

**A GENDERED ANALYSIS OF INTRAHOUSEHOLD RESOURCE ALLOCATION AND
BENEFIT SHARING ALONG THE BANANA VALUE CHAIN IN MERU COUNTY,
KENYA**

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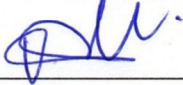
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DECLARATION

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

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DEDICATION

To my late dad, Nyabaro Bitonga. We did it.

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ABSTRACT

There has been low inclusiveness of gender dimension in the development of agricultural policies of Africa despite the fact that women play a crucial part in the African farming structure. Unequal access to agricultural resources such as land, labor and capital has driven women to less rewarding roles along the value chain while allowing men to take up the dominant management roles. This study sought to map the banana value chain with respect to resource allocation and benefit sharing. Additionally, the study identified the factors that influence gendered resource allocation in banana production while also looking at the factors determining the participation of women in benefit sharing. Findings of this study will play a key role in designing agricultural policies that are aimed at ensuring that the gender gap in African agriculture is less evident. It could also be used as a guide for development projects geared towards gender equity in agriculture as it will highlight areas where gender gaps exist between men and women. To achieve its stated objectives, the study used a fractional logit regression to identify the factors that influence gender resource allocation and the participation of women in benefit sharing. Systematic random sampling was used from banana production groups to select the respondents for the survey. A total of 160 respondents were interviewed. Descriptive statistics from the survey indicated that men were more concentrated at the production level of the value chain while women were active participants at the marketing stage. Female education was found to have a positive effect on land and capital allocation by the wife whereas gender of the household head negatively impacted on wife land allocation towards the banana enterprise. Other variables that positively or negatively influenced land and capital allocation were household assets, off-farm income the current value of livestock, household credit access, extension contact, group membership among others. Factors that were significant in influencing participation of women in

income use were off-farm income, farm size and years of education of the wife. Given the importance and significance of livestock in the area, diversification of banana production into livestock keeping could increase intra-household equity in the sharing of land and capital assets in the study area. Education of the wife is a factor is linked to human capital, and it is therefore important for women empowerment. Further research should take a look at the inadequate participation of the youth in the banana value chain.

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ACRONYMS AND ABBREVIATIONS

ACP	African Caribbean and Pacific countries
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CGM	County Government of Meru
DURP	Department of Urban and Rural Planning
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FRM	Fractional Response Model
GDP	Gross Domestic Product
HCDA	Horticultural Crops Development Authority
ICCO	International Cocoa Organization
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
KES	Kenyan Shilling
LPM	Linear Probability Model
MoA	Ministry of Agriculture
NCPB	National Cereals and Produce Board
OLS	Ordinary Least Squares
USD	United States Dollar

CHAPTER ONE: INTRODUCTION

1.1 Background information

For decades now, gender bias has pushed women to the periphery of the value chain and has, in turn, reduced their overall effectiveness as chain actors, more so in the high-value horticultural value chains (Swinnen et al., 2007). Women in Sub-Saharan Africa countries are excluded from high-income ventures because of their limited access to productive resources compared to their male counterparts (Doss et al., 2015).

A study by Salami et al. (2010) indicates that 90 percent of Africa's agricultural produce is produced by smallholder farmers where women constitute about 80 percent of these smallholder farmers. However, smallholder agriculture has been faced by a number of challenges ranging from poor market access, low productivity, inefficient policies such as high input prices, lack of subsidies and underdeveloped agricultural technologies which have further worsened women's level of participation in commodity value chain (Zhou et al., 2013)

In Kenya, agriculture contributes 29.3 percent to the country's GDP with about 80 percent of the country's population living in the rural areas (MoA, 2016). Fruits contribute to 26 percent of the domestic value of horticulture and banana at 35.6 percent is the most contributing fruit in terms of horticultural value. In 2016, the area under banana was 52,102 Ha with a total production of 1.43 million tons valued at KES 18.16 billion. However, there was a drop in production from 1.25 million tons to 1.24 in the year 2016. The drop in production was attributed to low productivity in areas that do not have access to irrigation (HCDA, 2016).

Banana production is carried out as a source of food and income for low income and resource poor households in the country. During the pre-colonial period, the crop was characterized as

semi-subsistence whose production involved women. However, due to urbanization and population growth, there has been an increase in the demand for the crop in urban areas and this has resulted into commercialization of the enterprise (Wambugu and Kiome, 2001).

Over the years, the traditional cash crops in the country such as tea and coffee have had a decline in terms of income generation. This has led to a shift in focus from these cash crops to other crops such as passion, pawpaw and banana. The profitability of bananas has been growing because of increased urbanization and growing consumer demand for the produce in Nairobi markets (Obaga and Mwaura, 2018)

Commercialization of banana production has been boosted by different governmental and non-governmental initiatives that are characterized by the supply of improved planting materials such as tissue culture, good agronomic practices and access to profitable markets (Mbogoh et al., 2003). However, commercialization has redefined the gender roles along the value chain and brought about opportunities for both men and women while creating challenges at the same time. The dynamics of resource allocation in terms of labor and land has evolved as a result of commercialization (Spring, 2000).

Gender is the socially constructed roles that critically define the position of women and men, girls and boys (Doss et al., 2014). The gender roles differ with country, age, race and region. In Africa for instance, in many traditional African societies men reserve the right of decision making at the household level while women perform both the productive and reproductive roles (Blackden and Wodon, 2006). For instance, ICCO (2009) found out that women are disadvantaged because of limited access to education, land and capital.

At the smallholder level, gender relations influence intra household interaction, the division of labor, power dynamics and the allocation of productive resources which in turn have an effect on value chains. Gender relations are therefore an important element in analyzing the concentration of men and women at different nodes of the value chain and in the process evaluate the efficiency of a given chain (Sebstad and Manfre, 2011)

A study by Doss et al. (2014) highlights instances where men take over the high-value crops such as bananas and tendencies to divert resources towards the same thereby taking control over resources and benefits accrued from the same. Male farmers have a tendency to take control of profits generated from bananas by redefining it as a cash crop which falls within their legitimate domain of control (Heyer, 2006).

According to Rubin et al. (2009), value chains are socially embedded where cultural norms dictate intra household resource allocation, gender labor division of household and farm activities, the differences in control over income and decision making and bargaining power of individuals within the household. Gendered patterns of resource allocation often imply differences in participation and in the sharing of benefits from participation for both men and women. According to Sebstad and Manfre (2011), gender-defined roles in value chains and within households affect access to financial services, control over income, access to and use of new technologies, inputs and social services.

Further, gender relations affect and are affected by the ways in which value chains function (Mutua et al., 2014). While value chains offer tremendous opportunities for men and women through better market linkages and employment opportunities, the way these value chains operate can, however, affect some groups such as youths and women negatively (Mutua et al.,

2014). The focus on gender issues in agricultural value chains and the differential distribution of benefits to men and women began in earnest in the last decade (Laven et al., 2009; Van et al., 2013).

Critically, there is recognition that while the success of women as farmers and market sellers is equal to that of men, productivity can only be equal if they have the same asset endowment. In any crop or livestock value chain, it is unlikely that women will have the same access to assets as men, even more so in female-headed households. Cultural expectations of women's domestic responsibilities reduce the amount of time (labor) they may freely give to cash crop agriculture. However, this effect is felt not only in the efficiency of production, but in the marketplace, where less productivity in the field, means there are less goods to sell (Blackden and Wodon, 2006).

1.2 Statement of the problem

Social and economic factors including gendered norms and practices contribute to preventing women from participating at par with men in agricultural production. The role undertaken by women both in agricultural production and household custodians limits their mobility and their participation in agricultural value chains (ASARECA, 2016). Despite forming a huge part of the African farming structure and household custodians, the benefits accrued to women are negligible with little impact on agricultural development. This is in line with Friedemann-Sanchez (2006) who found that, although there is presence of equal pay in the Columbian flower industry, female workers are less likely to use their wages to accumulate assets due to their household financial responsibilities. In order to improve and increase the total productivity of the agricultural sector in developing countries, women need to have access to productive resources. With increased productivity and yield, the proportion of undernourished people in the world could be reduced by between 12-17 percent (FAO, 2012).

Unequal access to agricultural resources such as land, labor and capital has driven women to less rewarding roles along the value chain while allowing men to take up the dominant management roles. For instance, Ragasa et al. (2013) found gender differences in access to extension services in Ethiopia where 20 percent of female farmers had access to extension services compared to 30 percent of male farmers. This differential access equips men with skills and knowledge necessary to participate in high value agricultural ventures. Subsequently, with the declining performance of cash crops in Meru County, men have shifted to high-value horticultural crops such as bananas, tomatoes and passion fruits (Wambugu and Kiome, 2001) which has displaced women who rely on banana value production as their source of income.

Resource allocation and benefit sharing is a contentious issue especially in high-income enterprises such as banana production. According to Doss et al. (2015), assessing gender inequality from male and female perspective does not clearly bring out the intra household aspect of resource allocation. Therefore, there is need to look at how owning and controlling resources jointly impact production and sharing of benefits at the household level. Literature has documented the impact of women's access to productive resources and their engagement in profitable markets on improved household welfare (Quisumbing et al., 2001; Ogunlela and Mukhtar, 2009). This study however, sought to analyze the role played by different economic, institutional and socio economic factors in gendered allocation of agricultural resources within the household.

1.3 Objectives

The objective of the study was to assess resource allocation and benefit sharing within the household along gender lines in the banana value chain in Meru County.

1.4 Specific objectives

1. To map out resource allocation and benefit sharing in the banana value chain.
2. To identify factors influencing intra household resource allocation in banana production along gender lines.
3. To analyze factors influencing participation of women in benefit sharing in banana production.

1.5 Research questions

What is the nature of resource allocation and benefit sharing in the banana value chain?

1.6 Hypotheses

1. There are no factors influencing intra household resource allocation in banana production along gender lines.
2. There are no factors influencing the participation of women in benefit sharing in banana production.

1.7 Justification

In a society where gender roles are clearly defined, incorporating a gendered analysis in any agricultural study is key in unearthing issues hindering development in the sector both at the household and at the national level. Thus, mapping out the banana value chain is important in understanding the key players and how resources are allocated between the different actors in the banana value chain. Further, mapping the chain will reveal the constraints faced by the different actors, the opportunities at the different stages and how the benefits can be used as an incentive to attract more women into the value chain while identifying how gender affects the allocation of different resources along the banana value chain.

Gender equity has been one of Africa's pertinent goals for decades since equity incorporates economic empowerment as a crucial component in any developing country. Determining the level of participation of both men and women will help reveal where along the value chain women are more concentrated than their male counterparts. Previous studies have indicated that income from women is likely to have a greater impact on nutrition, health and education. Results from this study will inform policies regarding resource allocation and women empowerment strategies more so in the African society. This study focuses on increasing women participation in cash crop sales, as a method to improve household food security.

Although advocating for equality in resource endowment may go beyond the mandate of research institutions, the role of research is to inform policy action in this area giving evidence on how this impacts overall research outcomes and the overall national development agenda. Thus this research is one among the few that seek to point out where gender equity gaps exist and in the process contribute to knowledge that can help in ensuring men and women benefit equally from existing opportunities. Eliminating gender inequality in resource control and access including access to improved technologies can increase incomes under the control of women and contribute to achieving poverty reduction and nutrition goals.

The study will also play a critical role in achieving Kenya's vision 2030 social pillar and the Big Four Agenda on food security. One of the core pillars of vision 2030 is the social pillar which targets gender, youth and vulnerable groups. The social pillar seeks to increase opportunities for women, youth and all disadvantaged groups by increasing the participation of women in all economic, social and political decision-making processes including representation in parliament. The study will also contribute to the attainment of the United Nation's sustainable development goals of no poverty, gender equality, quality education and zero hunger in the world.

CHAPTER TWO: LITERATURE REVIEW

2.1 An overview of the banana sub-sector

The role of banana as a semi-subsistence crop cannot be overlooked (Beed et al., 2012). The importance of banana production has been strengthened by the increase in production over the years (Mbogoh et al., 2003). There has been an upward trend in production as shown in Table 1. Other than urbanization, this upward trend has been propelled by the shift from cash crop production which has been characterized by poor prices, mismanagement and the high cost of agricultural inputs (GoK, 2002). However, despite the rising demand due to urbanization, a large share of the bananas is sold at farm gate with few producers and traders being able to sell in local markets (Fischer and Qaim, 2012).

Table 1: Banana production in Kenya 2015-2016

Year	Hectare	Production level (tons)	Value (KES)
2015	60743	1,257,663	16,977,647,483
2016	63074	1,242,559	18,109,189,023

Source: HCDA, Validated Report, (2016)

Commercialization of banana production in Kenya was initiated by a number of organizations and public-private partnerships that sought to increase productivity, improve market access and market linkages (Mbogoh et al., 2003). For instance, Techno Serve and Africa Harvest both non-governmental organizations, have been working together in the Central Kenya region in the last one decade. They promoted the use of clean planting material and the tissue culture technology that have resulted in improved banana production. The rising demand for bananas, commercialization of its production and the decline in output of traditional cash crops such as

coffee has led to increased incomes from the crop and its recognition as a cash crop (Wambugu and Kiome, 2001).

This increase in income from banana has led to the participation of men in the banana value chain displacing women to lower nodes in a sphere that has previously been under their control (Smale and Tushemereirwe, (2007); Beed et al., (2012). According to Doss (2001); Negin et al. (2009) and FAO (2011), although commercialization of agricultural production is accompanied by benefits, the role played by women in value chains is negated as increased incomes and better technologies give men a higher bargaining power in value chains while reducing the role of women.

In Kenya and Africa in general, women have control over income accrued from food crops. In Malawi, Njuki et al. (2011), found that women had a higher control on foods crops such as beans and groundnuts whereas given the importance of soy bean as a source of income, men had the highest control. However, despite the role bestowed upon them with respect to food production, women have limited access to resources that are critical in production such as land, labor, and capital (Olumakaiye and Ajayi, 2006; Ibnouf, 2011).

2.2 Value chain mapping

Mapping a value chain provides a descriptive structure that is necessary for data generation and analysis (Kaplinsky, 2000). It often results in the development of tree-like diagram showing the interconnectedness of various actors and their relationship in an input-output direction. It also involves market margin analysis which encompasses identification of actors, product transformation and estimated costs arising at every stage. Evidence indicates that value chain analysis has been used to understand how various actors interact with each other, the different roles that men and women play, the challenges and opportunities available for the chain actors

(Lowitt et al., 2015). While value chains incorporate gendered analysis, they have not been able to concisely illustrate how gender equitable markets can be accessed by increasing participation of women in agricultural enterprises.

