

**FACTORS DETERMINING CHOICE OF MARKET FACILITATORS BY
SMALLHOLDER HORTICULTURAL FARMERS IN LAIKIPIA COUNTY, KENYA**

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the Award of a Master of Science Degree in Agricultural Economics of Egerton University.**

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DECLARATION AND APPROVAL

DECLARATION

I declare that this thesis is my original work and has not been submitted for any award either in this university or in any other institution for any award.

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APPROVAL

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DEDICATION

I dedicate this thesis to my parents, brothers and sisters for their support and understanding in the pursuit of my studies.

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ABSTRACT

In rural areas particularly arid and semi-arid lands (ASALs), smallholder farmers produce mainly under subsistence system due to poor access of market. Farmers in ASALs particularly in Laikipia County depend on horticultural crop production for their livelihood and as a major source of income and rural employment. The purpose of the study was to determine factors influencing choice of market facilitators and their impact on smallholder horticultural farmers' livelihood. Primary data was collected using structured questionnaires to contact 396 respondents through employment of multi-stage sampling procedure. Descriptive statistics and propensity score matching model were used to analyze the data. From the study it was shown that most farmers used traders while marketing their produce, radio and television to access market information. Gender and distance to output market had a positive significant influence on choice of market facilitators by smallholder farmers. In addition, it was shown that household size, age of household head and marketing through a group positively influenced choice of market facilitators. On the other hand, number of members in the group, access to market information, purpose of farming and amount of output produced negatively influenced choice of market facilitators by smallholder farmers. The findings also indicated that, farmers who involved market facilitators had slightly higher income, than those who marketed their produce independently. The study recommends that to effectively link smallholder farmers to market: governmental organization ought to play a bigger role in disseminating extension services and market information on output price and market availability also infrastructure should be improved especially roads networks in rural areas. In addition, policy makers and government institutions should formulate laws that will enable successful linkage of farmers to the market, through frequent extension services and farmer training services.

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LIST OF ACRONYMS

ASAL	Arid and Semi-arid lands
CBS	Central Bureau of Statistics
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GoK	Government of Kenya
HCDA	Horticultural Crop Development Authority
ICTs	Information Communication Technologies
Kshs	Kenya Shillings
PPS	Probability Propensity Score
PSM	Propensity Score Matching
SPSS	Statistical Package for Social Sciences
TCE	Transaction Cost Economics
VIF	Variance Inflation Factor

CHAPTER ONE

INTRODUCTION

1.1 Background information

Agricultural sector accounts for 26% of gross domestic product (GDP) directly and 25% indirectly (GoK, 2010). Over 50% of produce marketed is mainly from smallholder farmers (GoK, 2005). About 85% of farmers in rural population are smallholder and characterized by holding land of less than five acres (Omiti *et al.*, 2009). Horticultural crop (fruits and vegetables) production is considered as the main source of income and employment in rural areas. This account for 70% of the total production, 23% of the total foreign exchange earnings and is one of the leading economic earning sectors (GoK, 2006). Horticultural sector contribute 33% of Agricultural GDP, this therefore acts as a major source of food security and household income (GoK, 2010). In addition, it reduces poverty mainly especially in rural areas thus it is one of the major source of agri-business services for example extension services (Brigitte *et al.*, 2009). Smallholder horticultural farmers contribute 55% to 60% of total exported horticultural crops (fruits and vegetables) (HCDA, 2004) and dominates horticultural production (FAO, 2009). Its production is possible with unreliable weather condition and gives higher returns compared to other cash crops (Minot and Ngigi, 2004).

Market opportunities over the past years in Kenya have changed due to market reforms and globalization. These reforms mainly targeted large-scale farmers and neglected smallholder farmers thus reducing their linkage to output market and leaving them with few financial sources (Kamara, 2004). Urbanization, rising consumer incomes and demand for higher food standards have created new domestic market opportunities which can be utilized by poor smallholder farmers particularly those in arid and semi-arid lands (ASALs), but there is poor linkage to these markets (Best *et al.*, 2005). Smallholder horticultural farmers in rural areas are then likely to market their products at farm gate level at unfavorable low price; reducing income from the farm due to poor market linkage (Robbins, 2000).

A study by Chowdhury *et al.* (2005) revealed that barriers to market access include information asymmetry, transport, communication costs, policy induced barriers, social and non-economic factors and in rural areas; distance to the market and provision of standardized products to the

market on a continuous basis (Gulati *et al.*, 2007). Inaccessible product markets contributes to poor market performance and is likely to prevent farmers from taking advantage of new market opportunities; high output price and steady supply to the market (Omiti *et al.*, 2006). Smallholder farmers are likely to be limited to unstable spot markets when there is weak marketing institutions and poor marketing strategy forcing them to produce under subsistence system (Shanoyan *et al.*, 2012). Shepherd (2006) noted that, agricultural production should be linked with market demand and farm level activities should be looked at within the context of the whole supply chain and linkage within the chain. Presence of imperfect markets and limited institutions which support marketing functions, liberalization strategies were bound to fail in integrating smallholders in less-favored areas into high value output markets (Shiferaw *et al.*, 2009). In a situation of limited markets and pervasive rural market, imperfections in inputs and output markets, producer organization, collective marketing groups and market facilitation through market facilitators provide alternative marketing mechanisms. This will enhance market oriented production and enhance technologies in linking smallholder farmers to output markets and raise market participation and commercialization of smallholder production.

Market facilitators help smallholder farmers' access input and output markets and participate in those markets. Choice of market facilitators by smallholder farmers' and their participation in marketing activities is likely to be influenced by economic factors such as reduction in transaction costs and payment period. Non-economic factors such as forming trust based relationships with consumers and market facilitators (Louw *et al.*, 2006). In addition, they are likely to provide market information especially on output price and available markets. Smallholder farmers are then enabled to forecast, plan and produce efficiently (Mundy and Sultan, 2001) and reduce marketing risks (Robbins, 2000), thus helps them to decide on what to produce, choice of marketing strategies and technologies to use in production (Mukhebi *et al.*, 2007).

Market facilitators coordinate smallholder farmers to access input and output markets that include; private firms, individual sponsors, government run schemes and non-governmental organization who mainly undertake market facilitation particularly in ASALs. These areas are preferred mostly due to their irrigated horticultural products (GoK, 2001). This study therefore

sought to identify the effects that market facilitators have on smallholder farmers particularly in arid and semi-arid lands at farm level. Appropriate understanding is then concluded on ways to link smallholder farmers to output high value market especially to the government, agricultural stakeholders and donors.

1.2 Statement of the Problem

Smallholder horticultural farmers in Arid and Semi-Arid lands (ASALs) are poor and lack access to markets, producing mainly for subsistence. Access to markets particularly in ASALs areas is likely to benefit farmers by increasing their income. Smallholder farmers do not have access to markets mainly due to poor linkage to output market and presence of market information asymmetry. There is inadequate information on high value markets for output produce and prices at the markets. Market linkage involves linking farmers to high value markets and provides them with information on output prices, in order to take advantage of emerging market opportunities. Market facilitators mainly link smallholder farmers to the market. Presence of market facilitators is likely to benefit smallholder farmers in coordinating the movement of output product to market and also provide access to farm inputs and this is likely to have marginal effect on their income. There is scarce information on those factors that influence smallholder farmers in their choice of market facilitators despite their participation in marketing activities and their impact on farm income. The study therefore sought to distinguish farmer's characteristics with respect to their choice of market facilitators, determine factors influencing choice of market facilitators by farmers and evaluate the effect of market facilitators on farm income among smallholder farmers in Laikipia County.

1.3 Objectives

1.3.1 General Objective

The broad objective was to assess the contribution of market facilitators on smallholder horticultural farmer's livelihood and welfare in Laikipia County, Kenya

1.3.2 Specific Objectives

- i. To distinguish smallholder farmer's characteristics with respect to choice of market facilitators in Laikipia County.
- ii. To determine factors influencing choice of market facilitators by smallholder farmers.

- iii. To evaluate the effects of market facilitators on smallholder horticultural farmers' income.

1.4 Research Hypotheses

- i. There are no distinct characteristics relating to smallholder farmers and their choice of market facilitators.
- ii. There are no significant factors influencing choice of market facilitators by smallholder farmers.
- iii. Market facilitators have no significant effect on smallholder farmers' income.

1.5 Justification

Market access is of primary importance to most rural households in eradication of poverty (IFAD, 2003). In rural areas particularly ASALs their main economic activities are livestock production and horticultural crop production (mainly fruits and vegetables). Access to market by horticultural crop farmers in ASALs has an effect on their income. To achieve the Millennium Development Goals of halving people living in absolute poverty especially in rural areas by the year 2015; linking smallholder farmers to output and input markets is the best strategy (World Bank, 2007). Market linkage is likely to be constrained by farm characteristics (distance to the market, farming experience and asset owned) and market related factors (time taken to reach the market, access to market information and credit facilities). With improving linkage to the market, smallholder farmers are likely to increase farm productivity and thus raise their welfare. This forms a basis of transforming from subsistence farming system to commercial agricultural production. In addition, linking smallholder farmers to markets and confronting those constraining factors act as an incentive in raising farm efficiency, farm income and creating employment in rural areas and therefore help in attaining Kenya's Millennium Development Goals and vision 2030. This study is vital in informing the government, donors and policy makers while making the necessary supportive measures to link smallholder farmers to input and output markets. Market linkage studies assist in revealing the contributions that market facilitators have on agricultural production, marketing, farm income and enable the government in development planning. The study provides information on factors influencing smallholder farmers on their choice of market facilitators, which is essential to policy makers while

developing policies that assist in linking smallholder farmers especially in rural areas to the market. The study also contributes to the body of literature existing since many studies carried out on market linkage concentrated on ways and benefits of linking farmers to the market while paying little attention on the influence that facilitators have at farm level.

1.6 Scope and Limitation of the Study

The study was conducted in Laikipia County, among smallholder horticultural farmers. The scope of the study was to examine the effects that market facilitators have on smallholder horticultural farmers in ASALs areas particularly in Laikipia East Sub-County. The data on farm and marketing characteristics was collected from smallholder horticultural crop farmers in the District.

1.7 Definition of Terms

Market facilitator - These are organizations and consultants whose sole or primary responsibility is to handle marketing functions for example providing market information on input and output markets (Thinah, 2010).

Market linkage - It refers to any market related activity which promotes the sale of produce and entry into a market (Key *et al.*, 2000).

Bonding social capital - It is connectedness between close people who wants to achieve a common goal. It builds strong ties, but can also result in exclusion of those who do not qualify, (Schuller *et al.*, 2000)

Bridging social capital - It is characterized by asymmetric feelings of connectedness that exist between heterogeneous groups i.e. smallholder farmer and market facilitator these are likely to be more fragile, but more likely also to foster social inclusion (Schuller *et al.*, 2000).

Smallholder farmer - Small holder farmers are referred to in literature as smallscale farmers, peasant farmers, resource-poor farmers, subsistence farmers , food deficit farmers and emerging farmers (Thinah, 2010)

Output market access - It refers to ability to sell all the marketable output at the right time and at the expected price.

CHAPTER TWO

LITERATURE REVIEW

2.1 Marketing Choice

The demand for food, both of crop and animal origin, is increasing globally and especially in developing countries due to increase in population, incomes and urbanization (Mengesha, 2012). Consumers in developing countries have also been exposed to global trends due to ease of communication and travel (Mendelsohn and Olmstead, 2009). The delivery of food from producers to consumers is extended from rural markets and regional wholesale markets to supermarkets in urban areas where consumers can get all goods under one roof and choice of marketing is done by producer depending on resource availability and market access.

Market access is seen as an avenue of generating more household income, due to its comparative advantages over subsistence production. A relative lack of access to market information by smallholder farmers weakens the negotiating power of small production units. Furthermore, economies of scale in marketing and value added horticultural products tend to favour integrated producers over independent ones. Finally, even if some smallholder farmers would be able to produce objectively high-quality and reliable horticultural products, they find it hard to gain access to market premia for quality and reliability because of infrequent and small amounts sold and the difficulty of differentiating their output from the mass of smallholder producers.

