AN INVESTIGATION OF THE DRIVERS OF DIVERSIFICATION TO BANANA FARMING AMONG HOUSEHOLDS IN MERU COUNTY, KENYA

ANANUA STEPHEN MWENDIA

DEPARTMENT OF GEOGRAPHY

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DECLARATION

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

Signature…………………………………………..Date…………………………

        Ananua Stephen Mwendia

        C50/CE/26852/2011

Supervisors: This thesis has been submitted with our approval as University supervisors:

Signature: …………………………………………..…..Date………………………

        Dr. Philomena W. Muiruri

        Lecturer

        Department of Geography

Signature: ……………………………………………Date………………………

        Dr. Ishmail O. Mahiri

        Lecturer

        Department of Geography

DEDICATION

I dedicate this work to all the farmers in Imenti South sub-County who sacrificed their time and energy in providing me with the data/information and any other support I required to complete this thesis.

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ABSTRACT

Banana farming is a practice carried out in many countries in the world for commercial and subsistence purpose. India is the world largest producer of banana and Uganda the second. However, Uganda is the leading producer of banana in Africa. On the other hand, Kenya is one of the countries practicing banana farming with several regions in the country growing the crop for subsistence and local markets. Meru County, specifically Imenti South sub-County, has embraced this activity with many households engaging in banana farming at a high rate. The study addressed the following specific objectives: to establish the extent of diversification to banana farming among households in Imenti South sub-County; to determine socio-economic factors influencing diversification to banana farming among households in Imenti South sub-County; to assess the benefits of diversification to banana farming among households and determine constraints of diversification to banana farming by the households in the study area. The study used a cross-sectional study design where quantitative and qualitative methods of data collection were applied. Quantitative data was collected using questionnaires while qualitative data was collected using key informant interview guides. A total of 388 farmers were selected using cluster sampling while 20 key informants were purposively selected to take part in the study. The study applied descriptive and regression which analyzed quantitative data using SPSS version 20. The qualitative data was also analyzed thematically using Nvivo software so as to understand the emerging themes in the study. In regard to extent of diversification, findings showed that 72% of the respondents had diversified to banana farming from coffee farming. In relation to socio-economic factors, age (p=0.033), education (p=0.014), average monthly income level (p=0.024), ecological area (p=0.021), land size (p=0.016); availability of labor (p=0.014); availability of farm inputs (p=0.024) and availability of hybrid seedlings (p=0.012) had a statistically significant relationship with banana diversification. In regard to benefits of diversification, 86% of the respondents cited high market returns (profitability) and high crop productivity to be the main benefits of diversification. In regards to constraints of diversification, small land sizes (89%), inadequate farm inputs (76%) and shortage of water (73%) were the main constraints facing banana farming diversification. In conclusion, there is a high rate (72%) of diversification to banana farming which is driven by high crop returns and productivity of the banana crop. On socio-economic factors, higher education attainment, improved monthly income, bigger land sizes, ecological area positively affected diversification. However, lack of sufficient farmer support systems such as lack of sufficient water and inputs remains a key challenge for diversification to banana farming. Therefore, there is need for the government to develop and implement policy guidelines which create a supportive environment for diversification to banana farming such as proper market price regulation, supply of water to farms and easy access to production inputs to farmers.

LIST OF ACRONYMS AND ABBREVIATIONS

ACCORD   Agency for Cooperation and Research in Development

FAO   Food and Agriculture Organization

FLM   Fuzzy Logic Model

GDP   Gross Domestic Product

GoK   Government of Kenya

IITA   International Institute of Tropical Agriculture

KII   Key Informant Interviews

KWFT   Kenya Women Finance Trust

MoA   Ministry of Agriculture

NAADS   National Agricultural Advisory Services

NGOs   Non –Governmental Organizations

TC   Tissue Culture

UNEP   United Nations Environment Program

UNFA   Uganda National Farmers Association

WTO   World Trade Organization

FGDs   Focused Group Discussions

KARLO   Kenya Agricultural Research and Livestock Organization

OPERATIONAL DEFINITION OF TERMS

Diversification   Is a term which means adjustment of farm activity aimed at increasing farm income, productivity and reducing vulnerability to loss and risks.

Drivers   Refers to factors which influence or cause particular phenomena or event to happen or develop.

Banana farming   Refers to an act of growing banana either for subsistence or commercial purposes.

Biotechnology   Refers to use of living systems and organisms to develop useful products, or any technological application that uses biological systems, living organisms to make or modify products or processes for specific use.

Banana farmers   Refers to people who practice banana farming activities in either large or small scale.

Households   Refers to all people living together in a house. It's the people in a family or other group that are living together in one house.

Perennial crops   These are crops which remain for multiple growing seasons.

Plantains   Means a plant with broad flat leaves that spread out close to the ground. Its fruits are edible and are generally used for cooking. It is a crop from genus *musa.*

Labor   The workforce; effort expended on a particular task.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Banana is a perennial crop that is grown and harvested all the year-round. The precise origin of edible banana is not known but the generally accepted theory is Malaysia. Regions including the Malay Peninsula, Indonesia, the Philippines and the New Guinea were the primary source while India was a secondary source (Simmonds & Shepherds, 1955). It is likely that, it spread out of Asia due to human movement. The modern day edible banana is a mixture of wild cultivated species and hybrids associated with *musa acuminata* and *musa balbisiana*. *Musa acuminata* is the most widespread of the species (Bosma *et al.,* 2010).

Diversification to banana farming means a farming practice where farmers replace their previous crops such as coffee, tea and sorghum with a new high value crop. It means changing from the previous farming activity to banana farming due to increase income flow in the new crop, high productivity, low loss and risks and favorable ecological conditions. (Kumari *et al.,* 2010).

Banana production in India supports livelihood of millions of people with a total annual production of 116,555.9 tonnes with a national average of 26.7 tonnes per hectare during 2003-2004 (Anonymous, 2006). To the Indians, it is used as subsidiary food. Leaves are used for serving meals; and chopped banana stems are used as cattle feeds. The flower from the banana tree is sacred and is used in religious and important ceremonies such as weddings where banana flowers are tied around the head, believing that it brings good luck. Some species of the banana yield fiber used for making ropes. Banana is also used

as a raw material in industries for preparation of banana powder, chips, juices and beer (Anonymous, 2006). The juice of banana stems is used in making paper bond and tissue paper, among others. Another country where banana is useful is Asia, where it is consumed in its natural state as raw or cooked. It is also added value by processing it into flour which is put into different uses and fermenting it for the production of beverages such as banana juice, beer, vinegar and wine (Pillay & Tripathi, 2007).

In Burma and Bangladesh, banana leaf buds are eaten as vegetables; the core of the pseudo stem is used for cooking, while the corm is a source of starch and has been eaten in times of famine (Nelson *et al*., 2006). Banana is a popular food crop in sub-Saharan Africa, with Uganda being the leading producer of bananas in Africa and second to India, with an annual output of 9.84 million tonnes, accounting for 11.8% of the world total production according to Food and Agricultural Organization (FAO, 2006). It is a major staple food crop in Uganda with consumption of 10.5m tons per annum, accounting for approximately 10.5% of the total global production. Millions of small scale farmers in Africa grow this crop for household consumption or local market. The highest consumption of banana per person is in Uganda, estimated at close to 1kg per person per day (Edmeades *et al*., 2006).

Nigeria is among the largest banana producing countries in Africa. Banana crop is ranked third among many other staples crops after cassava and yam being rated ahead according to International Institute of Tropical Agriculture (IITA, 2009). Consumption of banana has risen tremendously in Nigeria in recent years because of the rapid increase of urbanization and the big demand for easy and convenient foods by non-farming urban population. Besides being the staple food for many people in more humid regions, banana

is a delicacy and a favoured snack for people even in other ecologies. A growing industry, mainly plantain chips is believed to be responsible for high demand being experienced now in the country. Banana crop has been useful because it has provided humans with food, medicine, clothing, shelter, paper and handicrafts (E-book, 2015). It provides food security and income for small-scale farmers who represent the majority of producers.

Banana remains as the staple food as well as the raw material for many products in many parts of Nigeria. The banana fruit that is not mature is peeled, cut into slices, then dried and made into powder and consumed as 'plantain fufu'. The ones that are mature, which could be ripe or unripe are consumed boiled; they can also be steamed, baked, pounded, roasted, or sliced and fried into chips. The Overripe banana fruits are processed into beer products or spiced with chili pepper, or even fried with palm oil and served as snacks which are sold in supermarkets ('dodo ikire') (IITA, 2010).

In Rwanda, banana is a very important food crop and cash crop covering 23% of the total cultivated land (Mpyisi *et al., 2005)* and is grown by 90% of the households. Banana cultivars in Rwanda exist under local names and often within limited distribution. Different species of banana in Rwanda are green-cooking type with limited distribution. Other cultivars exist for brewing and cooking banana which many believe they originated through mutation of cooking and brewing cultivars or vice-versa (Okech *et al.,* 2005).

In Tanzania, banana is main staple food for about 30% of the total population. (Kalyebara *et al.,* 2007). In the high-rainfall highlands of Kagera, Kilimanjaro and Arusha, about 70-90% of households grow banana for their own consumption or as a cash crop, making

banana the second or third biggest cash crop in these local economies. Banana in lake zones of Tanzania is well known for its soft matoke bananas. It's also used for roasting and as a starchy food for other areas.

Banana is a very popular food crop in Kenya, with around 2 million tons produced annually from approximately 80,000 ha (MoA, 2006). It plays a key role in the economy and food security in Kenya and it is mainly grown in Central, Eastern, Western, Nyanza and Coast regions.

There are two main products of banana in Kenya, namely desert or fruit bananas and cooking or plantain bananas; with different geographic origins. Desert bananas originate in the Central region of Kenya like Kirinyaga, Murang'a and Meru. Plantains are mainly produced in Western and Nyanza region like Kisii (Mwangi *et al.,*2012). These two products have different varieties and some of these varieties include: *Lacatan, Apple, Gross Michael, Kampala, Dwarf Cavendish, Uganda green, Giant Cavendish, Williams, Varely, Grand Nain, Muraru, Kiganda and Sukari*.

Kisii County has been the leading producer of banana in Kenya with a national farmer average production of 12 tons/ha, but Meru County has emerged as a leading banana producer in Kenya in terms of revenue with Ksh.77 billion annually (Koigi, 2013). Though taken as just any other horticultural crop only about a decade ago, banana farming has now overtaken coffee as a dominant crop in Meru (Techno Serve, 2009).

This study set out to establish the extent of diversification and other related factors which influence this diversification to banana farming in Imenti South sub-County, Meru County. Further, the study aimed at establishing key benefits as well as the constraints of

diversification in Imenti South sub-County in Meru County to provide the basis for customized recommendations for improving diversification in the study area.

1.2 Statement of the Problem

Imenti South sub-County is known to be agriculturally productive with the major cash crops being coffee, tea and cotton. Other subsistence crops are maize, millet, cow peas, sorghum, green grams among others. However, around a decade ago, parts of Meru County diversified to banana farming, abandoning coffee and other subsistence crops. Farmers in Imenti South sub-County had tea as the dominant crop on the upper zone and coffee on the lower zone. This has gradually changed, with most of the farmers diversifying to banana farming from coffee in the lower zone and banana has become the dominant crop. This could have possibly been necessitated by several factors which this study set out to investigate (M.O.A, 2006).

As a result of increasing diversification to banana farming, available land for subsistence farming has greatly reduced which has affected livelihood and diversity of income. In addition, several banana markets in the study area have come up where they sell their produce. Therefore, there was a need to determine the drivers of diversification to banana farming in Imenti South sub-County to facilitate formulation of appropriate policy actions for scaling up and supporting diversification to banana farming in the sub-County (MoA, 2006).

1.3 Objectives of the study

1.3.1 General Objective

The general objective of this study is to investigate drivers of diversification to banana farming among households in Imenti South sub-County.

1.3.2 Specific Objectives

The following specific objectives guided the study:

1. To establish the extent of diversification to banana farming among households in Imenti South sub-County;

2. To determine the socio-economic factors influencing diversification to banana farming among households in Imenti South sub-County;

3. To assess the benefits of diversification to banana farming among households;

4. To determine constraints of diversification to banana farming by the households in the study area.

1.4 Research Questions

 The study addressed the following research questions:

2. What is the extent of diversification to banana farming among households in Imenti South sub-County?

3. Which are the socio-economic factors influencing diversification to banana farming among households in Imenti South sub-County?

4. What are the benefits of diversification to banana farming among households?

5. Which are the constraints of diversification to banana farming by the households in the study area?

1.5 Research Hypotheses

This research was guided by the following null hypotheses:

Ho$_1$: There is no significant relationship between socio-economic factors and diversification to banana farming in Imenti South sub-County.

Ho$_2$: There is no significant relationship between diversification to banana farming and the benefits among households in Imenti South sub-County.

Ho$_3$: There is no significant relationship between diversification to banana farming and the constraints by the households in Imenti South sub-County.

1.6 Justification and Significance of the Study

Banana farming is one of the agricultural activities practiced extensively in the world, with 87% of the production being for local consumption (Biodiversity International, 2008). In Imenti South sub-County, farmers have gradually diversified to banana farming for subsistence and commercial purposes which prompted the need to investigate the extent of such diversification and why farmers have diversified to this activity, the effects on the households and the challenges for diversification in this area. Imenti South sub-County was chosen for this study because it is the area where diversification to banana farming has taken place extensively in the whole county (Koigi, 2013). Households in the study area have embraced this activity to the extent of other surrounding areas copying the same.

The study findings are relevant for policy recommendations on diversification to banana farming especially in providing useful insights for improving the productivity as well as

increase the profit margin and improve the quality of banana produced. This will provide more food to households; more income and more crop production hence increase in the food security in the area. Improvement in diversification, being a strategy to generate additional income, will result in high income flow among the farmers. This will boost Meru County revenue so as to reach the economic pillar of Kenya Vision 2030. This therefore will create more jobs in the region hence curbing rural to urban migration among youths. The findings of this study will also contribute to the academic knowledge by expanding the existing body of literature which will assist the researchers in various institutions to widen their knowledge as well as act as a future reference for further studies.

1.7 Scope and limitations of the Study

Although Meru County is agriculturally productive with many crop such as coffee, tea, banana, maize, beans, millet among others, the study only focused on banana farming since the crop is widely grown in this region. The study covered only Imenti South sub-County because it is the area where banana farming is more prevalent (Koigi, 2013). The study focused on the diversification of banana farming and its effects to the households; which included the benefits and constraints in the production of the crops. The study was conducted among farmers who had diversified to banana farming in this region regardless of their socio-economic status.

The study was limited to only two wards: Abogeta East Ward and Mitunguu Ward, since these are the areas where banana farming is highly practiced. The main limitation in this study was the problem of transportation due to the state of the poor road network, hence reaching the respondents especially during rainy season was challenging. Motorcycles

were however used in areas where road network was poor. Another limitation was that majority of the respondents had only elementary education hence answering questionnaires was problematic. In this case, local language was used by the research assistants to interpret the questionnaires where clarification was required.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The literature review in this study was based on the relevant themes and dealt with diversification to banana farming. The topics discussed include drivers of diversification, ecological requirements to diversification, constraints to diversification and socio-economic impacts of diversification, among others. This literature review has incorporated many studies to give a clear view on the knowledge gaps in the study and how to fill them. Several studies have been done on banana such as, banana production, challenges and socio-economic impacts to the households.

2.2 Drivers of Diversification in Crop Farming

Diversification entails a large mix of diverse and complementary activities within agriculture and a movement of resources from low value to higher value agriculture. It is a strategy to maximize the use of land, water and other resources with a view of avoiding risks and uncertainties due to climatic and biological variables. Diversification is considered as an effective approach to utilize scarce land and valuable water resources to make agriculture suitable and environment friendly (Kumari *et al.,* 2010; Josh *et al.,* 2007). It gives a comparative high return from crops by minimizing price and yield created by climatic variability and volatility of agricultural produce. Again it offers higher labor productivity, optimizes use of resources and utilizes the land effectively (Mukherjee, 2012). Diversification aims to increase farm incomes or reduce income vulnerability and risks.

A study by Bhattacharyya (2008) on crop diversification as a search for alternative income in farmers in the States of West Bengal in India showed that the farmers were slowly moving towards high profit making crops like fruits, vegetables and flowers. The study indicated that most of crop diversification resulted due to personal efforts of small scale farmers where government support was very minimal. It showed major determinants of diversification was a demand–sided factor that had induced farmers to shift towards production of value crops. Diversification was practiced more in rain-fed areas than in irrigated areas, hence the need to find reasons for farmers to diversify to banana farming in Imenti South sub-County in Meru County

Study by Joshi *et al*. (2007) also showed that, Indian agriculture was gradually diversifying in favor of high-value commodities in particular fruits, vegetables, milk, poultry and fish. Their study revealed that agriculture diversification towards high-value food commodities augmented income, generated employment opportunities, empowered women farmers and conserved natural resources. Promoting agriculture diversification towards high-value commodities, doing value addition through their processing and creating appropriate markets for them can be used as an effective measure to alleviate rural poverty, generate rural employment and conserve natural resources in the niche areas; however Abro *et al*. (2010) concluded that diversification towards high value and labor intensive crops could provide adequate income and employment to the farmers.

Crop diversification towards high-value crops indicated that greater attention must be devoted to that avenue for rural income growth and offered an opportunity to augmented income, generated opportunities, empowered women farmers and alleviated poverty.