Value chains are socially embedded and this is pivotal in the distribution of resources, benefits and opportunities. Resource allocation and benefit sharing along gender lines bring about the gendered differences in value chain participation which in turn dictates the benefit sharing based on participation. According to Sebstad and Manfre (2011), gender-defined roles and responsibilities along value chains and within households affect access to financial services, control over income, access to and use of new technologies, inputs and social services which in turn, affects the way in which value chains function. While engendering value chains is a proposed means to achieving gender equity in agriculture, Riisgaard et al. (2010) argue that there is no direct correlation between increasing women's participation in value chains and their level of decision making power within the household.

A study by Ouma et al. (2015) in Uganda found out that men are more involved in the overall production and management activities as well as decision making compared to the women. Despite men being more involved in the production, 47 percent of women from banana selling households play a key role in decision making regarding the proceeds from the sale of the crops. Worthwhile to note is that the years of schooling of the household head, suitability of the soil for banana production and availability of a mobile phone motivate the participation of both men and women in the banana value chain. The presence and existence of gender division between cash, subsistence and or semi-subsistence crops has given men an upper hand in the cash and export crops value chains (Doss, 2001) while women are more included in the subsistence value chains (Njuki et al., 2011).

2.3 Resource allocation in the banana value chain along gender lines

2.3.1. Gender issues in the banana value chain

According to FAO (2009), gender-based inequality has been a big challenge to most developing countries and more so in Sub-Saharan Africa. Closing the existing gender disparity is particularly important in providing a level ground for both men and women taking part in agricultural activities. This can be made possible by provision of sound institutional policies that clearly define the property rights of both men and women in terms of access to and control over productive resources and mature tenure systems. The gender gap in agriculture has been aggravated by women having less access to productive resources and opportunities along different value chains compared to their male counterparts.

Despite forming a larger part of the agricultural labor force used in production, women are faced with a number of challenges and constraints that hinder them from being optimally productive. For instance, Vargas (2009) points out their limited access to land, the unequal power relations within the household reinforced by a low bargaining power in decision making, barriers to credit and information access on the prices offered by the different marketing channels as some of the constraints faced by women.

According to FAO (2011), increasing women's access to productive resources could raise food production by 20-30 percent consequently leading to the growth of agricultural productivity by 2.5-4.0 percent. Women farmers have less access to productive resources and government support, even though they make up the majority of farmers (Mwangi et al., 2011). However, championing for more participation of women in agricultural value chain production, marketing and processing is not directly proportional to increased incomes for them or increased participation in decision making on matters to do with the utilization of income from the sale of

crops neither does it give them a higher bargaining power within the household (Dolan and Sorby, 2003; FAO, 2011). There is a need for an inclusive and wholesome approach that ensures the representation of both men and women in legislation, access to education and equal provision of social services.

2.3.2 Labor allocation along gender lines

Gender labor allocation is an issue that has received a lot of attention from researchers (Quisumbing et al., 2001; Takane, 2008; Spritzer and Hammer, 2016). This is attributed to the fact that women account for over 50 percent of the informal labor force in agriculture (World Bank, 2011). In most sub-Saharan countries, cash crops and export crops have always been considered a man's crop while women have been left to take part in less income-generating subsistence crops. The distinction between cash crops and food crops is becoming more elusive especially in banana production.

The decision on who to provide which labor has been deemed to be elusive. According to Ilahi (2000), women's labor is divided into household labor provision and farm labor whereas men either work in the agriculture or non-agriculture sector. This suggests that the burden of both productive and reproductive roles has been endowed upon women thus their household labor contribution is not productive (Quisumbing et al., 2001). Policymakers and stakeholder within the agricultural sector have always argued that technological advancement is the key to rural development and eventually economic growth. However, with an improvement in technology, the dynamics of household labor allocation and division of proceeds from providing labor are affected.

A study by Newman (2002) in Ecuador found that, despite value chains providing opportunities for women in terms of higher wages, most women tend to reject the opportunities because such jobs could have adverse effects on family relations. Women tend to have smaller plots for production and this may be attributed to low labor availability from the household (Takane, 2008). This restricts the productivity of women more so in instances where prices of their enterprises appreciate. Women rely on men for some of the labor-intensive activities such as spraying and ploughing which results in reduced output as a result of delays to access of these kind of services. Thus women tend to cultivate smaller plots and get low output (Sakala and Benson, 2002).

In their finding, Dolan and Sorby (2003) note that in the modern and global value chains women are more actively engaged in the high-value horticultural industries such as fruits and vegetables due to their low land and labor requirement. For instance, Dolan and Sutherland (2002) found that 80 percent of workers in the Kenyan horticulture industry are women. These findings are supported by those of Martens and Swinnen (2009) who state that women compared to their male counterparts, tend to get unskilled tasks and occupy less reliable and flexible jobs that do not guarantee social security, medical insurance and maternity leaves.

2.3.3 Land allocation along gender lines

Of all the productive resources in agriculture, land is the single most limiting of them all. In the traditional African society, access to and control over land is synonymous with status, wealth and power. However, societal confines discriminate women in accessing land and the consequences of such norms are detrimental to development within the agricultural sector. Development can only take place by raising women's access to and control over land which will eventually raise their standing and influence within the household.

Empirical evidence documenting gender disparities in developing countries is widespread. According to FAO (2010f), women are less likely to own land, to have access to rented land and if they have access to land, it is often of poor quality and smaller in size. For instance, in sub-Saharan Africa, women hold an average of 15 percent of agricultural land with further findings indicating that male controlled holdings in terms of agricultural productive resources are higher than female-controlled holdings (Deere and Leon, 2003).

Rapidly growing demand for agricultural land is putting pressure on property-rights systems particularly in Sub-Saharan Africa, where customary tenure systems have provided secure land access. In Uganda, while many households report husbands and wives as joint owners of the land, women are less likely to be listed on ownership documents and they have fewer rights (Bomuhangi et al., 2011). In their study in India, Savath et al. (2014) examine impacts of a joint land titling and allocation scheme implemented by the Government of West Bengal and find that inclusion of women as co-owners leads to improved security of tenure, agricultural investments and women's involvement in food and agricultural decisions.

In their study, Johnson et al. (2016) found that men have exclusive rights to individually owned assets. However, in most of the sub-Saharan Africa households, assets are jointly controlled by both the man and woman thus giving women access to ownership rights. Findings from the qualitative analyses indicate that men and women agree on household issues but in scenarios where they fail to come to a consensus the man reserves the right to the final decision. This depicts the extent of power dynamics and the critical role it plays within a household in terms of intra household decision making.

2.3.4. Access to capital

Access to financial services and capital has far-reaching implications on investment in agriculture. Financial services such as savings, credit and insurance provide opportunities for improving agricultural output, food security and economic vitality at the household, community and national levels. Studies have shown that improving women's direct access to financial resources leads to higher investments in human capital in the form of children's health, nutrition and education (FAO, 2012). Women generally have less control over the types of fixed assets that are usually necessary as collateral for loans. Institutional discrimination by private and public lending institutions often either ration women out of the market or grant women loans that are smaller than those granted to men for similar activities (Fletschner, 2009). In Nigeria, for example, 14 percent of males have access to credit compared to 5 percent of females who are able to obtain formal credit, while in Kenya the percentages are 14 and 4 for males and females, respectively (Saito et al., 1994).

In Malawi, Me-Nsope and Larkins (2016) state that there are differences in access to both formal and informal credit between men and women. However, these differences in access to credit are not as a result of resource disparities between men and women but due to lesser constraints on men's time, ability to work outside the home, great social networks and their control over household income compared to women. Constraints on women's access to capital have a measurable negative impact on their production capabilities.

In Zimbabwe, Chawatama et al. (2005) state that access to capital has been one of the biggest challenges to women interested in engaging in livestock production as income within the household is controlled by men. The presence of micro-finance that allow women to access credit services could be used as a way to encourage women participation in production. In

addition to that, other than credit access, women access to and control over asset portfolios in a household give them a higher bargaining power and the ability to accumulate capital for agricultural production. Access to capital is an important determinant in the participation of both men and women in high-value chains. A number of factors come into play in determining access to and control over capital and its accumulation.

2.4 Participation of women in benefit sharing along the banana value chain

The commercialization of banana production in Kenya has led to centralization that has placed the enterprise in the hands of men (Mbogoh, 2003). With commercialization, there is increased efficiency associated with higher output and reduced equitable distribution of incomes. Equitable distribution of benefits within the household is dictated by a number of internal and external factors such as asset endowment by individuals and source of household income. These factors are important in determining the level of bargaining power that an individual has.

The level of participation of women in benefit sharing in a household is low due to their limited outside options. Poor access to and limited control of income by women within the household has a number of negative effects. According to Olumakaiye and Ajayi (2006), an increase in household income has a general positive effect on the overall well-being of the household. However, income under women has a positive and significant effect on the nutrition status of school going children. This is attributed to the fact that women are more likely to spend money on food and other basic household goods, unlike men who divert household income to asset accumulation. According to Schultz (2002), there is a close correlation between women education and household well-being.

Having access to agricultural resources and being actively engaged at any stage of the value chain determines who gains, who can access the benefits and how the benefits can be distributed

within the household. Sharing of benefits accrued from participation in the value chain is quite often based on participation in chain activities and participation is as a result of gendered patterns of intra household resource allocation. The gendered nature of asset distribution has implications for participation in different nodes of the value chain and the control over the benefits derived from participation. Research pointing out the benefits that women get by participating in agricultural value chains is limited and benefit sharing directly points out to intra household gender dynamics, power distribution and bargaining power. In their finding, Mitchell and Coles (2011) argue that participation in the value chain nodes whether in cash crops or food crops does not automatically result in benefits for the participants. For instance, in Kenya, out of a 72 percent labor provision from women, their income account for 38 percent (Dolan, 2001).

Empirical evidence on the presence and extent of intra household benefit sharing is contradicting depending on the region. For instance, in his study in Malawi, Kerr (2005) argues that allocation of resources within the household and division of benefits is highly dynamic with some households practicing egalitarian income while in the northern part of Malawi women have little access to resources and limited control over income from crop sales. Other than income, women are likely to gain through social networks that are created and maintained subject to their participation within the value chain.

In addition to that, Kerr (2005) points out that despite the presence of egalitarian income sharing, the role of the husband as the household head and the sole decision maker within the household still remains undisputed. Although women have control over income generated from the sale of food crops and other minor enterprises, men are the final decision makers on how income from larger enterprise is to be shared, used and invested.

If given access to horizontal linkages, the role and participation of women in any value chain can be improved through access to financial services, exposure to price information and available marketing options. The ability and capability of women to improve their social and economic conditions is dictated by the kind of linkages and networks they have established. In addition to this, other than economic gains, women who are actively involved in agricultural value chains have wider business networks, can easily access information and are more likely to have improved skills.

Access to and control over income is not only critical for determining who participates in a value chain but also how the benefits accrued along the chain are distributed within the household. Findings from the pigeon pea value chain in Malawi indicate that not only do power relations determine how income is invested, but also, men are the key decision makers on income to invest in what crop and since men are more engaged in maize production, a high percentage of household income is diverted towards the maize enterprise (Me-Nsope and Larkins, 2016). This points out the impact that intra household income sharing has on productivity and household food security.

2.5 Theoretical framework

A household is both a producer and a consumer thus, decision making on production, labor allocation and consumption are intertwined and dependent on each other. The interconnectedness of production and consumption in agriculture is better illustrated using the Agricultural household models that came into play in the early nineteen hundred. The production behavior of smallholder farmers across Sub-Saharan Africa and Asia and the impact of this behavior on the economies of these continents can be comprehensively explained using the agricultural household models (Taylor and Adelman, 2003).

The models can either be unitary or collective (Hart, 1992). The unitary model depicts the household as a single unit of decision making where there is always a consensus on issues to do with production and consumption. However, there are a number of arguments against the use of the unitary model in household modeling. The key failure of the unitary model is its inability to capture and take into account individual preferences, the existence of intra household inequality, conflict and different levels of bargaining power between members of different sex, age and gender within the household (Alderman et al., 1995). Since the household is assumed to maximize utility from the available resource (Chayanov, 1966), it is, therefore, paramount to understand the dynamics of intra household decision making.

The collective model on the other hand views intra household resource allocation as an outcome of bargaining processes among the members of a household and it therefore, recognizes individual preferences and utility functions that exist in a household. From an agricultural point, collective models of the household recognize that there are differences in ownership, use and control of production resources between men and women in a household. This allows us to see how resources held and controlled by either men or women are utilized to enhance agricultural productivity and the welfare outcomes especially on school going children and their nutritional benefits.

The model suggests that outside factors that affect an individual 's utility have an impact on how the individual is involved in decision making within the household and their level of bargaining power. These factors include individual's income, access to land and other resources. According to Doss (2001), access to and the ability of a person to effectively use the available technologies dictates income obtained. The income is synonymous to control and outcomes of major household decisions related to agricultural production.

The agricultural household model is consistent with utility maximization. The model can also be seen as simply describing the relation of explanatory variables to the outcome of a choice, without reference to exactly how a choice is made. The household model demonstrates how the different preferences between household members have an effect on how the production and consumption decisions are made and the outcome of these decisions. Ideally suited for analysis in this study is Osmani's (1998) bargaining model because it helps to explain the outcome of gender conflicts and the negotiation process within the household. Bargaining power within the household plays an important role in access to and control over resources as women with higher education levels, more assets, and who are older are favored (Agarwal, 2011).

CHAPTER THREE: METHODOLOGY

3.1 Conceptual framework

A value chain framework is used to identify ways in which women and men can be easily accommodated within the value chain while pointing out stages and levels where men and women have the ability to fairly participate and derive economic gains (Bellu, 2013). According to Mitchell and Coles (2011), a gendered value chain analysis is one of the tools that can be used in value chain development while at the same time addressing issues of gender inequalities that may be present. A value chain can be described as a sequence of organizational activities undertaken by firms or people through production all the way to end use as well as disposal (Kaplinsky and Morris, 2001).

According to Rubin et al. (2009), gender equity and value chain development are not mutually exclusive in ensuring that gender roles and relations are well defined and beneficial to men and women along value chains. As conceptualized in Figure 1 gender equality in agricultural value chains leads poverty reduction, improved household food security and better nutrition. Giving men and women equal access to opportunities and resources at the household level can contribute to aggregate growth by improving efficiency in the allocation of scarce resources (World Bank, 2011). However, women control over income coupled with favorable intra household dynamics lead to key development outcomes, such as improved child nutrition, health and education (Quisumbing et al., 2002; Bussolo et al., 2009).

