Mumbuni	Makueni
Kisuu	12	Mumbuni	Makueni
Kithiani	18	Mumbuni	Makueni
Mboani	15	Kilili	Nzau
Wee	20	Kilili	Nzau
Low organization and high access	No. of respondents	Location	District
Muselele	12	Kilala	Kaiti
Itangini	6	Kilala	Kaiti
Nduundune	12	Kilala	Kaiti
Kaseve	16	Mumbuni	Makueni
High organization and high access	No. of respondents	Location	District
Nzueni	16	Mumbuni	Makueni
Kyumu	9	Kilala	Kaiti
Ngutw'a	13	Mumbuni	Makueni

Source: Survey data, 2014

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents both descriptive and econometric results of the study. The first section presents descriptive statistics that addresses the first objective; to characterize the different market channels available for mango farmers in Makueni County. Hypothesis one; that there is no difference in the prices offered by the different channels, is also tested in this section. The second section addresses the second objective; to evaluate the factors affecting farmers' choice of market channel. The second hypothesis; that socio-economic, institutional and technical factors do not affect farmers' choice of marketing channel, is also tested.

4.1 Characterization of the households and mango marketing channels in Makueni County

Data on the socioeconomic and institutional characteristics of mango farmers analyzed through descriptive statistics such as means and percentages. Results are presented in Table 4.

Table 4: Socio-economic characteristics of respondents (n=227)

Variables	Percent of farmers
Education level	
No education (percent of farmers)	6.2
Primary school (percent of farmers)	35.2
Secondary (percent of farmers)	39.2
Post-secondary (percent of farmers)	19.4
Percent of male headed households	87
Variables	Mean
Mean age of the decision maker (years)	49.9
Mean number of total family members	6.2
Mean distance to nearest tarmac road (Kilometers)	11.32
Mean years farmer has been growing mangoes (years)	9.89
Mean total land size in acres owned	7.34
Mean land size under mangoes (acres)	2.3
Mean number of trees per acre	78
Mean total mango trees per farmer	175.28

Source: Survey data, 2014

More than half of the respondents have attained secondary education, and only less than 10 percent have no education at all. In 2000 prior to the policy of free primary education in Kenya, the gross enrollment rate in primary school was 87 percent (World Bank, 2004) while World Bank (2009) estimates a net enrollment rate of only half of the population in secondary schools in Kenya. The position of level of education among the farmers is closely similar to the national figures. Education is posited to influence a household's understanding of market dynamics and therefore improve decisions on where to sell.

The average age for all respondents was slightly below 50 years. The constitution of Kenya defines a youth as a person above 15 years and below 34 years (GoK, 2010_b); the study therefore

finds very few youth engaging in agriculture. According to the Institute of Economic affairs (IEA, 2010), up to 80 percent of Kenyans are below 34 years old. The current study agrees with World Bank (2013) report that indicates very low involvement of the youth in agriculture. Various reasons have been fronted on why agriculture is not attractive to the youth, in the current study, it could be attributed to lack the requisite resources especially land, to carry out mango farming.

A large majority of decision makers among mango farmers in the study area are male, at 87 percent. In contrast, KNBS, (2009) found that slightly less than half of the households in Makueni district are headed by females. ABD (2011) attributes the low number of women in mango farming to the prevailing socio cultural factors where land and permanent crops are generally owned by men. The variable 'gender' was therefore left out of the econometric analysis because of the insignificant number of female farmers involved in mango farming.

The average distance in kilometers to the nearest market connected to electricity for all respondents was slightly less than 5 kilometers. From discussions with farmers, it was discovered that most of the farmers selling directly to the market targeted towns and cities far away such as Nairobi, Mombasa and Makindu and so the short distance to nearest center may not be an important factor. This is probably because during the mango season, most of the market centers nearby are already fully supplied with mangoes and hence the prices are more or less the same as at the farm gate. This means distance to tarmac was the more important factor as compared to distance to market center. The average distance to the nearest tarmac road for all respondents was more than 10 kilometers. Remote areas far from tarmac roads are sparsely populated compared to those closer to tarmac road, and so farmers own larger parcels of land as compared to their counterparts closer to the tarmac road.

The average trees per acre were 78, against a recommended rate of 28 trees per acre and 57 trees per acre for intensive farming (ABD, 2011). This shows that spacing of mango trees in Makueni was extremely small and this may affect long term productivity of the trees. Table 5 shows a comparison of recommended spacing against the practice by farmers in Makueni.

Table 5: Mango trees per acre in Makueni

Trees per acre				
Makueni			Intensive	Recommended
Max	Min	Average	(7m x 10m)	(12m x 12m)
188	12	78	57	28

Source: Survey data, 2014

The recommended spacing for ASALs is 12m x 12m due to infertile soils are poor rainfall. The difference between minimum and maximum trees per acre also provides insight in to mango farming in Makueni. Some farmers did not follow any specific spacing, rather they would scatter the trees all over the farm, or as an intercrop with citrus trees. As such, size of land under mangoes was not included in the econometric model as including it would have yielded wrong results. Instead, the number of mango trees a farmer had was more accurate in estimating the production, as opposed to land size.

4.2 Characterization of the different mango marketing channels

Different aspects of the channels in consideration were analyzed to determine any variation in the way that the different buyers interacted with farmers. More than half of the respondents mainly sold to brokers while only slightly more than ten percent sold directly to the market as illustrated in Figure 6.

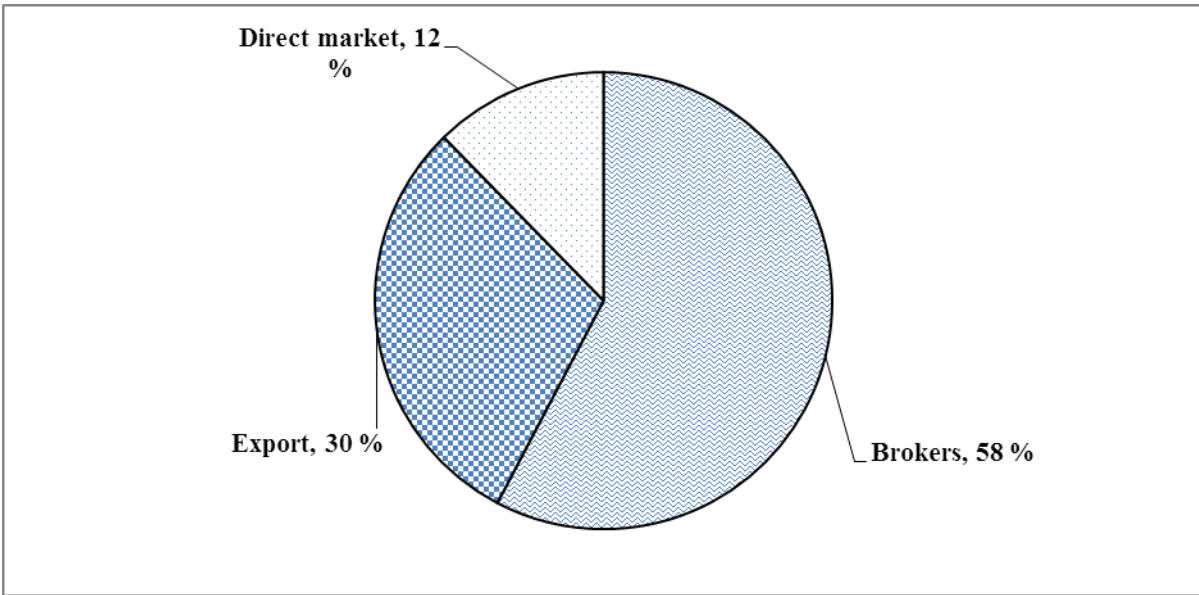


Figure 6: Distribution of farmers that target different channels

Source: Survey data, 2014

Only channels used as the main outlets are presented here, some farmers would sell most of the mangoes to these main outlets and the remaining few and low quality mangoes, which is a negligible quantity, to rural retailers or brokers. This was not considered as it only accounted for a negligible proportion of the total quantity a farmer produced. Such a case was common with farmers who sold to exporters as their main outlet because of their preference for quality as mentioned earlier.