In Bangladesh, Rahman and Sanzidar (2008) concluded that crop diversification should be a desired strategy for agricultural growth. Development of rural infrastructure was also essential as this would not only improve technical efficiency but might also synergistically promote diversification by opening up opportunities for technology diffusion, marketing, storage and resource supply to improve production. However, Birthal *et al.* (2007) revealed that diversification towards high-value crops can potentially increase farm income, especially in a country like India where demand for high-value food products had been increasing more quickly than that for staple crops.

Saraswati *et al.* (2011) through their study revealed that crop diversification was determined by a number of infrastructural and technological factors. Their finding suggested that creation of basic infrastructural facilities such as sustained supply of water for irrigation, markets, fertilizer availability, proper roads and transportation was an essential pre-requisite for creating an enabling condition for banana diversification.

Ashfaq *et al*. (2008) used a multiple regression model in which the value of Entropy index of crop diversification were taken as independent variables and different factors affecting diversification were taken as dependent variables. They found that diversification levels were determined by the size of the land holding, the age, education level, farming experience and off-farm income of the farmer, distance of the farm from the main road, distance of the farm from the main market and farm machinery. Van de Berg *et al.* (2007) recorded that diversification into high-value vegetable crops and away from rice enabled Chinese farms to sustain a reasonable income level given present farm size distribution.

While in North- Central Nigeria, a study by Ibrahim *et al.* (2009) on crop and income diversification among farming households in a rural area, reported that crop and income diversification were strategies that were essential for reducing rural poverty and raising income. This was due to diversification to high-value crops which fetched more income hence reducing poverty level; while Saraswati *et al.* (2011) showed that factors affecting crop diversification were gender, education, trade experience, membership in cooperatives, resource ownership, features of land owned, access to extension services and transportation costs. In Kenya, Mwangi *et al.* (2012) found out that the intensity of diversification to horticultural crops was influenced by gender of household head, number of children pursuing post primary education, occupation of the household head, size of the farm, social conservation activities and experience of the farmer in the crop farming.

A study by Nguthi (2007) sought to establish the factors which determine diversification to tissue culture banana among smallholder farmers in rural Kenya. The study was based in rural Kenya, Maragwa district in the former Central province (now Central region). The study adopted a livelihood approach methodology which incorporated both quantitative and qualitative data collection. The study results showed that, diversification was attributed by technology among smallholder farmer, age of household head, family size, off farm livelihood activities and contact with extension agents.

A study by (Nguthi, 2007) carried out in Kenya, focused on adoption of agricultural innovations among small scale banana farmers with a special focus on tissue culture farming. According to Nguthi, tissue culture is a new farming technique which helps improve farm yields and profitability of products. However, reviews found no known

studies on factors for diversification in Kenya. Therefore, this study focused on drivers of diversification and to what extent farmers have diversified to banana farming in Imenti South sub-County in Meru County, hence filling the knowledge gap on the factors for diversification. These factors could be variety of factors, but their effect is paramount to the drivers and extent of diversification to banana farming.

2.3 Ecological Requirements of Diversification to Banana Farming

Banana is essentially a tropical plant requiring a warm and a humid climate. However, it can be grown from sea level up to an altitude of 1200 meters. Banana can be cultivated in temperature ranges between 10^0C and 40^0C, with higher yields when temperatures are above 24^0C for a considerable period. In cooler climate, the crop requires longer time to mature. Plants exposed to low temperature and humidity during active growth stage show reduced growth and yields. It requires an average of 1700mm rainfall distributed throughout the year for its satisfactory growth. Stagnation of water is injurious and may cause diseases like Panama Wilt (Nelson *et al.,* 2006). .

It is generally considered that fertility of the soil is important for successful diversification to banana farming, as the plant is a heavy feeder. Banana is one of the few fruits which has restricted root zone. Hence, depth and drainage are the most important considerations in selecting the soil for banana. The soil suitability for banana should be 0.5m to 1m in depth, rich and well drained, fertile and moisture retentive, and soil containing plenty of organic matter. Alluvial and volcanic soils are the best for banana cultivation (Wairegi *et al*., 2007).

A soil pH range of 5.5-7.5 is suitable for growing bananas, with a pH of 5.5 considered optimal (Macharia *et al.*, 2010). A low pH however, solubilizes elements like iron, aluminum, and manganese; these can be toxic and have negative effects on the plants such as reduced root growth. This is exacerbated when the soil becomes water logged or has low carbon levels. A low pH also reduces the availability of other nutrients such as calcium. Careful fertilizer management reduces soil acidification. A pH higher than 6.5 can reduce the availability of trace elements such as boron, zinc, copper and iron. The study sought to explore whether ecological conditions in Imenti South sub-County play a major role in the diversification to banana farming in Imenti South sub-County hence filling the knowledge gap on optimal requirements for banana diversification. Ecological requirement is crucial to any farming activity to be successful; hence serious assessment before any study has to be undertaken.

2.4 Constraints to Diversification to Banana Farming

A study in Tungabhadra Command Area in India revealed that, the major problems faced by 85% of the banana farmers was non availability of sufficient irrigation water which discouraged farmers (Saraswati *et al.*, 2011). In that study, 73% of the farmers noted that price of fertilizer was high; while a further 68% reported that they were facing the problem of planting materials. Another major problem in the production identified in the same study area was shortage of labor during peak time, hazards of soil salinity and hailstorms with heavy winds. Financing was noted as a problem since loans were inadequate, compounded by high rates of interests.

In addition, there was a major problem in marketing of banana due to price fluctuations, high transportation cost and delayed payments on sale proceeds by the trader and high

commission intermediaries. Another study in Haveri district of Karnataka in India identified production problems like lack of technical knowhow, scarcity of labor, pests and diseases, lack of adequate credit facilities and scarcity of water (Kumari *et al.,* 2010). Farmers also reported further marketing related problems like involvement of intermediaries, lack of storage facilities and inadequate transportation.

On economic analysis of tissue culture banana and sucker propagated banana revealed that, the risk in cultivation of banana using tissue culture plantlets was lower than that of suckers propagated banana production. The constraints in tissue culture banana production were that the cost of tissue culture plantlets was very high. Farmers also expressed a problem in marketing of big size bunches obtained from tissue cultured banana. Another study on the economies of production and marketing of banana in Sindhudurg district of Masharashtra in India also revealed that farmers were facing the problem of banana diseases and pests like aphids (Rane & Bagde, 2006).

 Recently, there was a study carried out on 159 plots in Central, Southern and South West Uganda which found that poor soil fertility is a constraint in diversification to banana farming. More so rapid population growth rate which was at (3.3% per annum) and increasing urbanization which was at (12% in 2000 and 15% in 2010) continued to increase pressure on banana systems in Uganda (Ngombi, 2010).

On the problems facing small scale banana farmers in Isingiro District in Uganda, Agency for Cooperation and Research Development (ACORD, 2010) found out that; out of the 75 respondents interviewed, 40% were concerned about lack of control over land which is cited as a major constraint in attaining food security. The men on the other hand,

were concerned about pressure on land due to increasing population, inadequate labor for farming, poor soil fertility and lack of extension services which resulted in poor yields in the banana plantations.

Another concern was low prices for bananas and failure by the government to intervene and ensure that farmers benefited from their produce (ACCORD Uganda, 2010). The study also showed that only 8 of the female farmers and 17 of the male farmers interviewed had received any form of technical support either from the government or NGOs. The support received included seeds, farm implements and manure. On the side of education, the support included improved farming practices, use of manure and knowledge on banana farming. Some of the organizations that extended their kind of support included the government, National Agricultural Advisory services (NAADS), Uganda National Farmers Association (UNFA) and Agency for Cooperation and Research Development (ACORD), among other NGOs.

In Kenya, Macharia *et al.* (2010) showed that the country had experienced a decline in banana production which has been attributed mainly to an increase in prevalence of pests and diseases due to limited practice of effective control. The main pests and diseases are *Fusarium wilt*, black *leaf streak* and *sigatoka leaf spot;* the banana *weevil* and the burrowing *nematodes*. Inability to access planting materials for banana growers in Kenya constitute a priority problem leading to farmers using untreated sucker for planting thus aggravating the problem (Dubois *et al*., 2006). In addition, cost of inputs like fertilizer and chemicals is high. Drought was also ranked among the highest constraints with 40% and only 11% had irrigation water (Kumari *et al*., 2010). This study helped to fill the knowledge gap of what constraints farmers experience in diversification to banana

farming. It revealed constraints which can be easily resolved by farmers themselves and those that required government intervention.

2.5 Socio-Economic Impacts of Banana Farming

Banana takes a good proportion in the national as well as in the household economy of Kenya. In terms of nutrition, banana is valued more than other fruits because of its richness in carbohydrates, vitamins and potassium. Banana production has provided income to poor farmers because it provides continuous income flow throughout the year because it is harvested in and out of the season. Banana suckers and leaves are used as animal feeds, especially during dry season when there is shortage of fodder (Joshi *et al*., 2007).

With the introduction of tissue culture (TC) banana and consequent revival of banana economy, it brought a multiplier economic effect to the Kenyan economy by providing employment and business opportunities to rural and urban dwellers (FAO, 2006). The social impact of diversification to banana farming is that, an increase in the banana production at the farm level leads to an increase in food security at the household level.

A higher income has improved quality of life to the farmers. They can afford to pay school fees for the children and also provide a good housing to the family members (Kumari *et al*., 2010). The formation of cohesive farmer groups has empowered the groups to address agronomic issues related to banana farming. These farmer groups have been effective in addressing anti-social behavior within the community. The group members support other members to access credit facilities; this has increased

accountability of member to the community, thus further increasing cohesiveness among the families

The total development in the community has been very important and the formation of groups has further influenced the management of community development funds (Rane & Badge, 2006). Many families have acquired assets such as mobile phones, bicycles and consumer durables from the sales of banana. According to a survey carried out in Nyanza, Central, Eastern and Western regions of Kenya showed that smallholder households grow and consume bananas as one of the staple foods, with nearly 83.5% of total output of banana coming from small- scale farmers owning up to 0.5 ha of banana land (Kumari *et al*., 2010). This filled the knowledge gap of socio-economic impacts of banana farming to the households in Imenti South sub-County in Meru County.

Results of literature review revealed that although studies have analyzed socio-economic characteristics of farmers, few studies had examined their influence on diversification to banana farming. Further, these studies were carried out in context different from Kenyan context and that of Imenti South sub-County hence could not be generalized to Kenyan context and especially Imenti South sub-County. Therefore, this study examined socio-economic impacts of banana farming to households in Imenti South sub-County, hence filling the knowledge gap on the socio-economic impacts in the study area which is one of the major factor encouraging diversification to banana farming.

2.6 Theoretical and Conceptual Framework

2.6.1   Theoretical Framework

The proposed study adopted Fuzzy Logic Model (Figure 2.1). This is a model that was introduced by Lofti Zadeh in 1965 in Berkeley (Nelson *et al.,* 2006). He coined the word fuzzy because he felt it was the most accurate description of what was going on in the theory. Fuzzy Logic Model (FLM) can handle problems with imprecise and incomplete data and it can model unlinear functions of arbitrary complexity. This framework provides a framework for understanding drivers to banana diversification and the role of drivers in diversification.

One can create any Fuzzy system to match any set of input-output data. The model uses three variables for family motives to diversification; these variables are potential of crop diversification, the production factors, and farmers' appreciation of the market prices and knowledge. The model sensitivity to variables determining diversification is of the same magnitude as its sensitivity to market prices and farmer's knowhow to the activity, but less than its sensitivity to labor, capital and land endowment (Bosma *et al.,* 2010).

What the structural model indicates therefore is that, when diversifying to another crop, one must consider age and gender of the household head as a variable. Farmers who are old, middle aged or young have different levels of manpower. Also, male or female is a variable to consider due to different levels of input in the production. Size of the land for cultivation, ability to get farming inputs and the ability to hire labor in periods of shortage should be considered.
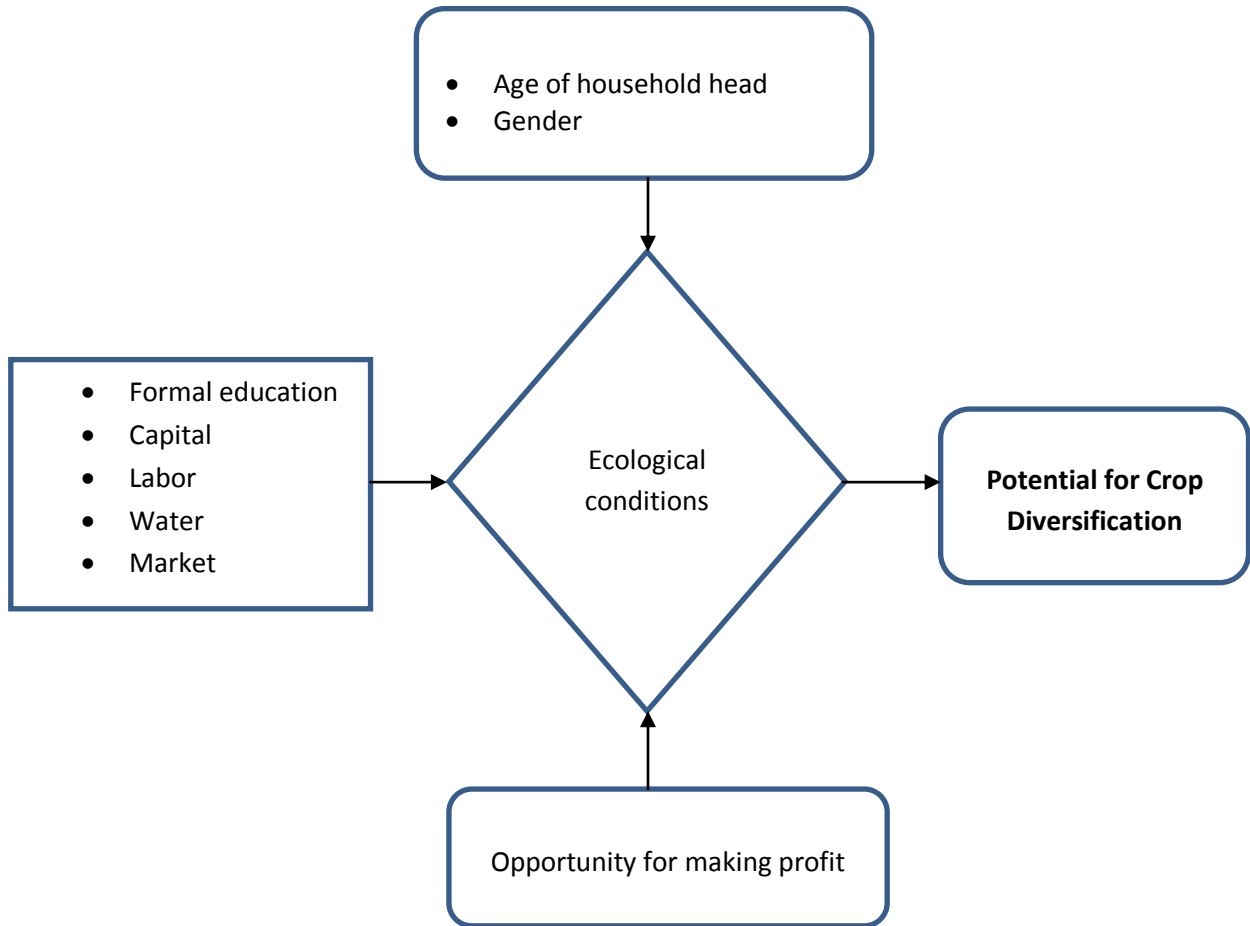
Figure 2.1: A structure of Fuzzy Logic Model on crop diversification.

Source: Bosman *et al.* (2010)

The model also indicates that there must be enough water for diversification to other farming activities. The water source will either be from rain water, where the amount of rain water will be determined by the rain duration or irrigation water. Labor during weeding or harvesting is a fundamental variable according to FLM. This labor could be household labor or hired labor force. The model also indicated opportunity to make profit which will be determined by the distance to the market place, cost of the farming inputs and market price products.

The model also shows that formal education, capital and extension services are necessary for a farmer to diversify. This study fits in this theoretical framework simply because; the variables used in the model are the same variables that are useful in this study. Independent variables such as age of household head, gender of household head, capital, labor, water, opportunity to make profit and formal education are necessary variables for a potential crop diversification. On the other hand, option to grow crops, diversification to another crop and farmer's preference for diversification are other variables necessary for the study.

FLM is practically applicable to this study because for a farmer to diversify to banana farming, he/she must have been in another farming activity; hence it was by choice to diversify to another type of farming after weighing the benefits and available options. The drivers for diversification highlighted as independent variables fits to be used in diversification to another farming activity.

2.6.2   Conceptual Framework

The study has used both theoretical and conceptual framework. Theoretical framework grounds the study on the existing knowledge, whereas conceptual framework brings the relationship between independent and dependent variables. This conceptual framework shows the independent variables of the study (socio-economic factors, benefits and constraints of diversification) and the dependent variable (Diversification to banana farming) (Figure 1.1).