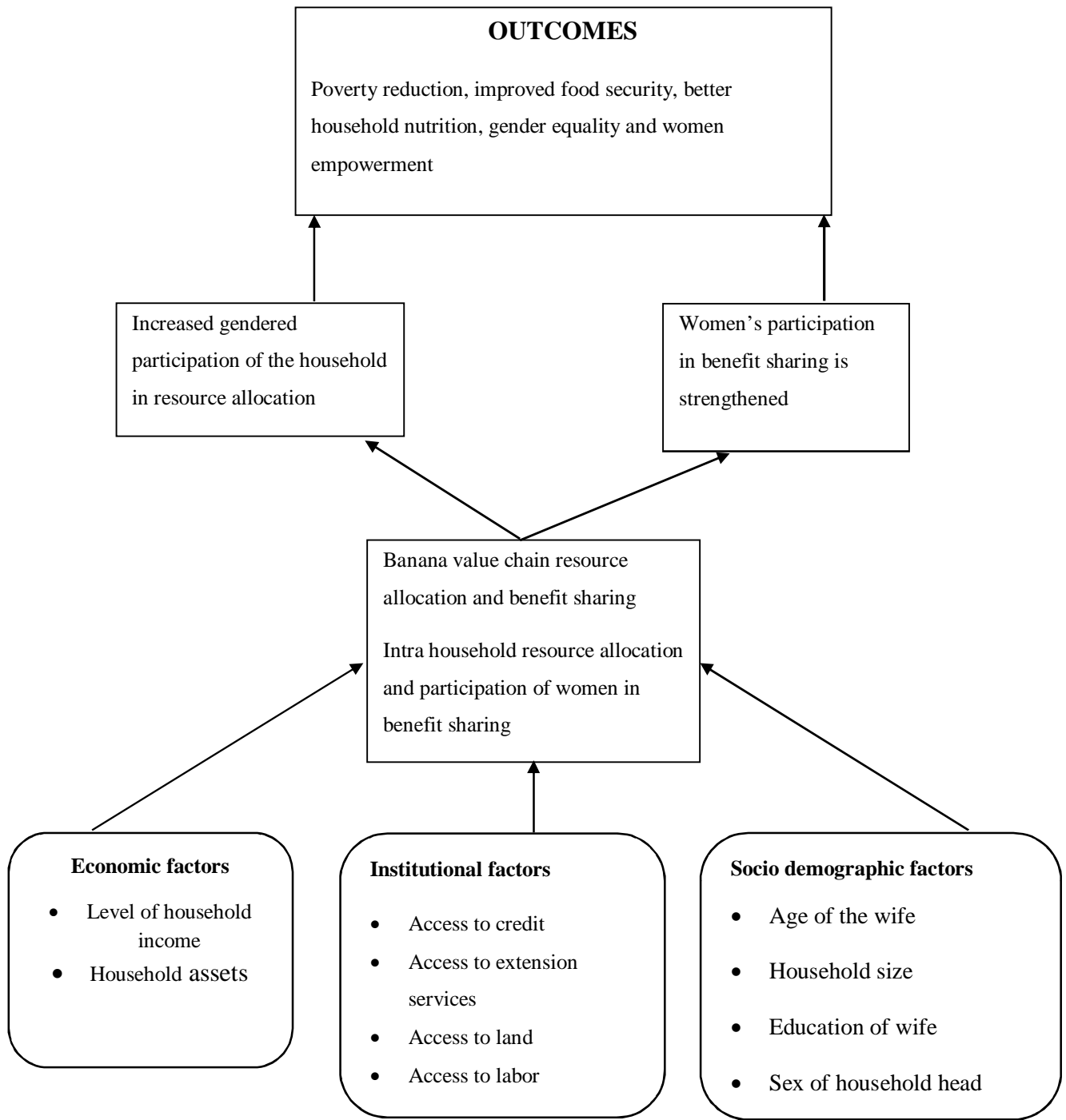


Figure 1: A conceptual framework illustrating resource allocation and benefit sharing in the banana value chain

Source: Author's conceptualization (2017)

It has been hypothesized that intra household resource allocation is determined by a number of factors ranging from economic factors to socio-demographic and institutional factors (Figure 1). The socio-demographic factors that determine how resource allocation and benefit sharing takes place include: sex of the household head, education of the wife, household size and age of the wife. For instance, empirical evidence suggests that in a male-headed household, most of the household decisions are made by the household head implying that gender of the household head plays a critical role in how resources are allocated (Chemurot, 2011)

Resource allocation and benefit sharing within the household go hand in hand. Thus, the determinants of resource allocation are in turn important in explaining benefit sharing within the household. For instance, women with a higher level of education and assets within a household are likely to take part in decisions concerning how benefits from the value chain are shared among the different household members (Lyngstad et al., 2010). For successful value chain development, there is need to ensure that the linkages between people directly dealing with the products, the value chain policymakers, providers of the regulatory framework and service providers within the chain are well defined and gender inclusive (Pyburn and Mundy, 2012).

3.2 Empirical framework

Two methods were used in achieving the stated objectives: descriptive and inferential statistics. Descriptive statistics mainly involved the use of key informant interviews and focus group discussions to map out the value chain and get a clear understanding of the gendered distribution of chain participants. Inferential tools were critical in achieving the second and third objectives of this study. This involved the empirical estimation of the dependent variable using a fractional logit regression.

3.2.1 Mapping out resource allocation and benefit sharing in the banana value chain

The study adopted FAO methodology of functional and institutional analysis to map out the banana value chain in a gendered manner (Bellu, 2013). Mapping started by conducting key informant interviews and focus group discussions to have a general view of the banana value chain in Meru County. This gave rise to an institutional analysis that enabled identification of the key participants and the functional analysis that clearly indicated the role played by each participant (Lowitt et al., 2015). The functional analysis provided an explanation of main functions in the value chain including production, processing, and transport and other support activities such as the supply of inputs, extension and credit services (Rudenko, 2008)

Focus group discussions and key informant interviews were used to prompt responses to questions that were aimed at achieving the objective. The interviews and interactions with the producers, processors and consumers were formal and key in understanding areas along the chain where different people were involved, why they were involved and the possibility of men, women and the youth taking part in the different stages of the chain. Descriptive statistics such as means, mode and frequencies were used to empirically estimate the objective.

Where possible, focus group discussions were conducted in a way that men and women were in different groups to facilitate and provide an enabling environment for free discussion of issues that are relevant either to women or men. The need to have two groups that are gender differentiated is important in understanding how the intra-household allocation of productive resources and control plays a role in the participation of men and women along the value chains and why either men or women dominate the chain.

Profit margins at each stage were determined using value-added method. Value-added is the amount of wealth created by a player in the chain; it is measured from net sales less the costs of

bought-in goods and services (Brown *et al.*, 2010). This study focused on the profit margins generated by the producer by selling to the different channels available in the study area.

Value-added = (Total sales value) – (Value of intermediate goods bought)

Total sales value = price x volume of final product sold. Mathematically, value added can be determined using a formula proposed by (Olukunle, 2013) as follows:

$$VA = P_i Q_i - \sum_{i=1}^n r_i X_i \dots \dots \dots (1)$$

Where;

PQ = Value of output

rX = cost of raw materials, transaction cost and intermediate goods bought

Worthwhile to note, mapping of the banana value chain was done to understand the structure of the value chain and how intra household resource allocation affects the banana value chain. In addition to that, the objective sought to identify the nature, characteristics and attractive attributes of the value chain. Banana value chain mapping was done through categorizing and clearly recording the interconnectedness of the existing stages through key informant interviews and focus group discussions. Clearly identifying the different stages from production to end use, activities undertaken by women, men and youths and the stages at which they mostly dominate were pointed out.

3.2.2 Factors influencing intra household resource allocation along gender lines

Descriptive statistics were calculated for all independent variables. The two kinds of dependent variables land allocation and capital assets allocation in the regression analyses of independent variables possibly influencing intra-household allocation of productive resources in banana production were each denoted as ‘joint’ ‘husband’ and ‘wife’ allocations; this resulted in a total of six dependent variables (e.g., land allocation under ‘husband’). The dependent variables were

calculated as the proportion of the resources allocated jointly, to the husband and to the wife, out of the total resources available in the household. Given the nature of the data, a fractional response model (FRM) was used to estimate the six regressions.

The FRM was the most suitable econometric model and it was selected since it is capable of modelling empirically-bounded dependent variables that exhibit piling-up at one of the two corners (Papke and Wooldridge, 1996). With allocation ratios ranging from 0 to 1 for land and capital assets, six estimations of factors that influence 'joint allocation', 'husband allocation' and 'wife allocation' were conducted. The data for land and capital assets allocations were collected directly from farmers practicing banana production.

3.2.3 Factors influencing participation of women in benefit sharing in banana production

The dependent variable on the participation of women in benefit sharing was bound between 0 and 1 where 0 is when a woman does not take part in benefit sharing and 1 implies that she is the sole decision maker on income accrued from the banana enterprise. Benefit sharing in this study was exclusively defined as the income from banana production that a woman has access to and control over within the household.

Resource allocation and benefit sharing was measured in a proportionate form. Use of OLS for analysis was not applicable due to the following drawbacks. Firstly, it might not consider the bounded nature of the fractions appropriately. In the analysis at hand, the dependent variable was a share, hence, the variable's empirical values can never be below zero or above one. However, they possibly lie outside those thresholds if predicted with OLS (Baum, 2008; Ramalho and Ramalho, 2011). Secondly, the OLS assumes a linear effect from the explanatory variable to the dependent variable. Yet, in the present analysis, the effects are most likely not linear, making the

OLS model a questionable choice for the current data. In addition to this use of OLS could have produced biased results for the extreme values 0 and 1 (Brown and Dunn, 2011).

Another popular method to estimate fractions is the Tobit model (Sevilla-Sanz et al., 2010). One problem with its application is that it does not correctly interpret the appearance of zeros. Tobit models assume that the zeros represent censored values of an underlying normally distributed latent variable that theoretically includes negative values (Brown and Dunn, 2011). However, in the analysis at hand, zeros were not the outcome of censoring (Papke and Wooldridge, 1996). Based on the above conceptualization, the fractional logit model initially proposed by Papke and Wooldridge (1996) was chosen for estimating gendered resource allocation and the participation of women in benefit sharing. It is capable of taking into account the fractional nature of the explained variable and it works for both discrete and continuous variables (Papke and Wooldridge, 1996), and is capable of handling the extreme values of 0 and 1 without having to manipulate the data (Baum, 2008; Mullahy, 2010).

3.2.4 Econometric model for gendered resource allocation and participation of women in benefit sharing

There are cases where the dependent variable cannot be observed beyond a certain range. For instance, the dependent variables in this case, can only be observed between 0 and 1 and anything below or above this range is unobservable. To analyze gendered resource allocation and the participation of women in benefit sharing, a fractional response model (FRM) was used. In this case, the dependent variable was able to explain ‘joint’ resource allocation, allocation to the ‘husband’ and ‘wife’ allocation in a proportionate form. The dependent variable was able to determine the share of land or capital allocated to different gender within the household. The fractional logit ensures that the expected allocation lies between 0 and 1 and the sum should add

up to 1 (Papke and Wooldridge 1996). It utilizes the quasi-maximum likelihood estimator to estimate the proportional outcomes in a simplified form of the log-likelihood function (Ye and Pendyala 2005).

In the fractional logit applied, the dependent variable (y) is operationalized as a fraction $0 \leq y \leq 1$ bounded between 0 and 1.

$$Y = \frac{G}{X} \dots \dots \dots (2)$$

Where Y was the dependent variable, G was the number/ value of a specific resource allocated to each gender and X is the total number/ value of a specific resource within the household. According to Papke and Wooldridge (1996), a fractional logit can take the following form:

$$E (Y |X) = G(\beta X_i) \dots \dots \dots (3)$$

where $G(\cdot)$ denotes the link-function satisfying $0 \leq G(\cdot) \leq 1$ and X_i represents a set of explanatory variables. The link function ensures that the predicted values lie in the interval (0,1). It can be written as follows (Wooldridge, 2009):

$$G(\cdot) = \frac{\exp(\cdot)}{[1 + \exp(\cdot)]} \dots \dots \dots (4)$$

The fractional logit is presented in a general form:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 \dots \dots \dots + \beta_n x_n + \varepsilon_i \dots \dots \dots (5)$$

Where y is fractional dependent variable, x the explanatory variables and ε_i the error term.

Maximum likelihood estimation was used to eliminate the errors of biased and inconsistent estimates that manifest in the use of ordinary least squares regression estimators. The

explanatory variables that exhibited a dispersed distribution, such as current value of livestock, total household income, off-farm income, total production cost, value of non-agricultural assets, and value of inputs used in production were converted into natural logs (base 10).

Table 2: Measurement of variables included in the models

Explanatory variables	Measurement
Sex of the household head	Dummy (1 = male, 0 = female)
Age of wife	Years
Household size	Total number of people in the household in the last 12 months
Education of wife	Years of formal schooling
Group membership	Dummy (1 = yes, 0 = no)
Total income	Amount of money in KES generated per year from all activities
Access to extension	Dummy (1 = yes, 0 = no)
Livestock value	Current value in KES of livestock owned
Off-farm income	Amount of money earned in KES from off-farm activities per year
Access to credit	Dummy (1 = yes, 0 = no)
Non-agricultural assets value	Current total value in KES of all non-agricultural household assets
Total land	Farm land owned in acres
Total cost of inputs	Total cost of inputs used in production of bananas in KES

Source: Author conceptualization

Gendered resource allocation within the household is a behavioral response that is triggered and dictated by a number of socio-demographics characteristics, farmer attributes and institutional factors. The different factors and endowment within the household coupled with bargaining power and decision making dictated male, female and joint allocation of land and capital towards banana production. Table 2 indicates the measurement of variables included in the model.

In this study, the dependent variable which was the proportion of land and capital jointly allocated, allocation to the husband, and wife allocation towards the banana enterprise was regressed against a number of explanatory variables. Also, the participation of women farmers in benefit sharing which was measured as the proportion of income controlled and accessed by women farmers was used as the dependent variables for objective three and regressed against a number of independent parameters.

3.3 Variables included in the models

A number of factors were hypothesized to influence women's participation in benefit sharing and resource allocation along the banana value chain. Several studies have concluded that benefit sharing can be explained by a number of factors that may in turn depend on the nature of individual characteristics. Table 3 shows the expected signs of the explanatory variables included in the model.

Female age refers to the age of a woman within the household. It could have a positive or negative effect on resource allocation and participation in benefit sharing. Older and more experienced farmers are able to make better production decisions compared to young and less experienced farmers (Omiti et al., 2009; Martey et al., 2013). Additionally, older women are accorded the same status as men in the African society thus more likely to take part in major

decisions compared to younger ones thus either positively or negatively influencing husband resource allocation within the household.