In a study determining factors influencing marketing channel choice by smallholder farmers in India, Rajeev and Sreekumar (2012) used multinomial logit model. They found that access to market information, grading, infrastructure, value addition, and access to steady output market were the major factors that influenced smallholder farmers' participation in informal market. Technical factors as well as institutional factors were major factors that influenced choice of marketing by smallholder farmers. At household level, choice of marketing was influenced by presence of extension services and transport to the market. However, findings by Toure *et al.* (2007) using regression model showed that, institutional factors did not significantly affect market participation by rice smallholder farmers in Burkina Faso, Mali and Nigeria. The major constraining factors were that of commercialization as evidenced by low level of rice output marketed in all the three countries, therefore rice farmers were not able take advantage of market opportunities.

A study by Jari and Fraser (2009), on factors influencing smallholder farmers marketing behavior in South Africa, noted that contractual agreements, collective action and tradition among smallholder farmers mainly influenced output marketing behaviour. They concluded that, formation of farmer groups was likely to increase bonding social capital hence smallholder farmers were easily linked to various market channel actors. Zivenge and Karavina (2012) did a study on factors influencing market channel access among horticultural crop farmers in Zimbabwe and found that informal markets were easily accessible than formal markets. Market channel choice by smallholder farmers was influenced by; output price, ownership of a mobile phone (it enabled farmers to receive information on output price at any given time). In addition, those who joined farmer groups could easily access market; hence, they were likely to choose formal marketing channel to take advantage of bridging social capital in bargaining for higher output price. In determining marketing preference by farmers in Honduras, Blandon *et al.* (2009) used stated choice model. They found out that, smallholder horticultural farmers preferred new supply channels that have pre-arranged price and quantity with the buyers. However, some farmers preferred to sell at spot markets whereby they received cash payments upon sale also it does not require grading of the produce and furthermore they are able to sell independently. Farmers' preference for traditional marketing channel is one of the major factors reducing commercialization in rural areas therefore hindering potential benefit that new supply chain would offer.

In determining those factors affecting market channel choice by potato farmers in Bolivia, Nadezda and Urquieta (2009) found that: market attributes (time to reach the market and distant to tarmac road), production (total acres owned) and household related variables (access to credit, cell phone ownership and age of household head) had significant effect on marketing choice. However, they noted that gender had no significant effects on the decision of marketing choice. A study by Reyes *et al.* (2012) estimating factors influencing marketing decision by potato farmers in Angola used double hurdle model. They study noted that potato producers, sellers and male-headed household were richer than their counterparts. They concluded that male-headed households were more likely to sell their potatoes due to ownership of productive assets and

access to extension services and finally, they noted that transaction cost had a negative effect on quantity sold and the choice of marketing.

2.1.1 Factors affecting farmers marketing choice

A study by Lupin and Rodriguez (2012) evaluating the socio-demographic factors affecting channel choice by potato farmers in Argentina noted that; commercial channel preferences, knowledge about varieties and quality attributes were important factors affecting choice of fresh potato channel and consumers. The study applied multinomial logit model where they observed that knowledge on price was important to consumers especially for unpacked fresh potatoes. In a study assessing factors affecting choice of marketing channel by vegetables farmers in Swaziland, Bongiwe and Masaku (2013) observed that, level of education, age of farmers, distance to output market and marketing agreement were the main factors influencing choice of marketing channel by farmers. They concluded that collective action among smallholder farmers should be promoted as a tool for linking farmers to agribusiness supply chain and help them establish networks. This will aid in knowledge sharing and farmers will therefore produce grades as required by the market or consumers. A study by Shiimi *et al.* (2010) using probit model observed that, transport cost, improved productivity, accessibility to market related information and access to new information technology were the major factors affecting choice of marketing channel by smallholder farmers. In addition, it was observed that payment arrangement, lack of access to marketing expertise and age of the respondents were some of the factors that influenced the proportion of cattle sold through formal market. The study concluded that substantial information should be obtained by modeling the marketing behaviour.

Angula (2010) found out that, labor availability, size of farm holding and revenue from crops sales were the main constraints on sustainable coffee marketing channel choice. In a study determining factors influencing producers' marketing decisions of crawfish, Nyaupane and Gillespie (2011) revealed that, scale of operation, quality and age of the farmer were the major factors that determined marketing channel choice. Wollni and Zeller (2006), while assessing the benefits received by farmers from participation in specialized markets noted that, small scale farmers are motivated by marginal income they receive from participating in specialized markets than the convectional markets. The study found that, farmers marketing through cooperatives

have a higher probability of participating in specialized markets in order to maximize advantages of economies of scale. The study concluded that, efforts to increase participation in cooperatives would help lessen the hardships brought on by low prices in conventional marketing channels.

A study by Bignebat *et al.* (2009) showed that, majority of smallholder farmers are not aware of the final buyers of their produce mainly because intermediaries hinder the visibility of the optimal marketing channels. The study concluded that, producers who are indirectly linked to supermarkets were more sensitive to their requirements in terms of quality and packaging than to the price they set for the produce. Chikazunga *et al.* (2008) in their study determining farmers' participation in tomato markets in South Africa, observed that access to land was a major key determinant of farmers' decision to participate in modern markets. The choice of marketing channel was influenced mainly by education level attained by the respondents and location of output market. The study concluded that ownership of a mobile phone and number of marketing channels to which the farmers are connected to, are the major determining factors in market choice by smallholder farmers. In a study determining marketing channel choice by Indonesian farmers, Umberger *et al.* (2010) noted that farmers' choice of marketing channel was influenced by cash payments, price of output and willingness to negotiate. In conclusion, the study observed that access to certified potato seeds, finance for input purchase and long term relationship with the buyers were factors used in determining channel choice by potato farmers in the country.

2.2 Linkage to the market

There has been an apprehension on the capability of smallholder farmers to participate in commercialized agriculture due to lack of access to input and output markets. Close link between smallholder horticultural farmers with market facilitators is important in reduction of transaction costs and production constraints; input price and input markets. According to World Bank (2007), domestic markets are still underexploited, underdeveloped and have small volumes of products traded. Horticultural marketing ought to give priority to local and regional markets over the export markets (USAID, 2005) as large amount of horticultural products are consumed locally compared to total exports (Anon, 2005), for example about 96% is consumed locally while 4% is exported (GOK, 2010). Kaganzi *et al.* (2009) in their study using participatory and area based approach to identify sustainable linkage of potato farmers to high value markets in

Uganda, revealed that urban centers offer new market opportunities for farmers to supply emerging growing markets. However, farmers need to be organized to successfully sustain market links through sale of high quality and required quantity to take advantage of economies of scale. Kariuki *et al.* (2006) assessed export market linkage of French beans in Kenya and used logit model to estimate those pre-requisite for linking smallholder farmers to market. The study revealed that, close proximity of farms to source of irrigation water, farm localities to crop collection centers and accessibility of preferred brokers in linking smallholder farmers to the market were major prerequisite. In addition, they noted that brokers and intermediaries are important as an emerging institution to link smallholder farmers to export markets especially in rural regions with poor infrastructures. According to Best *et al.* (2005) market dynamics; population growth, increasing urbanization and rising consumer incomes have created more market opportunities to horticultural crops farmers, but search for market information by rural poor farmers, due to increased transaction cost, marketing risks has become tedious. Smallholder horticultural farmers in rural areas face difficulty in accessing formal markets due to high transaction and marketing costs (Jari and Fraser, 2009).

Omiti *et al.* (2007) found out that, market participation by smallholder farmers in Kenya particularly in rural areas is low and has low level of output sold than those in semi-urban areas despite new market opportunities; growing demand and emerging food preference. At village level, market participation was hindered by poor quality and high cost of inputs, high transport cost, high market charges and unreliable market information. At household level, producer prices, market arrangement, share of non-farm income and gender were the major determinants of output sold. They concluded that to improve supply by smallholder farmers, market information provision should be enhanced, institutional and regulatory framework should be put in place to link smallholder farmers to the market. While assessing marketing channel option for small-scale horticultural farmers with the changing agri-food supply chains in South Africa, Louw *et al.* (2008) illustrated how farmers can be facilitated to peri-urban markets and how to overcome those challenges posed by the changing food system. They revealed that, there is need for a multi-actor approach for successful participation of smallholder farmers in order to allow them join the supply chain. Farmers were encouraged to form producer organization to jointly market and process output hence reduce transaction costs and increase negotiation power for

better output price. Collective action enables individual poor farmers to attain economies of scale for their output and amount of inputs. A study by Babu *et al.* (2007) noted that, major problems hindering horticultural marketing in Tanzania were unstable markets, fluctuating prices and low demand for horticultural produce at rural areas. They further noted that hotels and restaurants in near semi-urban areas demanded locally produced horticultural products regularly and fresh while farmers wanted regular markets for their produce. They concluded that to fill the supply and demand gap that existed there is need to improve; production and entrepreneurial skills of farmers, management support, credit and irrigation schemes from local institution was necessary.

2.3 Supply chain governance

Humphrey and Schmitz (2001) defined supply chain governance as an inter-firm relationships and institutional mechanisms through which non-market coordination in the chain takes place. Xiaoyong and Lusine (2005) showed that, supply chain governance is conceptualized from contractual and chain actors' relation aspects. The quality of supply chain governance can be revealed in the relationships between chain governance and its precursor; environmental uncertainty and supply chain performance. Supply chain governance arises because smallholder farmers are scattered over a wide geographical area hence high transaction and marketing costs in accessing output market. According to Ruben *et al.* (2006), market access, network governance and upgrading of supply chain were the main factors that influenced farmers to participate in the market. Supply chain governance arise when there is complexity of transactions and focuses mainly on the transaction cost economics (TCE) which is applied in marketing to show the relationship between the buyer and the seller (Jap and Ganesan, 2000). Schulze *et al.* (2007) noted that in transaction cost economic theory, one of the determinants of supply chain governance is the level of transaction costs; the degree of uncertainty, asset specificity and number of transaction time. Processors may behave opportunistically by paying a lower price to the farmer for their produce especially when there is market information asymmetry (Kydd and Dorward, 2004; Swinnen *et al.*, 2007). To reduce opportunism in transaction, trust among market actors (Fritz and Fisher, 2007), and smallholder farmers (Lu, 2007) is important. Trust between horticultural crop producer and market facilitator is likely to enhance farmers' participation in the market.

A study on backward linkages of smallholder farmers to retail chain by Mangala and Chengappa (2008), showed that marketing arrangement reduced market risks and transaction cost. It provide farmers with market information; breaking away from traditional markets through brokers to marketing directly. Retail shops increased control over quality and price stability due to direct marketing from producers. Retail shops linkage has provided an opportunity to smallholder farmers to supply their horticultural crop to the market at competitive output price therefore suitable for poor and marginalized farmers. A study by Gyau and Spiller (2008) assessing impacts of chain governance on inter-firm relationships among smallholder horticultural farmers in Ghana revealed that, if a firm adopts a more coordinated structure in supply chain governance, their economic dimension would improve. This justifies the theory that economic relationship performance was influenced by the governance structure used whereas behavioral performance is not.

2.4 Rural livelihood

World Bank (2008) revealed that, transformation of subsistence system of agriculture to market oriented production system in rural areas will lead to an improvement of farmers' livelihood and welfare especially in ASALs areas. Output market participation by rural farmers determines farmers' welfare gains (Otieno *et al.*, 2009), access to market provide opportunities to improve their livelihood and sustainable food security (Minot and Ruth, 2007). For profitable farm activities, smallholder farmers ought to shift production from subsistence system to market oriented production; which necessitate intensification of production and use of new technology (Omiti *et al.*, 2009). Investment in commercialization of agriculture in rural areas will lead to poverty reduction and economic growth (Geda *et al.*, 2001).

A study by Jaleta *et al.* (2009) showed that, commercialization among smallholder farmers in Ethiopia had an impact on smallholder farmers' welfare, which included, income and consumption (improved nutrition and health). In addition, they noted that commercialization comprises both participation in input and output markets and the decision by smallholder farmer to use inputs. In developing countries, market linkage plays a critical role in income improvement and food security (Sanginga *et al.*, 2004). Farmers in marginalized areas and those in ASALs may not benefit from market linkage, due to; imbalance at farm level, difference in

asset endowment and distance to the main road, this lowers rural farmers welfare and production decision (Warning and Nigel, 2002). Access to market by smallholder farmers is likely to provide incentives for specialization and agricultural production, which will lead to generation of employment and revenue enhancement (Chirwa, 2005).