Independent Variables   **Dependent Variable**

┌─────────────────────────────────────┐
│ **Social-economic Factors**   │
│ Age, gender, literacy/education levels, │
│ income levels, labor, Land, water, │
│ farm inputs, finances, transport and │
│ extension services.   │
└─────────────────────────────────────┘

┌─────────────────────────────────────┐   ┌──────────────────────┐   ┌──────────────────┐
│ **Benefits of Diversification**   │   │ **Intervening Variables** │   │ **Diversification to** │
│ Market returns, crop productivity, │   │ Government policies and │   │ **banana farming** │
│ market reliability and living standards │   │ regulations   │   │   │
└─────────────────────────────────────┘   └──────────────────────┘   └──────────────────┘

┌─────────────────────────────────────┐
│ **Constraints of Diversification** │
│ Water, farm inputs, market pricing, │
│ land sizes, knowledge and skills and │
│ soil infertility   │
└─────────────────────────────────────┘

Figure 2.2 Factors influencing diversification to banana farming

Source: Adapted from Literature review, 2015

Basing the study on the conceptual framework, the socio-economic characteristics of farmers can play a crucial role on individual decisions to diversify or not. For instance, a farmer who has sufficient land, water and financial capability has a higher likelihood to diversify compared to one who has inadequate factors of production. A Farmer who is middle aged, could diversify to banana farming more than the old who have less energy to work on the farm. In addition, a farmer whose labor, transport and extension services are available will be motivated more to diversify than one who does not enjoy these services and vice-versa.

In regards to benefits of diversification, a farmer enjoying benefits of banana farming such as higher market returns which gives a more income flow helps a farmer acquire

necessities of life which improves the living standards. This motivates one to diversify to bananas farming and vice-versa. Improved crop productivity and market reliability encourages one to diversify to banana farming because their produce have a ready market hence exchange for money is instant thus encouraging production.

 When it comes to constraints to diversification, farmers who experience increasing challenges such as lack of water for irrigation and poor product prices can be discouraged and hence choose to diversify to a different crop. Small land sizes also discourages one to diversify, because the small piece of land cannot be sub-divided any further for banana farming and other subsistence crops. Soil infertility also affects diversification, in a situation where soil is infertile; farmers tend to get discouraged to diversify because the productivity will be minimal.

Government policies and regulations are also important factors for diversification. National government and the County government have set policies and regulations that have helped farmers diversify to banana farming. Field days have been set for farmers to learn more about banana farming from Sub-county Agriculture Institute. The County government has set days for the market in the areas where banana farming is practiced. The government has regulated the laws for tapping irrigation waters from the existing rivers hence allowing many water projects to come up. These projects are supported wholly or partially by both National and County governments.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter gives a description of the methodology applied in the study. It highlights the study design, variables, location of the study, study population, sampling techniques, sample size and sample size determination, pre-testing of research instruments, validity, reliability, data collection and analysis techniques and ethical consideration.

3.2 Research Design

The study adopted a descriptive survey design to investigate the drivers of diversification to banana farming in the study area. The design incorporated both quantitative and qualitative study methods for data collection. The design was appropriate in this study because it provided the opportunity to describe the respondents who took part in the study in their locality; and to generalize the findings to the whole population. Descriptive survey design is able to depict the participants in an accurate way (Kothari, 2004).

3.3 Study Area

This study was conducted in Imenti South Sub-County of Meru County in Kenya. Imenti South sub- County is the region in Meru County where banana farming is extensively practiced hence diversification to banana farming has taken place more in that region. Imenti South sub-County is on the lower side of Mount Kenya, on the windward side at an altitude ranging between 850m and 2240m above sea level, with a modified tropical climate of the Kenya highlands (GoK, 2008). It has six administrative wards: Abogeta East, Abogeta West, Igoji East, Igoji West, Nkuene and Mitunguu (Figure 3.1). The study covered Abogeta East Ward and Mitunguu Ward (Figure 3.1). These two sampled wards

are representative of the entire Meru County because the study results can be replicated to other wards in the county with similar characteristics. This is because the two wards are sampled on the basis of high concentration of banana farming. These two wards are located between latitude 00^0N and 05^0N and longitude 35^0E and 37^0E.
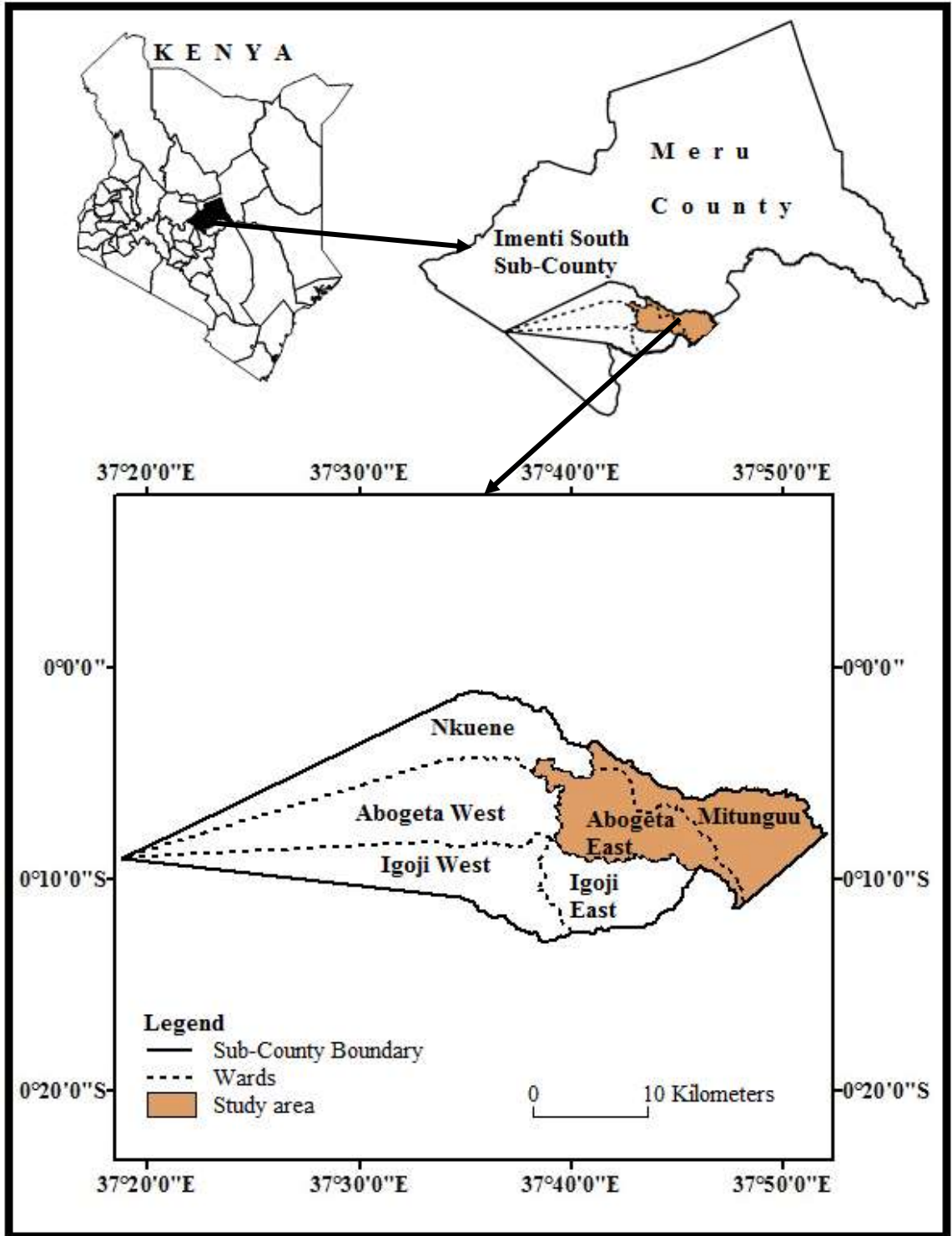
Figure 3.1: Map of the Study Area

Source: GoK (2008)

The study area has temperatures ranging between 12.4^0C and 24.5^0C with a bimodal rainfall pattern. In the area, long rains are experienced from October to December and the short rains from March to May every year.

The sub-County experiences average annual rainfall of between 800mm and 2000mm which is well distributed throughout the year. The study area is well drained with permanent rivers where farmers get water for irrigation. The two main permanent rivers which supply water for irrigation in this study area are River Thingithu and Kithino according to the Ministry of Agriculture (MoA, 2013).

The soils are dark brown moderately fertile loam soils that are well drained, with the main economic activity in the study area being agriculture. People in the study area practice cash crop farming which includes tea, and a few still growing coffee and cotton. They also practice food crop farming such as maize, beans, millet, sorghum, peas, among others. Others practice horticultural farming which includes vegetable and fruits. Markets for these products are readily available in the farm areas and also on the designated market places.

3.4 Study Population

The study population for this study involved small scale farmers in Abogeta East Ward and Mitunguu Ward who practice banana farming. The total population in Abogeta East Ward (Mwichiune, Kothine and Maraa locations) is 20,825 and in Mitunguu Ward (Ndamene and Kirendene locations) is 13,343 (GoK, 2009). Majority of households have diversified from their former cash crop to banana farming in the study area.

3.5 Sampling Technique and Sample Size

3.5.1   Sampling Technique

Multi-stage approach adopted was to get the sample for inclusion in the study. Imenti South sub-County in Meru County was purposively selected due to the high number of households practicing banana farming. From the six wards of Imenti South sub-County, namely: Abogeta East, Abogeta West, Igoji East, Igoji West, Nkuene and Mitunguu wards; the two wards were randomly selected for inclusion in the study. These two wards were: Abogeta East and Mitunguu Wards.

Then, the number of households in the two Wards was obtained from chiefs in the study area study. Then cluster sampling was used to select primary respondents of the study. The cluster sampling design was selected due to its ability to provide a strategy through which a population can be sampled when a comprehensive population list does not exist and it is not possible to construct one (Mugenda, 2003).

To select the households to be studied, the researcher identified the geographical centre of the village with the assistance of chiefs. One household at the geographical centre was selected to act as the first household to be sampled. This was followed by systematic sampling in which every 5th household growing bananas along established roads or foot paths was selected for interview. This was done until a total of 221 households in Abogeta East Ward and 167 households in Mitunguu Ward were systematically selected and interviewed resulting to a total of 388 households which were studied. This distribution of sample size was based on individual population of each of the wards.

3.5.2   Sample Size Determination

The sample size of the study was determined using the following formulae by Mugenda & Mugenda (2003):

$$N = \frac{Z^2 pq}{d^2}$$

Where:

N = the desired sample size;

Z = 1.96 at 95% Confidence Level;

p = prevalence, usually set at 0.5 if not known;

q = 1- p and d = error margin, usually 0.05

Therefore,

$$N = \frac{(1.96)^2 \times (0.5) \times (0.5)}{(0.05)^2} = 384 \text{ households}$$

To cater for non-response of questionnaires, 10% of the total questionnaires (38) were added to the sample size resulting to a sample size of 422 households. However, upon issuance of 422 questionnaires, 388 were duly filled and collected which represented a response rate of 91.9% which was within acceptable range.

3.6 Research Instruments

A questionnaire was used to collect data from banana farmers who were the primary study respondents (Appendix 2). A standard key informant interview guide (Appendix 3)

was used to conduct in-depth key informant interviews while images were used to illustrate important aspects of diversification. In addition, a field observation checklist (Appendix 4) was used to make observations during field visits and record them for further analysis such as proportion of land under different crops and type of crops farmed.

3.7 Pilot Study

A pilot study was conducted in Baranga Sub-location in Mwichiune Location which was then excluded from actual data collection. The purpose of pilot study was to test and determine the validity and reliability of the research tools. During pilot study, respondents were debriefed to test understanding and adequacy of the questionnaires. During debriefing, respondents were asked what they thought each question was asking. The respondents were asked if there were words that they did not understand or any expressions that they found unacceptable or offensive.

The questionnaires were edited to reflect the corrections made. This was by reducing the number and length of the research tools so as to minimize the time required to answer, and enhance logical flow of questions.

3.8 Validity

Validity is the accuracy and meaningfulness of inferences which are based on the research results. In other words, validity is the degree to which results obtained from the analysis of the data actually represent phenomenon under study (Kothari, 2004). Validity therefore has to do with how accurately the data obtained in the study represents the

variables of the study. The sampling techniques adopted ensured randomization and representativeness to cater for internal and external validity.

To enhance internal validity, random sampling techniques were used and homogeneity of selected study population was ensured. In addition, expert opinions and guidance from study supervisors was sought as a way of enhancing internal validity. On the other hand, to enhance external validity, a large sample of the study respondents was used to make it more representative and comparison to the findings with previous similar studies done.

3.9 Reliability

Reliability is a measure of the degree to which research instruments yields similar results after repeated trials. The Alpha measures internal consistency by establishing if certain items in the study measure the same constructs (Sekran, 2002). The Cronbach' alpha was used to test the reliability of research tools and instruments. Cronbach' alpha is computed by correlating the score for each scale item with the total score for each observation, and then comparing that to the variance for all individual item scores.

Using SPSS version 20 software, Cronbach' alpha coefficients were calculated to estimate the reliability of the instruments of this research. As advised by Sekran (2002), coefficients which are less than 0.6 are considered poor while coefficients greater than 0.6 but less than 0.8 are considered acceptable and coefficient greater than 0.8 are considered good. The average Cronbach' alpha coefficient for the instrument was 0.876 which is good for generalization of the study results. The coefficient indicates a reasonably high alpha suggesting that the study instrument was reliable measure of the items studied.

3.10   Data Collection Procedure

The study used questionnaires, key informant interview guide and observation to collect quantitative and qualitative data. During quantitative data collection, the questionnaires which were structured with closed ended questions were administered to banana farmers. Three trained research assistants were used to help administer and collect the research questionnaires. In few cases, where farmers could not read and write, research assistants who were fluent in the local language were used to translate the questions in a manner that was easier to understand and respond to.

Qualitative data was collected through guided interviews. Key informant interviews were conducted with sub-County Agricultural officers from Imenti South sub-County, TechnoServe and Meru Green officials. Study area Chiefs and sub-Chiefs were also interviewed face to face using the interview guide. Focused Group Discussions (F.G.Ds) was also conducted with farmers in the field and also at the market places

For ease of documenting and analyzing the qualitative data, permission was sought from the interviewees in order to record the interview conversation. Confidentiality and anonymity of respondents was assured to all the interviewees. In addition, cameras were used to take pictures and illustration of key activities and phenomena of interest for the study. Pictures were taken using high resolution cameras to ensure they were of high quality and visual resolution. Observation checklists were used to check and record important aspects, occurrences and observations such as land total acreage in farming, type of farming method, source of water supply, market availability and even road network connecting farms with the markets during the data collection.

With regard to secondary data, desk reviews was used to collect secondary data from published and unpublished sources, such as reports from the Ministry of Agriculture office in the sub-county, FAO, Meru County Integrated Plan and Kenya Agricultural Research and Livestock Organization (KARLO) in the County.

3.11 Data Analysis

Data collected from the questionnaires was cleaned and verified for correctness and consistency, before being entered into the SPSS for further analysis. Descriptive statistics was used to analyze the quantitative data to provide a descriptive summary of the responses from the respondents; and regression analysis was used to establish key drivers of diversification.

Regression analysis was also used to determined influence of study variables with diversification to banana farming (existence of statistical relationships among variables). The study adopted a statistical significance level of 0.05 %. The regression analysis used is defined by the following formula:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \text{- - - - - - - -} \beta_n x_n + \varepsilon$$

Where, Y-Dependent variables, X_{1-n} – Independent variables, β_0 – The constant,

β_{1-n} – Regression coefficients or change induced in Y by X and ε – The error.

Coefficient of determination was applied to help check how suitable the regression was in terms of its prediction. The Coefficient of determination (R_2) which lies in between 0 and 1 indicates that, the closer R_2 is to 1, the better the model and its prediction (Kothari 2004).

In this study, R_2 was 0.892 which means that the model was a good predictor of diversification. The regression model was also used to derive odds ratios which were used to predict how an individual variable predicted diversification among the farmers (i.e. likelihood of diversification to banana farming).

Qualitative analysis technique was used to analyze data collected through key informant interviews and observations. Qualitative transcripts and summaries prepared during and after field work were coded and entered into the Nvivo software for analysis. Patterns in the data were studied and themes developed. Relationship and patterns within the themes were studied and used to create new ideas, insight and explore assumptions made in the study.

Quantitative findings were presented using tables, figures, percentages and histograms. They were summarized based on themes and verbatim from key informant interviews. Field observations made during the study were illustrated using photos. These findings played a key role in facilitating an in-depth understanding, inquiry, interpreting, and validating findings from quantitative data.

3.12 Ethical Considerations

Authority to conduct the study was granted by Kenyatta University Graduate School. Local authority to conduct the study was also obtained from Meru County Government. Informed consent form (Appendix 1) was administered to selected respondents to obtain their consent in participating in the study. Confidentiality of the information obtained was maintained and privacy of the study participants secured by keeping the study materials under lock and key.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussion of the study findings on drivers of diversification to banana farming in Imenti South sub-County. Detailed analysis of the data collected from the field, interpretation of the same data and explanation of the results based on the specific objectives are given. A total of 422 survey questionnaires were administered to farmers who were the primary respondents. Out of these, 388 questionnaires were correctly filled representing a response rate of about 92% which was a good response rate for the study. The chapter is organized as follows: background characteristics of the respondents, status of diversification to banana farming, socio-economic factors, institutional factors, benefits and constraints of diversifications to banana farming.

4.2 Demographic Characteristics of the Respondents

This section summarizes the background characteristics of the respondents. The variables examined in this section included: area of residence, age, marital status, gender, education level and average monthly income. Table 4.1 summarizes the background characteristics of the respondents. It is observed that (57%) were from Abogeta East Ward, while 43% were from Mitunguu Ward.