4.2.1 Reasons given by farmers for targeting the different channels available

Farmers were probed on the reasons for targeting the channels they sold to. Figure 7 presents a summary of reasons that farmers stated for targeting the different channels.

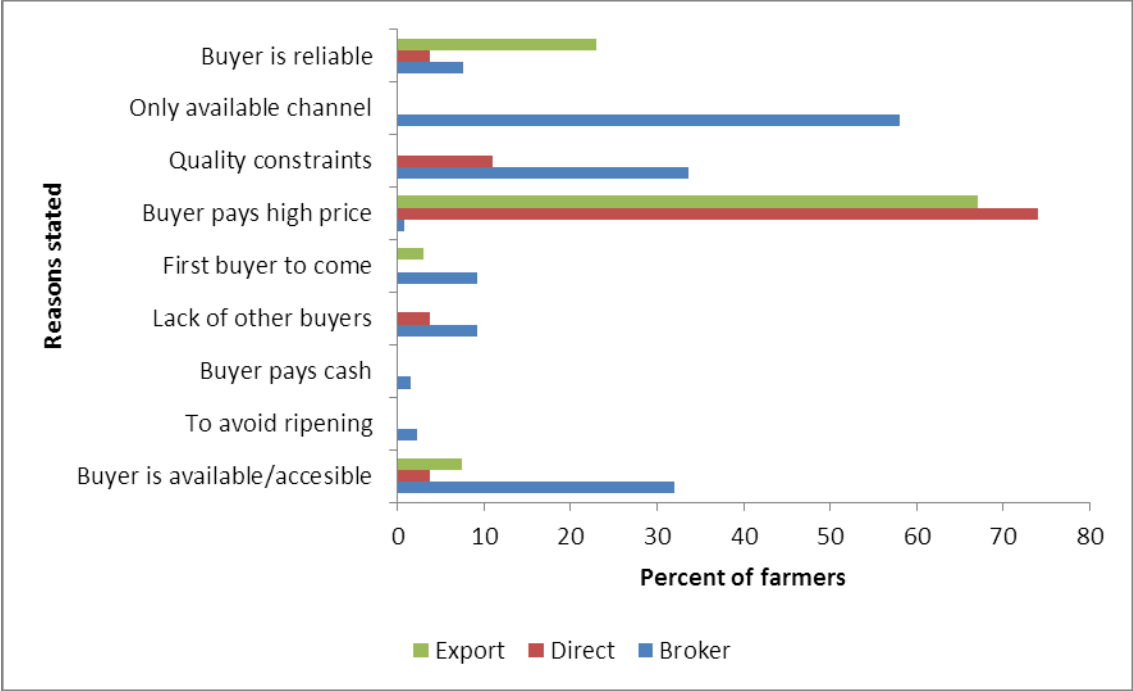


Figure 7: Reasons for using the different channels

Source: Survey data, 2014

Farmers gave varied reasons for selling to the different channels they targeted; a majority of farmers who sold to exporters and direct market cited high price as their main motivation when selecting market outlet. Up to 40 percent of farmers who sold to brokers were served by no other buyer (channel); this means these farmers were located in areas that were served by very few buyers. Fafchamps and Hill (2005) attribute this factor to small farms and geographical isolation of the farmers. In addition, Janvry et al. (1991) noted that the poorer the infrastructure, the less competitive the marketing systems, the less information available, and the more risky the transactions. Almost a quarter of respondents said they were forced to sell to brokers because their mangoes were of low quality and so not fit for especially the export channel. Reasons for low quality produce ranged from lack of credit to purchase pesticides, lack of expertise/training and lack of access to extension services, among others.

4.2.2 Price trends

Data was collected on gross prices that were paid by the different channels for the years 2011 to 2013; the results are presented in the Figure 8.

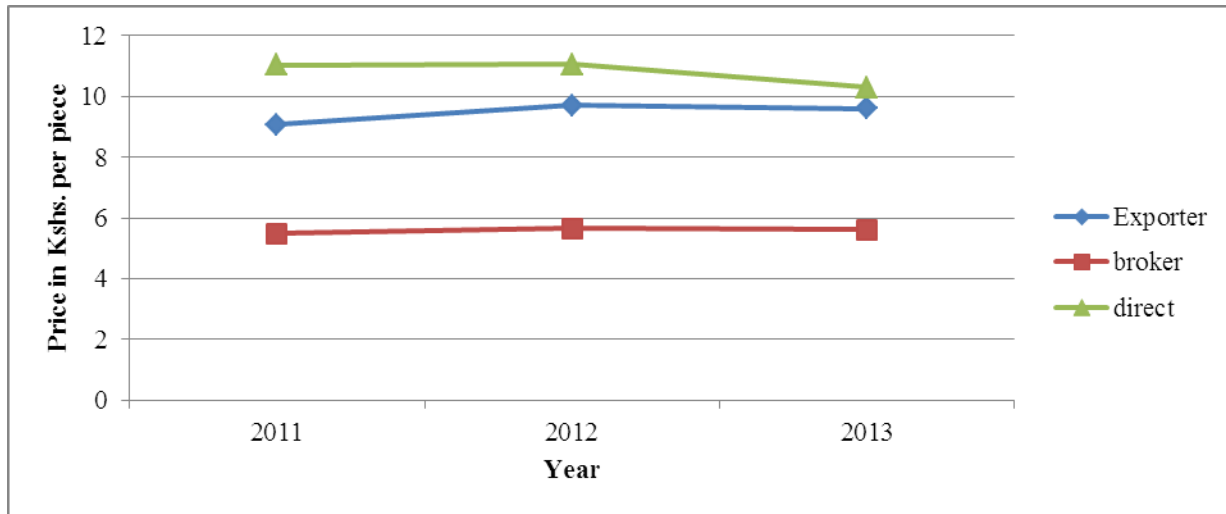


Figure 8: Gross price trends for the different channels 2011-2013

Source: Survey data, 2014

As shown in Figure 8, gross prices had been relatively constant within the channels for the period 2011-2013; direct market had the highest gross prices while brokers paid the lowest. High prices are however not tantamount to high profitability because of the difference in costs incurred in targeting the channels. Farmers who sold directly to the market incurred very high marketing costs in transport and storage. Farmers who sold to brokers incurred the lowest costs because brokers moved around in the farms in search of mangoes. These farmers incurred very low costs of searching for buyers, entering contracts, being in groups, transport, and monitoring as compared to those who sold to exporters and direct market. Gross margins were calculated to determine net prices paid by the channels, the gross margin results show that gross prices were a reflection of the average gross margins for farmers selling to the different channels as shown in figure 9.

