

**Socio-economic Factors Influencing Smallholder Banana  
Farmers' Participation in Banana Farmers' Association  
Marketing Channel in Murang'a South District.**

**A Thesis Submitted in Partial fulfillment of the Requirements  
for the Degree of Master of Science in Agricultural Economics  
of the University of Nairobi**

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### **Declaration by Student**

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

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### **Dedication**

This Thesis is dedicated to the memory of my sisters Alice Mukite, Caren Khakasa and Eddah who supported my primary school education.

### **Acknowledgement**

The successful writing of this thesis is owed to many individuals. I acknowledge the effort and personal dedication showed by my two supervisors Dr. J. Karugia and Prof. O.L.E. Mbatia. Their positive criticism, corrections and contributions were very valuable. I also extend my sincere gratitude to the staff in Agricultural Economics Library in Kabete campus and fellow students in availing secondary data for reference that helped shape direction of the thesis. My thanks also go to the farmers and Ministry of agriculture staff in Maragua division in support to ensure a successful primary data collection. Finally I extend my heartfelt thanks to all members of my family for their financial support, patience, endurance and encouragement during the entire period of my study.

**LIST OF ABBREVIATIONS**

AFC	Agricultural Finance Corporation
CBS	Central Bureau of Statistics
AHBFI	Africa Harvest Biotechnology Foundation International
GoK	Government of Kenya
GTL	Genetic Technology Laboratory
ISAAA	International Service for Acquisition of Agri-biotech Application
ITSC	Institute of Tropical and Sub-tropical Crops
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KACE	Kenya Agricultural Commodity Exchange
KARI	Kenya Agricultural Research Institute

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**Abstract**

This study analyses the socio-economic factors that influence smallholder banana farmers' participation in a marketing association. The study further evaluates the returns from alternative banana marketing channels to determine the effect of participation on the farmers' net income. A total of 120 smallholder farmers were interviewed from Maragua division of Murang'a South District. The division was purposively selected due to its high production of bananas, early adoption of tissue culture bananas and existence of banana associations. Tobit model was used to evaluate the socio-economic factors that jointly influence the probability and level of participation in the marketing association. Gross margins of the various marketing channels were also computed to determine the effect of participation on farmers' net income.

The results of the study showed that variables that significantly influenced farmers' participation in the banana marketing association were age and years of experience in marketing of household head, an irrigation facility on the farm, availability of family labor for farming activities, access to credit for agricultural development, contact with agricultural extension service providers, membership of household head in agri-commodity marketing association, good condition of roads and access to market information. The results further showed that all marketing channels gave positive net income but the marketing association had the highest returns.

The study concludes that banana farmers operate in an environment of inadequate business development services that limits their ability to participate in marketing associations. The farmers are constrained by inadequate capital to acquire the required farm inputs and equipment.



They have inadequate access to affordable credit, which is an impediment in engaging in marketing functions. There is information asymmetry in banana marketing; only the brokers and not producers have access to comprehensive market information. The farmers also have inadequate access to extension services. Their efforts to market their produce in the far of markets that offer higher price are thwarted by poor roads.

The study therefore recommends that the government should formulate policies to facilitate smallholder farmers' access and participation in acquisition of credit for banana production and marketing. The terms of credit should be improved to make credit facilities affordable; strengthening linkages between farmer groups and micro-finance institutions is hence required. Capacity building of the farmers' on rainwater harnessing and harvesting is required to enhance farmers' ability to irrigate their crops. The smallholder farmers should be sensitized on importance of producer marketing associations and be trained on group dynamics, collective marketing, contract development and bargaining and the required negotiation skills to improve their marketing skills. There is need for policies to support provision and access to marketing information to enhance transparency in banana marketing. The Government should put policies in place to strengthen provision of sufficient farm business development services.

## **CHAPTER ONE: INTRODUCTION**

### **1.1 Background**

Most Kenyans obtain their food, livelihoods, employment and foreign exchange earnings from the agricultural sector, even though only 20% of the country's territory is arable land (CBS, 2003). Small-scale farmers make up 80% of the farmers in the country (CBS, 2003); most of these farmers use low levels of farm inputs resulting in low quality products and sub-optimal levels of production (Joetzold, et al., 2006).

To increase agricultural productivity per unit area of land is one way of emancipating Kenyan farmers from poverty (Wambugu et al., 2001 and Qaim, 1999). Banana is one of the agricultural crops that have shown great potential for increased production in Kenya (Mbogoh, 2003 Wambugu et al., 2001 and Qaim, 1999). In the recent past, there has been an increase in banana production amongst smallholder farmers in Kenya (as shown in Table1). Many coffee growers shifted to banana growing after sustained periods of depressed coffee prices, mismanagement of co-operative societies, high cost of inputs and low productivity (GoK, 2002). The development of clean banana planting materials further increased banana production (Mbogoh et al., 2003).

The collaborative initiative of Kenya Agricultural Research Institute (KARI), Genetic Technology Laboratory (GTL) in Kenya, The Institute of Tropical and Sub-tropical Crops (ITSC) of South Africa, Jomo Kenyatta University of Agriculture and Technology (JKUAT), private sector players and International Service for Acquisition of Agri-Biotech Application (ISAAA) led to the development of clean planting material through tissue culture banana

technology. ISAAA initiated a pilot micro-credit revolving fund to enable small-scale farmers in Murang'a South district purchase the tissue culture banana plantlets. This resulted to 60% adoption rate of the banana (Mbogoh, 2003). However, the improved banana planting materials are more expensive relative to those for traditional banana; it implies that farmers require a certain level of additional economic returns in order to venture in to tissue culture banana production.

With the positive developments in banana production most of the small-scale farmers took up banana production but produce small, inconsistent quantities of varying quality (Splisbury et.al, 2003). Over 70% of the bananas sold by the small scale producers are transacted at the farm gate (Ndubi, 2000). At the farm gate, the smallholder farmers are not empowered to dictate at what price to sell their produce or where else to sell as they lack the information (Niven et al, 2005). The percentage of the marketing margin captured by the farmers is usually small as the produce changes ownerships many times (Dijkastra, 1997), this is depicted in figure1 on overview of the banana marketing channels in Kenya. Those who sell to brokers at the farm gate earn 9% of the marketing margin, while the broker earns 33% of it (Splisbury et al, 2003). Those who opt to transport the bananas by road and by public means, over a long distance exacerbate the percentage of spoilage as the produce for local market is usually transported in trucks that provide little protection against the tropical heat (Simmon, 2002). On domestic market, there are no standard measures or grading systems used in the rural-urban trade of the local produce (Niven et al, 2005), trading by sampling is predominant (Ndubi, 2000). The constraint faced by the small-scale farmers in attempt to market their produce impedes their growth as the incomes of farm dependent households falls overtime (Irungu and Odingo, 2005). The predatory nature of

the market intermediaries acts as a disincentive to the smallholder agricultural enterprise especially for those who sell their produce individually (Obare, 2005). This often results into low farm income, poor standards of living and rising poverty levels amongst the smallholder banana farmers (Ndubi, 2000).

Tables 1 and 2 below show an increasing trend in banana production in Kenya. The average price per kilogram of banana on the local market has been gradually rising from Kshs 6.60 per kilo to Kshs 9.5 per kilo over the six years.

**Table 1 Banana Production in Kenya, 2001 - 2006**

Year	2001	2002	2003	2004	2005	2006
Hectrage	77,576	78,156	79,598	81,673	83,687	85,161
Production level, 000tons	1,006.9	1,019.4	1,039.14	1,073	1,152.6	1,186.5
Yield (ton/ha)	12.98	13.04	13.05	13.14	13.77	13.93
Local Value Ksh,000	6,589,802.4	7,121,516.7	7,167,429.5	7,643,174.5	8,183,332.2	11,300,000

Source: GoK, Economic Review of Agriculture, 2006

**Table 2 Banana Production per Province in Kenya, 2006**

Province	Target area (Ha)	Achieved area (Ha)	Achieved Production(tons)	Achieved value (Kshs)
Nyanza	32,550	35,189	530,472	6,800,000
Central	15,900	15,258	305,156	1,940,010
Western	12,690	11,700	136,300	758,100
Eastern	12,500	13,820	91,698	762,080
Coast	6,000	5,730	68,970	700,080
R. valley	2,950	2,950	46,950	306,010
N .Eastern	500	476	6,573	27,700
Nairobi	40	38	349	6,156
<b>Total</b>	<b>83,130</b>	<b>85,161</b>	<b>1,186,468</b>	<b>11,330,236</b>

Source: Gok, Central planning and project monitoring unit, 2007

### **1.1.2 Fresh Fruits and Vegetable Marketing in Kenya**

The main suppliers of fresh fruits and vegetables to the domestic market are smallholder farmers (Splisbury et al, 2003) who have no formal market for their produce (Niven et al, 2005 and Stegelin, 1986). The Smallholder farmers are often excluded from supply chain by low capital base which constrains them from accessing essential services to engage in marketing functions and improve their competitiveness in markets (Lapar, 2003 and Simmon, 2002). Market access and competitiveness relate to the options farmers have to sell their outputs and purchase inputs. Compared to their larger and more capitalized colleagues, smallholders are disadvantaged due to, small size of operations, weak technical capacity, high vulnerability to natural and market risks, and inadequacy of capital (Acquah, 1997). These constraints could be worse if the smallholders are in remote areas.

The main marketing chain for smallholder fresh fruits and vegetables begins with trader-collectors (mainly brokers) who buy the produce from rural markets or directly from individual farmers (Splisbury et al, 2003). The trader-collectors constitute the main link between geographically scattered small farms in rural areas and the distribution network of wholesale and retail markets in urban centers (Obare, 2005). The produce for local market is usually transported in hired trucks. The way of transportation coupled with inefficient handling of the produce leads to high levels of deterioration and wastage of the perishable produce, this tends to increase the marketing cost and undermine the spatial marketing function in agricultural marketing (Technoserve, 2004).

Major urban centers in Kenya have a fairly large number of self-service groceries and supermarkets that stock locally produced or imported fresh fruit and vegetables for retailing. Small-scale groceries mostly get their supply from brokers, they then distribute to low-income household (Niven et al, 2005). Fresh fruits and vegetables retailing also takes place in large central markets located in well-constructed structures controlled by the municipal authorities (Dijkastra, 1997), Other retail markets are located in open spaces and lack basic infrastructure (concrete floors, drainage and facilities for sorting, weighing and handling of produce). Roadside marketing of fresh fruits and vegetables is common in main producing areas (Ndubi, 2000). The farmers display their produce along the roads to urban areas; this is mainly done to attract travelers who might not have time to do shopping of groceries in the county council, municipal market or supermarkets. Such market also attracts attention of the consumers due to the freshness of the produce.

Brokers dominate banana supply channel in Kenya (Niven et al, 2005). The supply channel is characterized by a small percentage of the marketing margin captured by the farmers as the produce changes ownerships many times (Technoserve, 2004). The brokers involved have high market power; they trade in largest volumes and are most knowledgeable about prices at the farm and in the wholesale markets (Niven et al, 2005). Brokers' dominate operations of banana trade as shown in figure 1; they have delivery schedules to different urban-based wholesalers in different locations. The frequent interaction of the brokers and other players in the banana supply chain enables them have good price information from urban centers unlike the producers (Technoserve, 2004); this indicates that there is information asymmetry in banana market. The main steps in the banana supply channel are: production, broker trading (sorting), ripening,

wholesaling and retailing with transport occurring between most of these stages (Dijkastra, 1997). The channel has a very large number of participants at each level, weak market information, poor handling of the produce and hence physical damage inflicted on the fruits at all levels leading to high post harvest losses estimated at 40% (Technoserve, 2004). Since there are no specific formal quality or safety food standards in domestic market; quality of the bananas is determined by firmness of the bunch, size of the finger and the degree of damage due to pest and diseases or physical bruises resulting from poor handling of the banana (Niven et al, 2005). The perceived quality plays a role in price determination (Djikastra, 1997). Though most farmers are aware of consumer preferences for different varieties, they rarely have timely market information to influence price of banana due to their poor organization (Mbogoh, 2001). Farmers mainly receive price information by going to collection centers and interaction with other farmers (Ndubi, J.M., and Murithi, F.M. 2000).