Table 3: Expected signs of variables hypothesized to influence gendered resource allocation and participation of women in benefit sharing

Variable	Expected sign on resource allocation	Expected sign on participation of women in benefit sharing
Age of the wife	+/-	+/-
Education of the wife	+/-	+
Household size	+/-	+/-
Non-agricultural Asset value	+/-	+
Sex of the household head	+/-	+/-
Livestock value	+/-	+/-
Total cost of inputs	-	-
Off-farm income	+/-	+/-
Group membership	+	+
Extension access	+	+
Credit access	+/-	+
Total land	+/-	+/-

Educated women have a higher bargaining power and are likely to allocate resources towards banana production and take part in how benefits accrued from sales are shared. In their study, Lyngstad et al. (2010) found a high correlation between a woman's level of education and taking

part in benefit sharing thus the positive correlation. The significant effect of schooling on crop activities is in line with the work of Quisumbing (2007) who argues that return to schooling for both men and women is significant in agriculture and this could influence husband allocation positively or negatively. However, according to (Ilahi, 2000) better-educated women invest less time and resources into farming. This is because agriculture is a risky venture and investment in less risky activities is taken up.

The current value of household assets was hypothesized to positively or negatively influence resource allocation. A household with a large asset portfolio is likely to invest in less risky ventures outside agriculture reducing the resources set aside for agricultural production. However, household assets are critical to agricultural productivity. In addition to that, women are more likely to take part in decision making where they own household assets (Friedemann-Sánchez, 2006)

A larger household could have a positive or negative effect on resource allocation and a negative effect in the participation of women in benefit sharing. In households where banana production could be individually taking place, the individualization of decision making is likely to negatively affect resource allocation. Land allocation and labor sharing within the household results in reduced resource allocation towards banana production. In addition to that, larger households could mean a higher dependency ratio that diverts more resources towards food crop production rather than cash crops. A larger household could also imply labor availability and given that banana production is labor intensive, it could result in higher productivity.

In a male-headed household, the probability of women taking part in decision making is reduced while resource allocation towards the banana enterprise increases. Given the socio-cultural setting of the traditional African society men reserve the right to decision making on resource

use, control of household resources and distribution of benefits from agricultural enterprises (Chemurot, 2011).

The flexibility of livestock as a productive and financial asset makes it easy for women to acquire it. Women are more likely to own small ruminants within the household increasing their bargaining power. Also, livestock can act as collateral in accessing capital necessary for banana production. However, in a household where the current value of livestock is high, fewer resources will be allocated towards banana production and emphasis would be put on livestock production.

The influence of off-farm income on resource allocation and participation of women in benefit sharing was expected to be positive. Off-farm income augments the total household income needed for investment in agriculture. However, higher off-farm income could act as motivation for investment in non-agriculture ventures due to higher returns generated. High production cost was hypothesized to have a negative effect on resource allocation towards banana production and participation of women in benefit sharing.

Group membership was hypothesized to positively influence access to output market as it provides the advantage of spreading fixed transaction costs through collective marketing of output. There are a number of activities and services that different groups provide for their members ranging from market access to input acquisition as well as credit provision (Agbola et al., 2010; Mathenge et al., 2010). A household whose members take part in group activities has a higher likelihood of allocating more resources towards banana production. However, the participation of members in group activities may reduce a woman's ability to be part of decisions regarding income shares. Given the opportunity cost of women's time, the incentive to participate in group activities is reduced thus giving men an upper hand in group activities that

increases their household bargaining power (Weinberger and Jütting, 2001; Meinzen-Dick and Zwaarteveen, 2003).

Extension service provision mainly targets men and therefore it was hypothesized to have a positive effect on resource allocation. With extension service access one has the ability to access production and market information on bananas resulting in better decision making on how intra household resource allocation will take place. Producers with information on input prices and output prices are more efficient when it comes to resource allocation than those who do not have access to information. In addition to that, a household that has extension contact is more likely to have women participating in benefit sharing. Women with access to agricultural information have a higher bargaining power and so is the probability of taking part in decision making.

Access to credit is vital for the improvement of small-holder agriculture as shown by Otieno et al. (2010). Household access to credit is expected to positively or negatively influence intra household resource allocation. Credit provision enables farmers to purchase inputs necessary for agricultural production (Martey et al., 2013). It also enables farmers to intensively invest in banana production resulting in increased productivity. Access to credit also improves the bargaining power of women thus increasing their participation in decision making.

It was hypothesized that household with large agricultural land that is well managed are likely to make positive decisions on how resources are to allocated. This is because it enables farmers to generate surplus for the market thus enjoy economies of scale (Martey et al., 2013). However, the importance of land in the African society has placed decision making regarding access to land and its utilization in the hands of men. Women can only be part of income shares generated from food crops.

3.4 Study area

The study was undertaken in South Imenti (Figure 2) which is an area where most dessert banana production takes place. The area was selected because most of the bananas from the area are transported to the major urban areas such as Nairobi, Meru town, Embu, Isiolo and Mombasa where consumption takes place. Selection of the study area was based on information from empirical studies highlighting the County as one with the highest concentration of banana production and marketing (Mbogoh et al., 2003; Miriti et al., 2014). The area has an altitude ranging from 300m above sea level to 5199 m above sea level and this has influenced the varied agro-ecological climate zones. The average rainfall per annum is 1250mm with temperatures of a low of 8 degrees centigrade to a high of 32 degrees centigrade during the hot season. Household land size is 1.8 ha for small-scale farmers and 18.25 ha for the large farmers (Kimenchu et al., 2014).

The county is well served with road network with majority of areas being accessible during the dry season. It has 1,259.9 km of road network of which 225.7km is bitumen, 266.7 km gravel and 767.5 km of earth surface. However, during the rainy seasons some sections of gravel and earth surface roads are impassable making transportation of perishable agricultural produce impossible.

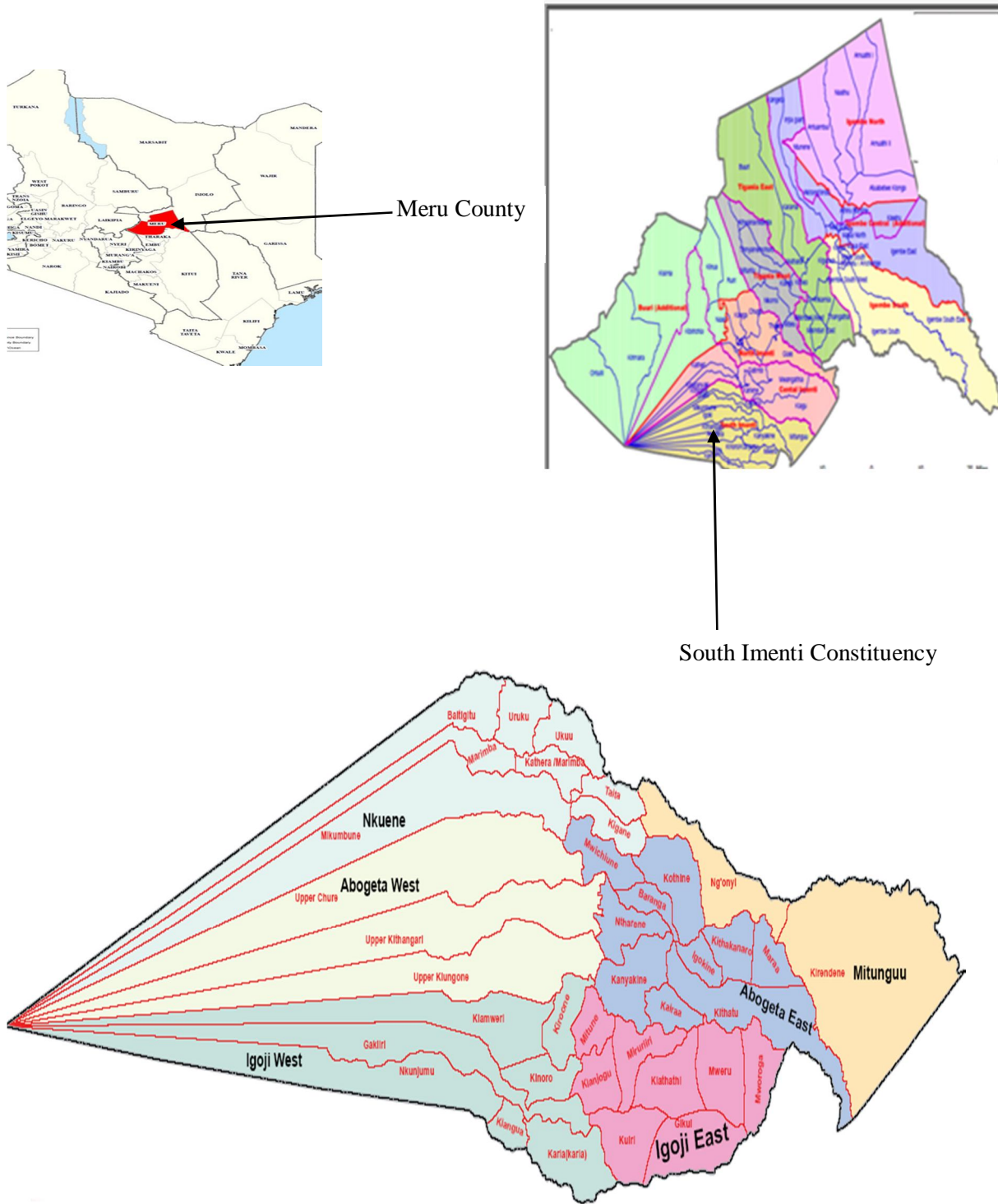


Figure 2: A map showing South Imenti constituency

Source: DURP, University of Nairobi, (2008)

The County is served by one airstrip; Gaitu airstrip in Meru Central which has been improved to serve more flights (CGM, 2016). Due to its high agricultural potential, Meru has attracted various commercial banks and other financial institutions including the Central Bank of Kenya. There are sixteen commercial banks, eight microfinance institutions, four village banks and a number of SACCOs. The strong presence of the various financial institutions indicates that the county has high potential for commercial services. The study area is well served with tapped water that is supplied by the Mount Kenya Water Services and agricultural production during the dry season takes place undisturbed using irrigation. The presence of a good water supply has boosted horticultural production throughout the year including banana production.

3.5 Sample size determination and sampling design

The respondents interviewed were selected from banana production groups in South Imenti. The survey was a follow-up on a baseline study on the hexanal technology adoption initially done by the University of Nairobi. The survey targeted farmers who grow bananas both for commercialization and subsistence with a household as a sampling unit. A list of banana producers in South Imenti was acquired and systematic random sampling was used to draw every 10th farmer on the list. This resulted in a sample of 160 banana farmers. This type of random sampling ensures that each outcome has an equal chance of being sampled.

3.6 Data collection and analysis

Primary data was collected by administering semi-structured questionnaire in Meru County. The questionnaires were structured to collect household information and socio-economic characteristics of households. The semi-structured questionnaire was used to gather information on household demographic characteristics, as well as physical, institutional, and socio-economic attributes related to gendered banana production and resource allocation within households.

Information on the type of resources available in a household were also collected taking into account issues such as who owns a certain resource, the quantity owned, and the current value in Kenyan shillings. Additionally, data on kinds of services such as extension and credit sought from the governments and other value chain supporters were collected. Data on gender issues, and on access to productive resources as well as credit were gathered and documented too. Focus group discussions were used to elicit responses. Recruitment of participants into the focus group discussions was based on the participants' knowledge and level of involvement in the production and marketing of banana. Special consideration was paid to the gender of the participants when recruiting participants into the FGDs. Data entry was done using SPSS statistical package and analysis was made possible by use of STATA statistical package. While the former statistical package is easy to use for data entry and manipulation, the latter gives more robust econometric results.

3.7 Model diagnostic tests

Heteroscedasticity

Heteroscedasticity is when the variance of the error term is not constant therefore resulting in a violation of the OLS assumption BLUE (Best Linear Unbiased Estimator). It is a common problem in cross-sectional data sets and it violates the constant variance assumption of the error term (homoscedasticity). It renders the estimated beta inefficient and thus invalid to use in making predictions about the dependent variable (Nzuma et al., 2001).

Multicollinearity

Multi collinearity is exhibited when the explanatory variables included in a model have a linear relationship (Koutsoyiannis, 1973) that makes hypothesis testing weak thus making it impossible to reject the null (Kennedy, 1985). According to Greene (2007), multicollinearity is evidenced by

large standard errors and low significant levels for coefficients of the collinear variables, giving misleading results and conclusion.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter is divided into two sections with the first section presenting a detailed discussion of the social economic characteristics of the sampled farmers, gendered resource allocation and benefit sharing and mapping of the banana value chain along gender lines. The second part provides insights on the factors that influence intra household resource allocation along gender lines and factors influencing the participation of women in benefit sharing. It was found that resources are allocated in a gendered pattern and benefits from the banana enterprise play a critical role in ensuring gender equity within the household.

4.2 Demographic and socio-economic characteristics of the sampled farmers.

Table 4 shows the mean and standard deviations of the variables included in the study. The descriptive statistics results for demographic and household characteristics indicate that 47 percent of the respondents from the survey were female whereas 53 percent were male. Findings from the study also indicate that 14 percent of the households were female-headed while 86 of the households were male-headed. This is an indication of the setting of the African households where men are considered to be the heads. Majority of the farmers in Meru County are small-scale farmers who constitute 48 percent of the banana farmers in the region. The marginal, medium and large-scale farmers make up 22, 27 and 3 percent respectively.

Table 4: Demographic and socio-economic household characteristics

Variable	Statistics (n=160) (Standard deviations in parentheses)
Sex of respondent (% male)	53.13(0.5005)
Farm category: Marginal farmer (%)	21.88
Small-scale farmer (%)	48.13
Medium farmer (%)	26.88
Large-scale farmer (%)	3.13
Household size	4.00 (0.1153)
Sex of the household head (% male)	85.63 (0.3519)
Age of the husband	57.52 (1.1475)
Age of the wife	49.84 (13.8526)
Years of schooling of the husband	9.39 (0.3511)
Years of schooling of the wife	8.89 (4.6033)
Total land size	2.11 (1.6618)
Access to credit (% yes)	15.10 (0.3891)
Group membership (% yes)	50.94 (0.5014)
Access to extension (% yes)	35.62 (0.4805)
Total cost of inputs	33486.60 (32860.63)
Total income	195697.80 (181796.30)
Livestock value	158938.40 (143764.10)
Nonagricultural asset value	312648.90 (278245.10)
Off-farm income	85243.46 (84455.34)

Source: Survey data (2017)

The mean land size in the area was 2.11 acres which was consistent with small-scale farmers who make up 48 percent of banana producers and the findings are similar to those of Miriti et al. (2014). Average household size is 4 members with the household head having an average of 58

years having attained a mean of 9 years of formal schooling. This implies that the highest level of education qualification is the primary school. In addition to that, these findings are similar to a report by the Government of Kenya (2008) which show that the average age of a Kenyan farmer is 60 years. The report attributed this to the fact that the younger generation think of agriculture as a “dirty job” and strive to get employment in the “white collar” sector.