In analysing the correlation between individual farm efficiency and income among the farms in Nigeria, Penda *et al.* (2011), used stochastic frontier model. They found that, as a farm become more efficient, more output is likely to be produced and sold thus increasing farm income. In a study on effects that market barriers and non-farm income have on farm income Olale and Nazli (2010), used Tobit model. It was revealed that, market barriers and farm income risk were the key factors that influenced farm household marketing behaviour and income diversification. The study by Wainaina *et al.* (2012), on impact of contract farming on farmers' income from poultry, revealed that those farmers who participated in contract farming earned more revenue than those who marketed independently; therefore, participating in contract farming is likely to improve farmers' welfare. They noted that level of education and distance to the market had a negative influence on decision by farmer to choose to produce and market under a contract. A study by Agboh-Noameshie *et al.* (2007), assessing the impacts of gender adoption of new rice for African variety on farm income in Benin, revealed that adoption of new rice variety had a positive impact on income and welfare of smallholder farmers. They concluded that adoption of new variety in Sub Saharan Africa would enhance farmers' income and welfare if they were provided with necessary credit facilities and access to input and output markets and market information. Women had more impact than their male counterparts did in adopting the new variety and market participation; therefore it is more profitable to target women than men in adoption of the new variety and provision of market information.

A study by Omiti *et al.* (2009), using truncated regression model revealed that distance to the market, output price and market information access were the major factors influencing farmers extent of market participation on their study determining factors influencing the intensity of market participation by farmers in rural and semi-urban areas of Kenya. Therefore, farmers in semi-urban areas will tend to have higher market participation intensity than those in the rural areas, more retail outlet and increase market links in rural areas are likely to increase market integration and hence improve poor rural farmers' welfare.

2.5 Theoretical framework

Smallholder horticultural farmers are assumed to be rational and want to derive the highest utility from the choice they make; either to market their horticultural product independently or under a market facilitator. They make their choices with respect to random utility theory, which states that a decision maker is guided by unobservable, observable and random characteristic when making a decision. Take U_j be the expected utility if an individual choose a market facilitator and U_t be the expected utility if one markets their produce independently, the model was specified as;

$$U_j = \beta_j X_i + \varepsilon_j \quad (1)$$

$$U_t = \beta_t X_i + \varepsilon_t \quad (2)$$

where X_i are the explanatory variables influencing an individual to either sell under market facilitator or independently, β_j and β_t are parameters to be estimated and ε_j , ε_t are the error terms which according to Greene (2003), are independently distributed and identically distributed. Therefore, if an individual chose to market their output product through market facilitator then the utility of marketing under market facilitator was expected to be higher than marketing independently as shown;

$$U_j (\beta_j X_i + \varepsilon_j) > U_t (\beta_t X_i + \varepsilon_t) \quad (3)$$

The probability that an individual will choose option j to market his produce through a market facilitator instead of t market independently was represented as;

$$P(Y = 1/X) = P (U_j > U_t) \quad (4)$$

$$\text{Therefore } P [(\beta_j X_i + \varepsilon_j) - (\beta_t X_i + \varepsilon_t) > 0/X] \quad (5)$$

$$\text{Hence } P (\beta^* X_i) + \varepsilon^* > 0/X) = F (\beta^* X_i) \quad (6)$$

Where; P is the probability function, $\beta^* = \beta_j - \beta_t$ is parameters to be estimated and $\varepsilon^* = \varepsilon_j - \varepsilon_t$ was the error terms. X_i was a vector of observed variables and $F (\beta^* X_i)$ is the cumulative distribution of the error terms and the parameters to be estimated (Greene, 2003).

2.6 Conceptual framework

The conceptual framework in Figure 1 illustrates the interrelationships in the study, the key variables involved and how they are interrelated. Socio-economic characteristics are background factors like (age, education level, gender, household income, occupation and household size), institutional factors like (membership to a group, access to extension service, road infrastructure) and market factors like (market charges, market information, farming experience, distance to the market) had an influence on choice of market facilitators. Time to reach market influenced smallholder farmer to either choose to market their produce independently or through market facilitator. Easy information access by farmers will enable proper decision making based on facts and current happenings in the market therefore will directly influence farmers to market their produce independently. Farm characteristics for example asset ownerships, farming experience and total land acreage owned will influence smallholder farmers to either market through a market facilitator or decide to market independently.

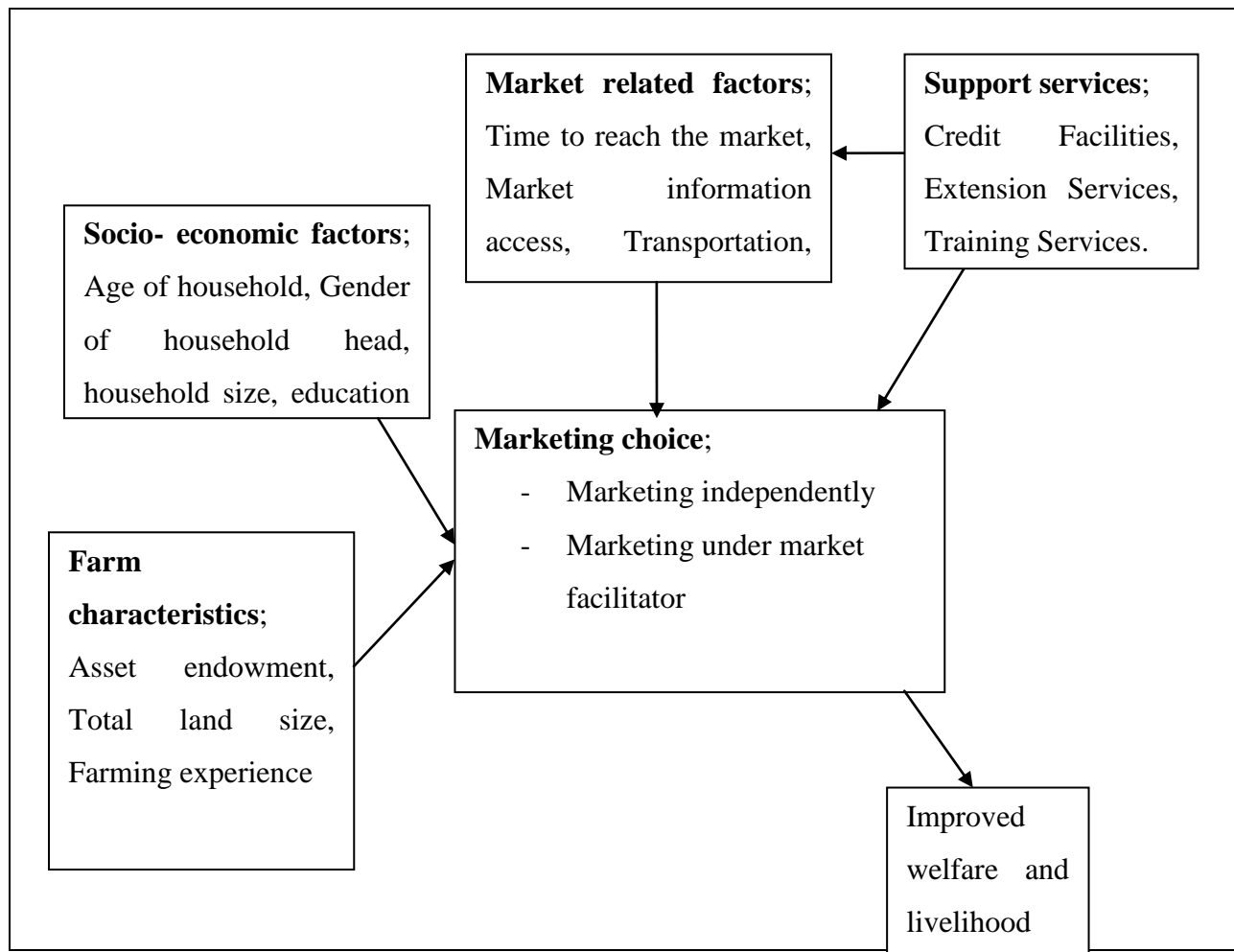




Figure 1: Conceptual Framework

CHAPTER THREE

METHODOLOGY

3.1 Study area

The study was carried out in Laikipia East Sub-County in Laikipia County. The Sub-County is situated within the transitional zone from wetter to drier regime. The rainfall ranges between 280 and 1100 mm year⁻¹ and a mean annual temperatures range between 16 and 20°C (Berger, 1989). Rainfall pattern is bi-modal with long rains occurring from March to May and short rains from October to November. The area also experience continental rains, which occur between June and September. Laikipia East Sub-County receive an average rainfall of 1024 mm year⁻¹, it is classified as semi-humid and semi-arid zones with an elevation of 2020 mm above mean sea level. It represents two of the agro- climatic scenarios found in most medium potential areas of Laikipia. Due to high altitude and relatively low rainfall, the soils have low mineralization and organic matter content.

Laikipia County has a total population of 399,227 persons with population density of 42 persons per kilometer square, and covers an area of 9500 Km² (GoK, 2009). It lies between Latitudes 0018” and 0051” North and between Longitudes 36011” and 37024” East. Economic activities in the area include; Agricultural farming (Food crops and Horticultural crops), Tourism and Livestock keeping. Farming practices in the county are strongly dependent on rainfall patterns. The dominant crops grown are maize and beans planted by all farmers. Other crops are potatoes, peas, sweet potatoes, cabbages, fruits, kales and peas. Maize is a staple food in Laikipia East Sub-County and its production is periodically affected by inadequate and poorly distributed rainfall. In addition to crop growing, farmers’ rear cattle, sheep, goats and chicken.

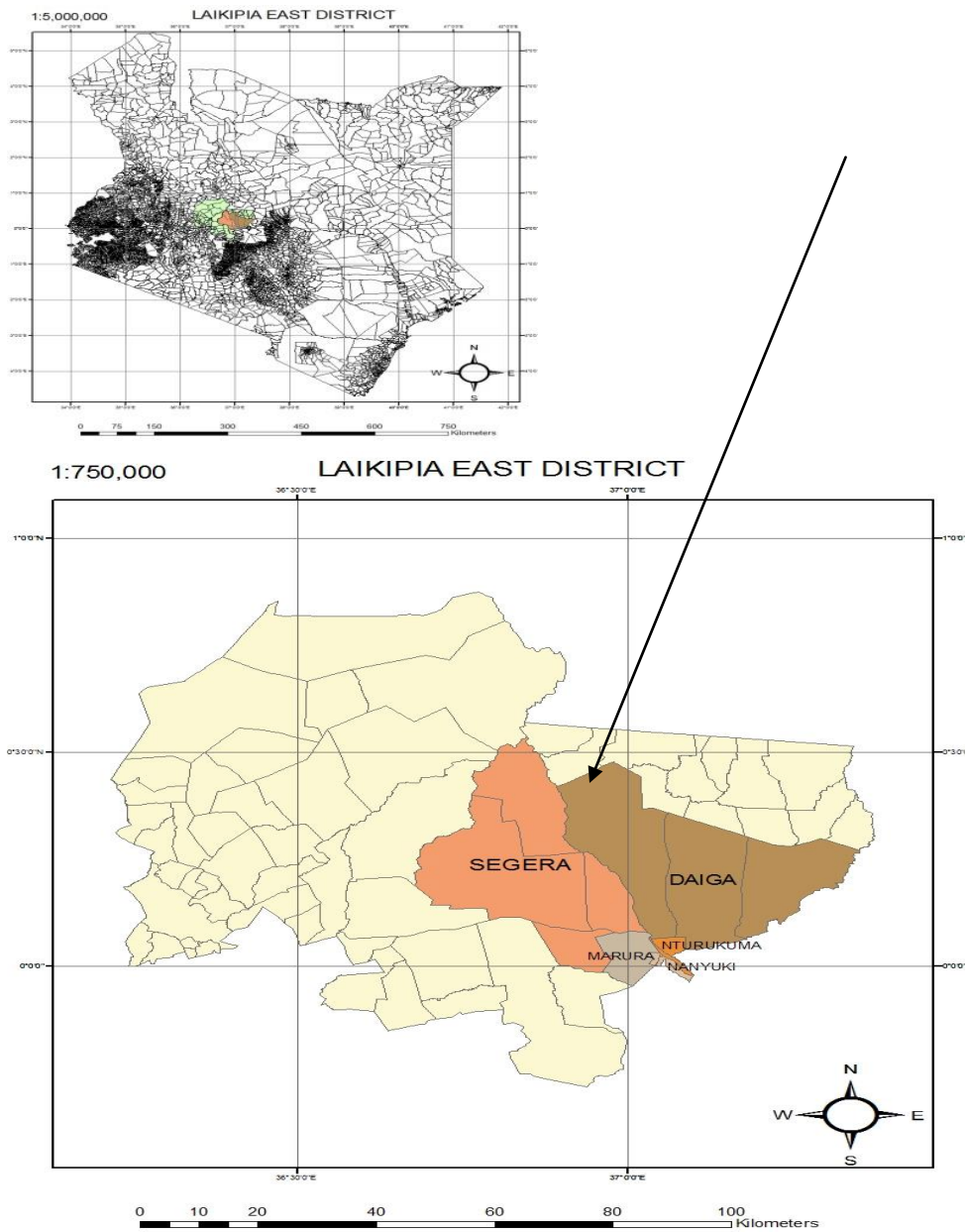


Figure 2: Map of Laikipia East Sub-County in Laikipia County
Source: Kenya Division 2000, World Resource Institute