Some smallholder banana farmers have formed producer marketing groups that enable them to capture more of the marketing margin and reach an intermediate step by selling direct to processors or retailers in urban areas (Technoserve, 2004). The groups combine their harvest to make it economical to be contracted by a wholesaler, agent or processor along the value chain (Niven et al, 2005). The farmers with common interests form commodity based farmer organizations popularly known as common interest groups (CIGs) (Irungu and Odingo, 2005). The groups register with the department of social services as social welfare groups (Obare, 2005). The farmers produce individually but market the commodity as a group. The farmers organize the harvesting, sorting and bulking of the required quantity of banana for sale (Jaffee, 1994). This supply channel has less volume losses relative to selling through the brokers as the

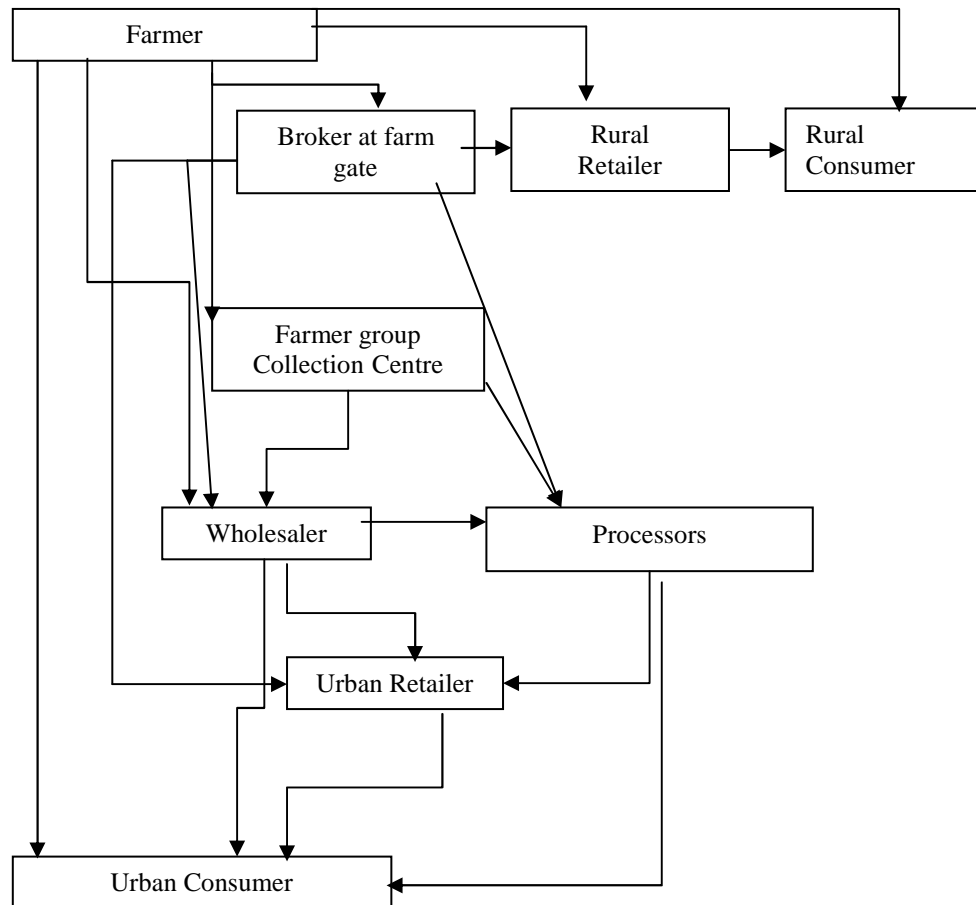
produce changes ownership fewer times than the former channel (Technoserve, 2004). The farmers in the producer marketing groups benefit from economies of scale in the course of transporting and marketing the produce, they also have a stronger bargaining power during price negotiations with the buyers than would have been if they sold on individual basis ( Irungu and Odingo, 2005).

There is growing interest in developing countries to improve the livelihood of the poor smallholder farmers facing production and marketing constraints in fresh produce supply chains (Acquah, 1997). One approach to improve smallholder farmers' access to the market is through collective action (Irungu and Odingo, 2005). Through collective action, smallholder farmers' can form producer marketing groups or associations and enhance the market opportunities for the small-scale farmers (FAO, 2001). Through coordination of production and marketing of the produce, the smallholder farmers can facilitate contracts with marketing agents along the value chain (Gadzikwa, 2007). The marketing associations would help shorten the long and complex-marketing channels that prevail in many rural output markets by directly linking smallholders with the upper end of the value chain (FAO, 2001). The smallholder farmers' participation in marketing associations would enable them to have better access to inputs, information on crop husbandry, prevailing market prices and a voice to lobby for support (Irungu and Odingo, 2005). Participation in marketing associations would thus improve their negotiating and marketing skills and hence increase their farm income. Even with the known benefits associated with group marketing the number of farmers participating in producer-marketing groups is low (Obare, 2005).



The figure below is the simplified banana marketing channels in Kenya. Figure 1.1 depicts the banana marketing channels operating in Kenya. The figure shows the major market outlets available to the smallholder banana producers.

**Figure1: Generalized Overview of Banana Marketing Channels in Kenya**



Source: Adopted from Splisbury et.al, 2003

## **1.2. Problem Statement**

Most of the smallholder banana farmers in Kenya sell their produce through marketing intermediaries popularly referred to as brokers (Mbogoh, 2001). The smallholder banana farmers' in Murang'a South District primarily sell their produce individually, making inconsistent supplies of small volumes of varying quality of banana to the market. The low quality and quantity of smallholder supplies combined with their low bargaining power results into low price for the produce. Most of the smallholder farmers sell their bananas at the farm gate; the predominant marketing channel used is characterized by information asymmetry (Splisbury, 2003; the brokers have comprehensive market information unlike the producers who are less mobile and less informed (Niven, 2005). Even though negotiations take place between the producers and the brokers, the producer seldom has bargaining power to determine the price (Obare, 2005). The smallholder farmers who sell their bananas individually to brokers hardly break even (Niven et al, 2005 and Ndubi, 2000). The predatory nature of the brokers resulting from the smallholder farmers' low bargaining leads to low net income on the part of the producer and hence a disincentive to continue in the farming enterprise (Irungu, 2005).

Past studies on agricultural marketing in Kenya show that smallholder producers are exploited by middlemen due to their low bargaining power (Irungu, 2005, Obare, 2005, and (Splisbury, 2003). Other studies have shown that smallholder farmers' participation in the market can be improved through collective action (Catacun, et al., 2006, Irungu and O,dingo, 2005, Obare et al., 2005, and Technoserve, 2004) as the farmers would have better access to inputs, market information and even have a voice to lobby for support. Participation in marketing associations would improve their negotiating and marketing skills hence increase their farm income (Obare, 2005).

From these past studies little is known about the factors influencing the smallholder banana farmers' participation in marketing associations to strengthen their bargaining power. The effect of participation in market association on farmers' net income is also not known.

### **1.3. Objectives of the Study**

The **overall objective** of the study was to assess banana marketing by the smallholder producers.

The **specific objectives** of the study were:

1. To analyze the socio-economic factors that influence farmers' decision to participate in banana farmers' association marketing channel in Maragua division and their level of participation in the marketing channel.
2. To determine the effect of participation in marketing association on farmers' net income.

### **1.4. Hypothesis**

The following hypothesis was tested was:

That farmer's decision to participate in banana farmers' association marketing channel is not significantly influenced by farmer's household characteristics, farmers' resource attributes, institutional factors and commercialization factors.

### **1.5. Justification**

With the broker dominating the banana marketing channels in Kenya, the profit margin going to the smallholder banana producer continues to reduce; this exposes the farmers to the constraint of low farm income hence low standards of living. One of the major challenges of commercial production by small holder farmers in the rural areas has been low bargaining power resulting from lack of collective sales of their produce and hence no benefits from economies of scale. The present study contributes to understanding of factors that influence smallholder farmers'

participation in a marketing association. It is expected that knowledge about the significant factors influencing farmers' participation in group marketing would be used in designing policies that increase participation by farmers in group marketing to increase their bargaining power and hence household income.

According to Adesina and Zinnah (1993), farmers' technology adoption decision is shaped by personal, economic, socio-cultural and environmental influences within which farmers operate. The present study considers participation in banana marketing association as an adoption of a marketing technology, which brings out an understanding of the various factors that influence the farmers' decision to participate in a marketing channel. This knowledge forms a basis of introducing change in smallholder farmers marketing system in order to increase the returns on farming and improve their standards of living. The findings from the study bear implications essential for policy makers in designing institutional and, or policy interventions that would support implementation of effective programs that enhance formation of producer marketing associations amongst smallholder farmers', improve market penetration and improve efficiency in marketing. The efficiency in marketing would give the farmers the required incentives to invest in improved production methods such as use of certified tissue culture banana planting materials.

Murang'a South District was chosen for study due its high production of bananas that partially resulted from early adoption of tissue culture bananas and existence of banana farmers' marketing associations in the area.

## 1.6 The Study Area

The area of study was Murang'a south district in Central province, which was carved from Murang'a district in 1996. The district covers 1,065 km<sup>2</sup> of which 226 km<sup>2</sup> is Gatara forest. The districts bordering Murang'a south are: Murang'a on the north, Thika on the south, Nyandarua on the west, Machakos on the east, Kirinyaga and Mbeere on the east west. The district has four administrative divisions namely; Maragua covering 200km<sup>2</sup>, Kigumo covering 210km<sup>2</sup>, Makuyu covering 195km<sup>2</sup> and Kandara 234km<sup>2</sup>. The district rises gradually from altitude of 1,100 metres above sea level in the east to 2,950 metres above sea level in the west. The district receives annual rainfall ranging from 900mm in the lower zones to 2700mm in the upper zones.

Murang'a south district's economic viability is dependent on agriculture. The main agro-ecological zones are: Tea dairy zone (LH<sub>1</sub>) which makes 33.7% of the land, Upper midland coffee zone (UM<sub>1</sub>=38.8%) and upper midland marginal coffee zone (UM<sub>2</sub> comprising 27.5%). The district has agriculturally viable land of 68,000 hectares. The main cash crops grown are coffee and tea on 6,500ha and 4,000 ha respectively. The remaining portion of arable land is mainly under banana, avocado, macadamia nuts, passion fruits, mango, sweet potatoes, maize and beans. In the recent past the management problems and low international prices in coffee sub-sector led to rapid replacement of coffee with horticultural crops mainly bananas, mangoes, avocados and passion fruits which replaced the perennial crop. The favorable proximity of the district to Nairobi and Thika market (in terms of distance and condition of the road) further encouraged increased horticultural production.

The survey on banana group marketing was conducted in Maragua division; Nginda, Ichagaki, Muthithi, Kahumbu and Makuyu locations. The agro-ecological zones of the surveyed area are UM<sub>1</sub>; Upper midland main coffee zone and UM<sub>2</sub>; upper midland marginal coffee zone that has

humic nitosols soils which are favorable for banana production. The soils physical properties in Maragua division had deteriorated that they could no longer respond to inorganic fertilizer application; to restore the anomaly the farmers took up minimum tillage farming methods and intensified application of compost and inorganic material which is quite suitable for banana production (Joetzold, 2006)

### **1.6.1 High Ridge Banana Growers and Marketing Association of Kenya**

High Ridge Banana Growers and Marketing Association of Kenya was formed in the year 2003 when International Services for the Acquisition of Agri-biotech Applications Afri-center (ISAAA) embarked on a pilot project to assist the small scale resource poor farmers in Murang'a south district to reclaim their banana orchards through the introduction and promotion of tissue culture banana production. Affiliate groups were formed that later formed the banana association. ISAAA initiated a \$15,000 micro-credit revolving fund to enable participating farmers acquire planting materials and other inputs for banana production. A part from the funds from ISAAA the groups also raised funds from membership registration. BEAM Business Options limited a private company with expertise in community mobilization, group organization and management of rural financial credit was given the task to implement the micro-credit revolving fund. The project targeted 450 smallholder farmers. Technoserve (an NGO) linked the association to Top Notch, a fruit-processing firm in Nairobi, and to an agent in Nairobi. The farmers produce bananas individually and bulk them for sale. The farmers also purchase their inputs as a group and engage in-group saving (table banking). Stipulated in the by laws of the association is that each individual member of the association grows a minimum of twenty banana stools. The bananas must be well managed to enable the farmers sell a minimum of 200 kg of sorted banana (according to standards set by the group) through the association per month.