Findings from this study indicate that 36 percent of the households had access to extension services and information regarding the production and marketing of bananas. These findings concur with Miriti et al. (2014) who found that 64 percent of the farmers in the region did not have access to extension services despite the region being a major banana producer. The results also reveal that of the 36 percent, 43.42 percent were men while 27.14 percent were women. The gender parity in agricultural extension could be attributed to the fact that male extension providers tend to pay more attention to male farmers with an assumption that the spillover effects will eventually reach women farmers (FAO, 2011).

The study found that 37 percent of the respondents sourced their extension services from government officers, while 25 percent of the extension services were offered by farmer groups. The non-governmental organizations and donor groups offered 15 percent of the information on banana production and marketing. Most of the information sought from extension officers was on product handling. Banana being a perishable crop, the quality attributes after harvesting dictates the price it fetches in the market. Post-harvest handling is one of the major constraints facing the banana value chain actors. Other kinds of services sought from the extension officers were on chemical handling (11.3 percent), soil and water management (9.43 percent) and pest management (7.55 percent).

Credit access and financial capital play an important role in agricultural production in the African agriculture setting. Credit access was estimated at 15 percent which is consistent with Miriti et al. (2014) who found that of all the respondents interviewed in South Imenti, only 10 percent had access to credit. The low access to credit could be attributed to the demand for collateral by financial institutions in the country. Focus group and key informant interviews attributed this to demand for collateral and guarantors by banks and microfinance institutions. Farmer groups such as banana cooperatives were the leading lender to farmers at 29.17 percent. These findings were consistent with results of focus group discussions and key informant interviews where the participants stated their preference for farmer group loans and financial services is based on the fact that they do not require collateral rather than it only needs guarantors who are members of the groups.

Commercial banks and Agricultural Finance Cooperation were at 20.83 percent and 12.50 percent respectively. Gender disaggregation analysis indicated that 13.33 percent of those who had access to credit were women while 16.47 percent were men. Empirical evidence on gender and credit access are mixed. For instance, FAO (2012) argues that the difference between men and women when it comes to credit access is little and insignificant whereas, according to Mehra and Rojas (2008) in some instances, men have low credit access compared to their counterparts who are favored by the credit institutions

As indicated, the study found that 51 percent of the households in the survey were in some form of group either formal or informal. The survey indicated that 29.4 percent of the respondents cited ease of market access by groups as one of the major reasons they joined the groups. The banana cooperatives in the region have been used as one of the marketing channels that are secure and offer better prices compared to roadside markets. The study found that, 9.4 percent of

the respondents were in group because the groups offered production information while 5.6 percent joined the groups because of the advantage of credit access by virtue of being in a group.

4.3 Mapping out the banana value chain.

The banana value chain in Meru County is clearly defined from input acquisition to urban consumption with different actors taking up different roles at the different stages of the chain. Banana production in Meru County takes place in South Imenti and it is majorly done by small-scale-farmers who make up 48 percent of farmers sampled. These are farmers who possess 2 acres of land on average. Key informant interviews and focus group discussions established that most of the inputs used such as fertilizers and agro chemicals were sourced from within Meru and outside the County. This study established that the key players in the banana value chain are the input suppliers, the producers, wholesalers and retailers while the majority of the respondents were producers with a few retailers as shown in Figure 3.

It was found that organic manure more so from cows, goats and sheep was sourced from Isiolo by the large-scale producers while small-scale farmers used manure from their cowsheds. Women, young boys and girls were more involved in the ferrying of manure to the farm and its application compared to men. Isiolo is the preferred region for the purchase of manure due to its dominance in livestock production with little or no agricultural production taking place. Distance to Meru County also plays a key role in being a major input supplier of manure to banana producers. Other inputs used in banana production were fertilizers which farmers deem to be detrimental to banana and thus used them sparingly. The inorganic fertilizers were purchased from the local agro-chemicals within Nkubu or Meru town while some farmers were able to access the subsidized fertilizers from the National Cereals and Produce Board (NCPB)

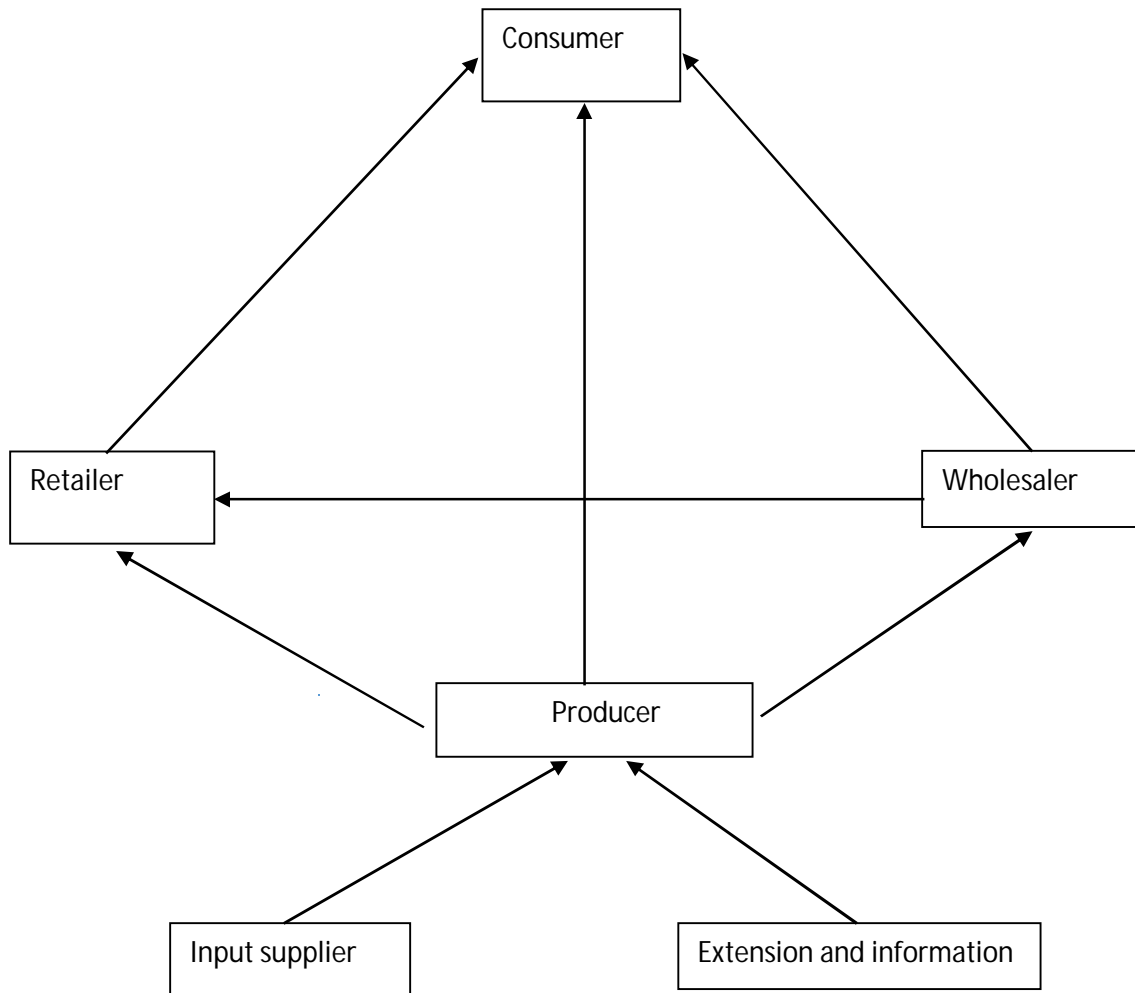


Figure 3: Simplified banana value chain map in South Imenti

Source: Survey data

Nematode attacks were one of the major production constraint that faced banana producers within the area. Producers were able to purchase the anti-nematodes from the local agro-chemicals. Provision of high-quality disease-free planting material such as tissue culture plantlets is facilitated by Non-governmental organizations operating in the area. Other than providing clean planting materials, the NGOs also offer training to farmers on how to maintain the banana orchards, the inputs to use and how to use them and how to come up with clean planting material from the already existing suckers.

At the production level, men invest most of their time more so during land preparation, staking, pruning, de suckering and harvesting of the crop. Women, on the other hand, are bestowed duties to do with weeding and watering of the plants. This was mainly because establishment and maintenance of the orchard is labor intensive and male labor is more utilized in this area. Women were more concentrated in the marketing stage of the banana value chain making up to 80 percent of the actors within the chain. These findings concur with those of Nalunga et al., (2015) who found that, in Uganda, 70 percent of the women take part in the marketing of bananas as retailers. This was because selling and buying of the bananas require a lot of patience, a skill which most men lack.

In as much as commercialization of banana production has taken place, men are reluctant to be involved in the marketing of the bananas as they consider it a woman's job to take care of the household expenditure on food and clothing from sales accrued from the proceeds. Also, traditionally, banana has always been considered a woman's crop and despite the increase in income from bananas, men still consider it to be women's.

The marketing level was dominated by wholesalers who purchase bananas from the Ntharene and Kanyakine markets and transport them to Nairobi, Isiolo and Mombasa where consumption takes place. Some of the actors in the markets were brokers who bulk the produce, oversee wrapping up of bunches to reduce bruises and abrasion during transport to maintain quality. Transport was done using trucks from Meru to Nairobi. Transportation of the produce to the local and County markets is done using motorcycles popularly known as bodabodas charging 20 KES per bunch with some farmers opting to carpool and use of pick-up trucks.

Some of the bananas from the areas were purchased by retailers and the remaining sold through cooperatives. Selling through cooperatives has proven to be effective as farmers sell their

produce in terms of KES per kilogram. However, this marketing channel was marred by a number of challenges ranging from delayed payments, delays in collection and stringent quality standards. Further, the need for quick and ready money by traders has attracted traders into the open air markets despite the presence of challenges such as high market fees per bunch, theft and adverse weather conditions. There was little value addition and processing that takes place along the banana value chain. These findings are consistent with Gatwiri (2014), who found that most of the bananas were sold at the farm gate and some farmers were paid while bunches were still on the stalk. Wine making was tried by the Ntharene banana farmers' cooperative. However, inadequate equipment for processing and lack of markets stalled the wine making.

Other than shortage of equipment, wine making requires a lot of bananas to be able to produce enough marketable wine and hence the lack of interest in value addition. However, producers in cooperatives have been trained on other value addition activities that are less time consuming and do not require advanced equipment such as banana flour milling, jam making and banana crisps. These value addition and processing activities were majorly aimed at diversifying the source of income and reducing the pre and post-harvest losses experienced by producers.

Table 5 shows the proportion of banana sold through each channel in the study area. The banana value chain has proven to be profitable and beneficial more specifically to the women actively participating. Other than improved incomes, women have taken up leadership positions, improved household nutrition as they are the custodians of their household, better networks and higher social capital. As indicated below, the study found that 80 percent of the bananas produced in Meru are sold to wholesalers. Due to the commercialization of banana production in the region, Meru has become one of the major supplies of dessert bananas to the major urban cities such as Nairobi, Mombasa, and Isiolo among others. These findings are similar to those of

Mbogoh et al. (2003) who found that urbanization and increase in population has fueled the demand for dessert bananas in major towns. The produce is usually bulked at the buying centers during the market days and transported by trucks to the different urban centers. Of the total value sold to wholesalers, women sold 88 percent of the produce through this channel whereas men sold 82.35 percent of bananas through wholesale means.

Cooperatives also play a critical role in the banana value chain in Meru as 15.98 percent of bananas are sold to cooperatives. This is mainly because the cooperatives buy the produce in terms of KES/kilogram. Results from focus group discussions and key informant interviews showed that cooperatives are the preferred means of selling the bananas as farmers get value for their money. However, delayed payment from the cooperative officials and stringent quality measures discourage producers from selling their produce through cooperative thus the high percentage selling to wholesalers. The retail marketing channel was highly dominated by women though there is a high presence of men. The study found that 12.43, 7.69 and 4.73 percent of the bananas in the region were sold to retailers, consumers and commission agents respectively. Most of the bananas produced in Meru are for domestic consumption with no export.

Table 5: Proportion of bananas sold through each channel

Channel	Statistics (n=160)
Wholesale (% yes)	80.47
Retail (% yes)	12.43
Cooperative (% yes)	15.98
Consumer (% yes)	7.69
Commission (% yes)	4.73

Source: Survey data

4.4 Intra household decision making on activities

The entire surveyed households in the study produced bananas as one of the major cash crops both for the local markets and other regions. Both organic and inorganic fertilizers were used in production. The use of tissue culture banana plantlets was widely practiced with a single plantlet going for as low as KES 100 depending on the variety in question. Inputs used in production were locally sourced from agro vets. Household decision making on activities along the value chain were divided by gender with men, women and youths taking up different activities. As illustrated in Figure 4, men play a major role in making decisions at the production level while women are more involved at the marketing stage. For instance, women play a role in decisions to do with harvesting time, means of transport to use to the marketplace, the choice of marketing channel and post-harvest handling of the produce.

In her findings on vegetable production, Muriithi (2015) states that men typically control all the major production decisions such as the use of fertilizers, pesticides, water for irrigation, credit access and utilization of other farm inputs within the household. Findings from the study coincide with findings of the current study as they indicate men control general input use, technical activities such as digging pits, staking, agricultural extension and credit access.

This is because most of the women within households take part in the marketing stage thus they have an upper hand in activities concerned with marketing of the bananas. Focus group discussions and key informants revealed that men rarely participate in the selling of bananas as it requires patience in bargaining and convincing buyer to purchase one's goods. Also, income from banana enterprise is used for household expenditure and since women are the custodians of the household, there is a high likelihood that they are involved in the selling of the produce. Decision making at the production level is dominated by men. As shown in Figure 4, 41 and 53

percent of decisions regarding the purchase and use of manure and fertilizers are made by men respectively. Since resource allocation takes place at the production level, this could imply that men play a major role in resource allocation in the banana value chain.