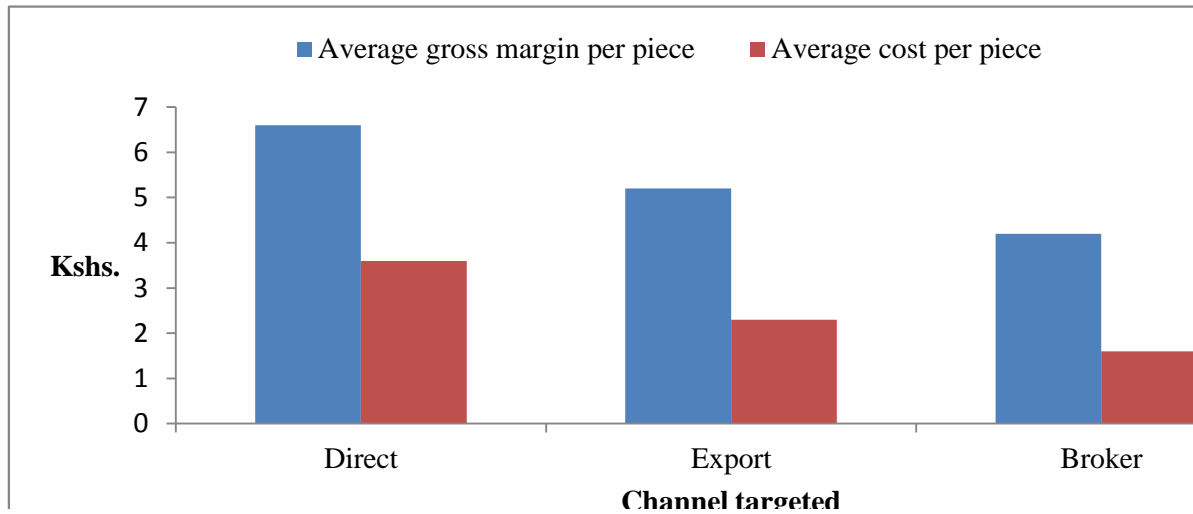


Figure 9: Gross margin and cost comparison

Source: Survey data, 2014

4.2.3 Testing for variation in prices: Analysis of variance (ANOVA)

To test whether there was any difference between the net prices paid by the different channels, a one way ANOVA was carried out on the average net prices for 2013 and the results are presented in Table 6.

Table 6: One way ANOVA results for average net prices between and within groups

	Sum of Squares	df	Mean Square	F	P-value.
Between Groups	82.862	33	2.511	16.482	0.000
Within Groups	29.402	193	0.152		
Total	112.264	226			

Source: Survey data, 2014

With $p = 0.000 < 0.05$, the test supports the rejection of the null hypothesis that there is no difference in prices offered by the different channels and conclusion that means for the prices offered by the different channels are different.

4.2.4 Price discovery in different channels

The different channels used various approaches to arrive at prices with the farmers, 4 approaches were identified;

1. Individual negotiation; this is where there was a negotiation of prices between the farmer and buyer, but the farmer negotiated as an individual as opposed to a group.
2. Group negotiation; this where there was a negotiation between buyer and a farmer group as opposed to individual farmer.
3. Buyer decides; this is where the price was decided by the buyer and there was no negotiation whatsoever.
4. Farmer decides; this is a case where the farmer decided the price with no negotiation with the buyer.

Results of how prices were arrived at between buyers and farmers are presented in Figure 10.

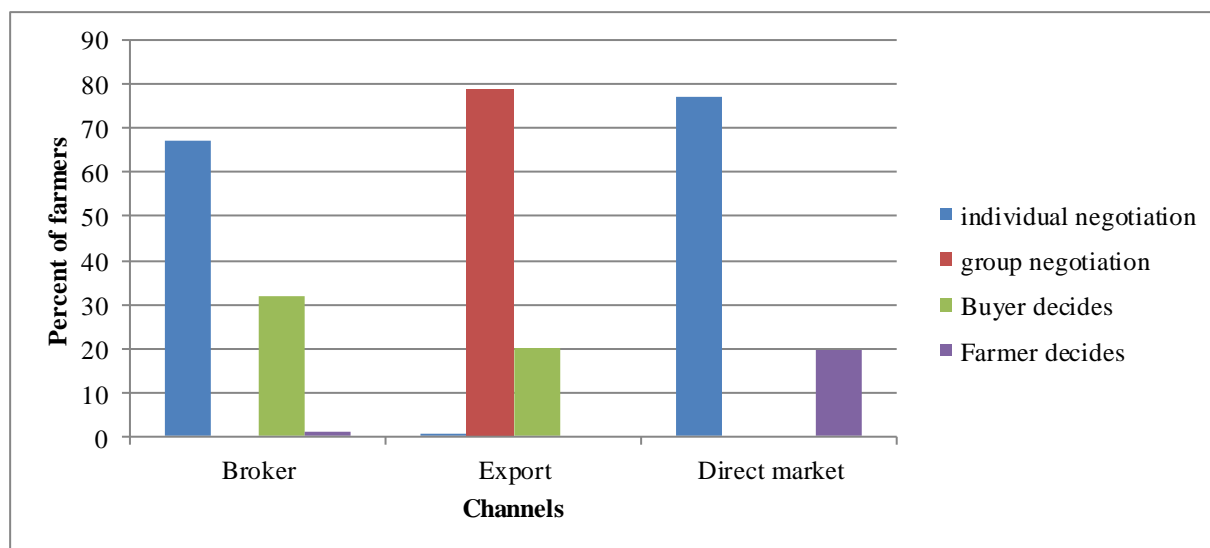


Figure 10: Price discovery methods used in the different channels

Source: Survey data, 2014

Brokers mainly bought from individual farmers and not groups; even for farmers in groups, brokers negotiated with individual farmers and not groups. As such, prices offered by brokers differed from farmer to farmer whereby even neighboring farmers received different prices from the same broker. Brokers often refused to sign contracts and were secretive, the price a farmer would receive from a broker would depend on several factors including; negotiation skills, bargaining power, among others. Farmers with few mango trees, poor quality and low quantity have low bargaining power and would accept the price offered by the buyer in fear that he/she may not get a better price before mangoes start ripening and rotting in the farms.

Exporters mainly negotiated with farmer groups either in group meetings or the groups would send their representatives to the exporters to negotiate for prices on behalf of the group. As the picking season progressed, quality would drop with every subsequent pick, and supply also increased, consequently a renegotiation of price would be done between the exporter and the group. Unlike the norm in other sectors, it was not a requirement for farmers in mango marketing groups to sell through the group or to the specific exporter whom the group had negotiated prices with; this may have been because the existing exporters were few and lacked capacity to serve the many farmers willing and able to sell to exporters. Being in a group reduces transaction cost of both the buyer and the farmers hence raising farm gate prices, group also improves the bargaining power of sellers and thus they are able to obtain a better price. The direct market had a sizeable proportion of farmers who could decide price which could be attributed to the fact that these farmers transported their produce to the market where they had a broad choice of buyers.

4.3 Institutional factors in mango marketing

Distribution of farmers in relation to collective action, information access, transaction costs, contracts and access to training is presented in Figure 11 and discussed in the sections that follow.