Bananas of good physical appearance and big size of 8-9 inches long with girth of 6 inches form the first quality, 6-7 inch long with girth of 5 inches form the second quality that are preferred for sale through the association. Both tissue culture and non-tissue banana are sold through the association provided they are of the “right” quality. The bananas that do not meet the required quality are either ripened for sale to nearest market or sold in raw form directly to consumers in the villages. Two tons of bananas are sold to Murang’a Nutribusiness every month; Nutribusiness is a flour processing plant in the neighboring Thika district. The sales to Top Notch are made fortnightly. To minimize the variation in quality of banana, the committee members of the affiliate groups have taken a supervisory role; they monitor the watering, mulching, intercropping with leguminous crops, de-leafing of old and diseased leaves and good sucker management on the members’ banana farms. The members form commodity based farmer organizations popularly known as Common Interest Groups (CIGs) in banana production. The formation of groups is also for ease of accessing technical assistance from field extension staff from the Ministry of Agriculture or private agents. Banana collection points are been set up, where bananas are collected sorted and cleaned and weighed before loading into trucks to the market. The mode of payment is mainly on credit; payment is made after fourteen days. The returns from the sales are then shared out in proportion of the quantities and quality sold by a member.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.0 Introduction**

This section reviews past studies on marketing of agricultural commodities.

### **2.1 Smallholder Farmers' Association**

A smallholder farmers' association is made up of Producer marketing groups (FAO, 2001). It is normally created and financed by member farmer groups to provide them with services that help improve their economic and social conditions (Gatarwa, 2005). An association is a form of collective action; the farmer groups undertake a voluntary action to achieve a common interest (Meizen-Dick, 2004). Collective action typically arises in instances where there are significant incentives to cooperate (Van Heck, 2003). Based on group member's socio-economic characteristics, they may recognize strong benefits of working as a group. The group brings together individuals with common problems and aspirations and who, as individuals cannot meet certain goals as efficiently as when in a group (Obare, 2005). By pooling their capital, labor and other resources, the members are able to carry out profitable activities which if undertaken by individuals would involve greater risks and effort (Gatarwa, 2005). The association is formed of individuals at the same stage of development, with a common interest to jointly solve their problem and meet their needs. The common views, opinion and willingness to work together drive them to work towards a common goal.

A typical smallholder farmers' association is made up of a range of five to ten cluster groups with total membership of 25-150 individual members (FAO, 2001). The location of the members is normally close for ease of regular attendance of meetings. The members own and control their association. Each cluster group elects representatives on a regular basis as agreed on by members



to act on behalf of its members. The representatives make most of the association's decisions. The association has a chairperson who conducts meetings and manages the association.

The producer marketing associations in Kenya are formally registered as welfare organizations as is permitted under Kenyan law. They have well-defined objectives, by-laws, and an elected body that leads the group on behalf of the members. Their objectives go beyond social welfare and include improved access to market for their produce, technologies and inputs.

## **2.2 Past Studies on Market Participation.**

Goetz (1992) studied the participation of Senegalese agricultural households in grain market. He used a probit model of household decision to participate in the market, followed by a second-stage regression model on the extent of market participation. The study explicitly assumed sequential choice: household initially decides whether or not to participate in the market and, then decide on volume purchased or sold conditional on having chosen market participation. The current study followed the same approach, focusing on small-scale sellers. Market participation was assumed to be a discrete variable with proportion of quantity sold as a continuous variable.

Key *et.al* (2000) developed a structural model to estimate structural supply functions and production threshold for Mexican farmers' participating in maize market. They modeled the household making the discrete market participation simultaneously with continuous decision as to volume purchased or sold. Their model differentiates between effects of fixed transaction costs and proportional transactional costs. The study reveals that both types of transactional costs play a significant role in household behavior, with proportional transaction costs being more important in selling rather than buying decision. The current study evaluated effect of farmer's

household characteristics, resource attributes and institutional factors on choice of the marketing channel.

Makhura *et.al* (2001) used Probit model to determine the factors affecting the decision of the smallholder farmers' participation in maize market in Northern province of South Africa. They then used OLS to estimate the significant factors contributing to level of participation. The two-step procedure is similar to Tobit model decomposing the probability to participate and the level of participation. The study reported size of household, arable land, capital owned and proximity to town and road conditions as factors that determine participation in maize market.

Niven *et. al.*(2005) studied the impact rapid rise of supermarkets in Kenya on fresh fruits and vegetables supply system. They used the Probit model to determine the decision to participate. They found that farm size, presence of modern irrigation systems were critical determinants of participation in supermarket channel. The current study went ahead by using the Tobit model to estimate the level of participation in the smallholder group marketing channel.

Muricho (2002) aimed at analyzing the performance of dry pigeon pea marketing channels in Makueni district. He identified three main channels as farm gate to urban open-air retail, farm gate to retailers in urban supermarkets and farm gate to export market. He also identified six major marketing intermediaries. He used policy Analysis Matrix framework to analyze the performance of the identified channels. The results showed that the transaction costs were significant at the post farm level in the sub-sector than at the farm level. The current study a part from identifying the marketing channels and intermediaries involved also considered group

marketing, gender and availability of off farm income and the level of participation in group marketing, the study further analyzed the variables influence on level of participation.

Hundson (2002) applied binomial Probit model to access the motivation for opportunities and participation in mergers and joint venture in agriculture cooperatives in the United States of America. The results revealed that research and development, market diversification affects the opportunities and participation. Farm size, placement in market channel influenced frequency of participation in the merger. The current study includes gender, availability of family labor and access to credit facilities in factors influencing participation in farmers' marketing associations.

Dijkastra (2001) analyzed factors that influence the farmers' encountering a more disintegrated horticultural marketing channel in Kenya. Multinomial Logit analysis was used. The study aimed at creating a better understanding of the marketing structures in Kenya that would help predict structural changes that would ensue from any anticipated changes in the marketing environment. The results showed that the number of inhabitants at the market center, the population density of the rural hinterland and more time taken to transport the goods to the market positively influenced the probability of encountering a more disintegrated marketing channel.

### **2.3 Past Studies that used the Tobit Model**

Bellemare *et.al* (2004) applied Tobit model to evaluate the pastoralist participation in livestock market in northern Kenya and southern Ethiopia. First they modeled the household choice of whether to be net buyers, autarkic or net sellers. The second stage modeled the quantity bought or sold based on observable household characteristics. The study revealed that household demographic characteristics affect livestock marketing patterns. A household's wealth and

income affect livestock marketing patterns; livestock sales increase with household income. Variable cost increase with the number of livestock sold. Like this study, the current study evaluated the determinants of the channel choice, decision on volume to supply and the channel's effect on the farmer's income but considering a highly perishable commodity-banana.

Tsihunza (2001) analyzed the factors that influence farmers' decision to produce cooking banana for market in South East Nigeria. Tobit analysis revealed that the price of ripening banana, stage at sale of cooking banana, presence of middlemen in the marketing chain were the most important determinants of the proportion cooking banana planted for market. This is an indication that cooking banana growers respond to market forces. Age, gender, ownership of land also influenced the proportion of crop planted for market. In addition to the above study, the current study analyzed the effect of collective action amongst the small-scale producers in terms of returns from the marketing channel.

Shapiro and Brorsen (1988) used the tobit model to analyze factors that affect hedging decision of sample of Indiana corn and soybean farmers. They found perception of the ability of the futures market to reduce risk and farmers debt position to be the most important factors explaining farmers to participate in futures markets. The current study also evaluated the farmers' perception on access to credit facilities and agriculture extension services among other factors on participation in the market but on non-contract basis.

Lapar (2003) analyzed the factors that determine the smallholder livestock farmers' participation in the market in Northern Luzon in Phillipines. The study used both the Probit and Tobit models

to determine the decision to participate and the quantity to supply to the market. The results from the study showed that age, farming experience and educational attainment of the household head were significant to the decision to participate in livestock market. Gender status of the household head was significant with participation; with participants originating from male-headed households. The size of the household, contact with extension service providers and the number of livestock were also significant variables in determining the decision and level of participation in the market.

Ngigi (2000) evaluated the factors that determine milk sales among the smallholder farmers in Nairobi, Kenya. The study hypothesized that dairy farmers in Nairobi milk shed chose milk outlets and levels of cash sales that reduced transaction cost and help assume reliable future outlets at the expense of current income. The study used Tobit model to estimate the share of producer output sold for cash rather than credit. The results showed that the younger, more educated producers, receiving a regular off-farm salary and situated near market center were more likely to accept sales on credit. The older with more experience but less formal education were more likely to sell for cash rather than credit

#### **2.4 Past Studies on Collective Action**

The study by Gadzikwa (2006) used multinomial Logit model to identify predictor variables that explain participation in Ezemvelo Farmers' Organization, a certified organic smallholder group in Kwazulu Natal, South Africa. The model distinguished between participants and non-participant farmers while differentiating between the fully certified and partially certified farmers. The model further assessed the effective range of variables in explaining a set of

mutually exclusive outcomes. The results suggested that survival of the collective marketing was likely to succeed if market information, transport services and certification services of the members are fully subsidized. In the current study the choice of marketing channel is not mutually exclusive. The farmers participate in several marketing channel depending on the quantity, quality and terms of payment for their produce.

A study by Catacutan (2006) evaluated the factors determining the smallholder farmers' participation in Agroforestry tree seed association of Lantapan in Bukidhon province in Phillipines. The study used descriptive analysis to evaluate the smallholder farmers' participation group processing and marketing of tree seeds and seedlings. The study revealed that the younger, male farmers who own large farms were more likely to participate in group production and marketing of tree seeds and seedlings. The farmers with fewer years of formal education and only had farm income were more likely to participate in the collective action. The study recommended farmers increased participation in training sessions, farm visits and conference organized by World Agroforestry Center (ICRAF) to improve their knowledge on product quality improvement and diversification in agroforestry.

Obare et al (2005) assessed the role of producer marketing groups in enhancing the market opportunities for the rural poor in Mbeere and Makueni districts, Kenya. The study used descriptive analysis to evaluate the existing channels through which the farmers sell their grain. The study found out that 90% of the volume of grain traded and 36% of the transactions occur at the farm gate or village markets. The study further revealed that grain prices are unlikely to increase within 5km range from the farm gate and prices tend to increase at an estimate of Ksh

3/km per 90kg bag of grain. The study concluded that producer-marketing groups could provide effective institutional arrangements to improve markets for the rural poor. However, the study did not estimate the proportion of grain produced that the farmers can sell collectively given the various marketing channels in which they participate.

Gatarwa (2005) assessed rural development through household participation in-group activities in Central Kenya. The purpose of the study was to identify factors that influence people to join groups and the benefits of participating in-group activities. The results suggested that both men and women were engaged in similar group activities but motivation for joining the groups were different. Men were motivated to join groups that had an element of commercialization (marketing) while the women were interested in social insurance and building household assets. The study recommended on need to assess quantity contribution and benefits from groups. The current study quantifies the benefits of group marketing by computing the gross margins of the marketing channels.

## **2.5 Past Studies on Horticultural Marketing**

Study by Ndubi et al, (2000) examined factors that determined banana farmers' participation in municipal markets in Eastern Province of Kenya. They found out that most farmers sold their bananas to brokers at the farm gate at a price that just made them break even. The study only assessed the probability of participation and not the level of participation in the market. The current study focuses on the probability and level of participation in producer marketing groups. Further the study aims at describing and evaluating banana sales against a background of producers' household specific factors, farmers' resource and institutional factors that predispose a household to participate in one or the other marketing channel. The findings can lead to a better

understanding of the current banana marketing performance in Kenya, which could assist in efforts to promote short marketing channels to improve the profit margins of the small scale producers in the banana supply chain.