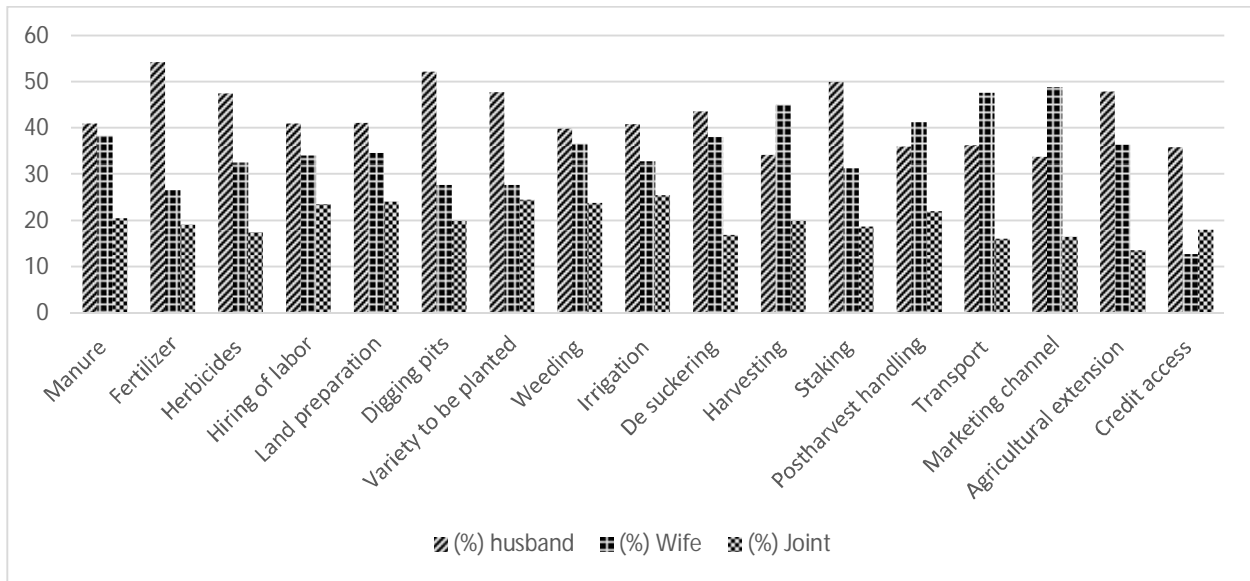


Figure 4: Intra household decision making of activities

Source: Survey data

In Columbia, it is evidenced that despite the fact that women devote a large share of their labor to coffee production, they often have little say in agricultural decision-making (Lyon et al., 2010). Previous findings point out that men are the major decision makers on labor hired for agricultural production thus they dictate the units and cost used in labor (Dolan, 2001). Findings from this survey are in line with other studies as the results show that labor hire decision are made by men.

4.5 Intra household resource allocation

The most utilized resource within households in the region are land, labor and capital. Decisions concerning the allocation of these resources were made by the head, spouse or jointly. Focus group discussions and key informant interviews on access to and control over land established that land ownership is exclusively a man's legitimate sphere of control. Further analysis indicated that as men realize bananas earn more money than their traditional cash crops, they release more land for planting bananas to women or shift to banana production (Muyanga, 2009). The land's title deeds are in a men's names and women have no control whatsoever on matters to do with the land. These findings are consistent with Miriti et al. (2014) who found that over 90 percent of the title deeds were under men who were over 36 years old.

Women can only own land through purchase. However, it was clear that women could have access to and use of land through consent from their husbands through usufruct rights. Women were allowed to have farm enterprises where they had control over the benefits from those enterprises and utilized the cash sales for household expenditure and merry go rounds. Results from the survey (Figure 5) indicated that 33 percent of intra household decision making regarding land was done by the husband, 22 percent of the decisions were made by the wife. Joint decision making regarding land allocation was estimated at 44 percent. This implies that a higher percentage of decisions regarding the use and control of land as a resource were made by both the household head and the spouse.

Findings from this study indicate that the husband makes 54 percent of the decisions regarding credit access while the wife decides only 19 percent on matters touching on credit. Joint decision making was estimated at 27 percent. The low percentage of credit access by women could be attributed to the demand for collateral such as title deeds as a necessity for credit access.

However, given the socio-cultural setting of the African society, women lack such collateral in order to access financial services.

However, findings from the key informant interviews and focus group discussion indicate that men are less likely to get access to credit compared to women. Men attributed this to the trust that financial institutions bestow upon women. Also, it is easy for women to access loans for small businesses in small amounts while men are able to access large amounts of loans to finance larger investments and development as this kind of loans require collateral.

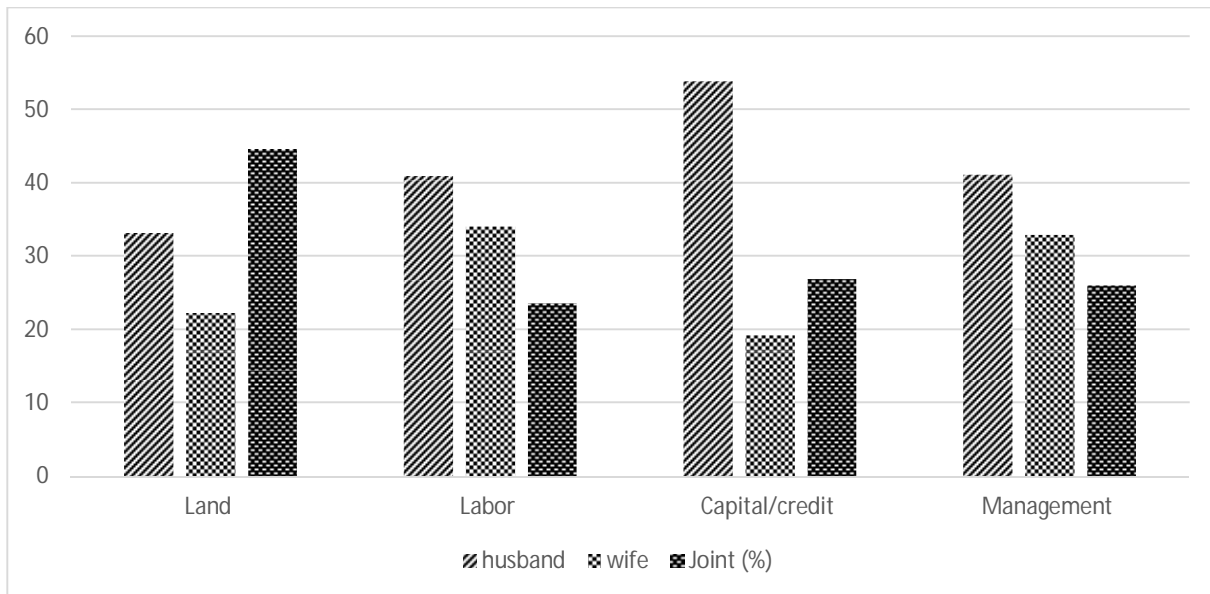


Figure 5: Intra household resource allocation

Source: Survey data

Other than banks and micro finances, women are more likely to access fund through informal and formal groups such as merry go rounds which have less stringent requirements. It was difficult for women to have their husbands act as guarantors in accessing credits which is mandatory in most financial institutions. Similarly, the youths also have limited access to credit due to inadequate and or lack of collateral. This is evidenced by the low participation of the

youth in the banana value chain as it is a capital-intensive enterprise. In addition to that, the youth are ignorant about the banking sector which puts them at a disadvantage in accessing loans and financial services. Investment in agriculture by banks requires innovation and creativity from the youths, an ability that most youths in the agricultural sector lack.

Labor, including family and hired, is an input greatly required on banana farms. Both men and women participate in the day to day management of banana plots, with men participating more in the production practices compared to women. Banana production is a labor-intensive enterprise where most of the activities such as digging pits, weeding, irrigation, staking, pruning and wrapping of bunches require a lot of man-hours. In their study in Kenya, Miriti et al. (2014) found that specific activities like land preparation de-suckering, loading and harvesting are predominantly performed by men. Women, on the other hand are largely involved in weeding, ripening and marketing activities. These results re-affirm a study by NALEP2 (2009) conducted in Kenya that showed that in both small-scale and large-scale agricultural systems, women are assigned the perceived less laborious roles such as weeding and watering while men take up the more technical activities such as ploughing.

Maintaining a banana orchard is also time-consuming according to focus group discussions. Men mostly take part in the production activities such as digging pits. In a household where there is a shortage of men, hired labor is used as an alternative to owned labor. In Uganda, Kikulwe et al. (2011), argue that men family labor is widely used in land preparation whereas female labor is utilized during the weeding period. The survey found that the husband makes 41 percent of the decisions regarding allocation and hiring of labor. The wife contributes 34 percent of the decisions while joint decision making is at 24 percent.

4.6 Intra household benefit sharing

Benefit sharing from any agricultural enterprises is one of the source of conflicts within the household. Focus group discussions and key informant interviews revealed that both men and women actively participate in the banana value chain though at different stages. It was found that men are likely to participate at the production level of the chain while the women majorly take part in the marketing stage of the chain. Benefit sharing in this study has been defined as decision regarding use and control of the income accrued from the sale of bananas. As shown in Figure 6, 31 percent of the decision on how the income is spent were made by the husband while the wife made 28 percent of the decisions. Joint decision making was estimated at 41 percent. The study findings are supported by the key informant and focus group discussions which revealed banana as a major source of household income. The women who mostly participate at the marketing level spend the income on household expenditure such as food and use for the remaining amount is jointly determined.

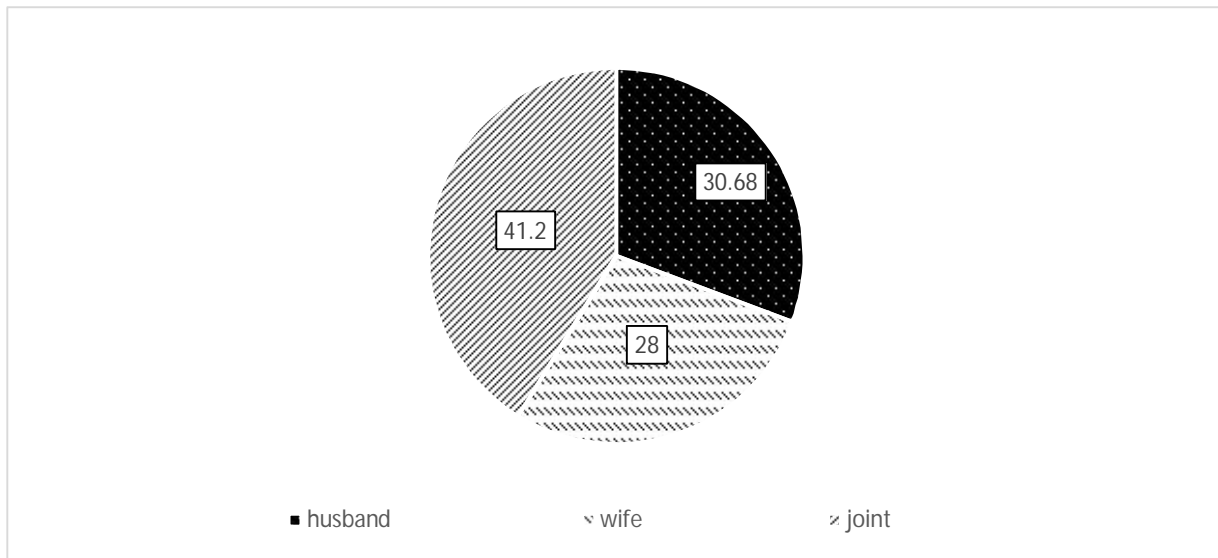


Figure 6: Intra household benefit sharing

Source: Survey data

4.7 Household profit margin analysis per channel per year

Table 6 presents the profit margins derived by selling through the available channels. The banana value chain in Meru has a number of marketing channels all fetching different prices for the same commodity. The most lucrative turned out to be selling through cooperatives as the produce was bought in terms of KES per kilograms as shown in table 6 above. This offers farmers better returns compared to selling bananas in bunches. However, selling through cooperatives has a major challenge which is delays in payment and thus producers prefer the open air market despite being marred by a number of challenges.

Table 6: Household profit margins analysis per channel per year

Channel	Mean	Std. dev	Min	Max
Cooperative	91995.44	70216.6	-73300	654400
Retail	41036.19	52382.98	-16500	141300
Wholesale	53945.3	10700.5	-18350	654400
Consumer	26154.85	34920.94	-21650	104700
Commission	13615	7764.59	-27000	80000

Source: Survey data

Focus group discussion and key informant interviews indicated that depending on the size, banana bunches can fetch as low as KES 100 to as high as KES 800. This price varies with the production season with the dry season fetching higher prices due to reduced production, one's negotiating skills, quality of the produce which is determined by the size of the bunch, presence or absence of blemishes, length of banana fingers among others. The gross margins in banana

production vary depending on the production costs that one incurs coupled with the marketing channel used.

4.8 Factors influencing intra household land allocation along gender lines

In this study, the partial correlation coefficients showed that farming experience and male age were highly correlated with a correlation coefficient greater than 0.5 (Appendix IV). In addition to that, it was also found that male age and female age were also highly correlated. Therefore, in both cases, male age was dropped from the study and is not included in the fractional logit regressions. Based on this criteria, male education and female education were highly correlated and therefore both could not be used in a single regression. The Breusch-Pagan test for heteroscedasticity in the regression for land allocation was not significant (Appendix III).

A number of factors were found to influence gendered land allocation in banana production within the households. As shown in Table 7, factors that favored 'joint' allocation of land for banana production include total costs of inputs of production ($p < 0.1$), value of livestock ($p < 0.1$), household size ($p < 0.05$), access to credit ($p < 0.05$), and sex of the household head ($p < 0.01$). Factors that hindered 'joint' allocation were years of education of the wife ($p < 0.01$), participation in groups ($p < 0.05$), and age of the wife ($p < 0.05$). As shown in Table 8, allocation to 'husband' was favored by education of the wife ($p < 0.05$) and participation in groups ($p < 0.05$) while it was inhibited by size of the household ($p < 0.05$) and access to credit ($p < 0.05$). Allocation to 'wife' was driven up by education of the wife ($p < 0.05$) and possession of non-agricultural assets ($p < 0.01$) while it was driven down by sex of the household head ($p < 0.01$), access to credit ($p < 0.01$), total costs of inputs of production ($p < 0.1$), and value of livestock owned by the household ($p < 0.05$) as indicated in Table 9.

Table 7: Marginal effect, standard error and significance levels of variables influencing intra-household joint land allocation

Variable	dy/dx	Std. Error	P>z ¹	95% confidence interval
Sex of the household head	3.1462	0.2676	0.000***	2.6216-3.6707
Household size	0.3167	0.1191	0.008**	0.0206-0.1404
Age of wife	-0.2995	0.1458	0.038**	-0.0114- -0.0003
Education of wife	-0.3959	0.0715	0.000***	-0.0589- -0.0291
Group membership	-0.0927	0.0421	0.024**	-0.3414- -0.0235
Access to credit	0.0320	0.0093	0.020**	0.0411-0.4899
Extension contact	0.0518	0.0325	0.122	-0.0354-0.3009
Log total cost of inputs	0.4578	0.2404	0.049*	0.0005-0.2184
Log non-agricultural assets	-0.1216	0.2413	0.613	-0.1095-0.0645
Log value of livestock	0.8199	0.4742	0.081*	-0.0198-0.3460
Log off-farm income	0.0390	0.0416	0.354	-0.0167-0.0469

Wald chi2(11) =356.9, Prob > chi2=0.0000, Pseudo R2=0.2496, Log pseudo likelihood = -63.458585, * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

¹ P-values are used to determine whether a null hypothesis is to be accepted or rejected. Confidence intervals provide information about a range in which the true value lies with a certain degree of probability as well the direction and magnitude of the effect.