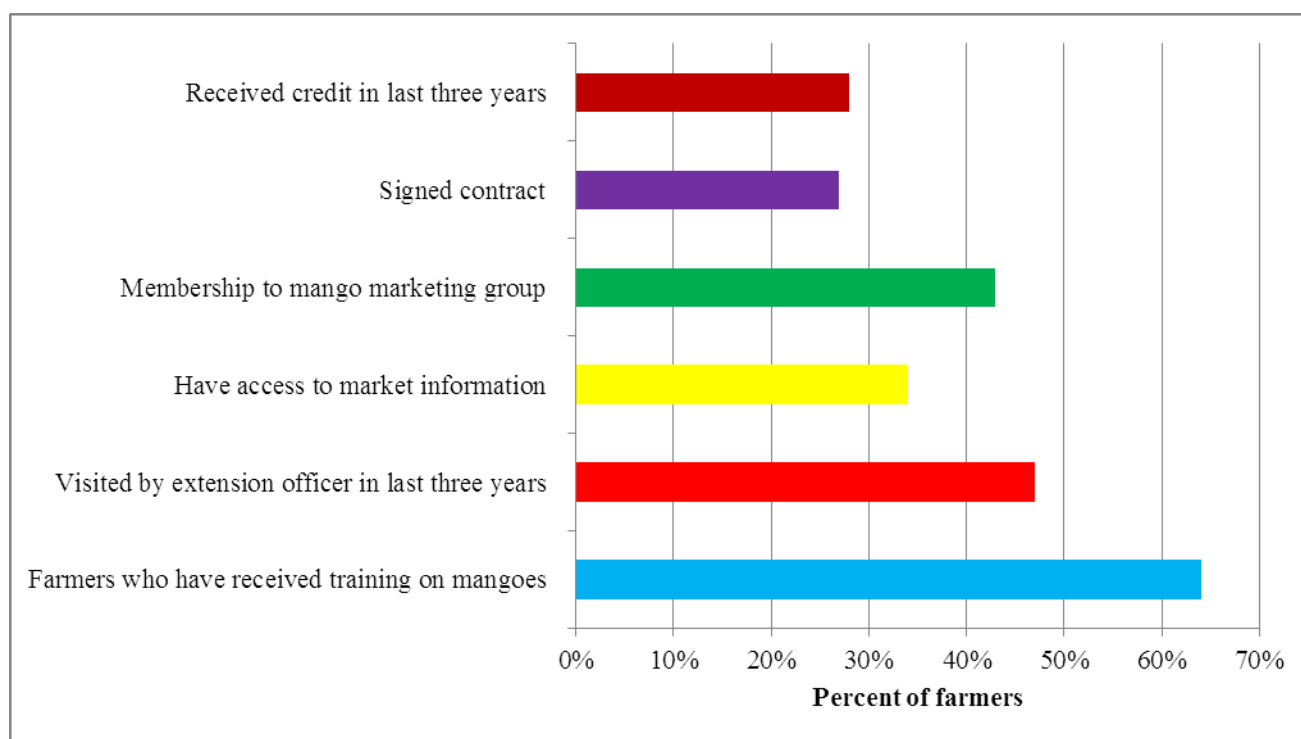


Figure 11: Distribution of farmers depending on institutional factors

Source: Survey data, 2014

4.3.1 Market information

Access to market information is important in that it reduces risk and uncertainty in markets and allows optimal allocation of resources by producers. More important is the source of the information; majority of rural small scale farmers are poor and therefore have no means to obtain information, they rely on the buyer as their source of information and this opens opportunities for exploitation by buyers. Contrary to the assumption of neo-classical economics that information is

perfect and free, Kirsten et al. (2008) argue that information is costly and thus farmers incur cost in looking for market information. Figure 12 shows the different sources of market information used by mango farmers in Makueni County.

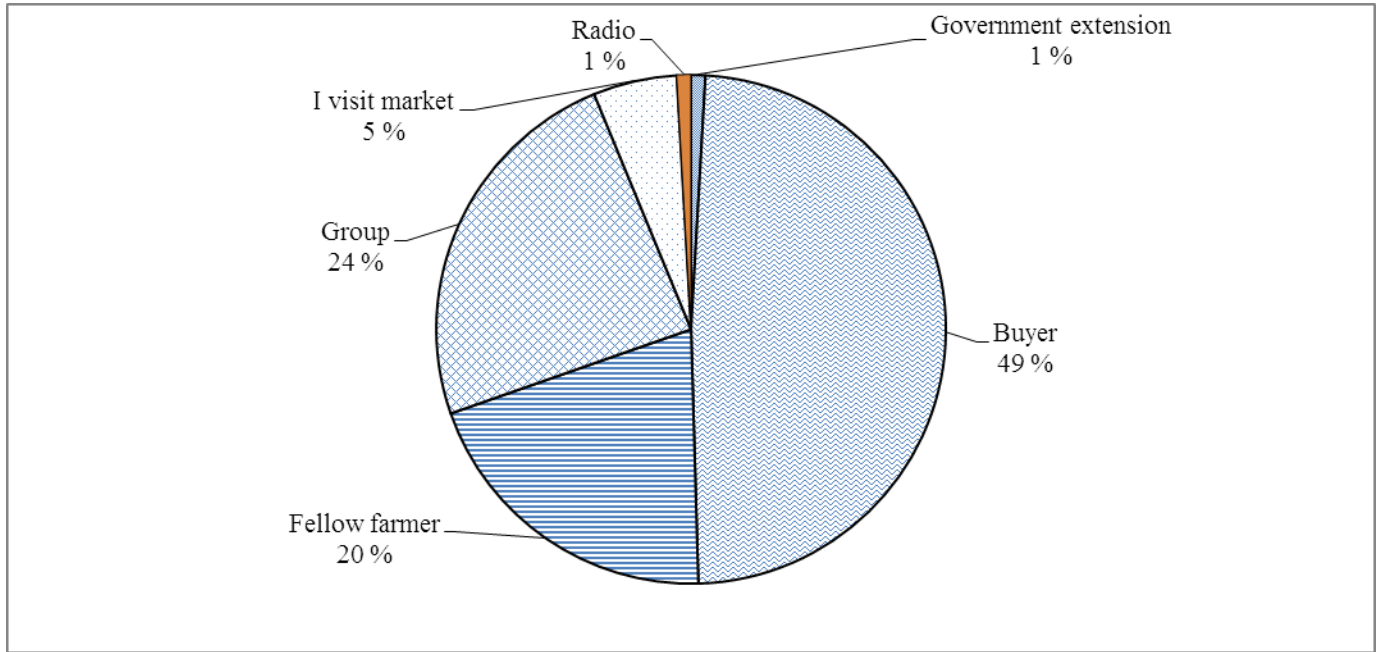


Figure 12: Sources of market information

Source: Survey data, 2014

From Figure 12, the study established 6 sources of information for mango farmers; government extension officers, buyer, fellow farmers, group, visiting market, and radio. The buyer, fellow farmer, and visiting market were the most actively used sources. These results partly agree with Mangisoni (2006) who found that majority of farmers rely friends, relatives and agricultural extension agents for market information. As such, the accuracy of such information is doubtful. Of interest here is that approximately half of respondents depended on the buyer as their source of market information. This category of farmers incurred minimum or no costs in looking for information; they waited for the buyer in the farms when produce was ready. However, as noted by Mangisoni (2006), farmers are more likely to accept low prices if the buyer informs them that

their product is of low quality. Slightly less than a quarter of the farmers obtained market information from farmer groups. Some of the groups normally sent their representatives to the buyers in Nairobi to negotiate prices on their behalf; the price reached was then communicated to group members in their meetings. This kind of negotiations enhances trust between the buyer and farmers.

Only a very small proportion (5 percent) of farmers obtained information from the market, this is the only group that can be said to have accurate information. Majority of these farmers were most likely selling to direct market. A major reason was that most of the households selling to direct market had at least one member of the family working off-farm in major towns. Similar information was provided by the chairman of Makueni County Fruit Processors Cooperative Society (MCFPCS); *“farmers do not know that when there is a mango glut in the county, there is scarcity elsewhere”*.

4.3.2 Membership to Collective action group, contract, access to training and extension services and access to credit

More than half of the farmers were not members of any mango marketing groups. This shows a very disadvantaged situation of the farmers considering the importance of collective action in marketing by increasing farmers bargaining power, reducing transaction costs and improving information flows. Such benefits of collective action have been outlined by several institutional economics authors such as Fafchamps and Hill, 2005; Shiferaw et al., 2006 and Kirsten et al., 2008. There is only one mango cooperative society in Makueni County, the Makueni County Fruit Processors cooperative Society (MCFPCS). MCFPCS had been able to improve market access for its members by exporting mangoes mostly to Dubai and selling the low quality to processors in the country. MCFPCS however faces financial challenges due to the complex

logistic issues involved in exporting. Cost of transport, cooling, and storage at the port of Mombasa were some of the costs that were cited as impediment to export by MCFPCS. Furthermore, MCFPCS was out of reach for many poor farmers due to the high financial commitment required as membership fee to join the cooperative. The small farmer groups lacked financial ability to carry out cold storage so as to slow ripening and minimize post-harvest losses, or carry out any other form of value addition. The county government was in the process of setting up a fruit processing plant in the county to process excess mangoes and compete with the other buyers, which would raise prices at peak season.