Splisbury (2003) analyzed the potential for developing an environmentally sustainable economic growth through improved banana production and marketing in Uganda, Tanzania, Kenya and Rwanda. The study used Rapid Assessment Technique. The market segments reviewed were fresh cooking banana, dessert banana processed banana fruit products. The study revealed that brokers in cooking in Kenya, Uganda and Tanzania exploited the small-scale banana producers by offering them oppressive price for their produce. The study found out that farmers' response to predictable annual price variation was essential to increase farm income and improve consistency in annual market volume while reducing consumer price peaks. The study recommended provision of regional market price information and assessment of benefits of group marketing by small-scale producers.

Mwangi (1990) evaluated marketing of horticultural produce in Kibirigwi irrigation farmers' cooperative in Kirinyaga, Kenya. The study compared the farm gate price for different outlet. The study explained that alternative market outlets were paying better prices than the cooperatives and attributed the low cooperative prices to high marketing cost. The study concentrated on the prices of the produce without considering the cost of production. The current study analyses the returns against cost and determines the effect of participation on farmers' net income.



## **CHAPTER THREE: METHODOLOGY**

This chapter of the thesis presents the conceptual framework, econometric model, data collection methods and the sampling procedure used in the study.

### **3.1. Conceptual Framework**

Banana marketing association was modeled as an incentive to domestic banana supply system. The study postulates that banana-marketing association earns higher income to farmers. In this study, the farmer's decision on whether or not to participate in banana farmers' association marketing channel was modeled as an adoption decision of a marketing technology. The surveyed households were therefore categorized into participants (adopters) and non-participants' i.e. non-adopters of the banana marketing association. Either type of farmer could sell to a wider set of buyers. For example, a participant in banana association marketing channel could sell his highest quality through the association and the lower quality to rural retailers, brokers at the farm gate or to consumers. On the other hand, non-participating farmer could sell to a broker at the farm for one harvest, but collaborate with other farmers to take the next week's harvest to a wholesaler in urban center. However, in most cases, both types of farmers sold most, if not all, of their harvest through a single type of buyer/channel. The farmer who always sold some banana through the association is a participant in this study. Only members of the association sold through the association. Those who did not sell through the association were considered non-participants in the study.

The farmer's decision to participate in the banana association-marketing channel was determined by incentives for and capabilities of the farmer (Feder et. al, 1985). The adoption decision is behavioral response arising from a set of alternatives and constraints facing the decision maker.

These alternatives and constraints are weighed against each other in mind of the adopter to bring about the observed choice, which is either to, or not to participate in banana association marketing channel. Conceptually the decision can be related to the set of alternatives and constraints facing the decision maker as in the following hypothetical model:

$$\text{Decision} = f(\text{alternatives, constraints}); \text{----- (1)}$$

subject to: desired welfare criterion (e.g. a higher utility) (Feder et. al.1985).

Equation (1) relates to adoption decision to a set of constraints and alternatives available to the decision maker at the time of making that decision. The alternatives in this study were the options from various marketing channels while the constraint was the capital requirement. The adoption is often quantified using a binary variable (participation in banana marketing association =1, non participation =0). In this study the proportion of the banana disposed of through group marketing; a continuous variable was be used to measure the level of participation. Based on the above conceptual framework, a limited dependent variable censored (Tobit model) was used to analyze the probability and level of participation. Tobit model was used instead of Logit or Probit model because the two binary models could only analyze the probability of participation and not the intensity of participation. Following Amemiya (1985), it is possible to derive the estimates of a Probit model once we have parameters from the Tobit model.

The returns from various marketing channels were also calculated to determine the extra gains in participating in marketing association.

### **3.2 Econometric Model**

There are some cases in economics where the dependent variable is only observed in some range, like in this study where for example some respondents participate in a marketing channel while

others do not. In such a case, the researcher may observe varying degrees of participation in the marketing channel among the participants; among the participants are differences in quantities of total sales supplied through the marketing channel. The non-participants in the banana association- marketing channel sold through other channels like to brokers at farm gate, to rural retailers or to urban retailers.

To analyze the level of participation in marketing association, a limited dependent model (the Tobit model) was used. Limited dependent variable models are either truncated or censored (Maddala et al 1993). Truncation implies that one does not have any observation either on the explained variable Y or the explanatory variable X if the value of Y is above or below a certain threshold level. In the censored regression model, one has data on the explanatory variable X for all the observations. As for the explained variable Y, we have observation for some while for others it is known they are above or below a certain threshold level (Maddala, 1983). In such case the Tobit model is used to analyze the probability and intensity of adoption of a technology (Tobin, 1958). The model applies to this study since the quantity of banana sold through the association is zero for non-participants, hence a censored distribution. The Tobit model provided an estimate of the probability that a specified farmer participates in the marketing channel and the proportion of total sales to supply. According to Greene (2003), the general formulation of the censored regression is an index function shown below:

$$y_i^* = \beta' \mathbf{x}_i + \varepsilon_i, \text{-----} (2)$$

$$y_i = y_i^* \quad \text{if } y_i^* > 0$$

$$y_i = 0 \quad \text{if } y_i^* \leq 0$$

where: the index variable,  $y_i^*$ , defines underlying unobservable tendency,  $\beta$  is a column vector of unknown parameters,  $\mathbf{x}$  is a matrix of known variables, while  $\varepsilon$  is a stochastic disturbance term. The individual either participates ( $y_i = \text{yes}$ ) or rejects ( $y_i = \text{no}$ ) in the marketing channel. For convenience, the censoring point for the model is usually assumed to be zero (Greene, 2003). The censored regression model uses both limit  $y_i = 0$  and non-limit  $y_i > 0$  observations to estimate  $\beta$  and  $\sigma^2$ . Thus a censored regression consists of a mixture of discrete and continuous parts (Greene, 2003).

The market channel participation choice is a behavioral response arising from a set of alternatives and constraints facing the decision maker. The set of factors that influence marketing channel choice can be broadly categorized into resource attributes (capital and labor requirement) and farmer's attributes i.e. banana marketing experience, institutional factors (e.g. group membership) and commercialization factors.

Defining  $i$  = individual (decision making unit such as farmer, household etc.)

$y$  = marketing channel choice,

$x_k$  = type of (k) attribute is farm, farmer and marketing channel specific attributes

$U$  = expected utility

Then the marketing channel choice of the  $i^{\text{th}}$  individual is a function of the set of attributes i.e.  $y_i$   
 $= y_i(x_k)$  ----- (3)

If the banana farmers are conceptualized as consumers of the marketing channel, then random utility theorem postulates that they would choose the channel from which they expect the highest utility (Batz et al, 1997; Adesina and Zinnah; Strauss et al, 1991; Kebede et al, 1990; Kennedy, 1985; and Rahm and Huffman, 1984). The farmer's decision to participate in the banana farmers'

association marketing channel is determined by the incentives (high returns) and capabilities (meet quantity and quality requirements) of the farmer (Feder et.al., 1985). This utility is a function of the characteristics of the individual and attributes of the marketing channel. This can be expressed as follows;

$$U_{iy} = U_{iy}(y_i, y_i(x_k)) \text{-----} (4)$$

Eventually, the individual will be seeking to maximize utility from the marketing channel choice  $y$ , expressed as:

$$\text{Max } U_{iy} = U_{iy}(y_i, y_i(x_k), \varepsilon_{iy}) \text{-----} (5)$$

subject to his or her objective function and resource constraint.

Participation in a marketing channel is a choice and the level of participation in the channel cannot be observed until it results in participation. Thus the participation decision is an underlying latent tendency which can be formulated as an unobserved index variable,  $y_i^*$ , such that participation is only observed when  $y_i^*$  is above a certain threshold level.

$$y_i^* = \beta' x_i + \varepsilon_i$$

$$y_i = y_i^* \text{ if } y_i^* > 0 \text{-----} (6)$$

$$y_i = 0 \text{ if } y_i^* \leq 0$$

$\beta$  is a vector of unknown parameters. Equation (6) means that adoption in ( $y_i$ ) was observed only when the latent tendency is above the unobservable threshold ( $y_i^* > 0$ ). On the other hand if  $y_i^* \leq 0$  then  $y_i$  becomes zero meaning there is no participation in the banana association marketing channel.

To estimate the probability and level of participation in the banana association-marketing channel, Tobit model using NLOGIT computer package was applied on equation (6). Following

the method of McDonald and Moffit (1980); the coefficients obtained from Tobit analysis were decomposed to show the effect of changes of the dependent variable  $x_i$ , in the probability and extent of participation in the marketing technology. This was achieved by differentiating the expectation of the index variable  $y_i^*$  on the  $x_i$  as follows:

$$\frac{\partial E [ y_i^* / x_i ]}{\partial x_i} = \beta \text{-----} (7)$$

Further McDonald and Moffit (1980) explained the intensity of adoption (conditional if  $y_i^* > 0$ ) of a given technology as:  $E(y_i^*) = X\beta F(Z) + \sigma f(z)$  -----(8)

Where X is a vector of explanatory variables, F(z) is the cumulative normal distribution of z, f(z) is the value of the derivative of the normal curve at a given point (i.e., unit density), z is the Z-score for the area under the normal curve,  $\beta$  is a vector of maximum likelihood estimates and the  $\sigma$  is the standard error of the error term. The change in intensity of adoption with respect to change in an explanatory variable among adopters is:

$$\frac{\delta E y_i^*}{\delta x_i} = \beta_i [1 - z f(z)/F(z) - f(z)^2/F(z)^2] \text{-----} (9)$$

The above variables were obtained from the Tobit output of the marketing channel under study.

### 3.3 Variables Included in the Econometric Model

The dependent variable was the proportion of the total banana sales channeled through the banana marketing association, i.e. the total quantity of sales through the association divided by the total quantity of banana sales as a percentage. This was computed by averaging the volume of sales since the year 2004

$$\begin{aligned} \text{SALEASN} = & \beta_0 + \beta_1 \text{AGE} + \beta_2 \text{GENDER} + \beta_3 \text{EDUCN} + \beta_4 \text{EXPRNCE} \\ & + \beta_5 \text{FAMSIZE} + \beta_6 \text{FAMLAB} + \beta_7 \text{IRIGATE} + \beta_8 \text{OWNTRUCK} + \beta_9 \text{DSTMKT} + \end{aligned}$$

$$\beta_{10} \text{RDMKTGD} + \beta_{11} \text{MKTINF} + \beta_{12} \text{CRDTPDN} + \beta_{13} \text{MEMBA} + \beta_{14} \text{AGEXTCH} + +\varepsilon_i$$

if  $\text{SALEASN}_i > 0$

$$\text{SALEASN} = 0 \text{ if } \text{SALEASN}_i < 0 \text{ ----- (10).}$$

The set of independent variables hypothesized to influence farmer's decision to participate in banana association-marketing channel among the smallholder farmers in Murang'a South District was categorized as:

**(a) Farmer's Household Characteristics**

The farmer's household characteristics that were hypothesized to influence participation decision are:

**AGE:** This is the age of the household head. Data was collected as continuous variable. Age was hypothesized to be positively related to probability and level of participation in the banana farmers' marketing association channel. This is because old farmers are more likely to adopt new marketing channels than the young farmers as the former have more resources than the young farmers to enable them venture into marketing technologies.

**GENDER:** This variable was coded as a dummy,  $\delta_1$ , representing the sex of the household head. The female household heads had  $\delta_1 = 0$  and  $\delta_1 = 1$  for male in household. With regard to gender, it was hypothesized that men are more likely to enter banana association marketing channel because they were assumed to have access to more of the required production factors than women and tend to get more involved when the transactions become more formal, sizeable and

rewarding (Dijkstra, 2001). It was therefore hypothesized that gender would increase the probability of participation in the banana farmers' association marketing channel.

**EXPRNCE:** Years of experience of the decision marker in banana marketing. This was computed as the total number of years the decision marker in the household has sold banana up to the time of the survey (in the year 2006). Frank (1995) observed that individuals assess the utility of new practices by relating their perception of the practice to their experience and interpreting the value of that practice to their needs. If the experience suggests that the potential reward to be gained from adoption process is greater than the expected effort or cost, then the individual is likely to adopt (Feder *et.al.* 1985). In this study, the decision maker's experience in banana marketing was hypothesized to be positively related to the probability of participation of the banana farmers' association marketing channel.