Table 8: Marginal effect, standard error and significance levels of variables influencing intra-household husband land allocation

Variable	dy/dx	Std. error	P>z	95% confidence interval
Sex of household head	0.1550	0.2034	0.438	-0.2454-0.5669
Household size	-0.2619	0.1039)	0.016**	-0.1291--0.0132
Age of the wife	0.0842	0.1431	0.552	-0.0038-0.0071
Access to extension	-0.0285	0.0297	0.371	-0.2369-0.0884
Log total cost of inputs	-0.2119	0.1732	0.223	-0.1348-0.0314
Education of wife	0.2414	0.0923	0.005**	0.0079-0.0443
Group membership	0.0872	0.0471	0.040**	0.0069-0.3103
Access to credit	-0.0194	0.0095	0.014**	-0.3625-0.0546
Log non-agricultural assets	-0.2934	0.2236	0.188	-0.1341-0.0263
Log value of livestock	0.1407	0.2545	0.578	-0.0705-0.1265
Log Off-farm income	-0.0362	0.0366	0.346	-0.0466-0.016

Wald chi2(11) =16.5, Prob > chi2=0.0235, Pseudo R2=0.1143, Log pseudo likelihood = -65.898807,

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source: Survey data

Table 9: Marginal effect, standard error and significance levels of variables influencing intra-household wife land allocation

Variable	dy/dx	Standard error	P>z	95% confidence interval
Sex of household head	-0.3848	0.01448	0.004***	-0.6822- -0.1317
Household size	0.0274	0.0881	0.753	-0.0352- 0.0487
Age of the wife	0.1015	0.1333	0.435	-0.0030-0.0070
Access to extension	-0.0113	0.0198	0.594	-0.1454-0.0832
Log total cost of inputs	-0.1977	0.1185	0.060*	-0.1099-0.0108
Education of wife	0.1713	0.0759	0.014**	0.0033-0.0298
Group membership	0.0032	0.0273	0.904	-0.0967-0.1095
Access to credit	-0.0158	0.0057	0.004***	-0.3967-0.0575
Log non-agricultural assets	1.1577	0.3523	0.001***	0.0833-0.3198
Log value of livestock	-0.6880	0.2663	0.010**	-0.2454- -0.0326
Log Off-farm income	0.0024	0.0403	0.952	-0.0248-0.0264

Wald chi2(11)=26.38, Prob > chi2=0.0057, Pseudo R2=0.3523, Log pseudo likelihood = -39.396314, * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source: Survey data

Turning to the effect of each factor across ‘joint,’ ‘husband,’ and ‘wife’ land allocation categories or dependent variables, it was found that current value of livestock in the household had a positive influence ($p < 0.1$) on ‘joint’ land allocation while it had a negative effect ($p < 0.05$) on ‘wife’ land allocation. This can be explained by the fact that livestock ownership in African society is mainly accorded to the husband. Women are only allowed to own small stocks such as chicken and goats. In some cases, they are also allowed to have control over livestock products such as milk (Njuki, 2011). Thus, as the number of livestock increases within the household, less land is likely to be allocated to wives as much of it is needed for grazing and fodder production.

The value of non-agricultural assets owned by the household had a positive influence ($p < 0.01$) on ‘wife’ land allocation and no significant effect on the other two types of allocation. This implies that as the non-agricultural assets increase in a household, individual bargaining power of wives increases and in the process they gain control of land. Thus, as the household gets wealthier, the probability of a wife being allocated land increases. These study results concur with past findings that indicate that ownership of assets increases the woman’s bargaining power within the household, which results in more resource allocation (Quisumbing and Pandofelli, 2010).

Credit access by the household increased the probability of ‘joint’ land allocation ($p < 0.01$) but at the same time reduced chances of ‘husband’ ($p < 0.05$) and ‘wife’ allocation ($p < 0.05$). This may be because most of the credit accessed by households is secured by having land as collateral and both wife and husband have to participate in land cultivation to ensure regular repayment. As expected, access to credit does not favor ‘wife’ land allocation.

'Joint' land allocation was negatively affected by participation in groups ($p < 0.05$). However, the same variable had a positive influence on 'husband' land allocation ($p < 0.1$). Group participation was mainly by men who seek the benefits of market access and higher profits associated with the selling of bananas in kilograms as opposed to bunches. It is likely that due to these incentives husbands hold onto the land and do not allow joint ownership or transfer of the property rights to their wives.

Education of wives had a negative effect on 'joint' land allocation ($p < 0.05$) while it exhibited a positive influence on both 'husband' ($p < 0.01$) and 'wife' allocations ($p < 0.05$). Thus, education as an investment in human capital plays a critical role in according married women a higher bargaining power in negotiations on ownership of resources like land. The results further indicated that as the education of the wife increases, households are not likely to have joint allocation of land but would rather favor husband allocation. Considering that the right to allocate land in the study area is mainly assigned to husbands, this result implies that married men retain control over land even if their wives are highly educated. This result concurs with the assertion of Kimani (2008) that no matter how hard women in Africa fight over access to and control over land, men will always have the decision-making power.

Total costs of inputs had a positive effect on 'joint' land allocation ($p < 0.1$) and a negative effect on 'wife' allocation ($p < 0.1$). This may be because using large amount of inputs in the production of bananas and other crops in the study area is associated with wealth which favored joint decision-making on the farms. Similarly, total costs of inputs reduced the likelihood of 'wife' land allocation since safeguarding wealth in the African set-up is associated with men (Soetan, 2001).

The age of the wife negatively influenced 'joint' land allocation ($p < 0.05$). This implies that joint allocation was not common in households with older women and this is perhaps due to cultural barriers. The size of the household, however, positively influenced 'joint' land allocation ($p < 0.05$) but had a negative effect on 'husband' allocation ($p < 0.05$). With large families, it might be expected that husbands would be more motivated to transfer land rights to their wives and, to some extent, to mature children in order to encourage production of the much needed food and to achieve self-sufficiency. As expected, having male-headed households favored 'joint' land allocation ($p < 0.01$) but negatively influenced 'wife' allocation ($p < 0.05$). This is likely because the right to land is mainly held by men who can allocate land to whomever they want. The result also implies that husbands in the study area do not have a problem with 'joint' land allocation.

4.9 Factors influencing intra household capital asset allocation along gender lines

Similarly, just as in land allocation multicollinearity was detected and variables that exhibited collinearity was dropped from the regressions. There was no heteroscedasticity in capital asset allocation at 5 percent significance level. Factors influencing intra-household capital assets allocation are somewhat different from the ones influencing land allocation except for value of livestock, group membership, and age of the wife. For capital assets allocation, the value of livestock had a similar negative and significant influence on 'wife' allocation ($p < 0.1$) (Table 12), and group membership had a similar negative influence on 'joint' allocation ($p < 0.05$) (Table 10). The results of the 'education of wife,' in the capital assets allocation model almost matched those of the land allocation. The variable showed a similar negative influence on 'joint' capital assets allocation ($p < 0.05$) and a positive influence on 'wife' capital assets allocation ($p < 0.05$).

The only significant factor with a different direction of influence was the value of non-agricultural assets ($p < 0.1$). This factor negatively influenced capital assets allocation of the 'wife.' It is most likely that households that already have higher values of non-agricultural assets are already regarded as well-endowed with capital assets and therefore this factor is not a key driver for 'wife' allocation of assets needed for banana production. There are two other variables worth mentioning here: access to extension and age of wife. Access to extension did not have any significant influence in the land allocation model, however, it had a significant, positive influence on 'husband' allocation of capital assets ($p < 0.1$) (Table 11) and a negative influence on 'wife' allocation of capital assets ($p < 0.01$).

These results are likely associated with the fact that extension services in the study area target mainly male members of the households as we have already explained in the descriptive statistics. In the capital assets modelling, the age of the wife had a significant, negative influence on 'husband' capital assets allocation ($p < 0.01$) and this differs from what was seen in the land allocation modelling. This may be because capital assets in banana production are normally allocated to older children in the household as women and men age.

Total land owned by a household had a negative influence on 'wife' capital assets allocation ($p < 0.05$). This may be mainly because in the traditional African society, land ownership is a man's affair and a wife is not empowered to negotiate with her husband on land issues. In fact, findings from the focus group discussions and key informant interviews in the study area indicate that land is predominantly owned by the men and is rarely owned by women. This result is closely related to the results of the total household income variable. As expected, increased income positively drove 'joint' allocation ($p < 0.05$) and reduced the likelihood of 'husband' allocation ($p < 0.01$).

Table 10: Marginal effect, standard error and significance levels of variables influencing intra-household joint allocation of capital assets

Variable	dy/dx	Std. error	P>z	95% confidence interval
Education of wife	-0.1487	0.0721	0.037**	-0.0347-0.0001
Age of wife	0.1503	0.1272	0.222	-0.0018-0.0079
Group membership	-0.0635	0.0301	0.018**	-0.2752-0.0079
Log non-agricultural assets	-0.0982	0.2239	0.656	-0.1005-0.0632
Log livestock value	0.5777	0.3702	0.118	-0.0285-0.2531
Log total income	1.1245	0.4604	0.018**	0.0162-0.1692
Log total land	0.0524	0.0573	0.380	-0.0249-0.0655

Wald chi2(7)=14.82, Prob > chi2=0.0383, Pseudo R2=0.1008, Log pseudo likelihood = -63.957321, * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source: Survey data

Table 11: Marginal effect, standard error and significance levels of variables influencing intra-household husband allocation of capital assets

Variable	dy/dx	Std. error	P>z	95% confidence interval
Sex of the household head	0.1893	0.1606	0.470	-0.2068-0.4480
Education of wife	0.0374	0.0893	0.314	-0.0094-0.0295
Age of wife	0.0374	0.1487	0.001***	-0.0126- -0.0016
Extension contact	0.0466	0.0275	0.010**	-0.0650-0.2799
Log of non-agricultural assets	0.2677	0.2426	0.305	-0.0443-0.1419
Log total income	-0.7165	0.3464	0.017**	-0.1468-0.0266
Log total land	-0.0090	0.0560	0.480	-0.06597-0.0310

Wald chi2(7)=13.21, Prob > chi2=0.0671, Pseudo R2=0.0764, Log pseudo likelihood = -67.313945, * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source: Survey data

Table 12: Marginal effect, standard error and significance levels of variables influencing

Variable	dy/dx	Std. error	P>z	95% confidence interval
Sex of household head	-0.0042	0.0596	0.309	-0.2306-0.0729
Household size	-0.0724	0.1522	0.108	-0.1407- -0.0057
Education of wife	0.1014	0.0500	0.020**	0.0041-0.0271
Age of the wife	0.2572	0.1522	0.084*	-0.0034-0.0026
Group membership	0.0183	0.0294	0.737	-0.0916-0.0648
Access to extension	-0.0244	0.0062	0.001***	-0.1801-0.0508
Log non-agricultural assets	-0.1897	0.1020	0.057*	-0.1235- -0.0087
Log livestock value	-0.2211	0.1259	0.065*	-0.0129-0.1141
Log Off-farm income	-0.0414	0.0184	0.021**	-0.0302- -0.0009
Log of total land	-0.0416	0.0189	0.019**	-0.0364-0.0047

Wald chi2(10)=65.8, Prob > chi2=0.000, Pseudo R2=0.3471, Log pseudo likelihood = -8.2262506, * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

intra-household wife allocation of capital assets

Source: Survey data

However, increased off-farm income had a different direction of influence, although it was tested only for 'wife' capital assets allocation due to model specification problems (i.e., multi-

collinearity mainly). This factor was found to have a negative influence on 'wife' capital assets allocation ($p < 0.05$). This is mainly because husbands often spend off-farm income the way they want, including directly apportioning it to the farm activities. In most cases, there are no household discussions on the use of off-farm income earned by men. It is important to note that given the socio-cultural setting of traditional African society, it is easier for men to work outside the homestead compared to women who are burdened with household chores. Therefore, there is a high likelihood that a 'wife' does not access capital assets associated with banana production as off-farm income increases, since this kind of income solely belongs to men. For the same reasons, the values of livestock ($p < 0.1$) and non-agricultural assets ($p < 0.1$) negatively affected the 'wife' allocations to capital assets.

Access to agricultural extension had a positive effect on 'husband' capital assets allocation ($p < 0.1$) while it exhibited a negative effect on 'wife' capital assets allocation ($p < 0.01$). This may be because extension agents, as discussed above, mainly target husbands, who are also mainly the household heads, to deliver their messages to households. For example, a study undertaken by (Miriti et al., 2014) in Kenya found that women have low access to extension services and even if they have high access, the benefits thereof are marginal and limited compared to those of their male counterparts.

Just like in land allocation analyses, group membership had a significant, negative influence on 'joint' allocation of capital ($p < 0.05$) for banana production. This implies that much of the capital assets remain with men who are also the main participants in group activities related to banana production.

The age of wife had a positive influence on 'wife' capital assets allocation ($p < 0.1$) and a negative influence on that of the 'husband' ($p < 0.01$). Similarly, years of formal education of the

wife had a positive influence on 'wife' capital assets allocation in banana production ($p < 0.05$). These two factors are associated with human capital, and thus empowerment of the woman. Older wives and educated ones have a higher bargaining power and therefore have a higher likelihood of accessing household capital assets than younger wives and uneducated ones. This may also help explain why education of wife does not favour 'joint' allocation of capital assets.

4.10 Factors influencing participation of women in income sharing

A correlation matrix of the variables in the model showed the presence of multicollinearity between husband age and wife age, husband age and farming experience, wife education and husband education. The Breusch Pagan test for heteroscedasticity was not significant at 5% (Appendix III). A total of eleven variables were included in the model and out of the eleven, five variables were found to have a significant effect on women's participation in sharing of incomes from the sale of bananas. The variables that were found to favor participation of women in benefit sharing were: livestock value ($p < 0.1$), off-farm income ($p < 0.05$) and education of the woman ($p < 0.1$). Factors that hindered participation in benefit sharing were total land owned by the household ($p < 0.05$) and sex of the household head ($p < 0.05$) as shown in Table 13.