3.2 Sample size

A total of 396 farmers were selected from Laikipia East Sub-County. According to Daniel, (1999), for unknown population, sample size can be derived using the formulae;

$$n = \frac{Z^2 pq}{e^2} \quad (7)$$

Where n = sample size, P = population proportion with smallholder farmers, $q=1-p$, $z = 1.96$ at 95% confidence level, e = Margin of error. Population of smallholder farmers is assumed at 50%, thus taking P as 50% will give a representative size with minimal error making $q = 1-p$ i.e. $1-0.5=0.5$, $Z = 1.96$, and $e = 0.045$ for a good precision. This is computed as follows;

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{0.045^2} = 400, \text{ Farmers were selected. An addition of four farmers was added to gather}$$

for unanswered questionnaires.

3.3 Sampling procedure

The target population of the study was smallholder horticultural farmers in Laikipia County. Multi-stage sampling procedure was used in selection of representative sample. The first step involved purposive selection of Laikipia East Sub-County due to its high number of smallholder farmers' growing horticultural crops and is also located in ASALs of Kenya. In the Sub-County there are five divisions namely Nanyuki, Marura, Segera, Daiga and Nturukuma Divisions. Secondly, three divisions were purposively selected that is Segera, Daiga and Nturukuma Divisions due to its large number of smallholder farmers as per Kenya population census 2009; this formed a representative sample. Finally, 132 farmers in each of the three divisions were selected randomly using simple random sampling to give 396 farmers who were interviewed.

3.4 Data collection

Primary data was collected through interview method, using structured questionnaires. Smallholder horticultural farmers were interviewed to collect data on farm characteristics and household marketing characteristics including other variables of interest.

3.5 Data collection procedures

Enumerators were trained so as to interpret questionnaires to farmers most effectively for quality data collected. Pretesting of questionnaires was done to find out any possible weaknesses of the questionnaire. Primary data was collected through interviews from those farmers who market their produce independently and those who involved market facilitators. The information collected included socio-economic, demographic characteristics of household, membership to groups and food security information of households.

3.6 Data analysis

Primary data collected was analyzed using SPSS and STATA software. Econometric models were used to identify significant variables and the influence they have on choice of market facilitators by smallholder farmers. To analyze the first objective distinguishing smallholder farmer's characteristics with respect to choice of market facilitators, descriptive statistics were used. To analyze the second objective determining factors influencing choice of market facilitators and the third objective evaluating effects that market facilitator have on smallholder farmers' income, propensity score matching model was used.

3.7 Empirical framework

The first objective sought to distinguish smallholder farmer's characteristics with respect to their choice of market facilitators, descriptive statistics was used. Smallholder farmers' socio-economic factors were used to analyze and show the difference of farmers marketing under market facilitators from those marketing independently and their influence. The socio-economic features such as age of household head, farming experience, education level, access to extension service, access to market information and source of market information was the major factors used in making the statistical inference between the two groups of farmers in the region.

Propensity score matching model was used to analyze objective two which sought to identify factors influencing farmers' choice of market facilitators and the third objective which sought to evaluate the effects of market facilitators on smallholder horticultural farmers' income. Propensity score matching model developed by Rosenbaum and Rubin (1983), was mainly proposed to find in a large group of those who involve market facilitators that are similar to those

farmers who market independently in all relevant pretreatment characteristics (X), where the impact of involving market facilitators on farm income (Y) was expressed as;

$$Y = \beta X_i + \beta K_i + \mu_i \quad (8)$$

Where; X_i are the explanatory variables, K_i is the participation dummy (1 for involving market facilitator and 0 for marketing independently), μ_i is the error term and β are coefficients.

The key question is how to match those who involved market facilitator to those who market independently, because conditioning on all relevant covariates is limited in the case of a high dimensional vector X. Rosenbaum and Rubin (1983) suggested the use of probability propensity score (PPS), modeling the probability of treatment given covariates (observable characteristics) X.

$$P(X) = P(D = 1/X) \quad (9)$$

Where D is a dummy variable indicating treatment status, if outcomes Y1 (Y0) are independent of treatment status conditional on X or Y1, Y0: D | X, then they are also independent of treatment conditional on the propensity score P(X).

$$Y_1, Y_0: D/P(X) \quad (10)$$

So that a multi-dimensional matching exercise is then reduced to a single dimensional matching problem: matching on the propensity score. A discrete regression function such as logit or probit model can be applied to estimate the propensity scores.

To estimate the propensity scores on factors influencing farmers' choice of market facilitators, a logit model was used. It is suitable in analyzing binary choice decision as used by Kariuki *et al.* (2006) while estimating those pre-requisites for linking French beans smallholder farmers to market. Ng'eno *et al.* (2012) used binary logit model while finding the drivers governing commercialization of edible wild fruits in Kenyan dry lands. Logit model involving estimation

probability of choice of market facilitators, where (Y) is a function of explanatory variables (X) can be expressed as follows;

$$P_y = Prob(\gamma = 1) = f(\beta' x_i) \quad (12)$$

$$P_y = Prob(\gamma = 0) = 1 - f(\beta' x_i) \quad (13)$$

Where γ is variable representing marketing choice with $\gamma = 1$ when marketing under market facilitator and $\gamma = 0$ when marketing independently. x_i is set of explanatory variables that influence choice of marketing by an individual where $i=1, 2, \dots, M$ and M being the number of variables.

We can then express those factors that influenced smallholder farmers' on their choice of marketing as;

$$Y_i = f(g_i) \quad (14)$$

Where Y_i represent response for i^{th} individual whereby the choice variables are binary. g_i is the latent factors influencing individual decision on their choice of marketing and f shows the functional relation between response of an individual and the latent factors (g_i) that determines the probability of an individual choice of marketing.

Therefore,

$$g_i = \sum_{j=1}^n b_o + b_j X_{ji} \quad (15)$$

There is a threshold level g_i^* for each individual; such that if $g_i < g_i^*$ the farmer is observed to have marketed his horticultural product independently, if $g_i > g_i^*$ the farmer will have marketed his product under a market facilitator.

Where b_0 and b_j are unknown parameters, X_{ji} is observable characteristics for i^{th} farmers on j^{th} options where $i=1, 2, \dots, n$, n is the total sample size and $j=1, 2$; j is the number of options available.

Logit model used cumulative logistics probability function (Pindyck and Rubinfeld, 1998) to show the choice of marketing. The model assumed that latent factors were normally distributed. Probability of using market facilitators in marketing was stated as;

$$Prob(\gamma = 1) = \frac{e^{g_i}}{1 + e^{g_i}} \quad (16)$$

Therefore, an individual choice can be represented as;

$$g_i = \ln \left\{ \frac{P(\gamma = 1)}{[1 - P(\gamma = 1)]} \right\} = \alpha + \beta' x_i + \mu \quad (17)$$

$\ln \left\{ \frac{P(\gamma=1)}{[1-P(\gamma=1)]} \right\}$ is the odds of choice in marketing, μ is a random error term, β' is a set of K parameters to be estimated and x_i is the number of parameters observed where $i= 1,2, \dots, n$, n is the total samples observed.

Logit model was used to determine propensity scores of factors influencing smallholder farmers' choice to market under market facilitators in ASALs. The equation showing these factors was represented as,

$$Y_i = b_0 + b_1 X_1 + \dots + b_k X_k \quad (18)$$

To evaluate the impact of market facilitator on smallholder horticultural farmers' income, both farmers marketing under a market facilitator and those marketing independently should show the same observable characteristics. We assumed that those marketing under a market facilitator are taken as the treatment and those marketing independently are taken as control, the average treatment effect (ATE) of involving market facilitators is the difference between the actual income and the income for involving market facilitators in marketing, it was stated as follows;

$$ATE = E(Y_{1i} - Y_{0i}/K_i = 1) \quad (19)$$

Where Y_{1i} is the income when i^{th} farmer involves market facilitator in marketing, Y_{0i} is the income when the i^{th} farmer markets independently and K_i is a dummy variable denoting involvement of market facilitators, 1= marketing under a facilitator, 0= otherwise.

The mean difference (D) between observable and control was written as;

$$D = E(Y_1/K_i = 1) - E(Y_0/K_i = 0) = ATE + \varepsilon \quad (20)$$

Where ε is the bias

Table 1: Descriptive of variables in Propensity Score Matching Model

Variable	Code	Description	Units	Expected sign
Dependent variable				
Marketing choice	Mktch	Marketing under market facilitator= 1 Independent =0	Dummy	
Independent variables				
Distance to the market	Dstmkt	In kilometers	Kms	+
Household Size	Hhsz	Number of household members	Numbers	+/-
Age of Household Head	Aghhhd	Number of years	Years	+
Extension Service Source	Extscr	Governmental=1 Non-Governmental =0	Dummy	+/-
Credit access	Crdt	Credit access=1 Otherwise=0	Dummy	-

Market information	Mktinfo	Access=1 Otherwise=0	Dummy	-
Group Marketing	Grbmkt	Yes=1 No=0	Dummy	+/-
Number of Members in a Group	Nbgrbmbrs	Number	Continuous	+/-
Farming purpose	Frmppse	Main reason for farming	Description	+
Pay market levy	Mktlv	Yes=1 No=0	Dummy	+
Farm Size	Frmsz	Number of acreages	Continuous	-

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussion of major findings of the study. Various forms of descriptive statistics and propensity score matching model were used in the analysis. Section 4.2 presents socioeconomic characteristics of the farmers. Section 4.3 presents description of farmers' choice of market facilitators in the county. Section 4.4 presents the effects of market facilitators on smallholder farmers' income.

4.2 Descriptive statistics

The socio-economic characteristics presented under this section include: age, educational level of the household head, group membership and distance to output market. The results in table 2 showed that, younger farmer had 21 years and the older farmer had 88 years and the mean age of farmers was 47.62 years with a standard deviation of 12.322. In terms of household size, it was shown that the farmer with the smallest household size had 2 members and on the other hand the household with the largest household size had 14 members. Most of the farmers had an average of five persons in the family, this is in line with the Kenya's national mean of five persons per household (CBS, 2005). In terms of distance to output market, it was shown that the minimum

distance was two kilometres and a maximum of sixty kilometres. The distance to output market had a standard deviation of 5.58 and a mean of 2.72 kilometres. Farm size indicate that, farmers own on average 3.33 acres, those farmers with a minimum farm size have one acre and a maximum of 23 acres with a standard deviation of 3.57 acres. The results conform to the findings of Omiti *et al.*, (2009) who characterised smallholder farmers as those who own land size of less than five acres.

Table 2: Age, household size and distance to market characteristics

Variables	Min	Max	Mean	Std Dev
Age	21	88	47.62	12.322
Household size	2	14	4.97	2.324
Distance to output market	2	60	2.72	5.58
Farm size	1	33	3.33	3.57

From the study it was shown that, eighty percent of smallholder horticultural farmers in Laikipia East Sub-County market their horticultural produce through market facilitators while twenty percent market their products independently (Table 3). The result represents a mean of 0.803 with a standard deviation of 0.398. This was attributed to transaction costs that were likely to be incurred while undertaking transactions, for example, risks involved in marketing and transportation of output to the market. Smallholder farmers in the region mainly from rural set up face problems of access to inadequate market information, poor infrastructure and long distance to urban output market. Hence they choose market facilitators in order to cut down on transaction

costs and gain economically through increased marginal farm profit and others opted to sell to middlemen at negotiated price.