In Makueni a non-governmental organization (Agricultural Business Development) funded by the Government of Netherlands had supported mango farmer groups by training service providers to serve the groups. Service providers were members of the different groups who had been trained on mango farm management; they worked as group extension officers by making visits to farms on call. As noted by Fischer and Qaim (2012), farmer organizations have the potential to take over responsibilities for accessing agricultural extension, input provision and distribution, bulking, grading, selling, and even processing. Some of the services that farmers mentioned that they accessed through groups include extension services, training, credit facilities, market, and market information. Only about a quarter of the respondents had pre-agreed contracts with buyers, majority of whom sold to the export channel. Most of the contracts were agreed between groups and main buyer as opposed to individual farmers. Having a contract was however more of a consequence of the channel selected rather than a determining factor.

Majority of farmers interviewed (64 percent) had received training in various areas of mango farm management comprising grafting, pruning, pest and disease control, marketing, post-harvest management and record keeping. Only about a quarter of farmers interviewed had been able to

access credit; among the different channels. Key reasons that respondents mentioned for failure to access credit was information on the sources and availability of credit and fear of risk. Similarly, Kloeppinger-Todd and Sharma (2010) note that most rural households lack access to reliable and affordable finance for agriculture and other livelihood activities as they live in remote areas where retail banking is limited and production risks are high.

4.3.3 Transaction costs

Respondents were asked whether they incurred any of these costs during marketing; negotiation costs (includes cost of travel to buyer location), cost of searching for buyers, and cost when signing contracts with buyers. Other transaction costs considered are cost of interest on any credit they borrowed to facilitate marketing, cost of communication (includes airtime), cost of monitoring pickers (and sometimes bribing them) and ensuring buyer keeps agreement, and cost of being a member of a marketing group. Distribution of farmers in relation to the types of transaction costs they incurred is presented in Figure 13.

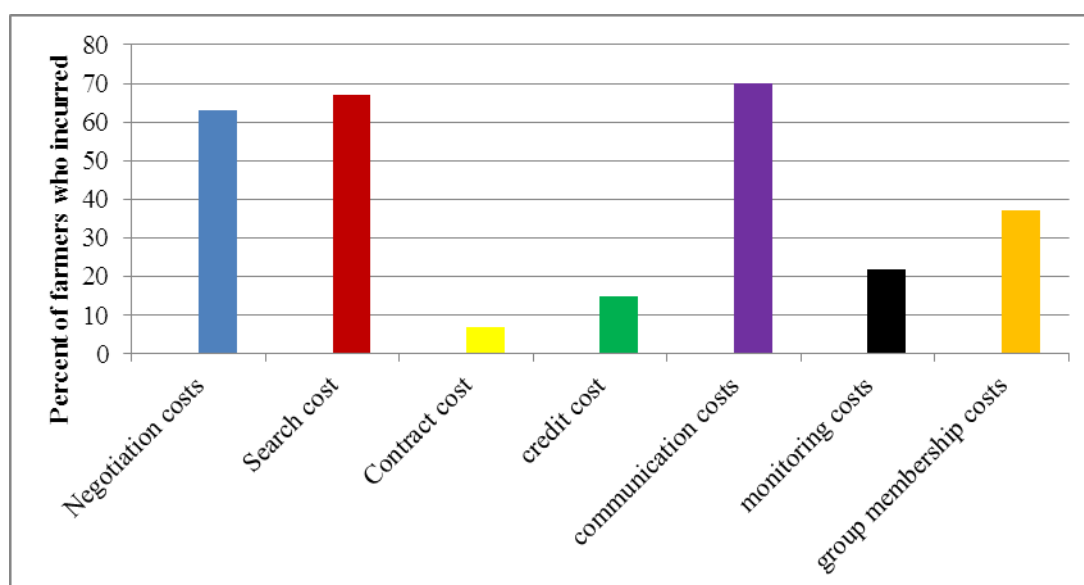


Figure 13: Transaction costs incurred by farmers

Source: Survey data, 2014

Communication and search costs were due to farmers calling their colleagues to enquire about prices and buyers. Farmers in groups paid the cost of travel to Nairobi and accommodation for their leaders as they searched for buyers and negotiated prices. Those selling directly to the market incurred very high transaction costs because they actively looked for buyers in the major towns. These farmers either physically visited the markets or called through mobile phones before transporting the produce to the market. Most of the farmers selling to brokers did not incur any costs as they waited for the buyers in the farm, price negotiation was also done in the farm after which the buyer would be allowed to pick the mangoes and pay on cash. Brokers incurred very high transaction costs as they dealt with individual farmers and had to move from farm to farm in search of mangoes, this partly explains why they offered the lowest prices.

4.4 Results for determinants of mango farmers' choice of market channel

Before carrying out the multinomial logit regression, diagnostics tests for multicollinearity, goodness of fit and IIA were carried out. Respective relevant tests were carried out to obtain the best transformation for the various continuous variables. Results for the tests are presented in the sections below;

4.4.1 Test for multicollinearity

Variance Inflation Factor (VIF) is used to test for presence of multicollinearity by estimating 'artificial' ordinary least squares (OLS) regressions with each of the farm characteristics as the 'dependent' variable and the rest as independent variables. All the variables selected for regression had VIF below 2. Following Maddala (2000), variables that had $VIF < 5$ were considered to have no multicollinearity. Further results are presented in appendix I.

4.4.2 Assessing goodness of fit for the multinomial logit model

The MNL model gives a McFadden's R^2 (Pseudo R^2) of 0.4351, a likelihood ratio test (*lrtest*) gave a χ^2 value of 60.08 and P value of 0.000, which means the model fits the data well. More results are presented in the appendix II.

4.4.3 Test for Independence from Irrelevant Alternatives (IIA)

The Hausman test was carried out to determine IIA. All choices gave a P-value of 1, and therefore no reason was found to conclude that the MNL model in this application was misspecified, hence the IIA was not violated. Results are presented in appendix III.

4.4.4 Determinants of mango farmers' choice of marketing channels

Parameter estimates (coefficients and marginal effects) from the multinomial logit model are presented in Tables 7 and 8 respectively. The parameter estimates of the multinomial logit provide direction and not probability or magnitude of change. The marginal effects measure the actual effect of a unit change in each of the explanatory variables on farmers' choice of market channel.

Table 7: MNL parameter estimates for determinants of choice of market channel (Broker used as base outcome)

Variable	Export			Direct market		
	Coef	Std error	p> z	Coef	Std error	p> z
YEARS_IN_SCHOOL	-0.066	0.065	0.303	0.060	0.087	0.49
OFF_FARM	0.810	0.510	0.112	1.083	0.656	0.09*
HH_INCOME	0.458	0.217	0.035**	0.698	0.277	0.01**
DISTANCE_TO_TARMAC	0.461	0.214	0.031**	-0.395	0.243	0.10*
TOTAL_TREES	0.924	0.318	0.004***	-0.456	0.398	0.25
GROUP_MEMBER	0.984	0.459	0.032**	-0.208	0.573	0.71
MARKET_INFORMATION	0.013	0.466	0.977	1.837	0.574	0.00***
TRAINING	0.279	0.110	0.012**	-0.064	0.161	0.69
EXTENSION	0.681	0.223	0.002***	0.039	0.269	0.88
OWN_VEHICLE	-0.198	0.646	0.760	1.446	0.659	0.02**
EXPERIENCE	0.121	0.052	0.021**	0.061	0.070	0.38
Cons	-11.363	1.945	0.000	-3.128	1.916	0.10

n = 227

LR Chi2 (22) = 185.00 Prob > chi2 = 0.000

Pseudo R2 = 0.4351

Log likelihood = -120.085

*****, **, * significance levels at 1, 5 and 10 percent respectively**

Source: Survey data, 2014

As mentioned earlier, coefficients from multinomial logit can be difficult to interpret because they are relative to the base outcome; a better way to evaluate the effect of covariates is to examine the marginal effect of changing their values on the probability of observing an outcome.