#### **(b) Farmer's Resource Attributes**

These variables include the physical capital requirements for the farmer to be able to participate in a marketing association. The farmers' decision to participate is determined by incentives and capabilities of the farmer (Feder, 1985). The capacities in this study are the physical capital requirements. The variables considered are:

**FAMSIZE:** This is the total land owned by the household in acres. Higher land availability to the farmer enables the farmers to optimize production by bringing the land under production to meet the demand (Joetzold, 2006). Taking in account all year round delivery to the market, the



farmer requires more land for banana production at various successive stages of the harvest cycle.

**FAMLAB:** Quantity of family labor available for farming purposes per year. This was measured in man-days. Family labor used on the farm from those under the age of 18 was considered child labor. Due to financial constraints that translates to inadequate productive resources; the smallholder farmers tend to have low ability to use hired labor. They resort to using family labor. The quantity of family labor available in a household for farming purpose was hypothesized to be positively related to the level of participation in banana association marketing channel.

**IRIGATE:** whether or not the household has an irrigation system on the farm. This variable was coded as a dummy variable  $\delta_2$ ;  $\delta_2=1$  for household that has an irrigation system and  $\delta_2=0$  otherwise. Production of good quality and consistence of supply to the market requires constant supply of water to the crop, which would only be achieved through irrigation. The study hypothesized that availability of irrigation facilities on the farm is positively related to probability of participation in the banana association-marketing channel.

**OWNTRUCK:** Whether or not the household uses their own vehicle (pick up or lorry) to move the banana to the market. This variable was coded as a dummy variable  $\delta_3$ ;  $\delta_3=1$  if the farmer has own means of transport to take the banana to the market and  $\delta_3=0$  if otherwise. It was assumed that the smallholder farmers collaborate more because it allows them to overcome their small size and jointly transport their produce to the market. Owning means of transport would

therefore mean that smallholder farmers would not be at the mercy of the person hired to transport the bananas and the inconvenience of delayed collection hence late deliveries to the market. The study hypothesized that the farmers ownership of a vehicle to transport banana to the market is positively related to the probability and level of participation in banana marketing association channel.

(c) **Commercialization Factors:**

Commercialization factors include the variables that affect the farmers' access to market. Access to market for smallholder farmers is crucial for exploiting their potential for production to contribute to cash income (Dijkstra, 1997). The factors considered for commercialization included:

**DSTMKT:** The distance from the farm to the market. This was measured in kilometers. Distance to the market was hypothesized to be positively related to the probability and level of participation in the marketing association. When farmers bulk their produce and transport over a long distance they incur lower average transport cost than when transporting small volumes of produce over the same distance.

**RDMKTGD:** whether the condition of the road to the market is good. This was coded as a dummy variable,  $\delta_4$ ;  $\delta_4 = 1$  for good road to the market and  $\delta_4 = 0$  for bad roads to the market. Roads were classified as A and B for paved roads, C for graveled roads that were in good condition, D for ungraveled roads and E for earth roads. Roads of class A, B and C was classified as good roads if they were in good condition from the year 2004. The study hypothesized that good road network acts as an incentive to farmers to participate in the market.

**MKTINF:** Whether or not the farmer has access to market information. This variable was coded as a dummy variable,  $\delta_5$ ;  $\delta_5=1$  for households who have access to market information on price of banana on a particular marketing channel and  $\delta_5=0$  otherwise. Farmers need comprehensive market information on what price, how much and at which market to be able to make a decision on which channel to dispose of their farm produce.

(d) **Institutional Factors**

**CRDTPDN:** whether or not the farmer has got credit. The variable was coded as a dummy variable,  $\delta_6$ ;  $\delta_6=1$  for households who have got to credit for investment in better agricultural development and  $\delta_6=0$  otherwise. In this study, access to credit facilities was hypothesized to be positively related to both the probability and level of adoption of the banana farmers' association marketing channel.

**MEMBA:** Whether or not the household has been a member of any agro-commodity marketing association. This variable excluded participation in banana-association, which would otherwise lead to collinearity with the dependent variable. The variable was coded as a dummy variable,  $\delta_7$ ;  $\delta_7=1$  for households who have membership in any agro-commodity marketing association and  $\delta_7=0$  otherwise. Technoserve (2004) observed that participation in agro-commodity marketing association enables the farmers' bulk their produce and deliver to the market in the required volume and time. By carrying out the marketing functions as a group the farmers benefit from economies of scale; marketing cost increases less than proportionately with level of sale, hence marketing cost per unit of output falls with sale. The members pool together their

experience; information assets, capital and labor to perform successfully that cannot be carried out on individual basis (Van Heck, 2003). The study hypothesized that membership in any agro-commodity marketing association (under institutional factors) to be positively related to participation in banana association marketing channel.

**AGEXTCH:** whether or not the farmer had contact with agriculture extension services. The variable was coded as a dummy variable,  $\delta_8$ ;  $\delta_8 = 1$  for households who have contact with extension services and  $\delta_8 = 0$  otherwise. Agricultural extension officers sensitize the farmers to take farming as a business, modern technologies and good agricultural practice. This exposure, in effect should have a positive impact on the likelihood of the farmer participating in the banana farmers' association marketing channel that requires quantity and quality production for sale.

### 3.4 Assessing the Goodness of Fit of the Econometric Model

A goodness-of-fit measure is a summary statistic indicating the accuracy with which a model approximates the observed data. In the case where the dependent variables are qualitative, accuracy can be judged either in terms of fit between the calculated probabilities or in terms of the model to forecast observed responses (Maddala, 1983). To measure the goodness-of-fit in qualitative response models, Greene (2003) suggests the use of the likelihood ratio index (LRI). The LRI also called McFadden  $R^2$  or pseudo $R^2$  is analogous to the  $R^2$  in a conventional regression. It is computed from the formula:

$$LRI = 1 - L / \ln L_0 \text{-----} (3.9)$$

Where  $\ln L$  is the log-likelihood function value for the model computed having all the independent variables and  $\ln L_0$  is the log-likelihood function value of the model computed with

only the constant term. A zero LRI indicates a perfect lack of fit; while an LRI of value one indicates perfect fit. Empirical evidence suggests that LRI usually lies between 0.2 and 0.4 (Jarvis, 1990)

### **3.5 Gross Margin Analysis of Various Banana Marketing Channels**

This was done in line with the objective of the study to determine the effect of participation on the farmers' net income. It was done to assess difference between gross income and variable cost of alternative marketing channels. The Gross margins were calculated on per acre basis. Gross income is yield per acre multiplied by unit price received. The selling prices were calculated at the farm gate, at the local market/ rural retailer, urban retailer and through the association. The gross margin is not the same as farm profit as it does not consider the fixed cost; it is just a step in direction of measuring profit (Ngo, 2004).

### **3.6 Data Sources**

Both primary and secondary data was used in this study. Primary data was obtained through administrating of a questionnaire. The survey assessed farmers' perception of factors that influence their decision to participate in banana association marketing channel.

Secondary data was used in background information and to identify missing gaps to be filled.

The secondary data used in this study was obtained from economic surveys, published and unpublished materials on banana production and marketing.

### **3.7 Sampling Method**

The household survey covered Maragua division. This division was purposively selected because of its high banana production. After an informal discussion of the objective of the study with the

divisional agriculture officers and farmer, banana producing locations and villages were purposefully selected. The enumerators with the assistance of the assistant chiefs compiled a sample frame consisting of households in each village. Twenty-four farmers were randomly selected from each of the five selected locations namely; Ichagaki, Nginda, Kahumbu, Muthithi and Maragua Ridge. The farmers were selected regardless of the marketing channels in which they participate. A total of 120 households were covered. However, because of missing information on some survey, the final sample size for analysis was reduced to 108 households. Structured questionnaires, informal questions and interviews were held with the farmers to generate information on factors influencing the marketing channel choice.

## **CHAPTER FOUR: RESULTS AND DISCUSSIONS**

The chapter has two parts. The first part gives the descriptive analysis of the data. Means and percentages of relevant variables were used to discuss farmers' socio-economic characteristics that are likely to influence smallholder farmers' participation in banana farmers marketing association. The second part gives the econometric analysis of the survey.

### **4.1 PART ONE: Results of Descriptive Analysis**

#### **4.1.1 General Description of the Respondents**

Adopters were defined as farmers who sold their bananas through marketing association since the year 2004. Forty two percent of the interviewed household participated through a marketing association, the remaining 58% sold mainly to brokers at the farm gate and some to rural retailers or to urban retailers in Nairobi.

Generally all the surveyed households in the sample produced banana as one of the major crops on their own farms. Both inorganic and organic fertilizers were used in establishment of the banana orchard. On average farmers participating in banana association marketing channel used about twice the amount of inputs (fertilizer, manure, chemicals) of the non-participants, but pay less per unit as they buy larger volumes as a group.

The most popular banana cultivar grown by the households interviewed was the Cavendish family. This variety of bananas was favored by the farmers because of its tolerance to Fusarium wilt; a common fungal disease in the area. Other varieties of banana grown are Chinese dwarf, lacatan, valery, "nyoro" and "Muraru". Fifty seven percent of the households interviewed got their planting materials from neighbors using unsterilised farm tools. This has

often led to transfer of diseased plantlets from one farm to another. All the participants had some tissue culture banana and had also retained some stools of non-tissue culture bananas. Tissue culture banana plantlets were sourced from KARI stations, JKUAT or any certified seedling producer. Thirty percent of the sample got banana plantlets from AHBFI to increase the size of their orchard. The economic attributes in the banana plantlets that were favorable to farmers included early maturity, high yields. Tolerance to common banana diseases and uniform maturity were added benefits to those with tissue culture bananas. Uniform maturity of tissue culture bananas enabled the members of association easily accumulate the required quantities to meet the order on the market. The average yield of the non-tissue culture banana was 14 tons per hectare. The mean harvest for the non-participants was 350 bunches per acre per year with an average weight of 15kg per bunch; most of the bananas were non-tissue culture. The average yield for the tissue culture banana was 30tons per hectare. The mean harvest for the participants was 600 bunches average weight 20kg per acre per year. The average home consumption by the interviewed households was 5% of the total production.

#### **4.1.2 Descriptive Analysis of Farmers Household Characteristics**

The mean age of the household heads participating in the marketing channel was about 43 years. The mean age of men was 42 years while that of women was 45 years. The mean age of the non-participating households was 50 years; the men having mean age of 50 years while that of women was 47 years. The results in table 3.0 indicate that the participants in the channel were on average 7 years younger than the non-participants. In general the participating households were younger, had more years of formal education and more years of experience in banana marketing compared to non-participants. This implies that younger farmers were more likely to participate



in smallholder marketing association and work in groups towards a common marketing goal; to share their human and physical resources. There is a further implication that the older non-participating farmers were originally producing banana mainly for subsistence purposes. Although majority of the household heads of both groups in the sample were men, majority of the participants in the marketing association were women.

**Table 3.0: Descriptive Statistics of Participants and Non-participants in the Smallholder Banana Marketing Association**

Variable	Entire sample N=108	Participants N=45	Non-participants N=63
Gender Males	79%	38%	45%
Females	21%	62%	55%
Average Age (years)	47	43	50
Average years of Education	9	11	7
Average years of Experience	8	10	7

**Source: Author's farmer survey, 2006**

#### 4.1.3 Descriptive Analysis of Farmers' Resources

The mean land size for the participants and non-participants was 2.35 and 2.4 acres respectively.

The overall mean land size for all the 108 households interviewed was 2.4 acres (sd =1.5). The

average land size under banana was 0.25 acres and 0.3 acres for participants and non-participants respectively. The participating households hired more labor than the non-

participating households. Family labor made up 68% of the total labor used by participants while

hired labor was 32%. The non-participants used 80% of family labor and 20% of hired labor. The

results indicate that Participants used about 12% of family labor more than the non-participants.

Women provided Eighty three percent of family labor, 15% from family members below the age

of 18 years and the remaining 2% was from men in the household. The results imply that low

income from the banana enterprise is a constraint to the farmers, forcing them to resort to child

labor, as they have no adequate resources to hire labor from adults. Most of the hired labor for the participating households was mainly for manual watering and harvesting of the banana. Seventy five percent of the participants also earn non-farm income while 33% of the non-participants earn off-farm income.