Table 3: Description of farmers’ choice of market facilitators in Laikipia County

Variable	Response	Frequency	Percentage	Cumulative %
Choice of market facilitators	No	78	20	20
	Yes	318	80	100

From the study (Table 4) it was shown that, market facilitators offered different farm interventions to smallholder farmers whereby, 76% of the farmers noted to have received services of linkage to input and output markets for their produce. This indicated that, the main reason why market facilitators’ intervened at farm level were mainly to link farmers to input output market and assist them in procuring farm inputs at an affordable prices. Moreover, 9% of farmers in the area received intervention of input transfer technology. This implied that, farmers received information on current technology after the intervention of market facilitators, in order to maximize output produced per unit and not by the total land area of production. In conclusion, 5% of farmers received training services this constituted a small percentage of the whole population. This inferred that, a higher percentage of farmers do not put much emphasis on trainings even though it is a critical tool in market information transfer and education on standard procedures used in production.

Table 4: Interventions received by smallholder farmers

Interventions	Frequency	Percentage
Linkage to input/output market	302	76
Index insurance	37	10
Input technology transfer	36	9
Training	21	5
Total	396	100

The study results inferred that, smallholder farmers realized changes as shown in Figure 3 after intervention from market facilitators on their farm production. High percentage of smallholder

farmers (46%) had a change on their yield after facilitators' intervention. This indicated that, the presence of market facilitators influenced farmers to either increase crop production acreage or increase inputs use per unit of production on their farms. This therefore, resulted in an increased total output produced and enhanced product quality marketed. Moreover, it was noted that, 37% of farmers in the region had a change in their production and output sales. These denote that, farmers in the area were willing to participate in the market by availing their produce to the market after intervention from market facilitators. Increase sale and subsequent profit earned by farmers would encourage them to increase production in order to continually earn marginal profits through reduced transaction costs; reduce cost of market information search. Smallholder farmers with less endowment are willing and ready to sell their product when there is ready output market that offers them lucrative prices to cover costs incurred from production and transportation to the market. Few farmers from the region reported to have changed their crop enterprise, this constituted 17% of the respondents. Crop enterprise change by farmers implied to have been influenced by market information access especially on output products needed in the market. A rational farmer would choose farm enterprise that will offer high return on capital, which takes shorter time to produce and those that are easy to deliver to the market.

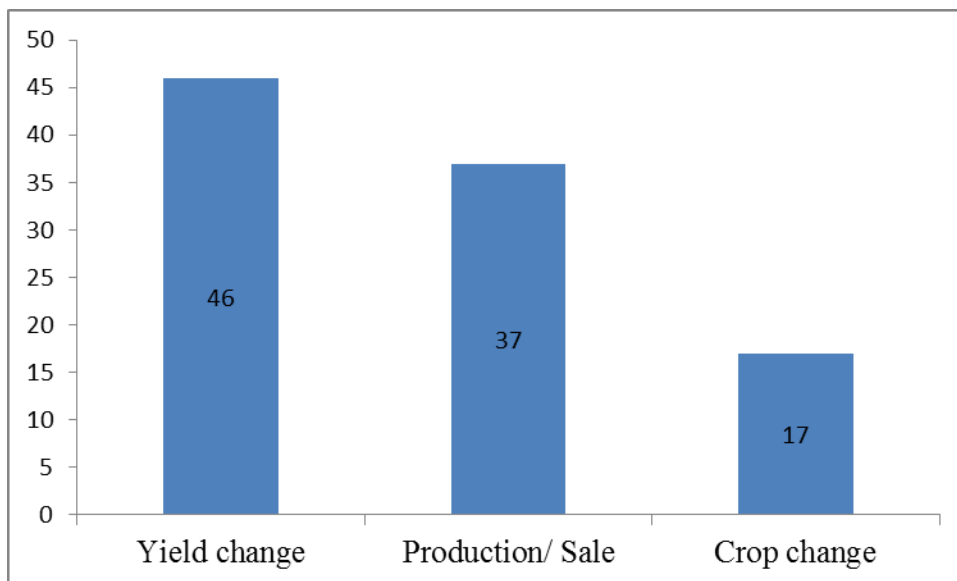


Figure 3: Changes from facilitators' intervention

The study results in table 5 show that, among smallholder farmers, 50% had formal education up to primary level. This implied that, farmers in the area did not receive formal education. In addition, 37% of farmers attained education up to secondary level and 13% attained formal education up to tertiary level. The level of formal education that a farmer attains determines the choice of market facilitators. It was shown that, among those farmers who choose market facilitators: 90.4% attained formal education up to tertiary education level, 79.9% attained primary education level and 75.9% attained formal education up to secondary level. Among those farmers who choose to market independently it indicate that, 20.1% attained formal education up to primary level, 24.1% of farmers attained education up to secondary level and 9.6% attained formal education up to tertiary level.

Among those farmers who attained formal education up to primary level: 79.9% choose market facilitators and 20.1% choose to market their produce independently. This implied that, most farmers in the area who have attained education up to primary level were risk averse and also they are not capable of acquiring market information easily that will enable them to directly access output market for their produce individually. Moreover, among those who have attained education up to tertiary level 90.4% choose market facilitators and 9.6% decided to market their produce independently. However, even though it is believed that farmers who have attained formal education are risk tolerant, it was noted that high percentage (90.4%) of those who attained education up to tertiary level choose market facilitators. This implied that, most farmers are risk averse and do not want to incur losses while marketing their farm produce regardless of their education levels.

Table 5: Education level and choice of market facilitators' in Laikipia County

Education level	n	Percentage	
Primary level	199	50	
Secondary level	145	37	
Tertiary level	52	13	
Involvement of market facilitators			
		Yes	No
	Frequency	%	Frequency
			%

Primary	159	79.9	40	20.1
Secondary	110	75.9	33	24.1
Tertiary/Advance	47	90.4	5	9.6
Total	318	80	78	20

A high percentage (62%) of smallholder farmers in Laikipia County noted to have faced drought as their major challenge. Laikipia County is one of the semi-arid areas in Kenya implying that during most months of the year the region is likely to be faced with drought. Smallholder farmers who are resource challenged are worst hit by drought incidence because most of them cannot afford to do irrigation on their farms due to high cost of irrigation and problem of water shortage in the area. It was also noted that, 18% of the farmers had faced a problem of drought combined with pest and diseases. This implied that, pest and diseases were major challenges that farmers do face especially due to drought and lack of sufficient water. Financial constraints combined with drought incidence were faced by 11% of the farmers. This implies that, farmers are not able to cover sufficiently for their transaction costs and also in trying to reduce the problem of lack of water through irrigation services. Financial difficulties were faced by 8% of farmers, this implied that farmers were constrained financially mainly due to lack of off-farm employment, less accessible credit services and insufficient output market; that offers high output price.

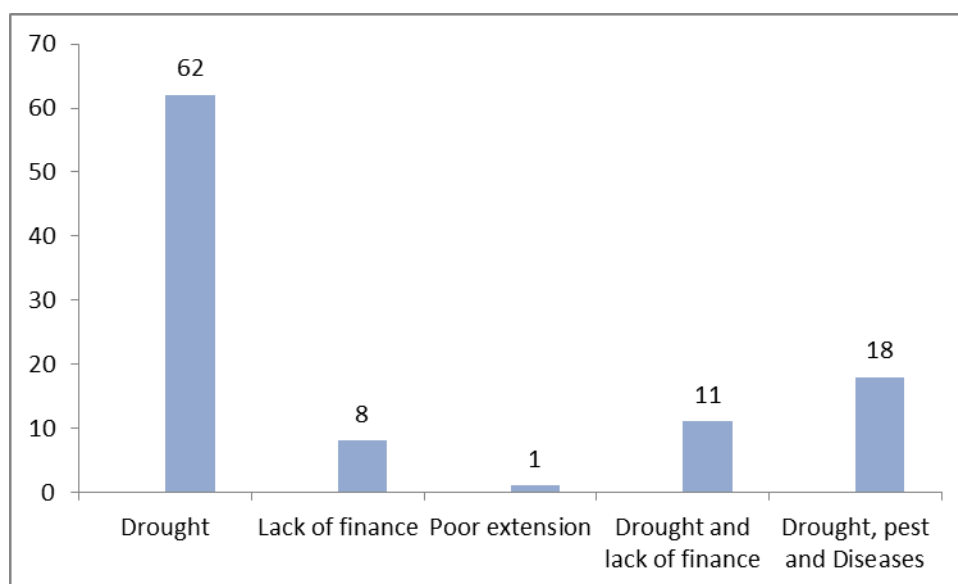


Figure 4: Challenges faced by farmers in Laikipia County

From the study results, table 6 summarizes access to extension services by smallholder farmers in Laikipia East Sub County. It was noted that, 82.3% of farmers received extension services and 17.7% did not receive extension services either from the government agencies or non-governmental organizations. This implied that, few farmers do not have easy access to extension service officers therefore, they have to look for an alternative ways to enable them acquire information regarding output markets and inputs use in their farms. In addition, among those farmers who received extension services: 52% received very relevant extension services, 40% received fair services and 8% received irrelevant extension services. The government through ministry of agriculture and other major agricultural stakeholders should ensure that extension services provided to the farmers should be in line with their relevancy to farm output production, market access, market conditions in terms of quality and quantity and market information access by individual farmers.

Table 6: Access to extension services by smallholder farmers

Access to extension services		
	Frequency	%
Yes	326	82.3
No	70	17.7
Relevance of extension services		
	Frequency	%
Irrelevant	27	8
Fair	128	40
Very relevant	171	52
Total	326	100

From the study it was observed that, 65% of smallholder farmers in the area accessed market information and 35% did not accessed. Moreover, figure 5 show that most of the farmers accessed market information from traders in the area, this constituted 35.9% of smallholder farmers. In addition, 10.1% of the farmers accessed market information from government agencies and 7.1% from extension officers. With these results it was noted that, most of the

farmers in the area do not easily access government agencies. Therefore, farmers relied on their neighbors and traders in order to have access of market information, therefore information they receive may not reflect the true output market condition hence farmers are forced to make their decision using wrong information. Radio and television was secondly used channel by farmers as their source of market information as shown by 19.4% of the respondent. This was attributed to the emergence of radio stations that broadcast using native languages hence enabling even the elderly farmers with no formal education to access adequate and accurate information on output market in an understandable language. Radio and television plays a major role in transferring knowledge and information to rural farmers at a low cost hence improving their access to output markets and agricultural credits, it also facilitates and strengthens networking.

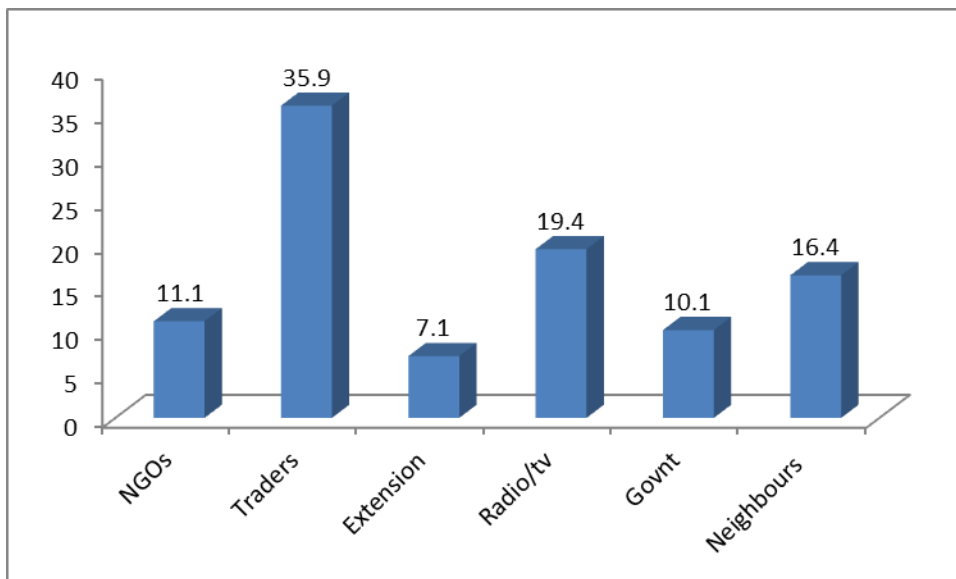


Figure 5: Source of market information to smallholder farmers in the area

Figure 6 shows suggestions that farmers deemed necessary in order to improve training services. It was noted that, 39% of farmers suggested to be offered more training services. This implied that, extension workers should be easily accessible in order to encourage farmers to visit the extension staffs when they want to clarify or access information. It was shown that, 33% of farmers suggested that more frequent visits to their farms should be done. This denotes that, visits to individual farms will enhance more uptake of new farming technology due to practical experience by the farmers. In addition, 17% of farmers suggested that farm demonstration

especially on their farms should be done. This implies that, for easy transfer of new farming technique to farmers, farm demonstration ought to be undertaken to show farmers the relevance and ways of implementing the techniques on their farms. In conclusion, 11% represented those farmers in the study area that preferred advice on credit services especially access and utilization of the credit on the farm. This inferred that, credit facilities even though is seen as the most influential factor in farm activities less farmers need advice on its use and access and would prefer other factors to be offered to them during training services provided to them.