Table 4.1 Background characteristics of the respondents

Variable		Frequency	Percentage (%)
Age (Years)	18-30 years	49	13
	31-40 years	75	19
	41-50 years	125	32
	51-60 years	85	22
	Over 60 years	54	14
	Total	**388**	**100**
Gender	Male	258	67
	Female	130	33
	Total	**388**	**100**
Marital Status	Married	166	43
	Single	91	24
	Widow	62	16
	Widower	44	11
	Divorced/Separated	25	6
	Total	**388**	**100**
Education Level	Primary	186	48
	Secondary	175	45
	Tertiary	22	6
	University	5	1
	Total	**388**	**100**
Average Monthly Income (Ksh)	Less than 5,000	153	39
	5,000-10,000	98	26
	11,000-30,000	97	25
	31,000-50,000	24	6
	50,000-100,000	13	3
	Above 100,000	3	1
	Total	**388**	**100**
Area of Residence	Abogeta East Ward	221	57
	Mitunguu Ward	167	43
	Total	**388**	**100**

Source: Field work (2015)

The background characteristics of the respondents revealed that the study had a good and diverse representation of the study population. In terms of age, majority of the respondents were aged above 40 years. This meant that most of the respondents had sufficient exposure and experience of farming activities in the study areas. In terms of gender, majority of the respondents were males. This was because in the study area, male households' heads were directly responsible for farming choices of the household. Further, in many instances, where a male household head was available, female respondents requested them to be interviewed due to their perceived understanding, insight and experience in the household farming decisions. This resulted into higher number of male respondents than females. Under instances where male or female head of household is not there, their children would be interviewed if they are practicing banana farming.

With regards to marital status, 43% of the respondents were married while only 6% of the respondents were divorced or separated. This meant that most of the decisions on diversification are likely to be consultatively made. In terms of educational level, majority of the respondents had attained primary and secondary education with few respondents with post-secondary education. This means that most of the respondents relied on informal source of employment such as farming. Consequently, diversification decisions would be highly based on the value and returns of their investment on type of farming adopted.

Concerning average monthly income, majority of the respondents were earning less than ksh. 5,000. This showed that most of the respondents did not have the financial capability to invest in farming activities which require huge investment capital. This means that the

respondents were low income earners who would easily embrace investments which had less startup capital and higher market returns. In terms of the area of residence, most of the respondents were from Abgeta East Ward because the Ward has a higher proportion of households which diversified to banana farming compared to Mitunguu Ward.

4.3 Extent of Diversification to Banana Farming

In this study, extent of diversification focused on establishing the proportion of respondents who had embraced banana farming in the area. Further, the study assessed the amount of land acreage under banana farming and the type of cash crops grown before diversification. Diversification to banana farming was used to mean a farming practice where farmers replace their previous crops such as coffee, tea and sorghum with a new high value crop, which in this study was banana farming.

4.3.1   Level of Diversification to Banana Farming

Respondents were asked to state whether they have diversified to banana farming. Results of the study indicated that the highest proportion of the study respondents (72%) had diversified from other cash crops to banana farming, while 28% had not diversified to banana farming (Figure 4.1).
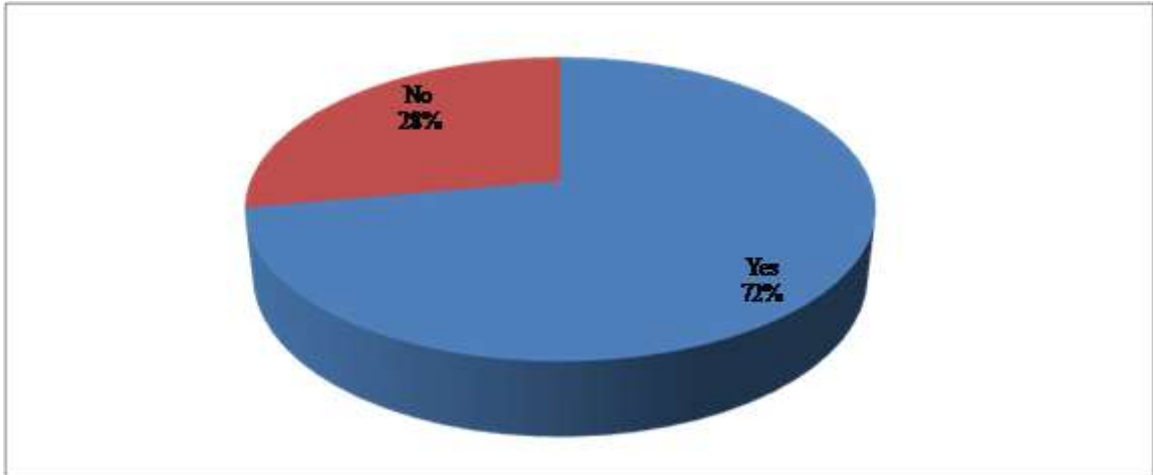
Figure 4.1: Diversification to banana farming

Source: Field work (2015)

According to the study results, diversification to banana farming had increased gradually over a period of time in the study area. The study found out that diversification encompassed a large mix of diverse and complementary activities within agriculture and a movement of resources from low value to high value agriculture as a strategy to maximize the use of land and other resources with a view of avoiding risks and uncertainties due to climatic and environmental factors. Many farmers had embraced banana farming in Imenti South sub-County since the crop is doing better and results in higher revenues compared to other cash crops grown in the area. This finding is similar to a study done by Koigi (2013) which reported Meru to be the leading County in Banana production after Kisii County. The study reported that farmers shifted from low value crops such as coffee and maize to banana farming due to its higher market value returns and favorable ecological conditions.

As a result, many farmers have continued to reduce the amount of land under the cash crop in the area such as coffee, so as to increase the number of acreage under banana farming which is associated with higher revenue generation. Plate 4.1 shows a farmer who had diversified from coffee farming to banana farming in Abogeta East Ward.

Plate 4.1: Banana farming in Imenti sub-County

Source: Field work Data (2015), captured on 15th May 2015

Increase in diversification is fuelled by the desire for better income and changes in ecological conditions in the area. A statement from one of the key informants expounds this point:

"This area is becoming famous with banana farming. Many people are abandoning the precious cash crops and embracing banana farming because it has more returns and is doing better."

Source: Maraa Location in Abogeta East Ward, 17.5.2015.

Among those who had not completely diversified to banana farming, there had been an increasing attempt to try banana farming through a mixed farming approach. Some of the farmers had planted bananas along with other cash crops, and they attributed this to lack of adequate land for complete diversification, fear of losing benefits associated with previous crops, and the high costs associated with banana farming, such as labor and material costs. They explained that such practice enabled them to get revenues from more than one cash crop.

According to this study, diversification to banana farming has been thriving in Imenti South sub-County as a result of abandonment of previous cash crops. When the respondents were asked to cite reasons which made them abandon their previous cash crops, 39% stated it was largely due to poor payment/crop returns, 27% cited poor management of Cooperative Societies, and 21% cited change of ecological conditions. These findings agree with those by Bhattacharyya (2008), who reported that majority of farmers embrace diversification of crops as an alternative to better income. The increasing trend of diversification has improved income level. As a result, despite the limitation of land sizes, there is increase in individual farmer efforts to diversify to banana farming owing to the benefits associated with the crop.

4.3.2 Size of Land Under Banana Farming

When respondents were asked to indicate the size of land under banana production, 41% of said they had less than one acre of land under banana farming, while only 6% of the respondents had more than 5 acres under banana farming (Figure 4.2).
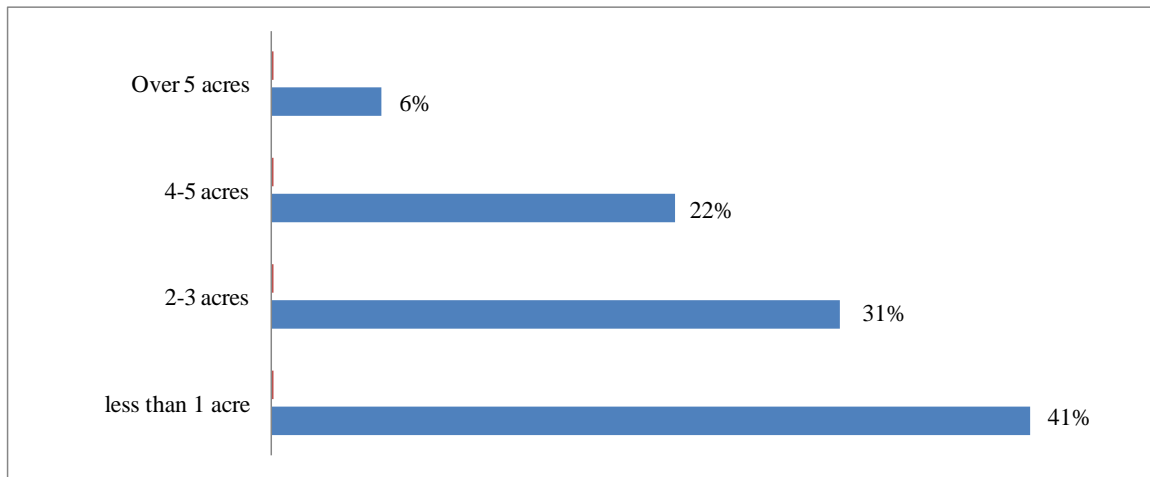
Figure 4.2: Size of land under banana crops

Source: Field work (2015)

The study showed that most of the respondents had very small portions of land sizes which limited diversification to large scale banana farming in the study area. The main cause for small portions of land sizes under banana farming was increased population which led to sub-divisions of land among the main beneficiaries of land from their parents. Study findings by Birthal *et al*. (2007) indicated that driven by scarcity of land as an economic resource limits agricultural production among small scale farmers. However, most farmers have resulted to innovative approaches for optimization of production including practising mixed farming and adopting high value crop diversification.

The study also revealed that the main source of land in the study area was through family inheritance. Buying and leasing of land comprised the least commonly practiced method used to obtain land among the farmers. This was re-affirmed by one of the interviewees who said:

> *"Land size is a great obstacle in diversification to banana farming in this sub-County. You know, most of the farmers in this area obtained their land from their parents as an inheritance. In reality, few people have bought land in this area because not many people are willing to sell their small pieces of land to others. The size of the farmlands is small because the population in this area has increased whereas the size of land remains the same. This means that the sub-divisions obtained by beneficiaries are very small and this limits one's ability to diversify without losing family income for a while."*

Source: Kirendene Location in Mitunguu Ward, 19.5.2015.

This finding is consistent with that by Ashfaq *et al.* (2008), who found that small land sizes were found to limit diversification to banana farming. Farmers with larger farm sizes reported ease in diversifying their crops without the risk of losing the sole source of family income, compared to farmers with smaller farm sizes. This was attributed to the potential of farmers with large farm sizes to diversify to more than one crop with ease, while the cultivation of previous crops continues. This enables such farmers to obtain more income from the many cash crops they cultivate. Such income can also support diversification to other crops such as banana farming which requires high capital especially during the land preparation, planting and growing stages. A study by Ngombi

(2010) also found that farmers continue to be faced with pressure on land due to increasing population which is a key factor in the production process.

4.3.3 Type of Cash Crops Grown Before Diversification to Banana Farming

When the respondents were asked to indicate the type of cash crops they were cultivating before diversifying to banana farming, results showed 65% grew coffee followed by tea 22%. Other types of crops grown were maize, beans and sorghum (Figure 4.3).

	Coffee	Tea	Others
—Series1	65%	22%	13%
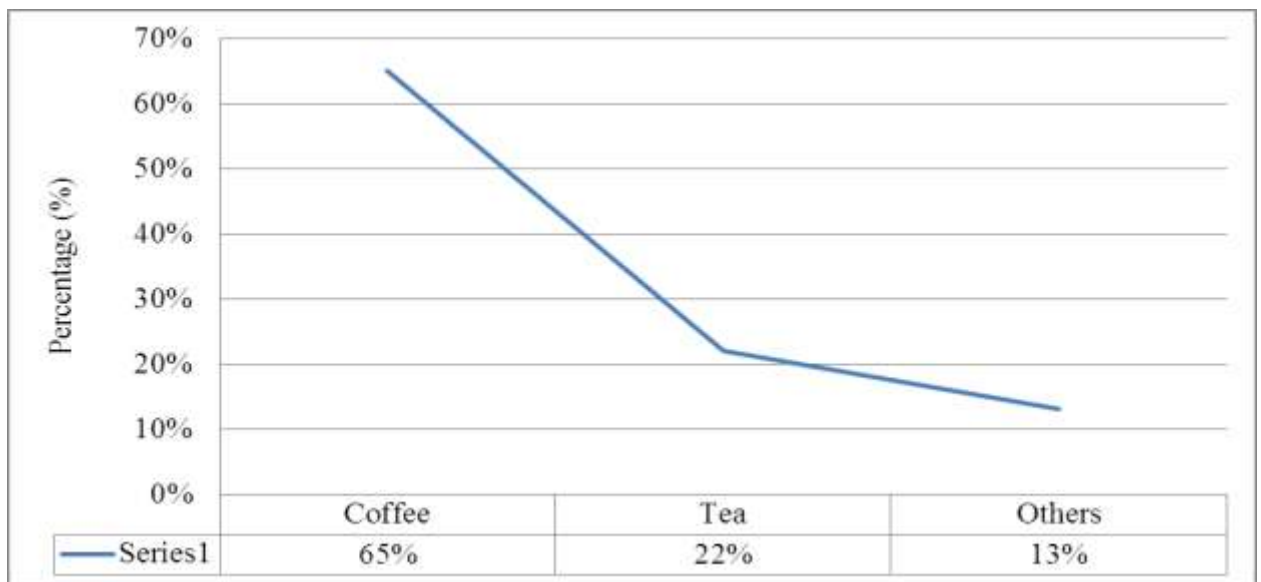
Figure 4.3: Cash crops grown before diversification to banana farming

Source: Field work (2015)

Coffee was the main cash crop grown mainly due to the favorable ecological conditions in the study area which favored the crop as well as high revenues which were enjoyed by the farmers who grew the crop. However, as the revenue generated by these cash crops continued to decline due to market instability, many farmers abandoned the crop in favor of banana farming which was fetching higher revenues. This was brought out in a study

by Bosma *et al*. (2010) who associated diversification to crop market value. The study showed that most farmers would rather incur losses associated with diversification such as labor for uprooting crops and loss of income during the growing period in anticipation of improved returns for a new but more productive crop. However, lack of sufficient information and farmer support such as inputs, ready markets and capital was reported to hamper diversification.

Plate 4.2 shows a farmer who was gradually introducing banana farming in his farm to replace coffee farming.

Plate 4.2: Banana farming in a coffee farm

Source: Field work Data (2015), captured on 15th May 2015

In addition, the study established that the previous cash crops had many challenges which included increase of pest and diseases, poor and delayed payment, poor management of

cooperatives and low market prices. As a result, some farmers shifted to banana farming and reported higher profitability and crop productivity which motivated other farmers to diversify to banana, as illustrated by one of the key informants:

"Yes, many of the farmers were previously cultivating coffee as the main cash crop which was doing well then due to the good environmental conditions of the crop in this area. At the time, the crop had high income and not as it is today. Today, most of them have abandoned and uprooted these crops due to poor payment and instead planted bananas which are doing very well in terms of productivity and market sales. Some years to come, if the government does nothing to stabilize and improve its prices, such cash crops will disappear completely from this area."

Source: Mwichiune Location in Abogeta East Ward, 16.5.2015.

Over a period of time, diversification to banana farming has been associated with improved living standards as banana give more returns as compared to the crops grown previously. Further, banana farming provides an alternative source of food besides fetching income for the farmers which gives it an added advantage over other cash crops previously grown in the area. This has made farmers to favor banana farming over the other previously grown cash crops.

4.4 Socio-Economic Factors Influencing Diversification

This section presents results of socio-economic factors that influence diversification to banana farming. The factors are presented and organized according to: age, level of

education, area of residence, gender, marital status, average monthly income, land size, labor and means of transport.

4.4.1 Age and Level of Education

The study sought to determine the influence of age on diversification to banana farming. Regression analysis results revealed that age of the farmer was significantly associated with diversification to banana farming (P=0.013).

The regression coefficient of the study was at 0.05. Where regression coefficient was less than 0.05 (P<0.05), the variable was significant to diversification and the null hypothesis testing it was rejected. But where regression was more than 0.05 (P>0.05), the variable was not significant to diversification and the null hypothesis testing it was not rejected. Therefore, the hypothesis that there is no significant relationship between age and diversification to banana farming was rejected. A farmer who was aged 31-40 years and 41-50 years was 1.959 and 1.960 times more likely to diversify to banana farming respectively, compared to one who was over 60 years old (P=0.013; CI=1.545-2.440) (Table 4.2).

Table 4.2: Influence of Age and Level of Education on Diversification

						CI for EXP (B)	
Variable	Beta (β)	T	df	P-value	Exp (B)	Lower	Upper
Age							
18-30 years	0.120	0.964	1	0.801	1.128	0.444	2.863
31-40 years	1.042	10.985	1	0.033	1.959	1.413	2.324
41-50 years	1.023	15.207	1	0.013	1.960	1.545	2.440
51-60 years	0.848	4.462	1	0.063	1.465	0.975	1.864
Over 60 years					1.000		
Level of Education							
Primary					1.000		
Secondary	0.916	19.852	1	0.004	4.230	2.957	6.798
Tertiary	0.955	10.701	1	0.014	2.876	2.041	3.599
University	0.849	9.692	1	0.001	4.987	4.051	5.675

Source: Field work Data (2015)

This means that young farmers embrace diversification much more easily than their elder counterparts. Therefore, age of the farmer is an important factor which predicts the potential of a farmer to diversify to banana farming. According to the study, farmers who are younger tend to be high risk takers and tend to embrace diversification for wealth and income creation. They have also more energy to invest in high value crop farming. Therefore, when a new opportunity for making money is identified, such young farmers are easier and eager to embrace it since they have energy and good source of labor for such a demanding farming activity.