Fifty two percent of the interviewed households watered their bananas. Eighty five percent of the farmers participating in the banana association channel regularly watered their bananas. Watering was done twice per week for at least three months. Only 28% of the non-participants regularly watered their bananas. Table 4 shows that the type of irrigation used by the farmers are rudimentary. The farmers cited inadequate knowledge on on-farm rainwater harnessing and harvesting and inadequate capital as the reason for not acquiring modern irrigation facilities. Most of banana production in the division takes place under rain-fed conditions, leading to strong supply and price seasonality; with annual production cycles tuned to after short and long rains seasons. This means that, for farmers to have a consistent supply of banana to the market, an irrigation system on the banana farm is necessary. The participating households required an irrigation system no matter how simple to enable them produce quality fruits all year round and meet the marketing conditions set by the association.

Generally both the participating and non-participating households hired means of transport to urban centers to sell their banana. Only 13% of the participants and 11% of non-participants used their own trucks to ferry banana to long distant the market. Sixty five percent of the households who sold their bananas to retailers in urban areas used their own means of transport. Three percent of the non-participants had severally but inconsistently hired one pick-up vehicle

with other farmers to transport their bananas to Nairobi. The common mode of transport was by mini Lorries for large quantities of banana and pick-ups for smaller quantities. Donkeys, bicycles or human labor were also used to transport bananas to markets or collection points that are near the producing farms. The farmers who sold bananas at the farm gate did not require means of transport to the market while those who sold at the nearest market center used bicycles or donkey drawn carts.

**Table 4.0: Irrigation Methods Used on the Farms**

<u>Method</u>	<u>Participants</u>	<u>Non-participants</u>
Horse pipe	53%	18%
Jerricans	33%	06%
Bucket	14%	04%
<u>Solely depend on rain</u>	<u>0%</u>	<u>76%</u>

**Source: Author's farmer survey, 2006**

#### **4.1.4 Descriptive Analysis of the Institutional Factors**

Credit facilities to boost banana production were accessed by 25% and 7% of the participants and non- participants respectively. Table 5.0 gives the different sources of credit facilities; it shows that Women groups' was the major source of informal credit facilities to farmers. The loan was in form of hard cash. Sixty nine percent of the interviewed households admitted having benefited from the revolving fund by ISAAA. More than 20% of the farmers did not access credit for agricultural development. All the farmers reported a decline in access to credit; this was attributed to the stringent conditions to access agricultural credit.

Generally more women had contact with extension service providers than men. Almost half of the interviewed households had contact with extension services; 49% of the participants and 15% of the non-participants had contact with extension services providers. Table 5.0 gives the source of agricultural extension services and the number of contacts the farmers' had with the service providers. The table shows that the Ministry of Agriculture was a major source of agricultural extension service to the farmers. A frontline Agricultural Extension Officer is found in every location in the division and offers services on demand. The government extension services are available to farmers but provided irregularly. The table further indicates that the participants had more contact with the agricultural extension service providers than the non-participants; the participants demanded for extension service and were trained as a group. Fifteen percent of the participants had agricultural extension services from private agents at a fee; twenty percent of the farmers got extension services from the buyers of their produce namely avocados and cut flowers. The extension messages disseminated included farming as a business with emphasis on good agricultural practices, adoption of modern farming technology and formation of commodity based farmer organizations (Common interest groups). The farmers were mainly taught agricultural production and not agricultural marketing. The farmers had no knowledge of grading bananas and food safety standards. Given that most farmers did not access the extension services they were not aware of the benefits of either collective marketing, the modern farming technologies or post harvest handling of the crop.

Five percent of the respondents cited inability of farmers to produce uniform quality of banana as the reason for not participating in the marketing association, 26% of the respondents preferred working alone, 14% lacked trust in other farmers, 17% of the non participants were not able to

meet the quality requirement to enable them sell through the association. Seventeen percent and twenty six percent of the respondents cited lack of sustainability of groups formed and inexistence of marketing associations in the village respectively. Sixty four percent of the participants and thirty five percent of non-participants had been members of other agro-commodity groups. The farmers had been members of coffee cooperatives, avocado and flower marketing groups.

**Table 5.0: Source of Credit, Agricultural Extension Services and Number of Contacts with Agricultural Extension Service Providers**

<b>Source of variable</b>	<b>Participants</b>	<b>Non-participants</b>
<b><u>Source of credit facilities</u></b>		
Women groups	16%	5%
Friends	07%	1%
Bank	02%	1%
Relatives	08%	8%
ISAAA	45%	24%
No credit	22%	60%
<b><u>Source of agric. Extension services</u></b>		
Ministry of agriculture	40%	25%
Africa Harvest (AHBFI)	25%	10%
ISAAA	20%	8%
Private agents	15%	12%
<b><u>Frequency of Agric. Extension contact</u></b>		
One time	10%	32%
Two times	45%	17%
Three times	28%	10%
Four times	17%	02%
No contact	00%	39%

**Source: Author's farmer survey, 2006**

#### **4.1.5 Descriptive Analysis of Commercialization Factors**

The smallholder banana producers sold their produce to brokers at the farm gate, to rural retailers, through banana marketing groups, to retailers and wholesalers in urban centers. A small

quantity of banana was sold direct to consumers at the farm gate or along the Murang'a –Nairobi highway. On average 67% of the participants sold over 70% of their bananas through the association. And 89% of participants sold (nearly all) their entire harvest at the farm gate to broker channel. The average sales from participants was 88.2 tons per year; of which 71% was channeled through the association and transported to Nairobi, 21% to brokers at the farm gate, 2.6% to Nutribusiness, 3% to rural retailer and 2.4% to local consumers. The average sales from non-participants was 128tons per year; of which 89% was to brokers at the farm gate, 6% to urban retailers in Nairobi, 4% to rural retailer and 1% to local consumers.

The mean distance to the market by the participants was 30km (min = 1km, max = 80 km, sd = 36km), while the non- participants covered mean distance of 12 km (min = .25km, max =80km, sd = 26km) to the market. Good roads to the market acted as an incentive to 75% of the participants and 42% of the non-participants to sell their produce to a distant market. Eighty percent of the respondents cited poor roads as an obstacle to venture into distant markets that could pay better price for the produce.

Generally all the respondents have access to market information. The source of the market information is presented in Table 6, and it shows that the brokers were the main source of market information. Seventy six percent of the respondents found out that although the brokers involved are most knowledgeable about prices since they traded in large volumes and have high market power, they did not pass the correct information to the producers resulting into information asymmetry. Half of the women who participated in banana association channel relied on other farmers for market information. Market information was mainly on what price at which market

but not on information on the quantity or quality required. Sixty-nine of the interviewed farmers admitted that the market information is quite untimely; little information was got when it was very late.

The main constraints faced by the banana producers in marketing the commodity were inadequate information on prices, alternative market outlets, price variability and post harvest loss resulting from highly perishable produce.

**Table 6.0 : Source of Market Information**

Source	Participants	Non-participants
Brokers	33%	48%
Other farmers	30%	32%
KACE	17%	7%
Radio	20%	13%

**Source: Author's farmer survey, 2006**

#### **4.3.1 Banana Sales to Urban Wholesalers**

A total of fifteen urban wholesalers were interviewed, five traders from Wakulima, Retail and Ngara markets in Nairobi. Eighty percent of the banana traders had more than two years experience in banana business. Brokers supplied average of 70% of the total bananas to the urban wholesalers in Wakulima, 72% to Retail market and 67% to Ngara market. Other suppliers were group of smallscale farmers who supplied average of 13% to Wakulima market, 18% to retail market and 15% to Ngara market. Other commercial farmers supplied the remaining of the quantities. Bananas were supplied from Kiambu, Thika, Maragua, Kirinyaga, Embu, Meru, Kisii districts and as far as the neighboring country of Uganda. Most of the dessert banana came from Central Kenya districts while the cooking type was from Kisii and Uganda. The bananas were transported to Nairobi market in trucks, mini-lorries and pick-up vehicles. The suppliers organized transportation of the commodity.

The urban wholesalers preferred working with the suppliers that are trust worth, would deliver consistently quality, consistency in time of delivery, have a truck to transport the produce and are flexible on payment schedule. All the above is for convenience of the traders planning. The major constraints faced by the urban traders were that few suppliers could diligently supply consistent quality, most suppliers are not loyal during period of scarcity on the market and that traders had to buy from many suppliers to meet their volume requirement. Depending on the agreement made between the supplier and urban trader, payment was made on the spot by 60% of the urban wholesalers, 20% after 7days, 6.7% after two weeks and 13.3% after 28 days.

#### **4. 3.2 Gross Margin Analysis of Various Banana Marketing Channels**

Gross margin analyses for smallholder farmers selling through banana association and to brokers at the farm gate, to urban and rural retailers were computed. Gross margins were computed to determine the effect of participation in various marketing channels on producers' income. The top half in the table 7 looks at production that allows for a straightforward comparison between the marketing channels. However, on marketing, a choice was made because the smallholder association had a particular structure, with all participants selling a specific range of quantity and quality of banana through the association in a given time period. The farmers participating in other marketing channels (non-participants) could however, sell to brokers, wholesalers or retailers (other than the association). Furthermore, either type of farmer could sell to a wider set of buyers at different links in the supply chain. For example, a banana association-channel farmer could sell his highest quality grade through association and the lower quality to rural retailers and consumers. On the other hand, non-participants in the banana association channel



could sell to a broker at the farm gate for one harvest, but sell the next harvest to a retailer in urban center. However, in most cases, both types of farmers sold most of their harvest to a single type of buyer.

Table 7 gives the most extreme marketing choices, namely banana association marketing channel where farmers sell (nearly) 100% of their banana through the association (applies to 67% of the farmers) and farmers selling to brokers at the farm gate (nearly) 100% of their banana to a broker at the farm (applies to 89% of the farmers). In table 6 are substantial differences between the two groups of farmers. On average, smallholder association farmers used about twice the amount of inputs (fertilizer, manure, chemicals) those selling to broker at the farm gate use, but paid less per unit as they bought larger volumes. The participants in the banana association marketing channel used mostly high priced tissue culture banana plantlets unlike those selling to brokers who mostly got plantlets from their own or neighbors' farms. Given the higher input levels, yields per acre are higher for participants in the marketing association than for non-participants. However, the two groups of farmers used more family labor than what was hired. Family labor was valued at the same rate as hired labor.

The average price of a 15kg bunch of banana at the farm gate was Kshs 80, while a bunch of 20kg was sold at Ksh300 through the banana association. Assuming that 100% of the marketable produce from the participants is sold through the association then, even though the Banana association-channel farmers incur transportation costs, they would receive a price which was three times the farm-gate price, resulting in a gross margin of Kshs 96,406 per acre per year compared to Kshs 8,725 per acre per year to the farmers in the broker at the farm gate channel.

The farmers who sold through the association earned a gross margin that was 56% of the total revenue and 59% of total revenue if cost of family labor is excluded. The Broker at farm gate channel farmers got a gross margin that was 33% of the total revenue. Before selling to wholesalers in urban center (Nairobi) the participants in the banana association channel already had the capacity to market their produce to other small buyers in Nairobi. But they chose to sell to Top notch that buys larger volumes per delivery, which lowers the farmer's transaction costs and less time spend in selling. This was reported by 76% of the participants in banana association. For individual farmers, shifting from a broker at the gate to selling to retailers in Nairobi would not have a larger gross income which would still be lower than that from group marketing since the transportation costs would be prohibitively high (given the small volumes). Forty nine percent of the farmers who sold to brokers at the farm gate, they found the channel most convenient because of cash on spot mode of payment, less time spend on selling. The remaining 51% were willing to change to a more paying channel.