Table 8 shows the marginal effects computed.

Table 8: Marginal effects of the MNL regression model for mango farmers' choice of market channels

Variable	Export			Direct market		
	dy/dx	Std error	p> z	dy/dx	Std error	p> z
YEARS_IN_SCHOOL	-0.012	0.011	0.262	0.006	0.005	0.38
OFF_FARM	0.119	0.085	0.166	0.059	0.046	0.19
HH_INCOME	0.066	0.036	0.002**	0.038	0.019	0.05**
DISTANCE_TO_TARMAC	0.082	0.035	0.018**	-0.031	0.015	0.03**
TOTAL_TREES	0.159	0.052	0.002***	0.042	0.024	0.08*
GROUP_MEMBER	0.169	0.761	0.026**	0.027	0.347	0.43
MARKET_INFORMATION	0.029	0.072	0.686	0.140	0.053	0.00***
TRAINING	0.047	0.018	0.009***	-0.008	0.010	0.41
EXTENSION	0.113	0.036	0.002***	-0.012	0.167	0.47
OWN_VEHICLE	0.060	0.085	0.481	0.146	0.089	0.09*
EXPERIENCE	0.019	0.009	0.026**	0.002	0.004	0.61

***, **, * significance levels at 1, 5 and 10 percent respectively

Dy/dx is for discrete change of dummy variable from 0 to 1

Source: Survey data, 2014

Household income (HH_INCOME) is significantly associated with a higher probability of choosing export and direct market as compared to brokers. The probability of choosing export and direct market relative to brokers increases by 6 percent and 4 percent respectively for every unit increase in the household income. Similarly, Fafchamps and Hill (2005) found that wealthy farmers were less likely to sell directly to the market, possibly because the shadow value of their time is higher. But if they have a large quantity for sale, they are more likely to sell it to the market. They are also more likely to travel to a distant market. Wealthy farmers are more likely to afford farm inputs which would enable them attain required quality for export market; alternatively they are able to afford transport to sell their produce in distant markets where prices are high.

Contrary to the *apriori* expectations, distance away from tarmac (DISTANCE_TO_TARMAC) is positively associated with a higher likelihood of farmers selling to export market relative to brokers. This may be because farmers farther from the tarmac road were more likely to have large farms which exporters prefer because of economies of scale. Another reason may be what Martey et al. (2012) found among Nigeria's yam farmers; that farmers farther from the tarmac roads were more likely to participate in marketing cooperatives, which exporters prefer to deal with as opposed to dealing with individual farmers. A Pearson correlation test proved that there was a significant positive relationship between distance to tarmac road and membership to mango marketing group. Jari (2009) found closely similar results in South Africa; that farmers with good road infrastructure participated more in informal markets and not formal markets. However, farmers close to the tarmac road were more likely to sell to direct market relative to brokers as expected *apriori*. This is because they are able to access the urban areas easily and at lower cost than their counterparts farther from the tarmac.

Farmers with a large number of mango trees were more likely to sell to export market relative to brokers. As noted by Martey et al. (2012), farmers who produce more prefer selling at their immediate market (rural market) to avoid post-harvest loss. This is especially if the product in question is highly perishable, as is the case with mangoes. In addition, Shilpi and Umali-Deininger (2008) explain that farmers incur very high transaction cost selling to the market as compared to traders if the physical market infrastructure is poor. Poor market infrastructure results in long waiting periods which will affect farmers more negatively than traders who may have better access to facilities even in congested markets, thus farmers with large quantities may be discouraged to sell directly in the market. They will sell at the farm gate but are more likely to sell to exporters at the farm gate relative to brokers. Results on direct market agree with the

above argument, farmers with a few number of mango trees were more likely to sell to direct market. Apart from being a perishable product, mangoes are fairly seasonal, buyers preferred unripe mangoes to avoid losses hence those with large quantities avoided transporting to the market because of their low capacity to sell at the market which is not organized as compared to the farm-gate buyers.

Membership to a mango marketing group (GROUP_MEMBER) is associated with increased likelihood of a farmer selling to the export channel relative to the broker channel. Being a member of a marketing group increased the probability of a farmer selling to export market relative to brokers by up to 17 percent. The importance of collective action has been emphasized by most institutional economics authors; Janvry et al. (1991); Kirsten et al. (2008); Elizabeth and Martin (2012), among others. Farmers in groups have the advantage of bulking hence gaining economies of scale. It is also easier and cheaper for exporters to enforce quality and grade requirements of the export market through reaching farmers in groups rather than individually. Membership to marketing group is, however, not significant for direct market channel; it is important to note here that farmers selling to the market do not bulk their produce to reduce cost. A similar result was found by Fafchamps and Hill (2005), which the study attributed to lack of trust among the farmers and especially in a climate of changing market prices. “The benefit from pooling sales may thus be outweighed by the cost of peer monitoring”, the study notes. In addition to the trust theory, the current study noted that farmers selling to the market were wide apart and so collective action may be hampered by the geographical separation.

Access to market information (MARKET_INFORMATION) is significantly associated with farmers selling to direct market channel relative to broker. Access to information increases the probability of a farmer selling to the direct market relative to brokers by 14 percent. From

discussions with farmers, lack of information was reported as one of the main challenges to access to direct market, which makes it very risky for farmers to try and access this channel. An important aspect of information is its source; farmers who receive information from buyers at the farm-gate would not be classified as having access to information because the legitimacy of this information cannot be guaranteed. A significant proportion of farmers in the study area were found not to actively search for market information, they waited for the buyer at the farm-gate and 'had no choice' but to accept what the buyer told them, including the price.

Having access to training (TRAINING) is significantly associated with higher probability of selling to the export channel relative to brokers. As explained earlier, the export channel only buys grade 1 mangoes of high quality. Only farmers who had gone through training were able to attain these quality requirements. Similarly increased contact with extension services (EXTENSION) increased farmer's likelihood of selling to the export channel relative to the broker channel; the probability of selling to the export channel increased by 11 percent for every extra contact with extension personnel. The results from the two variables may be attributed to their ability to produce quality mangoes free from pests and diseases.

Ownership of a vehicle (OWN_VEHICLE) is significantly associated with a higher probability of selling to the direct market relative to brokers by up to 15 percent. As registered from discussions with farmers, lack of transport means to the market and information were the main challenges to selling directly to the market. Hiring transport means was too expensive and risky for most of the farmers considering that they had no information on the market. Further, as explained by Panda and Sreekumar (2012), farmers' own vehicles allow them to access marketing centers located far off at a lower cost and within a shorter period as compared to their colleagues who had no transport means.

Number of years that a farmer had been growing mangoes (EXPERIENCE) is significantly associated with selling to the export channel relative to brokers. The probability of the farmer to choose export market relative to broker increases by 2 percent for every additional year of experience of the farmer. Farmers who had been growing mangoes for a long period had developed networks with fellow farmers and exporters, experience in growing mangoes also shows that farmers had gained expertise overtime and were able to meet the quality requirements of exporters.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Summary

Mango farming has the potential to improve the income of farmers in ASAL areas such as Makueni County due to its adaptability to the climate and soil in such areas. Marketing is however not organized and thus farmers incur heavy losses. The study used the MNL model to analyze determinants of mango farmer's choice of market channel in Makueni, Kenya. Specific objectives of the study were; to characterize the different market channels available for mango farmers, and to determine the factors that influence farmer choice of market channel.