The findings are consistent with Ibrahim et al. (2009) who found that younger farmers embrace diversification more easily than those who were older. The study found that younger people value and embrace farming opportunities because of perceived higher income and revenues which are associated with better living standards and greater wealth. Therefore, diversification to banana farming is highly perceived by young people

as a venture which has the potential of transforming their lives and improving their economic status.

Regression analysis results showed that level of education was significantly associated with diversification to banana farming (P=0.004). Therefore, the hypothesis that there is no significant relationship between level of education and diversification to banana farming was rejected. According to this study, farmers with secondary level of education were 4.230 more likely to diversify compared to those with primary level of education (P=0.004, CI=2.957-6.798).

This suggests that farmers with higher education attainment have a higher probability of embracing banana farming than those with lesser education levels. The study found higher education level to be correlated with ease to acquire better knowledge and skills on new farming practices and ability to articulate important issues key in successful farming as explained by one of the key informants:

> *"Farmers who are educated are the ones who easily embrace diversification to new but potentially beneficial crop farming. In the County, most of those who came around to buy land and practice banana farming are educated and therefore, able to appreciate benefits associated with the crop besides having the required capital."*

Source: Kirendene Location in Mitunguu Ward, 18.5.2015.

Based on this study, and supported by Abro *et al*. (2010), farmers with higher education attainments are able to carry out preliminary market and crop-related research such as pricing, costs of production and possible risks which form the basis for adopting new

farming business such as banana farming. This is important in decision-making and resource allocation which are important components of venturing in a farming business.

4.4.2   Average Monthly Income and Gender

Regression analysis results revealed that average monthly income had a statistically significant relationship with diversification to banana farming (P=0.001). A farmer who had an average monthly income of over Ksh.100,000 was 4.987 times more likely to diversify to banana farming compared to one who had Ksh 51,000-100,000 (P=0.012; CI= 2.019-4.488). This showed that a farmer who earns over Ksh.100,000 was more likely to diversify to banana faming than one earning less than Ksh.5,000 (P=0.001; CI= 4.051-5.375) (Table 4.3).

Table 4.3: Influence of Income and Gender on Diversification

Variable	Beta (β)	T	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
Average monthly income							
Less than Kes 5000					1.000		
Kes 5000-10000	0.765	1.661	1	0.416	0.185	0.074	1.942
Kes 11000-30000	0.724	0.988	1	0.665	0.254	0.096	0.953
Kes 31000-50000	0.888	18.675	1	0.024	1.312	1.049	2.423
Kes 51000-100000	1.521	12.502	1	0.012	3.418	2.019	4.488
Over 100000	1.018	19.158	1	0.001	4.987	4.051	5.375
Gender							
Male	0.047	1.629	1	0.866	0.954	0.755	1.642
Female					1.000		

Source: Field work Data (2015)

These findings indicate that farmers with higher income levels had higher abilities to diversify to banana farming. This is similar to the work of Rane and Bagde (2006) in

which it was found that individuals with higher income were able to obtain resources required for starting and sustaining productive crop farming like banana farming. Farmers who have access to higher incomes and financial resources possess the ability to afford and acquire necessary materials and resources needed for successful diversification to banana farming. Such resources include water, manure, labor, land, access to market and professional support for high productivity. This makes the variable "income level" an important aspect that influences motivation and ability to successfully diversify one's farming.

Regression analysis results revealed that gender was not significantly associated with diversification to banana farming (P=0.866). This means that the sex of a farmer whether male or female did not have a significant impact on his/her decision to diversify to a new crop.

4.4.3   Marital Status and Area of Residence

Regression analysis showed that marital status was not significantly associated with diversification to banana farming (P=0.068). Therefore, the hypothesis that there is no significant association between marital status and the diversification to banana farming was not rejected (Table 4.4).

Table 4.4: Influence of Marital Status and Area of Residence on Diversification

| Variable | Beta (β) | t | df | P-value | Exp (B) | CI for EXP (B) | |
						Lower	Upper
Marital status							
Married	1.387	3.918	1	0.068	1.967	1.314	3.522
Single	1.44	4.005	1	0.145	0.219	0.103	0.986
Widow	1.728	5.232	1	0.222	3.228	2.281	3.733
Widower	1.531	3.861	1	0.494	2.625	1.870	3.305
Divorced/Separated							
Area of Residence							
Abogeta East Ward	0.339	14.586	1	0.021	1.404	0.828	2.379
Mitunguu Ward					1.000		

Source: Field work Data (2015)

The study established that, whether a farmer was married or not, their decision to diversify was based on the returns on investment and benefit associated with the new crop and not their marital status.

In relation to residential area, regression analysis results revealed that area of residence was significantly associated with diversification to banana farming (P=0.021). Therefore, the hypothesis that there is no significant relationship between area of residence and diversification to banana farming was rejected. A farmer who was a resident of Abogeta East Ward was 1.404 times more likely to diversify to banana farming compared to a farmer residing in Mitunguu Ward (P=0.021; CI= 0.828-2.379). This meant that farmers in Abogeta East Ward were more readily able to adopt banana diversification than those of Mitunguu Ward. The study found that residents of Abogeta East Ward had diversified to banana farming to a larger extent than those in Mitunguu Ward. This was also attributed to the fact that Abogeta EastWard has more irrigation water sponsored by the

government and other group projects, hence favoring banana productivity than other areas.

Therefore, areas with favorable ecological conditions for banana production have been favored for production and hence banana diversification rate is high. This was supported by findings from a study by Ngombi (2010) who reported that areas with such ecological conditions are associated with higher productivity and returns for banana farming hence a motivation for diversification.

4.4.4   Land Size

When respondents were asked to state the size of their land in acreage, their responses indicated that 40% of the respondents had land size of less than 1(one) acre while only 5% had more than 5(five) acres of land (Figure 4.4).

	Less than One Acre	1-2 Acres	3-5 Acres	Over 5 Acres
■ Series1	40%	32%	23%	5%
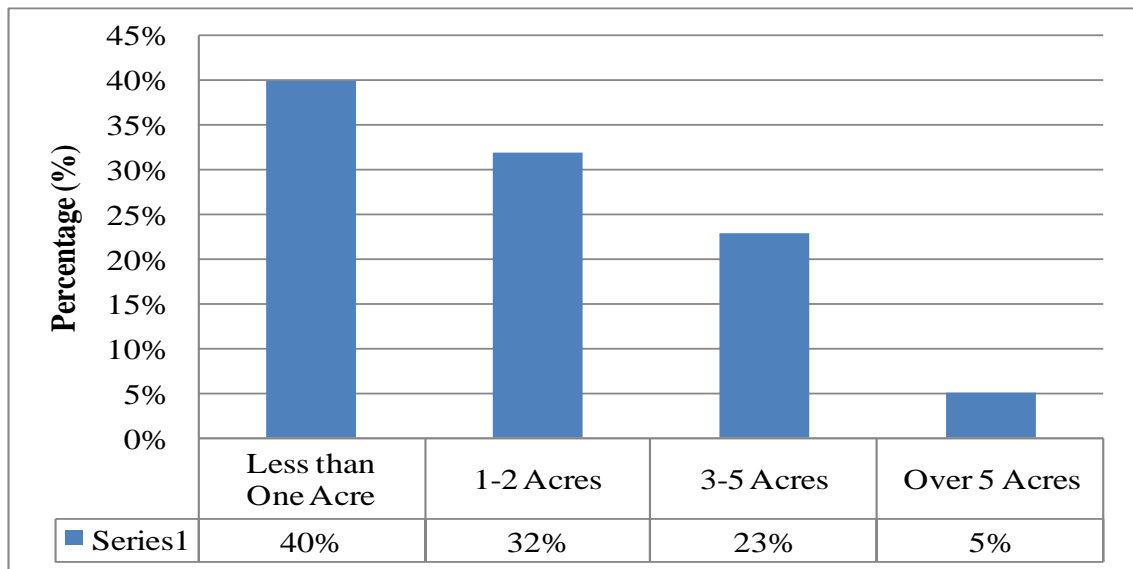
Figure 4.4: Farmers' Land sizes

Source: Field work (2015)

Regression analysis results revealed that land size was significantly associated with diversification to banana farming (P=0.016). Therefore, the hypothesis that there is no significant relationship between the land size and diversification to banana farming was rejected. A farmer who had over 5 acres of land was 2.437 times more likely to diversify to banana farming compared to a farmer who had less than less than 1 acre of land (P=0.014, CI= 1.965-3.312). In addition, a farmer who had 1-2 acres of land was 1.280 times more likely to diversify to banana farming compared to one who had less than one acre of land (p=0.016, CI= 0.994-2.791) (Table 4.5).

Table 4.5: Influence of Land Size on Diversification

Variable	Beta (β)	T	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
Land size							
1-2 acres	1.272	7.776	1	0.016	1.280	0.994	2.791
2-3 acres	0.855	10.46	1	0.001	1.743	1.460	2.238
Over 5 acres	0.829	9.179	1	0.014	2.437	1.965	3.312
Less than 1 acre					1.000		

Source: Field work Data (2015)

This indicates that bigger land sizes predict higher probability or potential for diversification to banana farming. As already stated earlier, small size of lands owned by majority of the study respondents is attributed to increased population in the study area that led to sub- divisions of available land by family members. Thus, resulting in land sizes for individual family members being reduced considerably, leading to many farmers ending up with land which was less than one acre. In addition, the respondents said that

the cost of land in the area is very high and not many farmers can afford to buy, even getting someone to sell land is also a problem.

This finding was in line with a study conducted by Abro *et al*. (2010) who found land size to be a major economic resource which remains a barrier to diversification efforts among developing countries which report high population growth. Proper use of the scarce land size by putting it into an economic activity such as a high value crop which brings maximum productivity has been reported as a key solution to the problem of declining land sizes for agricultural activities. This study reports that diversification to banana farming presents an opportunity for obtaining higher productivity and yields for small scale farmers due to its high productivity and revenue outputs.

4.4.5 Availability of labor and means of ttransportation

When respondents were asked whether labor for banana farming was readily available, the findings revealed that 65% had access to adequate labor for banana production. The labor required is mainly casual during weeding and harvesting. However, concerning having a reliable means of transporting, 63% of them said they had no access to reliable transport for their farm produce to the marker because most of the roads are impassable during rainy seasons. Many farmers, whose farms are more than two kilometers away from the markets, used motorbikes and vehicles to transport the bananas into the markets, which adversely affected their returns. For instance, some farms are located over 10 kilometers from the market which is costly to transport products to market (Figure 4.5).
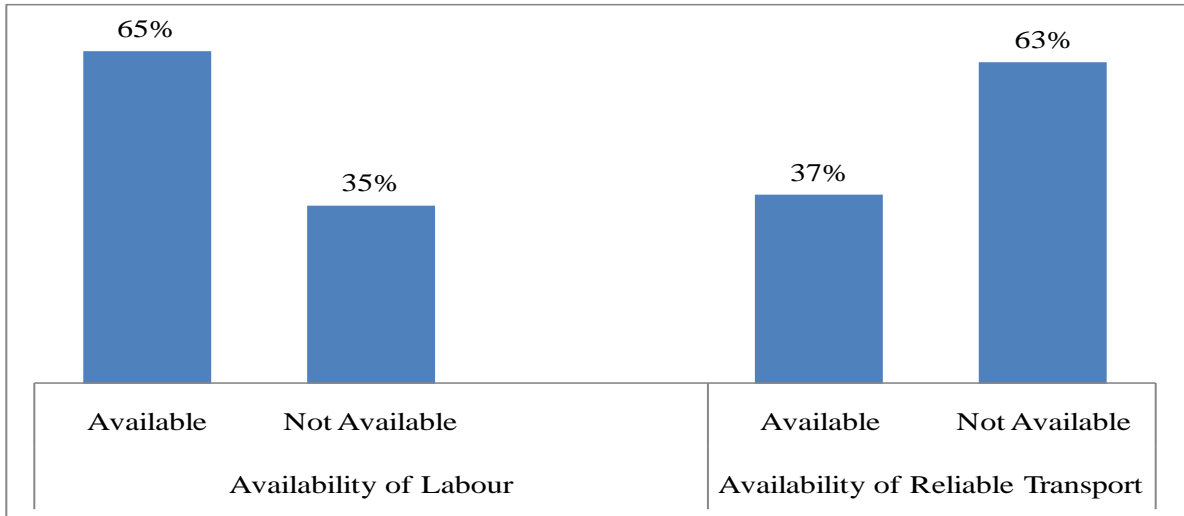
Figure 4.5: Availability of adequate labor for banana production

Source: Field work Data (2015)

Regression analysis results revealed that availability of labor was significantly associated with diversification to banana farming (P=0.014). Therefore, the hypothesis that there is no significant relationship between labor and diversification to banana farming was rejected. A farmer who had access to adequate labor was 2.847 times more likely to diversify to banana farming compared to a farmer who had no access to adequate labor (P=0.014, CI= 2.847-2.006) (Table 4.6).

Table 4.6: Influence of Labor and Transport on Diversification

Variable	Beta (β)	T	df	P-value	Exp(B)	CI for EXP (B) Lower	Upper
Availability of Labor							
Yes	0.166	11.396	1	0.014	2.847	2.006	3.419
No					1.000		
Availability of Reliable Means of Transport							
Yes	0.239	1.781	1	0.098	0.787	0.463	1.338
No					1.000		

Source: Field work Data (2015)

This suggests that farmers who had sufficient access to labor had higher chances of diversifying to banana farming compared to those who did not have access to sufficient labor. Availability of sufficient labor for banana productions provides an opportunity for higher productivity through proper and appropriate farming practices which do not compromise the quality of farming, as revealed by one key informant:

> *"From experience, high productivity requires farmers to provide necessary manpower at every stage of the banana production to avoid wastages, destruction of the crop and resultantly poor yields. In this area, many people are skilled in banana farming although professional training is required to scale up their farming practices for higher production. You find that when one has finished tending their farm, they become a source of labor to others who pay them wages for the services provided which makes it easy to find labor in this area."*

Source: Kothine Location in Abogeta East Ward, 20.5.2015.

This is similar to a study by Macharia *et al*. (2010) which found that sufficient and appropriate manpower and skills are necessities throughout banana production process including land preparation, planting, growing, harvesting and post harvesting stages. Plate 4.3 shows laborers tending to banana crops.

Plate 4.3: Laborers weeding banana crops

Source: Field work Data (2015), captured on 22nd May, 2015

Labor for banana farming is readily provided by locals who are compensated with wages. Such labor is also perceived as a source of income by locals who provide these services. However, Macharia *et al*. (2010) observed that many of the farmers are unable to afford adequate and skilled labor due to high costs associated with this farming. This adversely affects the productivity of such farms which discourages diversification.

In relation to transportation means, regression analysis results revealed that there was no significant association between availability of reliable means of transportation and diversification to banana farming (P=0.098). Therefore, the hypothesis that there is no significant relationship between means of transport and diversification to banana farming was not rejected. Most of the roads in the study area were not all weather roads which made them impassable during rainy season by lorries and other motor vehicles. Poor transport means was a challenge experienced by many farmers during rainy seasons.

In some instances, banana harvesting is done during rainy seasons or immediately after the rains hence the roads are always in bad condition which makes the banana transportation to the market sometimes impossible as emphasized in the following statement by a key informant:

"Transportation from the banana farms is a challenge especially during rainy seasons when most of the feeder roads to farms are impassable. This is a challenge to farmers who pay extra cost of transporting banana to the market. This reduces the revenue. However, many of the farmers use motorbikes or even human labor which makes it easier to transport the harvest during such period which reduces losses. Although this is a challenge to farmers, it doesn't prevent many of them from diversification."

Source: Ndamene Location in Mitunguu Ward, 21.5.2015.

The findings from the study revealed that poor road networks do not deter diversification to a larger extent because farmers use possible alternative means of transport in such instances as stated above (Plate 4.4).

Plate 4.4: Alternative means of transporting bananas to the market

Source: Field work (Data 2015), captured on 3rd June 2015

This finding contradicted that by Edmeades *et al*. (2006) who found that lack of transportation posed a great challenge to banana farming in Uganda. This difference in findings can be explained by the proximity of farms studied to reliable road networks, especially tarmac roads. In this study, although the feeder roads to farms are impassable and poor during rainy seasons, the farms are not far from the main roads which are reliable in all weathers for transporting the products to larger market within and outside the country.

4.5 Institutional Factors Influencing Diversification

This section presents results of Institutional factors and their influence on diversification to banana farming. The institutional factors are presented and organized in this section as follows: availability of farm inputs and availability of hybrid planting materials, access to loans and access to extension services.