**Table 7.0: Gross Margin Analysis of Smallholder Association vs. Brokers at Farm Gate channel**

Data are per acre per year		Farmers selling through association				Farmers supplying to brokers at the farm			
Line Items <sup>1</sup>	Unit	Units	Unit Cost (Ksh)	Cost Total (Ksh)	% of Total rev.	Units	Unit Cost (Ksh)	Cost Total (Ksh)	% of Rev.
Plantlets	Pcs	450	80	36,000	21	450	20	9,000	33.8
Inorganic fertilizer	Kg	67.5	30	2,025	1.2	25	50	1,250	4.6
Manure	MT	4.5	1000	4,500	2.6	2.25	1,200	2,700	10
Chemicals (Nematicides)	Kg	2.81	300	843.75	0.5	0	Na	0	
<b>Total inputs</b>				<b>43,368.8</b>	<b>25.3</b>			<b>12,950</b>	<b>48.7</b>
<b>Labor by activity</b>									
Land preparation	Mds	2.25	100	225		2.25	100	225	0.8
Digging holes	Mds	1	100	100		1	100	100	0.3
Planting	Mds	1	100	100		1	100	100	0.3
Weeding	Mds	10	100	1,000	0.6	10	100	1,000	3.1
Watering	Mds	48	100	4,800	2.8	24	100	2,400	9
Desuckering	Mds	6	100	600	0.4	6	100	600	2.3
<b>Labor by Source</b>									
Family labor	Mds	46.41	100	4,641	2.7	35.4	100	3,540	13.3
Hired labor	Mds	21.84	100	2,184	1.3	8.85	100	885	3.3
Total Labor Cost	Mds	68.25	100	6,825	4	44.25	100	4,425	16.6
<b>Total Prodctn. Cost</b>				<b>50,194</b>	<b>29.3</b>			<b>17,375</b>	<b>65.3</b>
Harvesting	Mds	24	50	1,200	0.7	0	0	0	
Load & offload	Mds	24	100	2,400	1.4	0	Na	0	
Take, sell at market	Days	24	50	1,200	0.7	0	Na	0	
Transport	Km	3,840	5	19,200	11.2	0	Na	0	
Phone Cost	Na	Na	Na	500	0.3	Na	Na	500	1.9
Total Market. Cost				<b>24,500</b>	<b>14.3</b>			<b>500</b>	<b>1.9</b>
<b>Total Cost</b>				<b>74,694</b>	<b>43.7</b>			<b>17,875</b>	<b>67</b>
<b>Total Revenue</b>	Bunches	570	300	<b>171,100</b>	<b>100</b>	332.5	80	26,600	100
<b>Gross Margin</b>				<b>96,406</b>	<b>56.3</b>			<b>8,725</b>	<b>32.8</b>
<b>GP (excl. family labor)</b>				<b>101,047</b>	<b>59</b>			<b>12,265</b>	<b>46</b>
<b>Yield</b>			<b>12 MT/acre</b>			<b>6 MT/acre</b>			

Source: Author's farmer survey, 2006

- 1 Manure application is 10kg per hole for 450 holes@ kshs1, 000/ ton and 5kg per hole for non-participants  
 Fertilizer application 150g of DAP per hole for 450 holes  
 Nematicide: 50g of mocap per hole@ kshs 350/kg  
 Watering: 2Mds of labor, twice per week for 3months for association and half the rate for other channels  
 Weeding: 5Mds of labor per weeding; 2 weeding per year  
 Desuckering : 2Mds, 3times per year  
 Rev% is the proportion of the cost item to the total revenue in banana enterprise

Table 8 compares the gross profits of selling through rural and urban retailer marketing channels. The farmers selling through the above-mentioned channels were considered non-participants, their cost of production was similar but marketing costs are differentiated by the cost of transporting the produce to the market. The farmers who sold their banana to rural retailer got a gross margin that is 38.3% of the total revenue and 47% of total revenue if the cost of family labor is excluded. The farmers who sold to urban retailers got 48.3% of the total revenue. Taking more risk to transport the banana earns the farmer 10% profit more than those who choose to sell at the local market. The farmers who once in a while joined up with other farmers to take their banana to urban retailers earned the highest returns but such arrangements were quite inconsistent.

**Table 8.0: Gross Margin Analysis of Urban Retailers vs. Rural Retailers Channel for****Non-participating Households**

Data are per acre per year	Unit	Farmers supplying to urban retailers				Farmers supplying to rural retailers			
		Units	Unit Cost (Ksh)	Cost Total (Ksh)	% of Rev.	Units	Unit Cost (Ksh)	Cost Total (Ksh)	% of Rev.
Plantlets	Pcs	450	20	9,000	7.7	450	20	9,000	22.5
Inorganic fertilizer	Kg	25	50	1,250	1	25	50	1,250	3.1
Manure	MT	2.25	1,200	2,700	2.3	2.25	1,200	2,700	6.8
<b>Total inputs cost</b>				<b>12,950</b>	<b>11</b>			<b>12,950</b>	<b>32</b>
<i>Labor by activity</i>									
Land preparation	Mds	2.25	100	225	0.2	2.25	100	225	0.6
Digging holes	Mds	1	100	100		1	100	100	0.2
Planting	Mds	1	100	100		1	100	100	0.2
Weeding	Mds	10	100	1,000	0.9	10	100	1,000	2.5
Watering	Mds	24	100	2,400	2.0	24	100	2,400	6.0
Desuckering	Mds	6	100	600	0.5	6	100	600	1.5
<i>Labor by Source</i>									
Family labor	Mds	35.4	100	3,540	3.0	35.4	100	3,540	8.9
Hired labor	Mds	8.85	100	885	0.8	8.85	100	885	2.2
<b>Total Labor Cost</b>	<b>Mds</b>	<b>44.25</b>	<b>100</b>	<b>4,425</b>	<b>3.8</b>	<b>44.25</b>	<b>100</b>	<b>4,425</b>	<b>11.1</b>
<b>Total Prodcn. Cost</b>				<b>17,375</b>	<b>14.9</b>			<b>17,375</b>	<b>43.5</b>
Harvesting	Mds	12	100	1,200	1	52	50	2,600	6.5
Load & offload	Mds	12	100	1,200	1	52	50	2,600	6.5
Cess at Market	Days	12	100	1,200	1	52	20	1,040	2.6
Transport	Km	3840	10	38,400	33	50	10	500	1.2
Phone Cost	Na	Na	Na	500	0.4	Na	500	500	1.2
<b>Total Market. Cost</b>				<b>42,500</b>	<b>36.5</b>			<b>7,240</b>	<b>18</b>
<b>Total Cost</b>				<b>59,875</b>	<b>51.4</b>			<b>24,615</b>	<b>61.7</b>
Total Revenue		332.5	350	116,375	100	332.5	120	39900	100
<b>Gross Profit</b>				<b>56,500</b>	<b>48.6</b>			<b>15,285</b>	<b>38.3</b>
<b>GP (excl. family labor)</b>				<b>60,040</b>	<b>51.6</b>			<b>18,825</b>	<b>47</b>
<b>Yield</b>				<b>6MT/acre</b>				<b>6 MT/acre</b>	

**Source: Author's farmer survey, 2006**

1. Sales to urban center are made on monthly basis while sales to the local retailers are on weekly basis.

In search for growth, the respondents have constraints; table 9 gives a summary of constraints the farmers face during production and marketing of their farm produce. A single most important input access constraint faced by the farmers was access to credit (Table 9). Forty four percent of banana association channel farmers believe that their status as a supplier to Top Notch in Nairobi had increased with their access to credit. However, increased access to credit does not necessarily mean affordable credit. Commercial credit is expensive (15-20% interest rate per annum), while government supported loans (10% interest rate from AFC) are according to the farmers, too difficult to obtain because of slow bureaucratic procedures and the harsh conditions to access the credit. This probably explains why banana association farmers' access to credit remains a key constraint. The main source of credit to non-participants of participants has been informal financial sector mainly from the women groups, this type of credit is equally expensive with 20% interest rate, though easy to get it is rarely adequate to match the demand for the facility.

Inadequate access to inputs such as the clean banana planting materials was another major constraint to the farmers. Though fertilizers and pesticides used in banana production were available as private traders provide them, they were highly priced. Sometimes the inputs were of low quality. Land was also a scarce factor of production for those who wish to expand their banana farm, in most cases the bananas are intercropped with other crops as a means of mitigating land constraint. Farmers had inadequate access to agricultural information; they had little knowledge on on-farm rainwater harnessing and harvesting. Access to comprehensive and timely information on how much, where and price to sell the produce is limited.

**Table 9.0: Constraints to Accessing Key Inputs Faced by Farmers**

<b>% of farmers indicating that:</b>	<b>Participants in Banana association</b>	<b>Non-participants in banana association</b>
Access to credit is a problem	60%	74%
Access to inputs is a problem	56%	35%
Access to land is a problem	72%	79%

**Source: Author's farmer survey, 2006**

#### **4.4. PART TWO: Results of Econometric Analysis**

This part of the thesis presents the results on econometric analysis of the survey data. The analysis was based on data collected during the survey to evaluate socio-economic factors influencing smallholder banana farmers' participation or adopting banana farmers' association marketing channel. Both the maximum likelihood and marginal effects of the exogenous variables are reported. The dependent variable was the proportion of total sales channeled through banana association, measured as a percentage of total sales. This was obtained by averaging the quantities since the year 2004 to 2006 to get the proportion per year.

##### **4.4.1: Factors that Jointly Affect the Probability and the Level of Participation in Banana Farmers' Marketing Association Channel**

The Tobit model was used to analyze the factors that influence the probability and level of participation in banana farmers' marketing association channel. The results in table 10 show that the coefficient on **age** of the household head was negative but statistically significant with ( $P < 0.01$ ). This implies that the old banana farmers did not have the interest in-group marketing of banana. The results suggest that the old farmers have accumulated enough resources to enable them carry out many farm activities independently.

The coefficient on **experience** of the household head on banana marketing had the expected positive sign and was fairly significant ( $P < 0.1$ ) in probability and level of selling bananas through an association. According to Frank (1995) individuals assess the utility of new practices by relating their perception of the practice to their experience and interpreting the value of that practice to their needs. The study by Feder *et.al* (1985) has also shown that an individual adopts a technology if potential rewards to be gained are greater than the cost. The many years engaged



in banana marketing gives the farmers desire to adjust their market links; trying alternative marketing channels to increase sales volume or better prices all this to maximize profits. The relationship also implies that experienced farmers had better knowledge of cost and benefits associated with various banana marketing channels; consequently they are likely to increase the quantities supplied through the banana marketing groups to benefit from economies of scale. As farmers gain experience, it is expected that the many years of practice will positively influence their decision-making skills (Adesina *et al*, 1993)

The coefficient on the availability of an **irrigation facility** on the farm had a positive and significant effect ( $P < 0.01$ ). The farmers with irrigation system on their farms are able to water the bananas and hence produce succulent, high quality bananas all year round hence consistent supply to the market. The coefficient on the **quantity of family labor used for farming** was positive and slightly significant ( $P < 0.1$ ). The financial constrains faced by smallholder farmers leads them to high dependence on family labor.

The coefficient on **participation in credit** for agricultural development was positive and significant ( $P < 0.05$ ). According to Neven *et al* (2005), as agricultural production becomes commercially oriented there arises a need for financial services to enhance enterprise development. The farming households that access credit invest in better farming and marketing practices than those with no access to credit. The main source of credit facilities to the farmers was through informal financial sector.

The coefficient on household's head **membership in any agro-commodity** marketing association was positive and significant ( $P < 0.01$ ). Farmers in associations are easily linked with those who provide inputs and other services in consideration of contractual production and marketing arrangements. Membership in a marketing association enables the farmers' to bulk their produce and deliver them to the market in the required volume and time and even have a greater bargaining power when negotiating for price which leads to efficient marketing. Through the simple innovation of bulking their farm produce, the farmers cushion themselves from exploitation and guarantee themselves good returns that ensure sustainability of banana production.

The coefficient on **contact with extension services** was significant ( $P < 0.5$ ). This explains the importance of capacity building of farmers by the extension staff from the any agri-oriented organization; both public and private sector. The extension messages passed to the farmers influence the farmers to carry out good agricultural practices, crop and livestock husbandry and farming as a business.