Results revealed three major channels in the mango sub-sector; brokers, export, and direct market; majority of farmers sell to brokers while direct market account for the smallest percentage of farmers. The channels exhibit varying characteristics in terms of prices and interaction with farmers; brokers offer the lowest prices while farmers selling to direct market earn the highest prices. Other varying characteristics include price determination mechanisms where whereas those selling to export use farmer groups to negotiate prices, majority of those selling to brokers negotiate individually and in most cases the buyer single handedly determines the price.

The study found that several factors influenced farmer choice of supply channels, they include; distance to the nearest tarmac road, household income, number of mango trees that farmer has, access to market information, contact with agricultural extension personnel, access to training,

membership to mango marketing group, time period that farmer has been involved in mango farming, and ownership of a means of transport.

5.2 Conclusion and policy recommendations

The findings of this study suggest that institutional factors are central in determining farmers' access to niche high value markets such as export and direct market. Initiatives aimed at ensuring access to market information by farmers would reduce the risk associated with direct market. There are private market information providers Kenya Agricultural Commodity Exchange (KACE), but the coverage and impact has been low. The government can partner with these privately owned initiatives to increase especially their financial ability in disseminating information, considering that there may not be any financial benefit to the private entity doing so. In addition to providing market information, facilitating farmers to acquire transport means would assist in reducing reliance on brokers and middlemen. Majority of farmers seem to prefer price regulation by the county government to reduce exploitation by middlemen. Though this is technically not feasible, the county government could perhaps regulate the activities of the middlemen to eliminate exploitation.

In addition, efforts by NGOs, the cooperatives directorate, and county government aimed at increasing farmers' participation in PMGs should be intensified. Further, building capacity in farmers already in groups and the group leadership would help them avoid the pitfalls that befall several groups that disintegrate a few months into operation. PMGs should be assisted to diversify their activities from just marketing, this would increase benefits farmers get from the groups and encourage participation. Assisting PMGs build financial capital would help them add value to their produce, and probably install cold storage to slow ripening and reduce post-harvest losses. Furthermore, higher levels of social capital such as cooperative societies can assist

farmers gain the capacity to access directly the export market instead of relying on exporters. The Makueni County Government could facilitate and collaborate with governments of counties that do not produce mangoes to have farmers or farmer groups ‘export’ to those counties.

The importance of extension services in Agriculture cannot be over emphasized; training and advisory services to farmers will ensure farmers produce the right quality required by export markets. Exporters have been forced to sponsor training to farmers in order get quality produce. Public private partnership between the government and these exporters would increase outreach to farmers. The government could also complement the efforts of NGOs in training group extension officers, commonly known as ‘service providers’. This is a new model of extension service provision which is more viable since the ‘service providers’ are not on salary, which is less costly, and are easily accessible to the farmers. This will be in tune with Kenya’s current National Agriculture Sector Extension Policy (NASEP), which advocates for private extension services, among other approaches.

5.3 Contribution to knowledge

Contrary to perception that farmers are making losses because of low prices for agricultural produce caused by flooded markets, this study finds that glut in production in the farm areas is caused by failure, fear or inability by farmers to venture out of the farm-gate and into the markets. Farmers are not willing to venture out for fear of the unknown; they lack information on markets, and do not actively look for it either. Even farmers with access to good road infrastructure are not willing to venture out of the farm-gate to market their produce. Traders take advantage of the farmers’ unwillingness to venture into markets to exploit them. As put earlier in the study, when there is glut in the production areas, there is scarcity elsewhere.

The study also reinforces the importance of institutional economics in understanding how agricultural product markets operate in developing countries. Results show that assumptions of perfect markets by classical and neo-classical economics are not applicable in most agricultural markets in developing countries. Information is not perfect and there is no trust between buyers and sellers hence market forces of supply and demand are not used to determine prices. Rather, the price that a farmer gets is determined by majorly institutional factors such as collective action, transaction costs and information access.

5.4 Suggestions for further research

There is need for future studies to focus on both the buyer and seller side, this study focused more on the producer and discussions are based on the perspective of the producer. Further research on the opportunities and constraints faced by buyers will help in coming up with broad based all-inclusive policy and/or practice interventions.

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Appendix I: Variance inflation factors results for multi-collinearity test

Variable	VIF	1/VIF
HHINCO	1.84	0.55
trained_areas	1.45	0.69
OFFARM	1.39	0.72
logt_mtrees	1.37	0.72
SchlgYrs	1.26	0.76
ext_times	1.17	0.81
exp_mango	1.17	0.85
GRPMBR	1.16	0.87
TransMNS	1.12	0.88
MKTINFO	1.10	0.91
D_tmcX	1.08	0.93
Mean VIF	1.30	

There was no multi-collinearity as VIF for all explanatory variables is below 5

Appendix II: Assessment of goodness of fit

Measures of fit for multinomial logit model			
Log-like intercept only	-212.59	Log-lik full model	-120.09
D(203)	240.169	LR(22)	185
		Prob > LR	0.000
McFadden's R²	0.435	McFadden's Adj R²:	0.322
ML (Cox-snell) R²	0.557	Cragg-Uhler (Nagelkerke) R²	0.385
Count R²	0.74	Adj Count R²	0.385
AIC	1.269	AIC*	288.169

The model fitted well with a McFadden's R² of 0.435 and prob>LR of 0.000

Appendix III: Hausman test for IIA

Choice	χ^2	$P > \chi^2$
1	0	1
2	0	1
3	0	1

There is no reason to conclude that the MNL model violates IIA assumption

Appendix IV: Questionnaire for mango farmers marketing practices in Makueni, Kenya



**UNIVERSITY OF NAIROBI
DEPARTMENT OF AGRICULTURAL ECONOMICS**

MANGO FARMERS' QUESTIONNAIRE

This questionnaire is meant to collect data on mango marketing in Makueni County; information obtained is for academic purposes for the researcher only and no commercial purpose whatsoever. Responses obtained will be treated with utmost confidentiality and no names will appear in the report. The questionnaire will take about 30 minutes. Your assistance will be highly appreciated

General information:

Name of the farmer _____

Location _____

Sub location _____

Mobile No. _____

Questionnaire No. _____

Part 1: Socio-demographic factors

- i. Who makes decisions on farming
Household head _____
Spouse _____
- ii. What is the gender of the decision maker
Male _____
Female _____
- iii. What is the age of the decision maker (years) _____
- iv. Number of years completed in school _____
- v. What is his/her main occupation? State income from each and note the main source
 1. Farming _____
 2. Business (non-farming) _____
 3. Employed _____
- vi. Are there household members working or doing business off farm? Yes ___ No ___.
- vii. If yes, specify who? ___ 1. Household head (man) 2. Wife 3. Son_ 4. Daughter_
- viii. What is the total average monthly income of the household
 1. Below Kshs. 10,000
 2. Kshs. 10,001-20,000
 3. Kshs. 20,001- 30,000
 4. Kshs 30,001-40,000
 5. Kshs. Above 40,000
- ix. What is the total number of family members? Total _____. Above 18 yrs __ below 18 yrs ____
- x. What is the distance in Kms to the nearest market Centre connected to electricity ____
- xi. What is the distance in Kms to the nearest tarmac road _____
- xii. For how many years have you been growing mangoes _____

Part 2: Production factors

- i) What is the total size of your land in acres _____?
- ii) What size of land is under mangoes in acres _____?
- iii) How many mango trees in production stage do you have?
 1. Apple _____
 2. Ngowe _____
 3. Indigenous _____
 4. Other _____
- iv) Is mango farming your main on-farm enterprise? Yes ___ No ___

v) Apart from mangoes, what are your other on-farm sources of income? (Specify the items and income obtained from each per year)* Assist farmer to calculate*

Codes: 1. Fruits _____ 2. Dairy _____ 3. Livestock _____ 4. Food crops _____ 5. Other _____

vi) Input use per year/season on the mango farm

Input*	Unit	Quantity	Cost per unit	Total cost*

Input codes: 1. Manure 2. Fertilizer 3. Foliar fertilizer 4. Insecticide 5. Fungicide 6. Other (specify)

Quantity codes: 1. Kgs 2. Cart 3. Wheelbarrow 4. Tractor 5. Litres

vii) What is your main source of labor: 1) Family 2) Employed (Casuals) 3) Employed (permanent)

viii) How much in Kshs do you spend on labor per season/year? ____

ix) Tick farm assets owned: 1. Jembes 2. Panga 3. Water pump 4. Knapsack sprayer 5.