4.5.1 Availability of Farm Inputs and Hybrid Planting Materials

When respondents were asked if they had access to farm inputs like fertilizers, pesticides and manure, 61% said that farm inputs were not readily available. Respondents were also asked if they had access to hybrid planting materials such as tissue cultures for banana farming, results indicated that 62% of the respondents did not have access to hybrid planting materials (Figure 4.6).
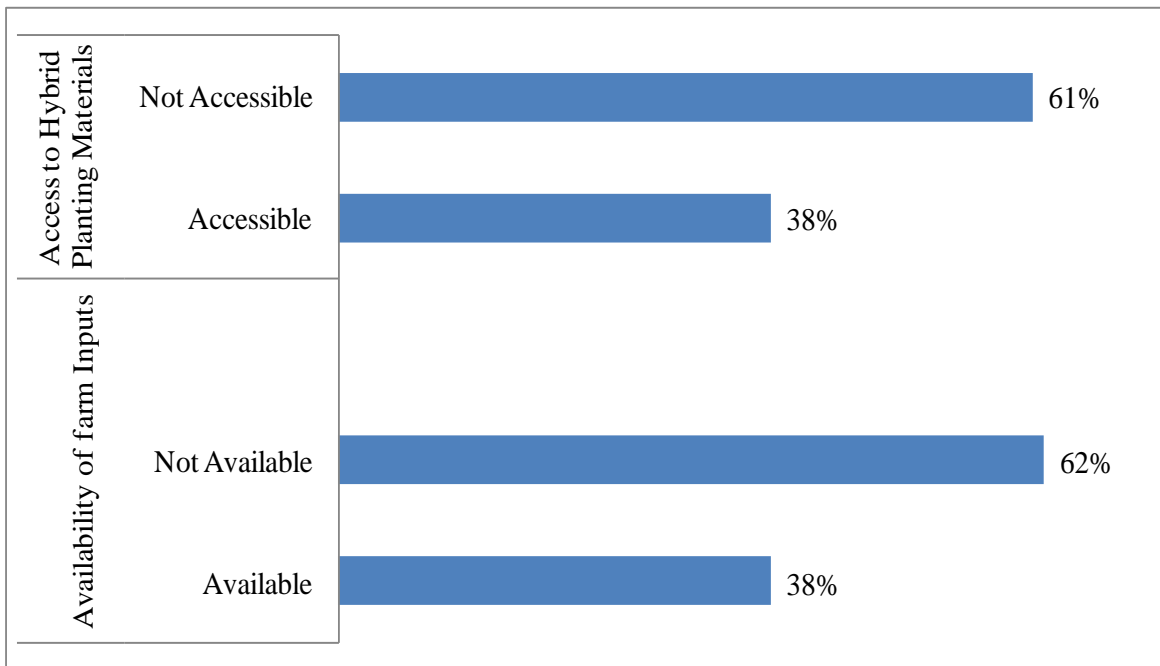
Figure 4.6: Access to farm inputs and hybrid planting materials

Regression analysis results indicated that access to farm input was significantly associated with diversification to banana farming (P=0.024). Therefore, the hypothesis that there is no significant relationship between availability of farm inputs and diversification to banana farming was rejected. Farmers who had access to farm inputs were 2.851 times more likely to diversify to banana farming compared to those who had no access to farm inputs (P=0.024; CI= 2.186-3.153) (Table 4.7).

Table 4.7: Influence of Farm Inputs and Hybrid Planting Materials on Diversification

Variable	Beta (β)	T	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
Availability of Farm Inputs							
Available	0.161	12.905	1	0.024	2.851	2.189	3.153
Not Available					1.000		
Availability of Hybrid Seedlings							
Available	0.416	17.996	1	0.012	2.660	1.992	3.693
Not Available					1.000		

Source: Field work Data (2015)

This suggests that access to farm inputs increased the ability of farmers to embrace new crops. Studies have shown that where appropriate farm inputs are unavailable, crops productivity reduces which adversely affects crop revenues (Mwangi *et al*., 2012). As a result, this discourages farmers leading to the abandonment of the crop as expounded in one of the key informant's statement:

   "Banana crops require adequate inputs such as manure and pesticides for it

   to be highly productive and also produce healthy and marketable products.

Some of the farmers are frustrated by lack of inputs which reduces productivity and revenues because as at now, there is no sufficient supply of input from government for banana farmers."

Source: Ndamene Location in Mitunguu Ward, 20.5.2015.

The study revealed that banana farmers do not have a well-established marketing system such as a Cooperative Society which can be tasked with ensuring sufficient and regular supply of required inputs such as manure. Similar findings by Ibrahim *et al*. (2009), lack of sufficient access to farm inputs has led to reduction in banana production among farmers who do not have adequate financial ability to acquire them. Diversification to banana farming requires reliable support of farmers in relation to inputs and other logistical support to sustain the crop productivity and revenue generation.

Regression analysis results revealed that access to hybrid seedlings or planting materials was significantly associated with diversification to banana farming (P=0.012). Therefore, the hypothesis that there is no significant relationship between availability of hybrid planting materials and diversification to banana farming was rejected. A farmer who had access to hybrid seedlings was 2.660 times more likely to diversify to banana farming compared to a farmer who had no access to hybrid seedlings (P=0.012, CI= 1.992-3.693). This suggests that farmers who had easy access to hybrid banana planting materials had high potential to embrace banana farming than those who did not have access to such materials. Hybrid banana materials for planting provide farmers with an added advantage of having crops which are disease resistant and of high productivity, hence higher returns in the market. This was also illustrated by a key informant's statement:

"Providing farmers with hybrid seedlings at low cost has helped encourage farmers to diversify to banana farming. These seedlings have high productivity, higher resistance to disease and pests and do well in different ecological conditions compared to the ordinary seedlings."

Source: Mwichiune Location in Abogeta East Ward, 21.5. 2015.

In addition, the study also revealed that high cost of hybrid seedlings can discourage small scale farmers from diversifying to banana farming. This is because inability to access planting materials for banana growers results in farmers using locally available untreated planting materials from other farmers which have low productivity, market and market returns (Dubois *et al*., 2006). This deters farmers from diversification due to its poor performance hence the need for providing farmers with healthy and adequate planting materials which are hybrid and ecologically favorable.

4.5.2   Access to Loan Facilities and Extension Services

When respondents were asked if loans were easily accessible to support farmers in their farming activities, the results indicated that 74% of the farmers did not have easy access to loan facilities to facilitate their farming activities. They were also asked if extension services (such as field education on farm preparation, planting, disease control, harvesting and post harvesting practices) to farmers on banana farming were available. Findings showed that 75% of them did not have access to field extension services (Figure 4.7).
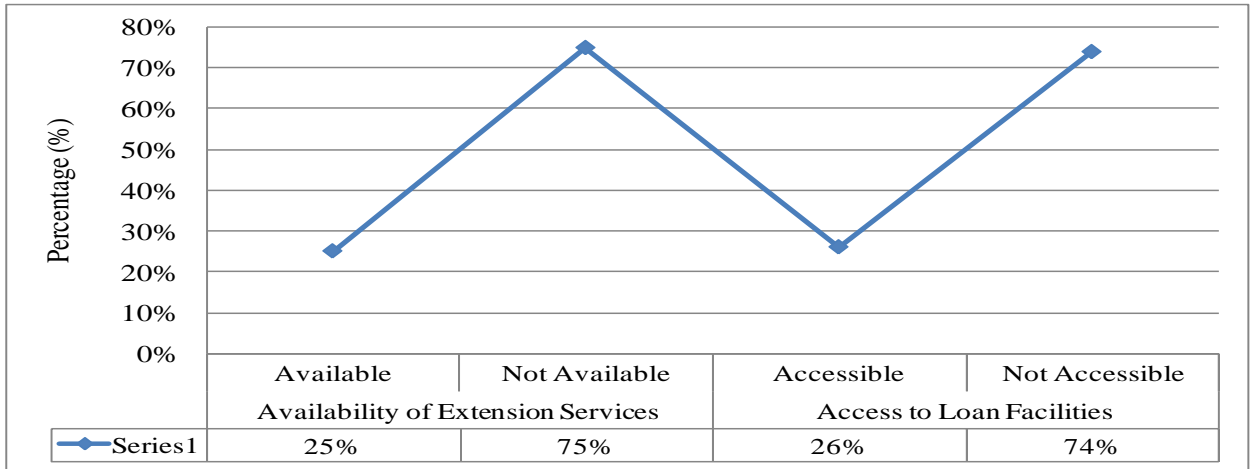
Figure 4.7: Access to loan facilities

Source: Field work Data (2015)

Regression analysis revealed that access to loan facilities for supporting banana farming was not significantly associated with diversification to banana farming (P=0.656). Therefore, the hypothesis that there is no significant relationship between access to loan facilities and diversification to banana farming was not rejected (Table 4.8).

Table 4.8: Influence of Extension Services and Loans on Diversification

Variable	Beta (β)	T	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
Access to Loans							
Accessible	0.178	0.698	1	0.656	0.837	0.381	1.835
Not Accessible					1.000		
Availability of Extension Services							
Available	0.242	1.353	1	0.553	0.785	0.354	1.743
Not Available					1.000		

Source: Field work Data (2015)

This finding was contrary to a study by Mwangi *et al.* (2012) who found that access to source of capital for supporting business farming such as agricultural loans influence

diversification to banana farming. This difference could be attributed to the fact that most of the farmers in the study area have small land sizes which are already cultivated, which do not require a large capital to prepare and start banana production. In addition, seedlings in form of suckers are readily available from surrounding farmers which reduces cost of acquiring seedlings in small scale farming as emphasized by a key informant;

"For small scale farmers, access to credit facilities is not an important factor for diversification. Most of them prepare their own lands and obtain planting materials from their neighboring farms at very low cost. However, medium to large scale farmers can be limited by lack of alternative funds such as credit facilities which is required for acquiring labor and other farming techniques such as water piping and proper farm management."

Source: Ndamene Location in Mitunguu Ward, 22.5.2015.

As illustrated above, lack of access to loan facilities may not significantly limit diversification to banana farming. However, lack of sufficient funds has resulted in poor farming techniques such as ignoring guidelines for banana farming especially input additions, spacing and spraying against pest and diseases (Rahman and Sanzidar, 2008). The outcome of this on one hand is low production of banana and revenues from the investment. As a result, many farmers have not yet attained maximum utilization of their farms due to inappropriate farming techniques caused by financial constraints.

On availability of extension services, regression analysis revealed that availability of extension services was not significantly associated with diversification to banana farming

(P=0.553). Therefore, the hypothesis that there is no significant relationship between availability of extension services and diversification to banana farming not rejected. This means that lack of extension services for banana farmers do not significantly influence the decision of farmers to venture into banana farming. This can be attributed to the low incidences of banana disease in the area especially where pure and disease resistant seedlings are readily available to the farmers who borrow or buy from other farmers in the area.

These finding results contradict findings from a study by Rane and Bagde (2006) carried out in India which reported that lack of extension services can result in abandonment of a cash crop in favor of those with professional support. This contradiction in findings can be as a result of difference in study context since India is a more developed country which provides its farmers with more professional and technical support compared to a developing country like Kenya.

However, the study results showing availability of extension services influences diversification was supported by the previous study by Koigi (2013) who carried a study in Kenya on banana production which found extension services played a significant role in a farmer's decision to diversify, especially during the production process in order to produce health seedlings.

4.6 Benefits which Influence Diversification

This section presents results of the benefits of diversification and how these influence the farmers' decision to either diversify to banana farming or not. The benefits are presented

and organized in this section as follows: high market returns and crop productivity, and access to reliable markets for the products and improvement in living standards.

4.6.1 High Market Returns and Crop Productivity

When respondents were asked to state key benefits they received from banana farming, results revealed that 86% of the respondents had realized high market returns (improved crop revenue), while 71% cited higher productivity as a benefit realized after diversification to banana farming. Farmers who had diversified to banana farming reported increasing their farm production capacity which translated to increase in revenues. This had empowered many of the farmers to improve their standards of living; they could easily educate their children and meet basic family needs (Figure 4.8).


	High Market Returns		High Productivity	
	Yes	No	Yes	No
Series1	86%	14%	71%	29%
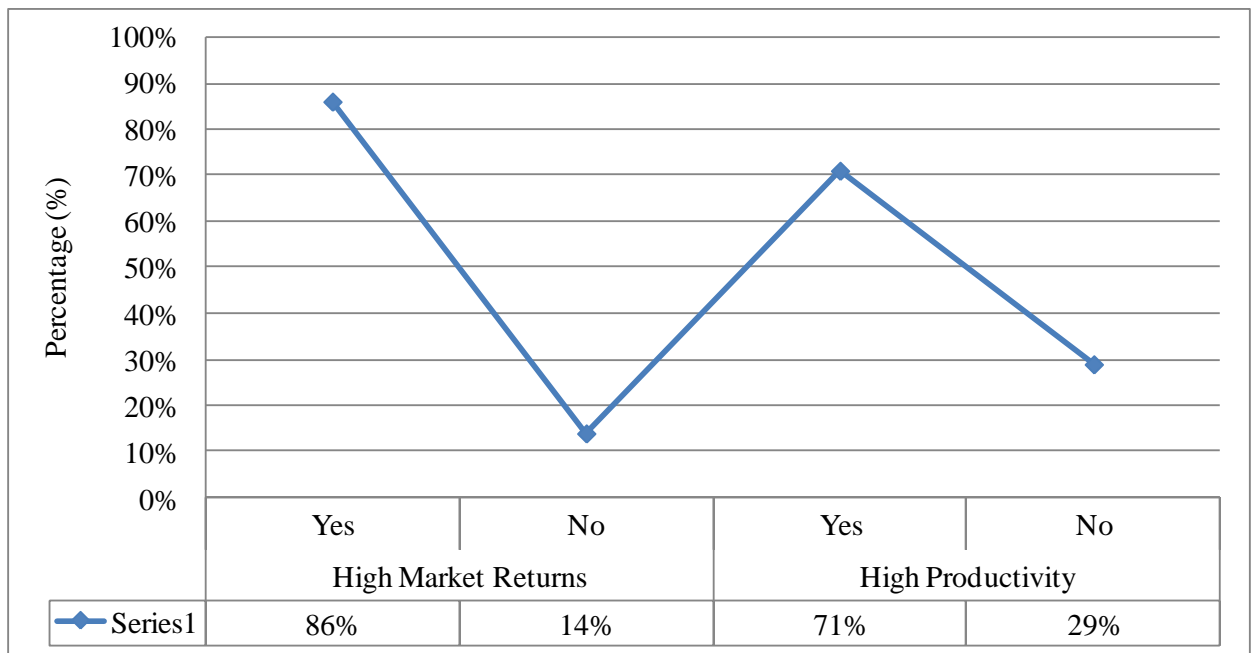
Figure 4.8: High Market Returns and Crop Productivity

Source: Field work (2015)

Regression analysis revealed that high crop revenues/returns was significantly associated with diversification to banana farming (P=0.001). Therefore, the hypothesis that there is no significant relationship between high market returns and diversification to banana farming was rejected. A farmer who had experienced high pay for the banana products was 5.489 times more likely to diversify to banana farming compared to a farmer who had not experienced better pay for the harvested products (P=0.001, CI= 4.317-7.755) (Table 4.9).

Table 4.9: Influence of Market Returns and Crop Productivity on Diversification

Variable	Beta (β)	T	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
High Market Returns	0.715	10.444	1	0.001	5.489	4.317	7.755
High Crop Productivity	0.352	17.976	1	0.023	2.703	2.249	3.215

Source: Field work Data (2015)

This implied that farmers who obtained higher returns from their banana farms compared to other cash crops had higher probability of expanding their farms under banana farming. Choice of cash crops is greatly informed by the level of revenues associated with the crop compared to other crops. Overtime, evidence of higher returns from banana farming has attracted and inspired other farmers to embrace banana farming due to its higher turnover sales, as said by one of the key informants:

"Definitely, the rate of returns from a crop over a specified period of time is

the most significant factor which guides an individual farmer's decision to

grow a new cash crop. For instance, banana crops have been shown to give higher sale returns within a short span of time and for a long period of time, the farmer continues to enjoy revenues from the continued harvest which has inspired many of the farmers to abandon the previous crops for banana crop."

Source: Kothine Location in Abogeta East Ward, 21.5.2015.

This is in line with study results by Van de Berg *et al.,* (2007) who reported that expectations and/or experience of higher pay and crop returns motivated farmers to embrace banana diversification. Such crops are associated with ease in accumulating wealth and poverty alleviations compared to the commonly grown cash crops such as coffee whose revenues have been not only unstable but also declining. Plate 4.5 shows healthy banana products being loaded to a transportation lorry after being bought in one of the local markets in study area.

Plate 4.5: Harvested bananas being loaded in a lorry from a local market

Source: Field work Data (2015), captured on 3rd June 2015

In addition, high productivity of banana crops was significantly associated with diversification to banana farming (P=0.023). Therefore, the hypothesis that there is no significant relationship between high crop productivity and diversification to banana farming was rejected. A farmer who had experienced high productivity of bananas was 2.703 times more likely to diversify to banana farming compared to a farmer who had not experienced high productivity (P=0.023, CI= 2.249-3.215). This means that farmers who perceive banana farming to result into higher output per specified acreage of land have higher chances of diversifying to banana farming than those who perceive otherwise. For instance, farmers who get higher productivity and increased income from one acre under banana crop compared to tea over a specified period of time are easier to scale up the

amount of land under banana farming overtime to maximize the output realized from the investment as emphasized by one key informant:

"Banana crop has higher productivity per acre of land compared to other cash crops such as coffee and tea which enables the farmer to obtain improved income. This enables farmers to get higher returns from banana farming than other cash crops which motivate them to scale up their land under banana crops."

Source: Kothine Location in Abogeta East Ward, 22.5.2015.

4.6.2   Access to Ready Market and Improved Living Standards

When respondents were asked to cite benefits realized after diversification to banana farming, 64% of them said they have ready banana markets within their gardens where buyers trade with them directly from the garden. More so there are set market places in the study area where farmers and buyers meet in certain days of the week and sell their banana while 76% of the respondents cited improved standard of living (Figure 4.9).