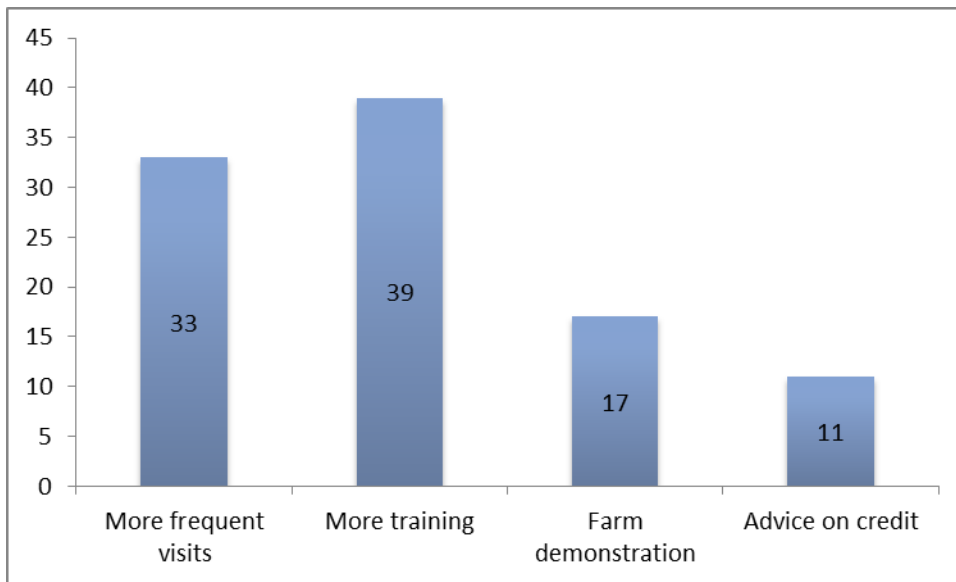


Figure 6: Improvement of training service offered

The results in table 7 shows market outlet where most of smallholder farmers in the study area market their produce. It was noted that, most of the farmers (56%) sold their produce to middlemen. Local market, especially rural market, was the second most used market outlet as noted by 20% of smallholder farmers who did sold their produce in these markets. In addition, 15% of smallholder farmers in the region sold their produce to their neighbors. This implied that, neighbors' form one of the major market outlets to farm produce especially in the rural areas. Moreover, 8% of the farmers sold their farm produce to local schools. This implied that, schools in the area are most accessible as potential output market especially in rural areas mainly because of its short distance which reduce the transaction cost; transportation costs.

Table 7: Output market by smallholder farmers

Output Market	N	Percentages
Middlemen	220	56
Local Market	76	20
Neighbors	60	15
Schools	36	8
Cooperative	4	1
Total	396	100

The results showed that, 40.15% of farmers in the study area were headed by males and 59.85% were headed by females (Table 8). Among those farmers who choose market facilitators 38.99% were headed by male and 61.01% were headed by female. In addition, among those farmers who market their produce independently 44.87% were male headed households and 55.13% were female headed households. The difference was statistically significant among those farmers who choose market facilitators and those who market their produce independently. Age distribution of farmers is fundamental in choice of market facilitators. Overall, it was noted that, 5.30% represented youth farmers. This implies that, most of the youth have opted to off farm activities apart from purely undertaking farming activities as their main source of economic livelihood. In addition, 49.49% represented older farmers and 45.20% represented younger farmers. This implies that, in the study area a higher percentage of the farmers are older mainly because they own factor of production; land and other fixed assets. Moreover, among those farmers who choose market facilitators, 49.69% represented older farmers, 44.97% represented younger farmers and 5.35% represented youth farmers. Among those farmers who choose to market their produce independently; 48.72% were older farmers, 46.15% were younger farmers and 5.13% were youth farmers. The difference was statistically significant among those who choose market facilitators and those who marketed their produce independently. This implied that, age of a farmer significantly influence the choice of market facilitators, whereby youth farmers were noted to least (5.35%) choose market facilitators as compared to younger and older farmers. In addition, older farmers were noted to involve market facilitators (49.69%) more as compared to younger farmers (44.97). This implied that, older farmers have more experience than youth farmers who have mainly ventured in farming and output marketing recently. This results were in line with the findings by Matungul et al., (2001) who noted that, older and more experienced

household heads tends to have more personal contact which allows them to discover more trading and marketing opportunities at low cost. Makhura (2001) argued that being old assists farmers to overcome fixed transaction costs since some experience about the market have been accumulated overtime.

Distance to output market is crucial in decision making by smallholder farmers to either market their produce independently or choose market facilitators. It was noted that, 57.07% of farmers were located in accessible distance to the market, 24.75% of farmers were located in moderate distance to output market and 18.18% of farmers were located in inaccessible distance to output market. However, among farmers who choose market facilitators it was indicated that: 58.49% were located in accessible distance, 26.42% were located in moderate distance to output market and 15.09% of farmers were located in inaccessible distance to the market. On the other hand, among those farmers who choose to market their produce independently it was shown that: 51.28% were located in accessible distance to market, 17.95% were located in moderate distance to output market and 30.77% of farmers were located in inaccessible distance to output market. There was significant difference between those who choose market facilitators and those who choose to market their produce independently. These results conform with findings by Dinh *et al.* (2012) where they revealed that, as the distance to output market increases, farmers are excluded from services since most of the service providers place their branches in more accessible location to output market and hence the need for market facilitators.

Table 8: Descriptive statistics of the selected demographic, socioeconomic factors

	Overall sample n=396	Choose market facilitators n=318	Market independently n= 78	χ^2
Demographic characteristics				
Gender (%)				
Male	40.15	38.99	44.87	9.006**
Female	59.85	61.01	55.13	
Age groups				
Younger	5.30	5.35	5.13	10.549**
Youth	49.49	49.69	48.72	
Older	45.20	44.97	46.15	
Market distance (%)				
Accessible	57.07	58.49	51.28	10.849**
Moderate	24.75	26.42	17.95	
Inaccessible	18.18	15.09	30.77	
Market levy (%)				
Low	89.65	89.94	88.46	0.5734
Moderate	5.56	5.66	5.13	
High	4.80	4.40	6.41	
Pay levy (%)				
Yes	38.38	37.42	42.31	0.6323
No	61.62	62.58	57.69	
Marketing under a group (%)				
Yes	29.55	28.30	34.62	1.199
No	70.45	71.70	65.38	
Main occupation (%)				
Farming	83.84	84.28	82.05	0.229
Off-farming	16.16	15.72	17.95	

Note: *** P<0.01, ** P<0.05, * P<0.10 means 1%, 5% and 10% significant level, respectively.

Market levy is one of the major factors influencing smallholder farmers in their choice of market facilitators. In the study it was noted that in overall, 89.65% of farmers accessed markets that charged low levy to participate in it. Moreover, 5.56% of farmers accessed and participated in market that charged moderate levy. Finally, 4.80% represented those farmers who accessed those markets that charged high levy to access and use it. Among those farmers who choose market facilitators in their marketing activity showed that: 89.94% accessed markets that charged low

levy, 5.66% accessed markets that charged moderate levy and 4.40% accessed markets that charged high levy to access and participate in it. However, those farmers who choose to market their produce independently it was indicated that: 88.46% accessed market that charged low levy; 5.13% accessed market that charged moderate levy and 6.41% accessed output markets that charged high levy to access. There was no statistical difference among those who choose to market independently and those who choose market facilitators. This implies that, farmers participate in output market that is available regardless of the amount of levy charged to access and participate in the market.

On average, in the study area 29.55% and 70.45% represented those smallholder farmers who market through a group and those who did not respectively. Among those farmers who choose market facilitators during their marketing process 71.70% represented those who were not selling their produce in a group and 28.30% represented those farmers who sold their produce through the group. On the other hand, among those farmers who did not choose market facilitators it was indicated that, 65.38% sold their produce independently while 34.62% of farmers were marketing their produce as a group. The results were not statistically different from zero for those farmers who choose market facilitators and those who market their produce independently.

In terms of farmers' occupation, it was shown that, 83.84% of farmers were involved in farming activities and 16.16% were involved in off-farm activities as their source of livelihood. Among those farmers who choose market facilitators, 84.28% were engaged in farming activities and 15.72% were involved in off-farm activities. In addition, it was observed that, among those farmers who market their produce independently, 82.05% and 17.95% represented those who choose market facilitators and those who marketed their produce independently respectively though the results were not statistically significant. This implied that, occupation activities among farmers do not have significant influence on choice of market facilitators. It was further indicated that, high percentage (83.84%) of farmers were involved in farming activities as their main source of livelihood.

4.3 Factors influencing choice of market facilitators

Propensity Score Matching model was used to analyze those factors influencing farmers' choice of market facilitators and the results are as given in table 9, whereby logit model was first used. The role of logit regression model is to obtain estimates of propensity scores on the covariates for each observation in the participation and comparison groups (Himas, 2008) and the probability of choice of market facilitators by smallholder farmers. It also yields results on factors hypothesized to influence the choice of market facilitators. Propensity score matching model was used because it solves for selection bias problem.

Multicollinearity Tests

Before running the model (Propensity Score Matching Model), independent variables were first tested to check for multicollinearity and heteroscedasticity. This was because the existence of multicollinearity could have caused the estimated regression coefficient to have wrong signs and smaller t-ratios that could have led to wrong conclusions (Mijena, 2011). This was done by employing Variance Inflation Factor (VIF) which tests for presence of multicollinearity among continuous variables. The larger the value of VIF, the more collinear the variables are. As a rule of thumb, if the VIF of estimated variables exceeds 10, then there exists multicollinearity problem. The VIF was specified as follows (Gujarati, 2003):

$$\text{VIF}(x_i) = \frac{1}{1 - R_i^2}$$

Where:

VIF (x_i) - Variance inflation factor for explanatory variable x_i

R_i^2 - Square of multiple correlation coefficients obtained from regressing x_i on the remaining explanatory variables.

The result of the VIF test was shown in appendix 1 where the mean of factors was 1.27. This indicated that there was no serious problem of multicollinearity since all the values of continuous explanatory variables used were ranging from 1.01 to 2.03 which were below 10.

A Logit model results showed that, household size, age of household head and marketing through a group were statistically significant at 1% significance level and positively influenced choice of market facilitators by smallholder farmers. Number of members in the group, market

information access, purpose of farming and output produced were statistically significant at 1% significance level and negatively influenced farmers' choice of market facilitators.