Wheel barrow 6. Cart 7. Tractor 8. Car 9. Mobile phone 10. Tv 11. Lorry 12. Pick up

Part 3: Marketing activities

Marketing trends

	Buyer	Quantity sold	Unit	Price per unit	Cash income	Payment cash/credit	Reason why that channel	Requirement of channel	Quantity not able to sell
2013									
2012									
2011									

Buyer codes: 1. Broker 2. Exporter 3. Retail market 4. Direct market 5. Processor 6. Other (specify)

Quantity codes: 1. Pieces 2. Boxes 3. Kgs 4. Bags

Reason codes: 1. High price 2. Reliable (will always purchase) 3. Accessibility 4. Only available channel 5. Don't know anywhere else to sell 6. Low quality (not fit for other channels) 7. Other (specify)

Requirement: 1. Quality 2. Size 3. Spray regime 4. Transport 5. Group member 6. Contract 7. Variety 8. Other (specify)

i. What has been the major cause of the shift in the channels targeted?_____

ii. Who do you consider to be your main buyer?

1. Broker 2. Exporter 3. Retail market 4. Direct market 5. Processor 6. Other (specify)

iii. Are you satisfied with your current main channel? Yes___ No___.

iv. If No, which channel would you rather sell

to?_____

v. What is the main constraint to targeting the preferred channel?_____

Constraint codes: 1. Cost 2. Quantity 3. Quality 4. Low price 5. Unreliable market 6.

Lack of information 7. Other (specify)

vi. What facilitation do you need to target the preferred channel?_____

Facilitation codes: 1. Transport 2. Storage 3. Information 4. Cold storage 5.

Processing 6. Market information 7. Other (specify)

vii. What services/incentives do you receive from your buyer?

1. Training 2. Market information 3. Credit 4. Inputs 5. Exchange trips 6. None

viii. Do you sell any off-season mangoes? Yes___No___

Buyer*	Quantity	Price*	Total	Contract Yes_No

Part 4: Institutional factors

i. Activities carried out by the farmer (production, harvesting, post-harvest)

Farm activities	Annual cost	Post-harvest activities	Annual cost	Areas where have been trained	Trainer	Cost yes/no
Apply manure		Picking		Grafting		
Weeding		Packing		Pruning		
Pruning		Cooling		Pest and disease control		
Grafting		Storage		Marketing		
Irrigation		Grading		Post-harvest management		
Spraying		Transport		Grading		
Keep records		Processing		Record keeping		
Other		Other		Other		

Trainer codes: 1 Extension officer 2. NGO 3. Buyer 4. Fellow farmer 5. Other (specify)

ii. Do you visit or get visited by NGO/Govt agency/private organization to assist in mango development? Yes__No__. If yes, provide name(s)

iii. If yes what services have you received from them? _____Name the NGO.

- 1.Training 2. Funding exchange trips 3. Looking for buyers 4. Giving market information 5. Organizing seminars/workshops 6. Credit 7. Transport 8. Witness contracts 9. Other (specify)

iv. Have you received any visit from government/private extension officer in the last 3 years? Yes__No__. If yes, how many times? __

v. Do you have information on mango market (prices, product requirements, location) Yes_No_

vi. From where do you get information on markets

- 1. Government extension 2. Buyer 3. Fellow farmer 4. Group 5. I don't receive information on markets

vii. How often do you receive this information?

Codes: 1. Daily 2. Weekly 3. Monthly 4. Once per season 5. Once per year

- viii. What is the means used to obtain the information?_____
1. Visit buyer/market (word of mouth) 2.Mobile phone 3. Buyer visits farm (word of mouth) 4. Farmer to farmer (word of mouth) 5. Other (specify)
- ix. On a scale of 1-5, 1 being lowest and 5 highest, how much do you trust information from these sources? 1. Government extension___ 2. Buyer___3. Fellow farmer ___4. Group_____
- x. Do you incur cost during the following marketing activities?_____
1. Negotiating prices (fare/transport, airtime)_____
 2. Looking for market(airtime, fare/transport)_____
 3. Maintaining contract with buyer (fee, lawyer, etc)_____
 4. Interest on loans/Credit_____
 5. Communication_____
 6. Monitoring costs (monitoring pickers, bribes)_____
 7. Group membership (registration fee, membership fee)_____
 8. Mention any other costs incurred during market_____
- xi. What means do you use to arrive at a price with buyer? Name the buyer for every method if different; broker___, exporter___, retail market___, direct market ___, processor___
1. Individual negotiation 2. Group negotiation 3. Buyer sets price 4. I set price 5. Other
- xii. Do you consider the price attained to be fair? Yes__No__. Give reason_____
- xiii. Are you a member of any mango marketing group? Never__ Yes__Left group(year)___

Duration (years)	Joining	Group services	Channel sold to via group	Other group terms	If left group, give reason
	Free				
	Charges				

Group services: 1. Marketing 2. Training 3. Information 4. Exchange trips 5. Bulk input sourcing 6. Other

Reason for leaving group: 1. Mismanagement 2. Favoritism 3. High cost 4. Other (specify)

xiv. If never a member, why?

_____ -

xv. Have you signed a contract with any buyer? Yes_Never_Left contract_. If yes or left contract fill table

	Terms of contract	Behavior of buyer when			buyer violates contract*
		Market prices are lower	Market prices are higher	Excess* supply	
Buyer/channel					Yes
					No

Terms of contract: 1. Quality 2. Price 3. Grading 4. Transport 5. Size 6. Other (specify)

If left, what was the reason for leaving?

1. Buyer violated contract 2. Group disintegrated 3. Could not meet terms 4. Not enough to sell

xvi. Have you applied for credit or loan in the last 3 years: yes_ no_? If yes fill the table below

	Amount applied	Amount obtained	Source	Form (cash/inputs)	Purpose	Activities carried out
2013						
2012						
2011						

Source of credit: 1. Banks 2. Rural microfinance 3.Sacco 4. Merry go round 5. Buyer 6. Other

Purpose of credit: 1. School fees 2. Medical 3.Farm (non-mango, specify) 4. Farm (mango) 5. Other

Activity carried out: 1. School fees 2. Medical 3.Farm (non-mango, specify) 4. Farm (mango) 5. Other

xvii. If not borrowed in question x above, why did you not borrow?

1. No need 2.Fear of risk 3. High interest rate 4. Lack of collateral 5.Other (specify)

xviii. What would say is the major impediment to the mango sub-sector in Makueni County?

1. High cost of production 2.Pests and diseases 3. Lack of market 4. Brokers 5. Lack of expertise/training 6. Other (specify)

xix. What would be the best way to improve your access to market_____