Series1	Access to Reliable Markets		Improved Living Standards	
	Yes	No	Yes	No
	64%	36%	76%	24%
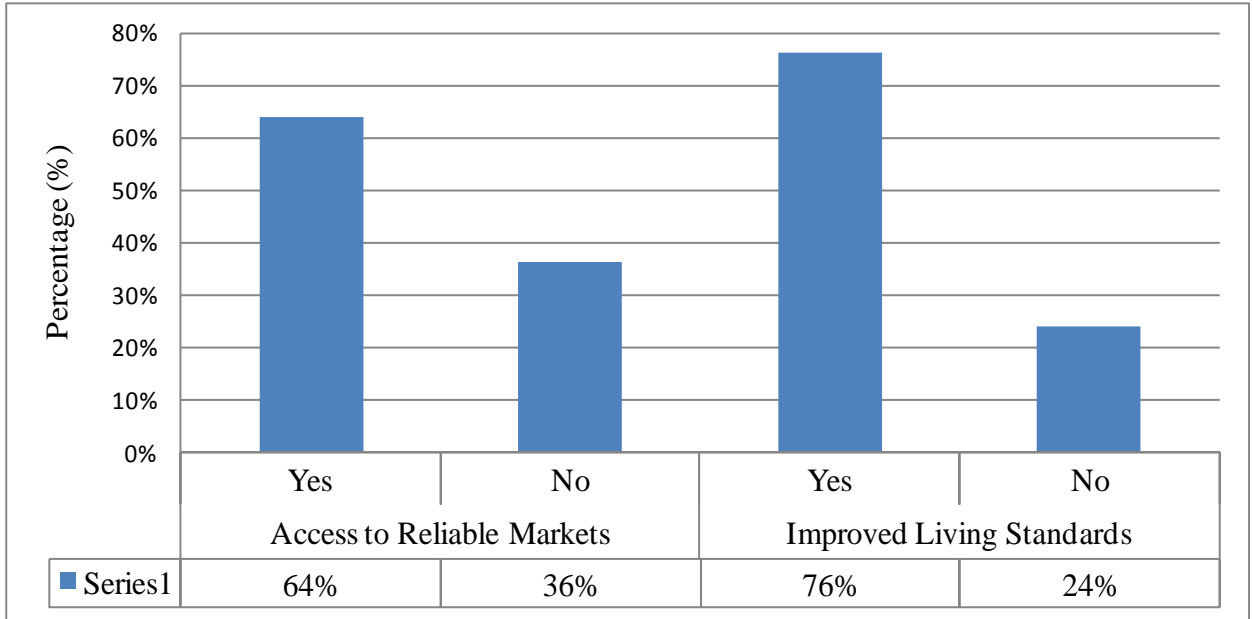
Figure 4.9: Improved standard of living

Source: Field Data work (2015)

Regression results showed that perceived access to reliable market (i.e. market which was predictable and stable) as a benefit was significantly associated with diversification to banana farming (P=0.038). Therefore, the hypothesis that there is no significant relationship between access to reliable market and diversification to banana farming was rejected. A farmer who had access to reliable market was 4.848 times more likely to diversify to banana farming compared to a farmer who did not have access to reliable market (P=0.038, CI= 3.617-7.651) (Table 4.10).

Table 4.10: Influence of Market and Living Standards on Diversification

Variable	Beta (β)	t	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
Access to reliable market	0.642	13.451	1	0.038	4.848	3.617	7.651
Improved living standards	0.391	16.087	1	0.004	3.001	2.803	4.012

Source: Field work (2015)

This implied that farmers who felt they had easy access to the market had higher likelihood of diversifying to banana farming compared to those who felt they did not have sufficient access to the market. According to the study, availability of ready market indicates high potential for the crop to generate the intended revenues and income. Similar to results of a study by Saraswati *et al.* (2011), readily available market for the banana products motivates farmers to venture into banana farming.

Access to ready market for the banana products is perceived to be an assurance for fast returns for the investment. In addition, most farmers can easily sell their products from the farm to other farmers and within the local market which makes the crop an easy source of revenue compared to other cash crops produced in the area. Regression analysis results indicated that improved living standards as a perceived benefit was also significantly associated with diversification to banana farming (P=0.004). Therefore, the hypothesis that there is no significant relationship between perceived improvement of living standards and diversification to banana farming was rejected. A farmer who perceived better living standard as a benefit of banana farming was 3.001 times more likely to diversify to banana farming compared to a farmer who had not perceived banana market to improve standard of living (P=0.004, CI=2.803-4.012).

This means that since the goal of every person is to impact positively to the improvement of their living standards and those of their families, farmers who associated banana farming with better life opportunities such as poverty alleviation and increase in income levels are more receptive of banana farming. Therefore, higher productivity and returns associated with banana farming is an important motivation for embracing diversification. This finding is in line with a study by Josh *et al*. (2007) who found diversification to favor high-value commodities and crops especially fruit crops like bananas which fetch higher income and have higher market returns. Banana farming as a high-value commodity with a ready market has been preferred for its ability to augment income, empower farmers to educate their children, help in meeting household and other daily expenses as well as engage in other business activities through capital generation from the high sale returns. As a result, banana farming has yielded many benefits which have been key in creating self-employment and alleviation of poverty among those embracing it.

4.7 Constraints to Diversification

This section presents results of constraints of diversification and their influence on farmers' decision to diversify to banana farming. The constraints of diversification according to respondents included: water shortage for irrigating banana crops, inadequate farm inputs, fluctuation of market prices, small land sizes, soil infertility, and inadequate knowledge/skills for banana farming.

4.7.1 Water Shortage And Inadequate Farm Inputs

When respondents were asked to cite constraints associated with diversification, 73% named shortage of water during dry seasons of the year, and 76% of them cited inadequate farm inputs to be major constraints experienced in diversifying to banana farming (Figure 4.10).
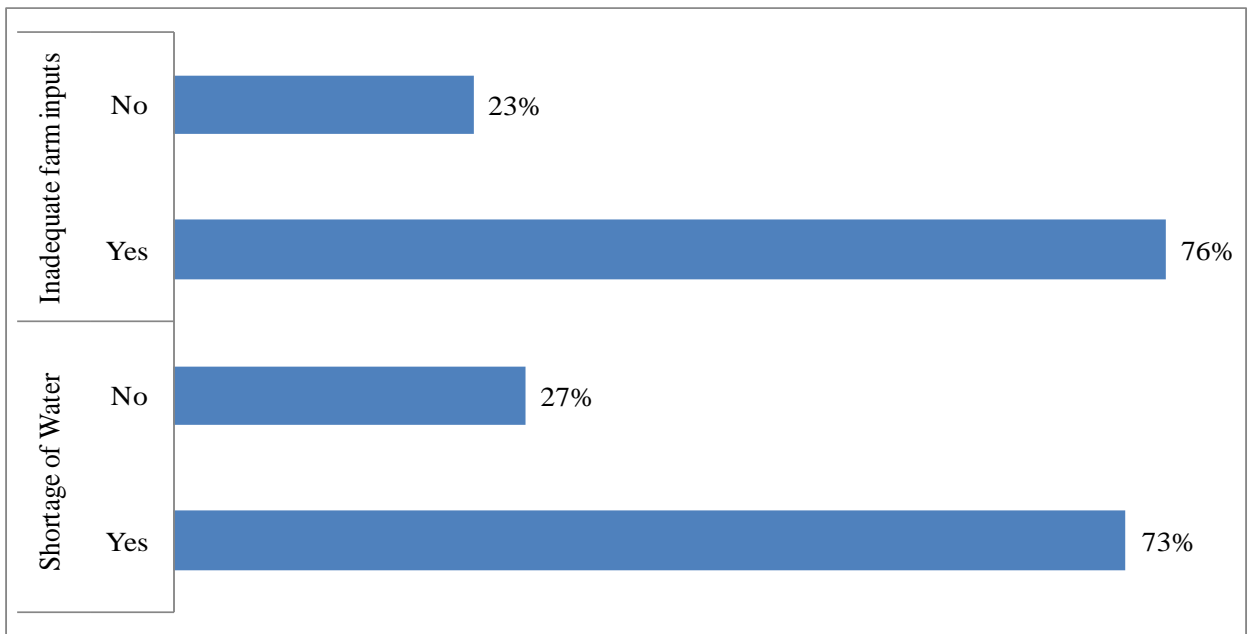
Figure 4.10: Water shortage and inadequate farm inputs

Source: Field work Data (2015)

Regression analysis indicated that lack of sufficient water for irrigation of banana crops was significantly associated with diversification to banana farming (P=0.040). Therefore, the hypothesis that there is no significant relationship between water shortage and diversification to banana farming was rejected. A farmer who had inadequate access to water was 0.456 times less likely to diversify to banana farming compared to a farmer

who had access to sufficient water for the banana farming (P=0.040, CI= 1.205-2.184) (Table 4.11).

Table 4.11: Influence of inadequate water and Farm Input on Diversification

Variable	Beta (β)	t	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
Inadequate water	-0.403	9.445	1	0.040	1.669	1.205	2.184
Lack of adequate farm inputs	-0.005	0.977	1	0.992	0.995	0.391	2.531

Source: Field work Data (2015)

This means that farmers who have regular supply of irrigation water within their farm can easily embrace farming than those who experience shortage of water especially during rainy seasons. Water is an important resource for higher productivity of banana crops throughout the production stages as emphasized by one key informant.

"You can get maximum production of banana farming when you have adequate and regular supply of irrigation water especially during the dry period. Where this is not possible, production of banana crops is sub-optimal. Although water is readily available in Imenti South sub-County, not many farms and households have sufficient supply of water that can be used for irrigating a considerable size of banana farm."

Source: Kirendene Location in Mitunguu Ward, 22.5.2015.

Banana farming requires adequate water to boost production throughout the year (Mwangi *et al.,* 2010). Many farms get water for irrigation from seasonal rivers which dry up during dry spells resulting in water shortage hence low banana production. This remains a key challenge to farmers because banana crops require plenty of water during growth and maturity period. Findings indicated that lack of adequate water adversely affects productivity and quality of products which results in massive losses to the farmers. Drought is ranked among the highest constraints of banana farming in Kenya (Kumari *et al.,* 2010). As a result, finding a solution for water shortage can help boost banana farming in these areas (Mwangi *et al*., 2012). Plate 4.6 shows farmers irrigating their banana crops during a period of less rainfall.

Plate 4.6: Farmers irrigating their farms with piped water

Source: Field work Data (2015), 27nd May 2015

In relation to farm inputs, regression analysis results showed that lack of ease in access to farm inputs was significantly associated with diversification to banana farming

(P=0.992). Therefore, the hypothesis that there is no significant relationship between access to farm inputs and diversification to banana farming was rejected. Results showed that most of the required farm inputs were at high cost which the farmers could not afford. This made farmers to practice banana production without essential farm inputs like fertilizers, manure, chemicals, among many other requirements. This has been linked to low production and crop returns which led to de-motivation of farmers who have a zeal for diversification to banana farming.

4.7.2 Fluctuation of Market Prices and Small Land Sizes

In relation to constraints to banana farming, 63% of the respondents cited fluctuation of market prices. Further, in relation to constraints of diversification, 89% of the respondents cited small land sizes to be a constraint in banana farming as shown in Figure 4.11.


	Yes	No	Yes	No
	Flacutation of market prices		Small Land Sizes	
Series1	63%	37%	89%	11%
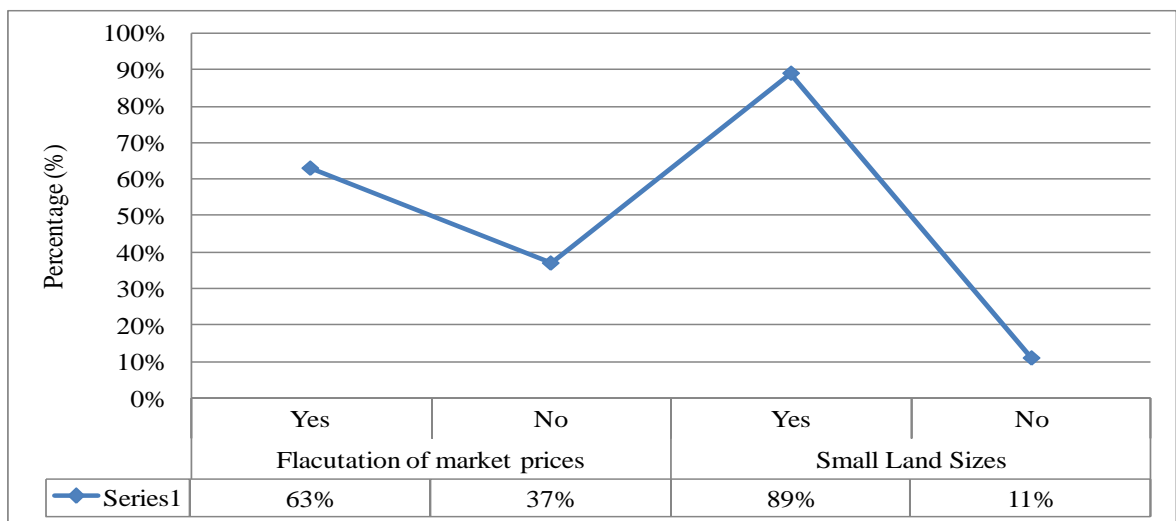
Figure 4.11: Fluctuation of market prices and pest/diseases

Source: Field work Data (2015)

Regression analysis showed that fluctuation of banana market prices was not significantly associated with diversification (P=0.982). Therefore, the hypothesis that there is no significant relationship between fluctuation of market prices and diversification to banana farming was not rejected (Table 4.12).

Table 4.12: Influence of inadequate market and small farms on diversification

Variable	Beta (β)	t	df	P-value	Exp (B)	CI for EXP (B) Lower	Upper
Market price fluctuation	-0.008	1.762	1	0.982	0.992	0.520	1.893
Small Farms	-2.262	15.860	1	0.023	0.475	0.134	0.817

Source: Field work Data (2015)

This suggests that changes in market prices did not affect individual decisions to diversify to banana farming to a significant extent. This can be attributed to the finding that banana market prices had been stable for a long time. Further, even with the fluctuations of market prices, banana farming produced higher returns than the previous cash crops grown. However, lack of proper planning and protection of banana markets from external forces such as middle men and un-regulated markets continue to threaten banana farming due to its potential of adversely affecting crop returns. One of the respondents during key informants' interview said,

"even though banana markets seems stable at present, this is likely to change due to the infiltration of banana into the country from external sources such as Uganda. This will affect the revenue returns from banana farming".

Source: Maraa Location in Abogeta East Ward, 21.5.2015.

High rate of diversification to banana farming has the potential to increase its market supply beyond a level of equilibrium which may destabilize the market equilibrium. This leads to losses and low returns which affects morale of farmers negatively. Such cases of potential market failure will result in decreasing market prices/returns hence decreasing the rate of diversification to banana crops in favor of other ecologically favorable cash crops in the region. Similar to arguments advanced by Ashfaq *et al*. (2008), poor market planning and regulation will have adverse effects on banana market prices and net returns. For instance, low market price coupled with high transportation cost and high commission by intermediaries has the potential of distorting a stable market and consequently destabilizing the thriving markets. Plate 4.7 shows a banana market affected by low price resulting in high supply of banana against a stable demand for the bananas.

Plate 4.7: Farmers selling their banana products during a market day

Source: Field work Data (2015), captured on 3rd June 2015

Lack of effective banana markets is compounded by lack of adequate government intervention and commitments in supporting banana farmers especially in providing necessary market and market regulation for banana products. In addition, small land sizes presented a major constraint for diversification. Regression results showed that small land sizes were significantly associated with diversification (P=0.023). Therefore, the hypothesis that there is no significant relationship between small farms and diversification to banana farming was rejected. A farmer who had a small farm size was 0.475 times likely to diversify to banana farming compared to a farmer who had large farm sizes (P=0.023; CI=0.134-0.817). This means that small land size acted as a disincentive for diversification.

Farmers with big land sizes had a higher likelihood of diversifying to banana farming compared to those with small land sizes. According to a study by Abro *et al*., (2010), scarcity of adequate land that can allow cultivation of more than one crop at the same time remained a constraint for diversification to banana farming. This is because, farmers with large farm sizes find it appropriate to diversify to a small scale and thereafter scale up upon satisfactory performance of the crop, as stated by one of the key informants during the interview.

Setting apart a portion of land for diversification is seen as an important aspect that cushions farmers against risks of lower income from the new crop and missing of income from the previous crops whose returns are used to meet their needs before returns can be

realized from the new crops. Therefore, small land sizes remained a major constraint for not only diversifying to banana farming but also the general agricultural practices within the region and worldwide.