The coefficient on **the condition of the road to the market was positive** and slightly significant ( $P < 0.1$ ) effect on the probability and level of participation in marketing association. It means that group marketing is favored by improved market access. The coefficient on **access to market information** was significant ( $P < 0.1$ ). The farmers require timely and adequate information on where, how much, when and what price to sell their produce to enable them plan their production and make informed decision on their farming enterprise. Comprehensive market information

enables them to form producer-marketing groups so that they can timely and adequately meet the required demand.

The marginal effects associated with effect of changes in values of the explanatory variables to the explained variable showed that farmers' additional year in banana marketing experience would increase the probability of selling through banana marketing association by 0.018% and increase the proportion of sales through the association in the whole sample by 0.02% and 0.005% increase among the participants. The results suggest that the experience generates confidence among the farmers hence become receptive to new technologies or ideas. For each additional year to the age of participating household head, the probability of selling through banana marketing association would reduce by 0.02% with decrease in proportion of sales in the whole sample by 0.19% and among participants by 0.005%. An additional Man day of family labor put into agricultural production would increase the probability of participation in banana association marketing channel by 0.004%; increase the proportion of the sales in the whole sample by 0.04% and amongst the participants by 0.001%. Having one more irrigation system on the farm would increase the probability of participation in the marketing channel by 0.45%, increase the proportion of sales in the whole sample by 0.46% and by 0.12% among the participants. The results suggest that the investment in the irrigation facility is for banana production. Good condition of the road to the market would increase the probability of participation in the banana association by 0.04%, increase the proportion of sales in the whole sample by 0.5% and increase the proportion of sales amongst adopters by 0.22%. The good condition of the road enables the farmers get their banana on the market in required time and in good form (firm and fresh). Development of good road network is an incentive for farmers to

raise productivity by investing in high yielding seeds like the tissue culture banana plantlets. Access to market information would increase probability of participation in banana marketing association by 0.24% and increase the proportion of sales through the channel in the whole sample by 0.25% and by 0.067% amongst the participants.

Farmers' having access to credit facilities for agricultural production would increase the probability of participating in banana group marketing by 0.27% and increase the proportion of sales in the entire sample by 0.31% and among participants by 0.074%. The results suggest that the credit is also used to increase banana production for the market. Membership in any agro-commodity marketing association would increase the probability of selling through the association by 0.35% and would increase the proportion of sales in the entire sample by 0.4% and among participants by 0.095%. Access to agriculture extension services would increase the probability of adopting banana group marketing by 0.27% and increase the proportion of sales among the participants by 0.08% and by 0.31% in the entire sample. The results suggest that there is need for the farmers to have regular contact with extension services to efficiently participate in the market. The importance of the institutional factors for participation in marketing association is therefore strongly demonstrated in the results.

**Table 10.0: Maximum Likelihood Estimates and the marginal Effects of Factors Affecting the Probability of Adoption and the Level of Adoption of Banana Farmers' Marketing Association**

Value	Coeff	t-ratio	Total change Change in participation	change in partcpn. intensity	Change in partcpn. intensity Probability (%)
Constant	0.142				
AGE	-0.193***	-3.646	-0.193	-0.005	-0.0191
GENDER	-0.111	-0.765	-0.111	-0.0376	0.110
EXPRNCE	0.019*	1.816	0.019	0.005	0.018
FAMLAB	0.04*	1.722	0.040	0.001	0.004
FAMSIZE	0.003	1.024	0.003	0.0003	0.001
IRIGATE	0.462***	3.663	0.462	0.124	0.456
DSTMKT	0.373	2.002	0.373	0.166	0.027
RDMKTGD	0.503*	0.694	0.503	0.224	0.036
CRDTPDN	0.310***	2.321	0.301	0.074	0.272
OWNTRCK	0.201	0.615	0.201	0.027	0.100
MEMBA	0.4***	2.681	0.400	0.095	0.349
MKTINF	0.03*	1.917	0.300	0.067	0.245
AGEXTCH	0.31**	1.188	0.310	0.075	0.272

Log likelihood function (LnL)= -50.3726 LnL<sub>0</sub> = -73.3529 Likelihood ratio index = 0.306  
 $\sigma = 0.445$  Z = 0.608 F(z) = 0.73 f(z) = 0.44

Source: Author survey 2006

\*\*\*, \*\* and \* is significance at 1%, 5% and 10% respectively

## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Summary**

The study was carried out in Maragua division, Murang'a south district. The study analyzed the factors influencing smallholder banana farmers' participation in banana farmers marketing association. Data was collected through questionnaire interviews. The sample was divided into participants of the smallholder banana marketing association (adopter) and non-participants (non-adopters) of the banana-marketing channel. Participants were defined as farmers who were members and sold through a banana marketing association since the year 2004. Descriptive statistics were analyzed, profits from various banana-marketing channels were compared and a Limited Dependent Variable Model estimated.

The results from descriptive statistics showed that on average 42% of the sample were participating in the banana-marketing channel at the time of the survey. Farmers' participation in credit facilities is low. The decline in accessing agricultural credit is attributed to the stringent conditions to access the credit. Farmers are required to provide land title deed as collateral for the loan. Many farmers are apprehensive of losing their lands hence opt not to look for the credit. Most of the farmers had inadequate knowledge of on-farm rainwater harnessing and harvesting. Generally the participants were more educated, younger and had more years of experience in marketing than the non-participants. Most participants were members of other agricultural commodities marketing associations and had had more access to agricultural extension services than the non-participants by the year 2006. Half of the households interviewed had contact with extension services of which majority were women. Agricultural extension services from the

government are available but often provided irregularly. Private agents provided extension service at a cost. As most farmers do not access the extension services, they are not aware of the benefits of collective marketing of their small quantities of produce. The messages relayed were mainly on good agricultural practice, formation of producer group but with limited information on marketing of the farm produce. Half of the interviewed household had access to market information but the information was neither comprehensive nor timely. The farmers accessed inadequate information on prices and alternative market outlets hence not able to take advantage of the available market. Those who sold at farm gate were constrained by low price for the produce, inadequate capital to enable the farmer venture into far away markets, invest in high yielding seeds also invest in irrigation systems for consistent supplies to the market. All interviewed farmers grew banana for sale with about 5% of the produce used for home consumption. All participating farmers and 13% of the non-participants had taken up tissue culture banana plantlets. The frequency of banana harvesting was generally on monthly for those with irrigation systems on the farm and after two months for those who depend on rain-fed conditions.

The Gross margin analysis revealed that all the major banana-marketing channels were profitable. The average price of a 20kg bunch of banana sold to brokers at the farm gate was Kshs 80, while the same bunch was sold at Ksh 120 to the local retailer or Ksh 300 through the association to urban wholesalers in Nairobi and Kshs 350 to urban retailer in Nairobi. The most popular banana-marketing channel to all the farmers in the sample was selling at the farm gate to brokers. This channel was favored because of prompt payments made as farmers receive the payment on delivering bananas. Short time taken to complete the marketing transactions was

another factor that made the farmers to prefer selling to brokers at the farm gate to any other existing channel. Marketing bananas through an association earned the farmers three times as much as what was earned by selling at the farm gate to merchant middlemen. The farmers who sold individually to brokers at the farm gate had a gross margin of 33% of the gross income, those who sold to rural retailers got 38%, to urban retailers got 49% while those who sold through the association got 56% of gross income. The reasons why the non-participants did not want to sell their banana through marketing association included lack of trust and varying quality in banana bulked for marketing.

The results of the econometric analyses indicated that probability and level of participation in a banana farmers' association marketing channel were positively influenced by years of experience of household head in banana marketing, quantity of family labor available for banana production, having an irrigation system on the farm. The institutional factors that positively influenced farmers' decision to participate in the marketing association were access to credit facilities for agricultural production, membership in an agro-commodity marketing group and contact with agricultural extension services. The commercialization factors that positively influenced the farmers' decision to participate in marketing association were access to market information and the condition of the road to the market. The age of the household head had negative influence on the participation in the banana marketing association amongst the banana farmers; the younger farmers in the sample sold their banana through the marketing association than the older farmers. This was mainly because the old smallholder farmers have the phobia of group marketing resulting from the adverse effect experienced when they collectively marketed their coffee



through cooperative societies that were then mismanaged, they also have good capital base which enables them to sell their produce independently.

## **5.2 Conclusion**

The results of the study show that the participants of the banana marketing association were younger, had more years of experienced in banana marketing than the non-participants. Availability of irrigation system on the farm and farm labor were the household resources that positively influenced the farmers' decision to participate in the banana marketing association-marketing channel. The availability of the irrigation system on the banana farm is essential for high quality and consistent production of banana for the market, though most of the farmers have inadequate knowledge of on-farm rainwater harnessing and harvesting.

Marketing experience of the household head had a positive effect on decision and level of participation in the marketing channel. It implies that the experience generates confidence among the farmers hence become receptive to new ideas. Age of the household head had a significant effect on the decision and level of participation in banana association marketing channel, but in negative direction. The results show that the young farmers are more eager to invest in more rewarding technologies than the old.

Institutional factors namely membership in an agricultural commodity marketing association, access to agricultural extension services and access to credit facilities positively influenced the farmers' decision to participate and the volume to sell through the marketing channel. This explains the importance of capacity building of farmers by the extension staff from the both the

government and private sector that provide information on farming as a business and organized market of agricultural produce.

From the significance of the variables stated above the study concludes that to improve the farming enterprise amongst the small-scale farmers', capacity building on market oriented farming and enabling farmers' access credit is essential. Small-scale farmers need capacity building on good agricultural practice, group dynamics and group marketing.

### **5.3 Recommendations**

From the study the following recommendations were made:

Access to credit facilities was significant to the probability and level of participation in the banana farmers' marketing association. The small-scale farmers have an inherent working capital constraint and require affordable credit facilities. The government should formulate policies on affordable credit to small-scale farmers. The policies should look at the grace period of loan repayment, the repayment period, interest rate on loans and availability of micro-financing institutions. Mobile rural finance schemes should be set up to encourage farmers take loans from formal financial sector. There is also need to strengthen linkages between farmer groups with micro-finance institutions.

Access to comprehensive market information is essential for development of agricultural marketing; the public sector should support provision of market information to improve on market transparency. There is also need for the public agricultural extension service providers to integrate market information in their routine extension messages. Training on grades and standards on banana marketing is also required for the produce to compete efficiently on the

market. The farmers should also be equipped with knowledge in production of high yielding quality products.

There is need for an increased investment in infrastructure like roads, electricity and storage facilities by the public sector; this would be incentive to farmers to raise agricultural productivity through investing in high yielding seeds like tissue culture banana plantlets and increase penetration into the market.

To increase the farmers' participation in producer marketing association both the public and private sectors should take part in sensitization of the farming communities on the socio-economic benefits associated with producer marketing groups.

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## APPENDICES

### Appendix (i) Testing for multicollinearity

(smallholder banana marketing association)

#### Correlation Matrix for Listed Variables

	AGE	GNDR	EXPRN	FMLAB	FMSZE	IRIGT	CRDT	OWTRK	MEMBA	MKTINF	AGEXT
AGE	1.00										
GNDR	-.12	1.0									
EXPRN	.11	.08	1.0								
FMLAB	-.05	.09	.04	1.00							
FMSZE	.06	.04	.00	.16	1.00						
IRIGT	-.12	-.00	.19	.02	-.04	1.00					
CRDT	-.06	.08	-.05	.00	-.11	.16	1.00				
OWNTRK	.15	-.00	.14	-.04	-.01	.13	.14	1.00			
MEMBA	-.01	.15	.16	.06	.06	.30	.08	.02	1.00		
MKINF	.09	.01	.13	.01	.10	.35	.31	.26	.19	1.00	
AGEXT	-.02	.11	.03	.02	.01	.22	.08	.11	.02	.20	1.00

### Appendix (ii). Testing for Goodness of Fit of Level Of Participation in Banana Association Marketing Channel

$$LRI = 1 - LnL/LnL_0$$

Where,

LnL = Log likelihood index

LnL = Log likelihood function value for the model with all independent variables.

LnL<sub>0</sub> = Log likelihood function value for the model computed with the constant term only

$$LnL = -50.3726$$

$$LnL_0 = -73.3529$$

$$LRI = 1 - (-50.3726 / -73.3529)$$

$$= 0.306$$