Table 9: Logit model regression results for choice of market facilitators

Variable	dy/dx	Co-effi	t- value	P> z
Pay market levy	0.038	0.441 (0.434)	1.02	0.309
House hold size	0.015	0.165*** (0.060)	2.76	0.006
Age of household head	0.040	0.446*** (0.256)	-1.74	0.008
Distance to market	0.033	0.364* (0.196)	1.81	0.070
Number of members in the group	-0.005	-0.049*** (0.015)	-3.19	0.002
Farming purpose	-0.120	-1.342*** (0.319)	-4.21	0.000
Market information Access	-0.047	-0.498*** (0.302)	-1.65	0.001
Output	-0.037	-0.417*** (0.195)	-2.13	0.003
Group marketing	0.204	3.110*** (0.850)	1.10	0.000
Loan access	0.0317	0.354 (0.322)	1.10	0.272
Extension service source	0.076	0.851* (0.080)	1.75	0.080
Constant		-1.849 (1.364)	-1.36	0.175
Log likelihood= -146				
Number of observation= 396				
LR chi2 (11)= 109.63				
Prob>Chi2= 0.000				
Pseudo R2= 0.2732				
Standard errors are in parenthesis				

Note: *** P<0.01, ** P<0.05, * P<0.10 means 1%, 5% and 10% significant level, respectively.

The results indicate that, household size were statistically significant with 1% significance level and positively influenced choice of market facilitators. This implied that, an increase in household size increases the probability of smallholder farmers' choosing market facilitators as noted by 16.5% increase in output marketed. Economically size of household represent productive and consumption unit of a household whereby larger household provide cheap farm labour and produce more output in absolute term, such that proportion sold remains higher than

the proportion consumed, this results were consistent with findings by Makhura (2001). Coeze, *et al.* (2003) added that having a bigger household would translate into an increased demand for market goods, therefore, transitively increasing the probability by smallholder farmers to choose to be facilitated to output market. Increased output sold to the market improves farm income margin and enable farmers to purchase other consumable goods.

Age of household head was noted to be statistically significant at 1% significance level and positively influenced choice of market facilitators by smallholder farmers. The results implied that, as the age of household head increase the probability of choosing market facilitators increase. The mean age effect showed that, an increase in age of household head by one year increased the probability of involving market facilitators by 44.6%. This implies that, as the respondents grow old they tend to become risk averse and therefore involve market facilitators in order to avoid loss. These study results conform to the findings by Nadezda and Urquieta (2009) and Bongiwe and Masaku (2013) where they noted that older farmers are more reluctant to invest in new technology.

Marketing through a group has been indicated by the result to be significant at 1% level with positive influence on choice of market facilitators by smallholder farmers. This implies that, marketing produce through a group would increase the probability of farmers involving market facilitators or third party facilitation. In addition, being in a group means farmers are effective in pooling external inputs, lobbying for favorable marketing policies and dissemination of market information. Finally, members in a group have easy access to external organizations that are in a position to create links to output market for them. This result were consistent with findings by Owuor (2009), who revealed that farmer groups are formed for the purpose of service delivery but production is on individual basis hence the choice of third party facilitation. This indicated that, farmers who are in a group were likely to produce more of their produce individually due to joint skills and learning among members in the group than those members who are not in the group. In addition, Wollni and Zeller (2006) observed that, farmer groups especially marketing groups have become an entry point for non-governmental organizations and other organizations that promote agricultural value chain and marketing to reach many targeted farmers and reduce

cost of operations while disseminating information on modern technologies, skills and input output markets.

Number of members in a group, was statistically significant and negatively influenced choice of market facilitators by smallholder farmers at 1% significance level. This implies that, as the number of members in a group increases the probability of individual farmers choosing market facilitators decreases as shown by the negative coefficient sign, hence they prefer to market their produce independently. In addition, there is improved capacity to penetrate into output market and gain market power due to easy access of market information and information communication technologies (ICTs) as the group members increase. Moreover, access to credit, extension services and collective purchase of farm inputs and output sale becomes easy. Due to collective sale of output they are able to meet economies of scale hence output price increase due to increased negotiation power from members in a group. The study also inferred that, transaction costs reduce once the number of members in a group becomes large because they are able to meet economies of scale while marketing their output. The results conforms to the findings of Randela *et al.* (2008) who noted that individual farmers cannot enjoy economies of scale therefore, the number of members helps in filling out the gap and hence benefiting farmers to meet the economies of scale.

In terms of output, the results showed that farm output was statistically significant and negatively influenced choice of market facilitators. This implied that, as quantity of output produced increase farmers will choose to market their produce independently rather than involve market facilitators. Economically, an economies of scale is achieved once output produced becomes more and therefore, transaction costs become low which leads to farmers getting profit from their sale and motivates them to market their produce independently. This result were consistent with the findings by Renner and Pieniadz (2008) who noted that firms with more output level were more flexible due to their ownership of assets.

Market information access significantly and negatively influenced farmers' choice of market facilitator at 1% significance level. This implied that, access to market information by smallholder farmers regarding market conditions led them to individually market their produce.

Market conditions are dynamic and bound to change frequently with regards to price, potential consumers' lifestyle, taste preference and government regulations. Farmers therefore, need to be informed of these market dynamics to help them in mitigating externalities through use of appropriate current technologies of production in order to produce quality produce that meet market demands (either voluminous or in small quantities). This result were consistent with the findings by Omiti *et al.*, (2009) who observed that the use of informal market information channels contributed to an increased output marketed in rural areas, choice of marketing channel and choice of facilitation to output market.

Farming purpose was statistically significant and negatively influenced choice of market facilitators by smallholder farmers at 1% significance level. This implied that, the main purpose for smallholder farmers' production will influence them on their choice of market facilitators. In the study area it was noted that, higher percentage (53%) produce for subsistence purposes while 47% produced for commercial purposes. In addition, those farmers who engage themselves in commercial type of farming tend to be risk averse.

4.4 Effects of market facilitators on smallholder farmers' income

Analyzing the effects that market facilitators have on smallholder farmers' income, the average treatment effect on the treated (ATE) was used to assess if there was an impact of market facilitators on farm income.

Table 10: Impacts of market facilitators on farm income

Variable	Sample	Treated	Controls	Difference	S.E	T-stat
Income	Unmatched	1.0125	1.0032	0.0932	0.0089	1.05
	ATT	1.0127	1.0003	0.0123	0.0135	0.91
	ATE			0.0051		

From the study results it was noted that, the average treatment effect on the treated (ATE) was 0.0051. This showed that, those farmers who choose to involve market facilitators while marketing their produce (the treated group) received 0.51% higher income compared to those farmers who were marketing independently and the results was not statistically significant (Table 10). Therefore, presence of market facilitators had no impact on smallholder farmers' income. This implied that, the insignificant difference in income between those who choose to market

through market facilitators and those who choose to market independently was attributed to ownership of mobile phones and easy access of information and communication technologies (ICTs) by most farmers in rural areas. This has enabled them to easily access market information therefore making it possible for them to participate in the market independently. This study results conforms to the findings of Kuhlitz and Abdulai (2011), who observed that household welfare was hardly affected at low levels of export revenue shares, but rose with increasing level of specialization.

As demonstrated by Dehejia & Wahba(1999) and Marco Caliendo (2008), it is an important step to check the overlap in estimated propensity scores between treatment and comparison groups (known as the region of common support), because a violation of the common support condition is a major source of evaluation bias. To check the quality of matching, the balance results for the key covariates before and after matching are reported in table 11. The matching considerably improved the balance in covariates between the treated and untreated group.

The balanced results showed high biasness before the variables were matched but after matching there was a reduction in percentage biasness especially with those variables that were statistically significant; this was seen by a reduction of t-value after matching the variables. The summary of distribution of biasness observed that there was a reduction in the mean from 25.26 to 15.73, standard deviations from 19.37 to 15.73, variance from 375.22 to 153.11 and skewness from 0.78 to 0.68 after matching the variables this implied that the model specification was correct and after matching variables for both those farmers who market their produce independently and those who market independently there was a reduction in biasness between the two groups.

In conclusion, group marketing, distance to output market and access to loan were statistically significant before matching and were statistically insignificant after matching. This implied that after matching the covariates it had no influence on the decision by farmers to choose market facilitators. It was noted that, farm output were significant before and after matching the samples for both those who marketed independently and those who choose market facilitators. Therefore, output plays a critical role in choice of market facilitators, whereby it was noted that it had a negative influence hence farmers would market independently as output increases.

Table 11: Balance of Covariates

Variables	Unmatched sample				Matched Sample			
	Mean		%bias	P-value	Mean		%bias	P-value
Treated	Control	Treated			Control			
Pay market levy	0.3	0.277	-42.9	0.685	0.304	0.272	-31.3	0.664
House hold size	1.412	1.239	24.9**	0.033	1.418	1.208	30.1*	0.054
Age of household head	19.110	19.564	-3.8	0.766	18.975	18.268	6	0.7
Distance to market	0.850	0.557	67.4****	0.000	0.848	0.779	16	0.267
Number of members in the group	2.957	3.427	-11.9	0.295	2.995	3.211	-5.5	0.719
Farming purpose	0.413	0.261	32.3	0.608	0.418	0.421	-0.7	0.608
Market information Access	0.738	0.789	-6.6	0.481	0.734	0.653	10.3	0.58
Group marketing	0.513	0.357	31.7**	0.011	0.519	0.570	-10.4	0.521
Output	1.737	2.016	-35.0****	0.007	1.734	2.040	-38.5****	0.001
Loan access	1.8	2.815	-42.9*	0.054	1.823	2.564	-31.3	0.159
Extension service source	3.288	10.516	-16.3	0.302	3.330	11.028	-17.4	0.194

****, **, and * represent 1%, 5% and 10% significant level, respectively.

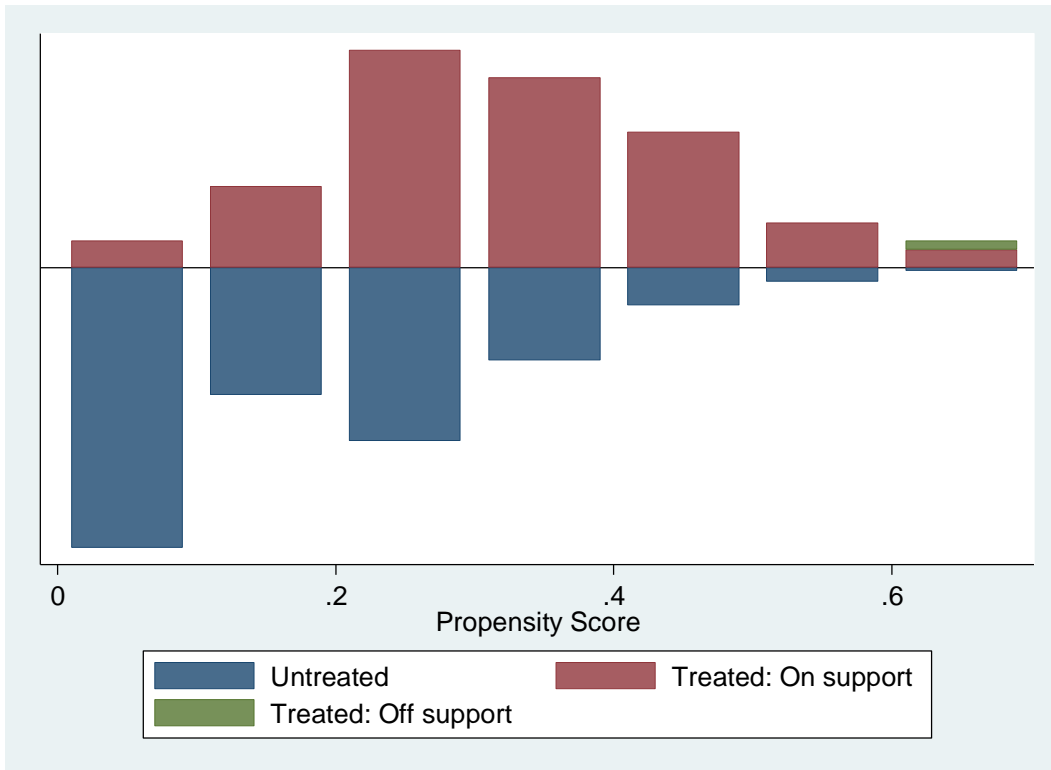


Figure 7: Propensity score graph

The distribution of propensity score for each household included in the treated and control groups were computed to identify the existence of common support as shown on figure 7 above. The distribution of the propensity score of those who involved market facilitators and those who marketed independently showed an overlap of the propensity scores which indicated that the assumption of common support holds as shown by the graph below. The graph shows that there is a wide area in which the propensity score of those who involved facilitators is similar to those who marketed independently.