4.7.3   Soil Infertility and Lack of Adequate Knowledge and Skills

Further, in relation to constraints to banana farming, results revealed that 27% of the respondents were faced with problem of soil infertility, while 37% of the farmers did not have adequate skills and knowledge in banana farming as shown in Figure 4.12.

| | Lack of Adequate Knowledge and Skills | | Soil Infertility | |
	Yes	No	Yes	No
Series1	37%	63%	29%	71%
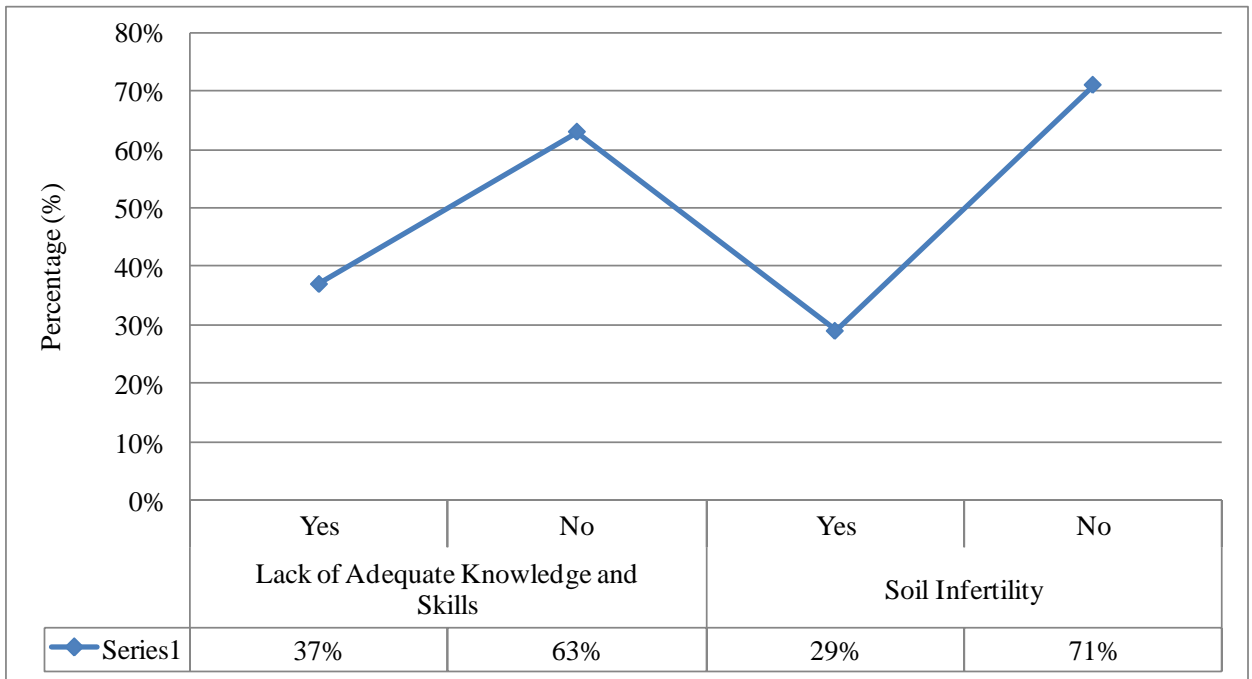
Figure 4.12: Soil Infertility and lack of adequate farming skills

Source: Field work Data (2015)

Soil infertility was reported to be a challenge in banana farming among the residents of Imenti South sub-County. However, regression analysis results indicated that soil fertility

was not significantly associated with diversification to banana farming (P=0.056). Therefore, the hypothesis that there is no significant relationship between soil infertility and diversification to banana farming was not rejected (Table 4.13).

Table 4.13: Influence of Soil Infertility and inadequate knowledge on Diversification

Variable	Beta (β)	T	df	P – value	Exp (B)	CI for EXP (B) Lower	Upper
Soil Infertility	0.372	2.691	1	0.056	0.032	0.021	0.092
Inadequate knowledge and skills	1.305	3.004	1	0.083	0.269	0.104	0.449

Source: Field work data (2015)

This implies that lack of sufficient soil fertility does not influence one's decision to diversify to banana farming to a large extent. This can be vindicated by the study findings that most of the study area had the required soil fertility, hence making soil fertility not a major constraint influencing farmers' decision to diversify. It was also evident that with appropriate farm inputs such as manures and plenty of water supply for irrigation, farmers can achieve appropriate production conditions such as appropriate pH levels and good crop productivity in areas reported to have poor yields. According to the study, soil infertility poses a greater challenge for small scale farmers who are limited by access to costly inputs. This has been linked to lower yields and returns hence affecting diversification to banana farming.

Further, the study results showed that lack of appropriate skills and knowledge for banana farming is a constraint for diversification to banana farming. Regression analysis results showed that lack of appropriate knowledge and skills was not significantly associated

with banana farming (P=0.083) Therefore, the hypothesis that there is no significant relationship between lack of appropriate knowledge and skills and diversification to banana farming was not rejected. This means that possession of appropriate skills and knowledge in regard to banana farming did not translate to increased diversification. This is because it is easier to acquire banana farming skills and knowledge from colleagues who are experienced. Further, even where people had the skills and knowledge, their greatest motivation as stated by some respondents was the productivity and returns associated with the crop.

In contrast, study by Birthal *et al.* (2007) which reported knowledge and skills of farmers to act as a catalyst for diversification to a new crop, the study revealed that acquisition of knowledge and skills for banana farming is not a significant driver of diversification to banana farming. However, improving the skills and knowledge of farmers on proper farming and production techniques can help improve the productivity of the crop which translates to higher crop returns. These skills and knowledge acquisition play an important role in facilitating farmers realize maximum returns on their farming venture investment not only in the short-term but also long-term.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusion and recommendations of the study based on the study objectives. The specific objectives of the study were: (1) to establish the extent of diversification to banana farming in Imenti South sub-County; (2) to determine the socio-economic factors influencing diversification to banana farming in the in Imenti South sub-County; (3) to assess the benefits of diversification to banana farming among households in Imenti South sub-County, and (4) to determine the constraints of diversification to banana farming In Imenti South sub-County.

5.2 Summary of Findings

The study surveyed a total of 388 respondents which was a good representativeness of the data. On the extent of diversification, 72 % of the respondents had diversified to banana farming in the area of the study, while 28% had not diversified to banana farming. In relation to cash crops grown before diversification, coffee was the most grown cash crop (65%) before diversifying to banana farming followed by tea (22%).

On socio-economic factors, the study revealed that 40% of the respondents had land size of less than 1(one) acre while only 5% had more than five acres of land, which was attributed to increased population in the study area that led to sub-divisions of land by family members. The main source of land was inheritance from parents. Majority of the respondents (40%) had less than one acre of land. Results indicated that age, level of

education, average monthly income and land size were significantly associated with diversification to banana farming (P<0.05).

In terms of institutional factors, 61% of the respondents did not have access to farm inputs and an almost equal proportion of respondents (62%) had no access to hybrid planting materials. Findings indicated that availability of farm inputs and access to hybrid planting materials were significantly associated with diversification to banana farming (P<0.05).

In relation to the benefits of diversification, 86% of the respondents had benefited by getting better pay and 71.4% had experienced higher productivity of their farms. The study results indicated that high market returns, high crop productivity, access to market for the products and improved standard of living were significantly associated with diversification to banana farming (P<0.05).

On constraints facing diversification to banana farming, the study findings revealed that 73% of the respondents experienced shortages of water for banana farming during dry seasons of the year while 76% had inadequate farm inputs. Results showed that shortage of water, inadequate farm inputs and small land sizes, soil infertility and inadequate of skills were significantly associated with diversification to banana farming (P<0.05).

5.3 Conclusion

The study concludes firstly that, extent of diversification to banana farming is high (72%) in the study area due to higher productivity, good market returns and favorable ecological conditions associated with the crop. However, a substantial proportion of small scale farmers have not diversified to banana farming due to the challenge of small land sizes

and lack of adequate resources for diversification. Secondly, in relation to socio-economic factors influencing diversification, results showed that higher education attainment, improved monthly income, access to bigger land sizes, ecological area, availability of labor, availability of hybrid planting materials and access to farm inputs were socio-economic factors positively influencing diversification to banana farming.

Thirdly, the main benefits associated to banana farming are high market returns, improved standards of living, high crop productivity and access to reliable/predictable markets for the banana products. Information available to farmers on the importance and benefits accruing from diversification to banana farming plays a key role in influencing their decision in relation to diversification. Finally, the study concludes that the main constraints facing diversification to banana farming is lack of adequate support systems such as well managed and equipped institutions to provide material resources (such as inputs, water supply) and technical support to the banana farmers at the local level to help them avert the negative effect of these constraints.

5.4 Recommendations

Based on the conclusions, the study recommends that the government in collaboration with its development partners and community should:

1. Scale up provision of information to farmers tailored to their needs on diversification options with a focus on new opportunities, innovations and emerging market trends on diversifications to banana farming to improve diversification. The information should be factual and customized to local farmers' needs to empower them to make informed decisions on diversification options and associated market decisions.

2. Disseminate best practices on banana farming such as proper planning and use of scarce land resource and labor as factors of production through initiatives like field extension services and training forums.

3. Provide adequate facilities and infrastructure for banana value addition such as processing facilities, marketing of the banana products and elimination of unnecessary intermediaries in the production process to improve benefits associated with banana farming and optimize returns

4. Institutionalize farmers' support systems and structures such as well managed and equipped institutions to provide technical and material support (i.e. supply of irrigation water, good market price regulation and farmer training) to the farmers at the local level to help avert the constraints facing banana farming.

5.5 Further Study

The study proposes the following areas for further research:

1. Impact of banana farming on livelihood of urban dwellers.

2. Effect of banana products and value addition on diversification to banana farming

3. Role of banana farming in improving food security in Meru County.

These studies will help advance the findings of this study as well as inform and drive key policy derivatives and agenda on banana farming not only in Kenya but also globally.

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APPENDICES

Appendix 1: Informed Consent Form

The Researchers' Statement

Hello, my name is Stephen Mwendia Ananua. I am a Masters' student at Kenyatta University pursuing Masters Degree in Geography. I have come here today to carry out a research study on *"An investigation of the drivers of diversification to banana farming among households in Meru County, Kenya".* All the information needed is captured on this form for you to decide whether to participate in this study or not. All answers whether right or wrong are necessary. You will be given time to decide whether to participate in the study or not. Please, study the form well and inquire from our research assistants where you do not understand. Show honesty in answering the questions bearing in mind that the information given will be purely private and confidential.

Purpose

The information obtained from this study will be used to inform policy on the diversification to banana farming in Kenya.

Procedure:

The interview will be through a self-administered questionnaire. It will take about 20-30 minutes and you are required to answer all the questions correctly. You will be allowed to give suggestions and provide more information on banana farming in this study area where necessary.

Risks

Many people in this country and beyond will learn your participation in this exercise. Every information given will be kept private and confidential by our researchers. It will be stored in a protected custody.

Benefits

The information given will not lead to any monetary gain or any other indirect gain. But your involvement and participation in this exercise will lead to a banana farming insight in this study area.

Confidentiality

There will be no identification of individuals in the information given in this exercise. Every participant will be given a name tag which will be a different numerical, and the information of each respondent will be treated with a lot of concern as confidential. After the researchers have gotten the data they wanted, every material that has been used to get this information will be destroyed for confidentiality.

Voluntary participation

Involvement in this exercise is free; you may deny giving information asked without suffering any consequences. You may as well terminate the exercise at any time without any consent.

Instructions:

Once you put your signature on this form, it is an indication that you have accepted to participate in this exercise. If there is any information that you did not understand after you have read this form, make sure it is explained clearly to you. This is to make sure that, what you are signing is well understood to you and you are doing it out of your consent.

It is my wish to participate in this research study on: **''An investigation of the drivers of diversification to banana farming among households in Meru County, Kenya''.**

I am aware that at any given time, I can withdraw my consent without any permission from the researchers. I have read and understood the information on this form and therefore, I give my consent to be interviewed.

Respondent's phone number ……………….……...Signature……….….……Date………

Researcher's Name…………………………………...Signature……………….…Date…….…..…

Appendix 2: Study Questionnaire

This study aims at establishing drivers for diversification to banana farming in Imenti South sub-County. Please provide your honest responses to each question. No names will be used in reporting or recording of the information/data collected for confidentiality.

<u>**Section A: Socio-Economic Characteristics**</u>

1. What is your Division?   [1] Abogeta   [1] Nkuene
2. What is your Age (in years)?   [1] 18-30 yrs   [2] 31 – 40yrs

   [3] 41 – 50yrs   [4] 51 – 60yrs   [5] Above 60
3. What is your Gender?   [1] Male   [2] Female
4. What is your Marital Status?   [1] Married   [2] Single   [3] Widow

   [4] Widower   [5] Divorced/Separated
5. What is your highest education level?   [1] Primary   [2] Secondary

   [3] College   [5] University
6. What is the average monthly income level of your household (in Kenya Shillings)?

   [1] Less than 5000   [2] 5000-10000   [3] 11000-30000   [4]   31000-50000

   [5] 50000-100000   [6] Above 100000
7. Are you involved in banana farming?

   [1] Yes   [2] No
8. How long have you been in banana farming?

   [1] Less than 3 yrs   [2] 3 – 5 years   [3] 6 – 9yrs   [4]   10-15 acres

   [4] Over 15yrs
9. What is the size of your land (in acres)?   [1] Less than 1 acre   [2] 1 acre

   [3] 2-3 acres   [4] 3-5 acres   [5] More than 5 acres

10. What size of the land is;

i)   Cultivated under banana production? _____ acres

ii)   Cultivated under coffee production? _____ acres

iii)   Cultivated under tea production? _____ acres

iv)   Others crops?_____acres

11. How did you acquire the land? (You can tick more than one option where applicable)

[1] Inherited   [2] Rented   [3] Purchased/Bought

[4]   Others   (please

explain)_____

12. Please answer each of the questions in the table below appropriately

Statement	Yes	No
a) I have access to adequate labor for the production and harvesting of bananas		
b) I have access to adequate water for irrigating the banana crops		
c) I have sufficient access to farm inputs		
d) I have/had sufficient capital to start banana farming		
e) I can access more land through leasing, buying and or renting		
f) I have access to reliable transport of harvested bananas to the market		

13. Have you been cultivating any other crop that generated money before you started cultivating bananas?   [1] Yes   [2] No

14. If yes in question 13 above, what type of the crop were you cultivating?

[1] Cash crop   [2] Food crop

15. If cash crop, which cash crop were you cultivating?   [1] Coffee   [2] Tea

[3]   Khat   [4] Cotton   [5]   Others   (Please

specify)_____

16. Which of the following reasons made you abandon the previous cash crop? You can tick more than one option

Reason for abandoning previous crop	Yes	No
a) Pest and diseases		
b) Low soil fertility		
c) Poor payment/prices/sale revenues		
d) Delays in payments after selling the crops		
e) Lack of extension services		
f) Poor management of cooperative societies		
g) Lack of reliable markets for the crop		
h) High production costs		
i) Inadequate labor		

Section B: Institutional factors

17. Tick the appropriate answer to each statement in the table below

Statement	Yes	No
a) I have access to extension officer services for banana farming		
b) I have easy access to banana markets		
c) Access to inputs such as fertilizer for banana farming		
d) I have easy access to hybrid seedlings suitable to our climatic conditions		
e) I have access to loans from societies and banks		
f) Others (please specify)		

18. How do you sell your banana produce?   [1] Individually   [2]   Farmer groups

    [3] Cooperatives/societies   [4]   Others   (specify)

    _____

19. Do you have any farmer groups in the area?

20.   [1] Yes   [2] No

Section C: Benefits of Diversification

21. What benefits have you received after you diversified to banana farming?

Which of the following Benefits of doing banana farming?	Yes	No
i) Better pay		
ii) High productivity of the banana crops		
iii) Availability of farm inputs		
iv) Availability of hybrid seedlings suitable to the climatic conditions		
v) Availability of extension services		
vi) Good management of cooperative societies		
vii) Availability of reliable markets for the crop		
viii) Low production costs		
ix) Availability of labor		
x) Others (specify)		

22. Please, specify how you use money obtained from banana sales?

[1] Pay   school fees   [2] Buy food/ cater for household expenses at home

[3] Invest in other businesses   [4]   Others

(specify)_____

Section D: Constraints of Diversification

23. What major constraints prevent you from increasing your production?

Constraints	Is this a constraint yes/no	Score: 1 = most critical 7 = least critical
a) Inadequate water/drought		
b) Inadequate fertilizer and manure		
c) Soil infertility		
d) Inadequate access to market		
e) Pest and diseases		
f) Inadequate knowledge on crop production		
g) Small farms		
h) Others (specify)		

24. What are your suggestions for improving banana production in your area?

Thank you very much for cooperation and participation.

Appendix 3: Key Informant Interview Guide

Questions

Part A: Identification Details

What is your position and role in relation to banana farming?

Part B: Extent of Diversification

1. In your own view, to what extent have farmers diversified to banana farming in this area? Probe diversification rate, previous cash crops and reasons for either diversifying or not diversifying to banana farming.

Part B: Socio-Economic Factors

1. From experience, what are the socio-economic factors which influence farmers' decisions on whether to diversify to banana farming or not in this area? Probe for the role of age, gender, sex, marital status, income level, labor, land size and means of transport on diversification

2. In your own opinion, in what way do such factors affect diversification to banana farming in this area?

Part C: Institutional Factors

1. In your own opinion, which are the main institutional factors that influence diversification to banana farming in this area? Probe for effect of inputs, hybrid planting materials, extension services and loans on farmers' decisions to diversify

2. What role do these institutional factors play in relation to diversification?

Part D: Benefits of Diversification

1. In your own perspective, what are the main benefits which accrue to farmers who choose to diversify to banana farming?

2. How do these benefits affect farmers' decision in relation to diversification?

Part D: Constraints to Diversification

1. In your own view, what are the main constraints facing farmers who are or wish to diversify to banana farming?

2. How do the constraints affect farmers' decision in relation to diversification?

3. In your own view, how could these constraints be addressed?

Appendix 4: Field Observation Checklist

Variable	Observation	Variable	Observation
Sub-County		Approximate Acreage under Banana farming	
Farm No.		Other Crops Grown:	
Approximate total farm Acreage		1	
Approximate acreage under Bananas		2	
Type of Farming		3	
		4	
Easy of Access to:			
Main Roads			
Water Supply			
Local Market			
Other Important Observations:			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			