CHAPTER FIVE

SUMMARY AND CONCLUSION

5.1 Summary

Choice and use of market facilitators is a potential way out of poverty for smallholder farmers in developing countries. The results indicated that, most smallholder farmers in the study area involved market facilitators during their marketing activities. In addition, education level of farmers played a major role in influencing decision making by smallholder farmers whereby it was noted that 50%, 37% and 13% had attained primary, secondary and tertiary education level respectively. Moreover, farmers in the region have not embraced off-farm activities as shown by 83.84% of farmers still undertake farming as their main occupational activities. In addition, socio-demographic and household characteristics for example gender, age of household head and distance to output market were noted to significantly influence the choice of market facilitators by smallholder farmers. Most farmers (35.9%) access market information from traders and followed by radio and televisions (19.4%). In determining those factors influencing choice of market facilitators. The results indicate that, household size, age of household head and marketing through a group were statistically significant and positively influenced choice of market facilitators. On the other hand, number of members in the group, market information access, purpose of farming and output produced were statistically significant and negatively influenced choice of market facilitators by smallholder farmers in Laikipia County. In evaluating the effects that market facilitators have on smallholder farmers' income in Laikipia County.

5.2 Conclusions

The study concluded that smallholder farmers especially those leaving in the rural areas need to be given information. Access to market information will further enable farmers especially those leaving in the rural areas to make informed decision on how to market their produce and gain economically. Farm level activities should also be looked at within the context of the whole supply chain and linkage within the chain.

5.3 Recommendations

Farmer groups especially marketing groups' forms an entry point for non-governmental organizations and other organizations that promote agricultural value chain and marketing. The

study recommends that governmental organization ought to play a bigger role in disseminating extension services and market information to smallholder farmers on output price and market availability. In addition, there is need for a multi-actor approach for successful linkage of smallholder farmers to the market in order to allow them join the supply chain. A positive action should be taken to sensitize farmers on the role that gender play in choice of market facilitators hence women should be encouraged to play part in farm production and marketing activities. Distance to the market plays a significant role in influencing decision to choose market facilitators. The study recommends that the infrastructure especially roads to output market should be improved in order to be accessible to smallholder farmers who are mainly financially challenged.

Based on the study it was noted that, household size, age of household head and marketing through a group were statistically significant in influencing farmers in their choice of market facilitators. The results confirmed the existence of a positive relationship between household size and choice of market facilitators by farmers. This finding brings to the fore the importance of a demographic policy which takes into account the composition of households. It is pertinent to determine the role of different household members in household choice of market facilitators. This therefore calls for the consolidation of government efforts to promote the involvement of youth farmers. To reach many farmers in rural set-up and reduce cost of operations while disseminating information on modern technologies and skills the study recommends that farmers should be encouraged to form groups to take advantage of services from non-governmental organization and other stakeholders in agricultural marketing sector. Age of household head play a vital role in major household decisions. The study recommends that, the government should enact legislations that will enable young and old aged farmers to access market information through provision of extension services, training and yearly market conditions.

5.4. Suggestions for further research

The focus of the current study was to determine those factors influencing the choice of market facilitators by smallholder farmers in ASALs region. The study suggest further research should be done on access to information communication technologies by individual farmers especially in rural areas and evaluate its impact on output market access by smallholder farmers. The study

also suggests research on social capital and their economic benefits to the members in those social groups.

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APPENDICES

Appendix 1: Variance inflation factor (VIF) multicollinearity test results for Logit model of market facilitator choice

Variable	VIF	1/VIF
Market charges	1.02	0.975813
House hold size	1.03	0.971034
Age of household head	2.03	0.493546
Distance to market	1.01	0.991888
Number of members in the group	1.01	0.992292
Farm size	1.13	0.881728
Farming experience	1.87	0.535018
Farm output	1.02	0.978977
Mean VIF	1.27	

APPENDIX 2: HOUSEHOLD SURVEY QUESTIONNAIRE

Household Survey 2012

Egerton University

Introductory statement

Hello, my names are I am a master’s student at Egerton University undertaking a research on “*Factors Determining Choice of Market Facilitators by Smallholder Horticultural Farmers in Laikipia County, Kenya*”. The purpose of the study is to find out impacts of market facilitators on farm income and productivity. I therefore kindly request you to feel free when answering the questions asked as the necessary confidentiality will be maintained. The questionnaire will take about an hour.

Identification particulars

1. Date of interview	
2. Name of enumerator	
3. District	
4. Name of respondent	
5. Gender of respondent	
6. Age of respondent	
7. Division	
8. Location	
9. Sub-location	

SECTION A: HOUSEHOLD PROFILE

10. Provide the following detail about the household head

Gender 1=Male, 2= Female	Age (years)	Primary activity	Farming experience (years)	Education (years)

11. Is the household head the respondent? [____] (1. Yes 2. No)

12. Is the household head the farm owner? [____] (1. Yes 2. No) If not, who is the farm owner? [_____]

13. Number of Household members? (including HH head) living permanently on the compound

Age Categories	Males	Females	Total	Number actually working on the farm

				at least once a week
< 20 years				
21 – 50				
>50 years				
Number of children attending school				
Number of siblings opting to do farming				
Number of siblings opting for the city				

14. Number of non-resident household members, living away but who occasionally benefit or assist in farm activities

Age category	Males	Females	Total
<20 years			
21-50			
>50 years			

15. Can you describe reasons why some choose to go to the city?

.....

Housing and Food Security

16. Type of wall for the house _____ (1. Mud, only 2.Plastered 3. Wooden 4. Bricks 5. Stone)

17. Type of roof for the house _____ (1. Grass 2. Iron-sheet 3. Tiles)

18. Type of floor _____ (1. Earth 2. Cemented 3. Plastered 4. Tiled)

19. For you what is the main purpose of farming? _____

20. In which months of the year you feel that the household does not have sufficient food?

Please tick

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec

21. What would you say are the major challenges in your farming operations?

22. What is the most important unmet need in your farming activities?

SECTION B: STRUCTURE OF LAND OWNERSHIP AND LAND USE

23. Land owned and operated

Total size (Acres)	Tenure system (Acres)			
	Owned	Rented in	Rented out	Communal
	[_____]	[_____]	[_____]	[_____]

24. Crop enterprises

24.1. Land use last long rains

Crop enterprise name	Acres	Seed kg used	Insecticides crops liters	Planting fertilizer (kg)	Top dressing (kg)	FYM (kg)	Compost (kg)	Famil labour hours	Hired labour hours	Production in kgs	Output price/kg/unit	Production in ksh

24.2. Land use last short rains

Crop enterprise name	Acres	Seed kg used	Insecticides crops liters	Planting fertilizer (kg)	Top dressing (kg)	FYM (kg)	Compost (kg)	Famil labour hours	Hired labour hours	Production in kgs	Output price/kg/unit	Production in ksh

--	--	--	--	--	--	--	--	--	--	--	--	--

25. Please give the unit prices for the inputs used as you purchased last year

25.1. Seeds

	Mai ze see ds	Bea ns see ds	Other lequ mes	Sorgh ums	Irish potat oes	Swee t potat oes	Bana na suck ers	Cass ava cuttin g	Sugarca ne planting material s/kg	Coff ee/ tea	Vegeta bles/ tomatoe s
Price in Ksh/u nit											

25.2. Other inputs

	Herbici des	Insectici des	Planti ng fertili zer	Top dressi ng fertili zer	FYM/ wheelbar row	Compost/wheelb arrow	Casual labour/ day	Perman ent labour/ day
Price in Ksh/u nit								

26. Irrigation

Total irrigated	land	Surface irrigated	water	Groundwater irrigated	Which crops irrigated, specify

27. Output market

27.1. Do you sell any of your crop produce? [] (1. Yes 2. No)

27.2. If yes, where do you sell your crop produce? (Focusing on four major crops)

Crop 1	Crop 2	Crop 3	Crop 4

(1. Local markets 2. Middleman/brokers 3. State marketing board 4. Cooperatives 5. Neighbors 6. Schools 7. Other, specify _____]

27.3. Do you pay cess or charges to local authority (market organizers) when you sell your produce? [] (1. Yes 2. No)

27.4. If yes, what are the charges _____ ksh

SECTION C: ASSET ENDOWMENTS AND HOUSEHOLD INCOME

28. Household Asset Endowments

Asset	Number	How long have you had it	How much do you think it is worth (Ksh)
Carts			
Vehicle			
Tractors			
Plough			
Wheel barrows			
Hoes/Jembes			
Pangas/Slashers			
TV			
Radio			
Bicycles			
Computer			
Mobile phones			
Plots/land			

29. Household income sources

What are the sources of income for your household in the last 12 months?

Type of earning	Please tick	What is the proportion of total income (%)
Income from farm production(crop produce, milk)		
Employment income		
Income from business		
Income from sale of livestock and other assets eg land, vehicle		
Transfer earnings from relatives, sons, daughters etc		
Land rented out income		
Buildings rented out income		
Other structures rented out income		
Motor vehicle rented out income		
Other income		

SECTION D: MARKET FACILITATOR AND EXTENSION SERVICES

30. Are you getting services from the market facilitator [_____] (1. Yes 2. No)

31. If yes, for how long already_____ months

32. What are your general expectations working with market facilitator?

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33. Please comment on current services/interventions by market facilitator and your participation

#	Name the Service/Intervention e.g Agronomic support Input	Did you adopt/participate it? (1. Yes 2. No)	If yes, which crops and	Comment on realized charges e.g. yield/acre	Comment on effectiveness 0-not effective	Suggest what you would want

	technology transfer Linkage to input/output markets Market-led extension Index insurance etc		how much area (acres)	change; production or sale volume change; crop change	1- least effective 2-fairly effective 3-very effective	improved
1						
2						
3						
4						
5						

34. Please describe the most effective approach that you feel would meet your needs

--

EXTENSION SERVICES

35. Did you receive extension contacts in the last 12 months: [____] (1. Yes 2. No)

36. If yes, please give details below

Extension source (Govt, Syngenta Foundation, input dealers, other specify)	Number of visits a year	Comment on relevance 1- irrelevant 2-fair 3-very relevant	What technology or tools are provided in this extension service	Comment on effectiveness 0-not effective 1- least effective 2-fairly effective 3-very effective

37. Have you attended farmer training in the last 12 months? [____] (1. Yes 2. No)

38. If yes, please give details below

Source of training (Eg: FTC- Farmers Training Center (Gvt) Syngenta Foundation, other specify)	Number of training attended in the last 12 months	Comment on relevance 1- irrelevant 2-fair 3-very relevant	What technology or tools are provided in the training	Comment on effectiveness 0-not effective 1- least effective 2-fairly effective 3-very effective

39. What are your suggestion for improvement on extension services

SECTION E: INSTITUTIONAL SUPPORT AND SERVICES

40. Farmer Groups and Cooperatives

40.1. Do you belong to any farmer groups or cooperatives? If yes, specify the name

40.2. How many people are in this group? _____

40.3. How long have you been in this group?_____

40.4. What are the role of your group?_____

40.5. Are there any benefits that you get being a member of this group? [____] (1. Yes
2. No)

40.6. If yes, which ones? [_____]

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42.4. Is the information received adequate to facilitate effective marketing? [____]

(1.Yes 2.No)

42.5. If not, what other information would you require? _____

43. Credit access

43.1. Have you taken any loans in the last 12 months? [____] (1.Yes 2.No)

43.2. Where did you get the loans _____

43.3. What was the interest rate[____] (%p/a)

43.4. What proportion of the loans goes to different activities (%), for example

Farm inputs	Farm machinery	Livestock	School fees	Food	Business	Other specify

43.5. How are you going to repay the loans? [____] (1.Through crops/livestock, 2.Employment income, 3.Business 4.Other, _____)

43.6. Was it easy to get a loan? [____] (1.Yes 2.No)

SECTION F: RISKS AND MANAGEMENT

44. If you have experienced any risks related to weather, pests or diseases, please indicate which ones.

Risks	Enterprises affected	Nature of effect or loss	Any resilience strategies used
Drought, dry spells			
Flooding			
Pests			
Diseases			
Weeds			
Other, specify _____			

45. Do you have any crop insurance (e.g. Weather index insurance)? [____] (1.Yes 2.No)

46. Do you like it and find it useful? [____] (1.Yes 2.No)

47. What else would you like to have insured? _____

Thank you very much for your cooperation!