Turning to the effect of each variable, off-farm income ($p < 0.05$) was found to have a significant positive correlation with the participation of women in benefit sharing within the household. A unit increase in off-farm income within the household increases the probability of a woman taking part in sharing of revenues by 0.12 units. This is because the availability of household off-farm income leaves income generated from bananas in the hands of women hence awarding them higher bargaining power within the household. Focus group discussions and key informant interviews revealed that in a household where there is generation of off-farm income by members, the revenue from banana is left under the management and control of the woman for

household expenditure. These findings augment a study by Twyman et al. (2015) who found a positive effect of off-farm employment on the participation of women in decision making.

Table 13: Marginal effect, standard error and significance levels of variables influencing participation of women in benefit sharing

Variable	Coefficient	Standard Error	P Value	95% confidence interval
Livestock value	0.4741	0.2796	0.090*	-0.4982 -0.0235
Non-agricultural asset value	-0.2463	0.1645	0.134	-0.3576-1.4435
Off- farm income	0.1210	0.0577	0.036**	-0.2432- 0.7046
Production cost	-0.2232	0.1422	0.117	-0.9704-0.3616
Total land	-0.1261	0.056	0.024**	-0.4757- 0.1569
Access to extension	-0.0158	s0.032	0.622	-2.7521-0.0263
Group membership	-0.0181	0.0322	0.573	-0.7376-2.2297
Sex of the household head	-0.3476	0.1417	0.014**	-3.5037 -0.2726
Household size	-0.0876	0.1256	0.485	-0.6537 -0.2266
Age of wife	0.1765	0.1622	0.277	-0.0806-0.0407
Years of education of wife	0.1748	0.0929	0.060*	-0.2171-0.0945

Wald chi2(11) = 19.48, Prob > chi2 = 0.0346, Pseudo R2 = 0.0982, Log pseudo likelihood = -15.61817,
 * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source: Survey data

The total land owned ($p < 0.05$) was found to have a negative but significant correlation with women benefit sharing. This implies that, as household land size increases, the probability of women taking part in income sharing of the banana revenues is reduced by 0.13 units. This may be attributed to the traditional African setting that characterizes land control and access rights as a man's affair. In their finding, Fischer and Qaim (2012) found a negative correlation of farm size on female-controlled income share in the banana value chain in Kenya. This was attributed to the higher degree of centralization and commercialization that is present in larger farm sizes.

Years of education of a woman ($p < 0.1$) was found to have a positive and significant effect on the participation of women in benefit sharing. A unit increase in years of formal education of a woman increases her participation in benefit sharing by 0.17 units. This implies that educated women are likely to participate in income sharing compared to less educated ones. According to Rahji (2007), the role of education in decision making cannot be overlooked. Educated people are expected to use their education to negotiate for higher benefits and they have greater bargaining power compared to their uneducated counterparts.

The current value of livestock ($p < 0.1$) has a positive effect on the participation of women in benefit sharing. Women have access to and control over small livestock such as goat, sheep, and chicken (Njuki et al., 2011). In addition to that, they also have control over by-products from larger animals such as the sale of cow milk (Patti et al., 2010). This access to and control over small livestock and livestock by-products increases their bargaining power and thus the ability to take part in benefit sharing of banana revenues. These findings are similar with those of Njuki et al. (2011) who found that women's ownership of livestock increased the probability that they would control livestock income and specifically income from the sale of milk, eggs and cattle.

In male-headed households, women are less likely to allocate income accrued from sale of bananas. The increased participation of men in banana production has rendered the decision making of women in the enterprise void. Low productivity in female-headed households is attributed to a number of factors including sex of the household head. Women in male-headed households are less likely to take part in decision making given their low bargaining power and in this study, descriptive statistics show that 86 percent of the households were male-headed hence the negative correlation.

CHAPTER FIVE: CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Conclusion

The purpose of this study was to map the banana value chain along gender lines and estimate the factors that drive gendered intra household land and capital allocation. In addition to that, the study went further to unearth drivers of participation of women in benefit sharing in banana production. The survey was conducted in Meru County and estimation of regressions made possible by use of a fractional logit regression.

Key findings from the study show that men and women are concentrated along different nodes of the banana value chain with men dominating at the production stage and women are active participants at the marketing level. It was found that decisions regarding use of land is predominantly a man's affair. These findings augment empirical evidence across Sub-Saharan Africa where decisions regarding land allocation, use and control are a reserve of men.

Further, larger household size was found to favor 'joint' allocation of land mostly because other household members enhance the bargaining power for land sharing between husbands and their wives. Further, older wives had higher bargaining power compared to younger ones, a factor that reduced the likelihood of 'husband' land and capital assets allocation. Thus policy interventions geared towards ensuring equity in intra-household resource sharing should mainly target younger families and smaller households. Such targeting would be favored by the fact that younger families are also small.

Given the household labor burden bestowed upon women and the time consuming nature of group activities, it is not surprising that group membership is male dominated. This puts men at an advantage in allocation of resources as they have access to information and output market. The education of wife positively affected 'wife' land and capital assets allocation. Since this

factor is linked to human capital, it is important for women empowerment. One of the factors hindering 'joint' intra-household allocation of land and capital assets is membership to groups. Instead this factor, which is a proxy for social capital, favors allocation of land to 'husband'. This implies that households with higher social capital do not value allocation of land and capital assets to married women. Thus although social capital has been identified in literature as one of the drivers of rural economies, it may not be one of the solutions of achieving equitable intra-household distribution of land and capital assets in banana production in the study area.

The presence of off-farm income within the household equips women with a higher bargaining power enabling them to take part in decisions on income use. In addition, wealthier households through ownership of livestock have a positive effect on women decision-making ability. Findings from the study area indicate that increasing the land size holding reduces the ability of women to take part in decisions on income use. Land ownership, use and control is a contentious issue in the traditional African setting with the right to ownership use and control being reserved for men. Women can only own land through their husbands or male relatives.

5.2 Policy recommendations

Policies targeting gender equity and women empowerment should be formulated in a way that they create opportunities that reach women directly rather than acting on spillover effects. Banana production groups can have flexible meeting hours that accommodate both men and women given the time constraint on women by household chores. There is need for diversification of household income that can be used as a strategy to cement the role of women in control of income from the banana enterprise. In addition to this if policy invests in the education of the girl child in the study area, there would be more women benefiting from intra-

household allocation of land and capital assets. This is drawn from the findings that exhibited the significance of education on wife allocation.

Given the state of land ownership as indicated by the study, policy intervention targeting women can improve their decision making and bargaining power on income use by ensuring presence of laws such as women land inheritance giving women access to and control over land. Otherwise, increasing household land size without laws in place protecting women will further overlook their position in decisions regarding income use.

From the study findings, it can be concluded that wealthier households and particularly through ownership of livestock, have a higher probability of adopting 'joint' allocation as compared to poorer ones. Thus diversification of banana production with livestock keeping could increase intra-household equity in the sharing of land and capital assets in the study area.

5.3: Areas for further research

Focus group discussions and key informant interviews in the region mainly comprised of men and women above the age of 35 years. It was noted that despite the gendered nature of the study, there was minimal participation of the youth at the production level of the value chain. Gender equality can only be achieved with the inclusion of the youth in analysis. Further research in the study area could take a look at the minimal participation of the youth at the production stage of the banana value chain. It is paramount to clearly identify the challenges preventing the youths from participating in banana production and opportunities and incentives that are likely to attract them into banana production.

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APPENDICES

Appendix I: Focus group discussion

Questionnaire for Focus Group Discussion in Meru

1. Which daily activities are undertaken by women and men at each level of the chain?
How much time do they invest?
2. What kind of activities are conducted by boys and girls?
3. How is land owned?
4. Are these legalized in their names/ can they sell them?
5. Do men and women have access credit; are there differences in amount or credit conditions for men and women?
6. What resources are available and controlled by women?
7. Who controls benefits?
8. What is the proportion of income earned by women in different segments of the value chain?
9. How have women's roles changed along the value chain? Are they taking leadership roles?
10. Do women have access to land, credit and information on the value chain?
11. How do women benefit along the value chain?
12. What are the issues that affect gendered participation in the value chain?
13. What are the factors promoting or hindering women decision making especially in banana marketing, group networks and interactions?
14. Who, between men and women is more knowledgeable, and about what specific aspects of banana production and marketing?

15. What activities/roles do men and women partake in banana production and/or marketing?
16. What activities are difficult to undertake because you are a man or woman?
17. What are the activities in banana production that men or women are discouraged from doing?
18. Who is more likely to attend training and technical meetings on bananas, men or women?
19. Do men and women members of producers' association have equal access to these resources?
20. What is the proportion men and women in the association or group?
21. How many men and women members occupy leadership positions in the association or group (committee members)
22. What must women have to occupy leadership positions in producer organizations?
23. Who is more involved in buying bananas? Men or Women Why? Please explain
24. What makes it hard for women or men to become buyers or traders?

Appendix II: Household interview questionnaire

County: _____ Sub-County _____
Division _____ Location _____
Sub Location _____ Village: _____

Date of the Interview:

Name of the Interviewer:

1= County; 2= Sub-County; 3 = Division; 4= Location; 5=Sub-location;

I. BASIC INFORMATION ABOUT THE BANANA GROWING FARMERS

I. Name of the Mr. _____ /Ms. _____

Respondent: _____

II. Phone Number :- _____

III. Gender: 1. Female 2. Male

IV. Relationship to the household head: 1. Spouse 2. Daughter 3. Son 4. Other(specify)

Household head:

V. Category of Farmer:

1.MF 2.SF 3.MMF 3.LF Specify;

MF- Marginal farmer owning less than one acre of land ; SF- Small farmer owning 1 to 2.5 acres of land MMF- Medium farmer owning 2.6 to 5.0 acres of land ; LF- Large farmer owning more than 5 acres of land

VI. Background of the Household Members:

1	2	3	4	5	6	7	8	9
Sl. No.	Name of the household Member	Sex (Code)	Age (Completed years)	Marital status (Code)	Years of schooling	Primary Occupation (code)	Duration of Occupation	Group Membership
1								
2								
3								
4								
5								
6								

3: Sex	5: Marital status	7: Occupation:
Female..... 1	Unmarried1	Cultivation (crop farming) 1
Male.....2	Married.....2	Agri. labor 2
	Widow/widower.....3	Non-agri. labor 3
	Separated/divorced....4	Petty business 4
	Others (specify).....5	Business (other than petty business)..... 5
		Private job 6
		Government job..... 7
		Livestock rearing..... 8
		Mixed farming9
		Student10
		Other (specify)11

10. Group Membership

- No Group.....0
- Self-Help Group....1
- Farmers' club.....2
- SACCO.....3
- Merry go round4

VII. Type of House:

1. Permanent 2. Semi-Permanent 3. Others Specify

	<p>Permanent House: A permanent house is one, which has walls and roof made of the following material (Wall material: Burnt bricks, stones (packed with lime or cement), cement concrete, etc. Roof Material: Tiles, GCI (Galvanized Corrugated Iron) sheets, asbestos cement sheet, RBC, (Reinforced Brick Concrete), RCC (Reinforced Cement Concrete) and timber etc.</p> <p>Semi-permanent House: The walls and/or roof of which are made of material other than those mentioned above, such as un-burnt bricks, timber, bamboos, mud, grass, reeds, thatch, loosely packed stones, etc.</p>
--	---

	Others: The houses, which are not covered by the types mentioned above, are to be treated as of 'others.'
--	---

VII Possession of Farm Land

a. Total farm Land

possessed _____

1	2	3	4	5	6	7		9	
Sl. No.	Type of land	In Acres						1= Rain fed Or 2= Irrigated	
		Owned	Leased in' land	Leased out' land	Forest land/ others without Title deed	Total Operational Area			
						H	W		HW
1	Area under annual crops								
2	Area under perennial crops								
3	Others, specify								

Title deed: Legal property right of land. Note: H-Husband; W-Wife

IX If irrigation facility is available, furnish the following details:

Source of irrigation water

1. Open Well 2 Bore Hole 3 Piped 4 Pond 5. Others

Specify _____

b. Type of Irrigation

1. Flooding 2. Ridges and Furrows 3. Strip 4. Sprinkler 5 Others

Specify __

c. Extent of area (acres) under different sources of water for irrigation

- i. Open well ii. Bore hole iii. Pond iv. Piped v. Others

X. Area under fruit crops: Need to be specified since above (VIII) have asked area under annual/perennial crops/ others

1	2	3	4	5	6	7	8.	9.
Sl. No.	Name of the fruit Crop	Area(Acres)	1=Rain fed/ 2=Irrigated	Variety / Hybrid	Age of the Crop	Seasonal Yes....1 No.....2	1=Pure crop/ 2=Inter crop	Decision Making Authority (H=Husband/ W=Wife) HW=(Joint)

1								
2								
3								
4								
5								
6								

XI. a. Do you keep livestock? [___] Yes [___] No (if Yes , go to b.)

b. If Yes (question a), indicate the number kept.

Type	Number owned and present at your farm	Current Value (KES)	Who owns them? (codes)	Type	Number owned and present at your farm	Current Value (KES)	Who owns them? (codes)
Cows				Goats			
Calves				Horses			
Bulls				Pigs			
Heifers				Rabbits			
Geese				Donkey			
Chicken				Bee			
Local				hive			

Chicken Improved							
Ducks				Fish			
Sheep				Others			
<u>Who owns codes:</u> 1=Head 2=Spouse 3=Head's father 4=Head's mother 5=Son 6=Daughter 7=Other joint (specify codes)[_____] 8=Hired worker 9=Others, specify [_____]							

Asset Ownership

XII. Does the household or farm have the following (tick)

Assets	No. owned now	Current Total Value (KES)	Who owns (codes)	Asset	No. owned now	Current Total Value (KES)	Who owns (codes)
1=houses				27=posho mill			
2=stores				28=weighing machine			
3=water tanks				29=grinder			
4=radio				30=cattle dip			
5=TV				31=power saw			
6=telephone/mobile				32=spray pump			
7=solar panels				33=irrigation equipment			

8=battery (car)				34=water pump			
9=gas cooker				35=cart			
10=bicycle				36=animal traction plough			
11=wheel barrow				37=donkey			
12=Beehives				38=motorcycle			
13=sewing/knitting machine				39=car			
14=milking equipment/shed				40=truck			
15=zero-grazing units				41=trailer			
16=chaff cutter				42=tractor			
17=water trough				43=harrow/tiller			
18=poultry houses				44=ploughs for tractor			
19=pig-sty				45=planter			
21=borehole				46=Sheller			
22=well				47=ridger/weede r			
23=dam				48=generator			
24=jaggery unit				49=boom sprayer			

25=cane crusher					50=Furniture (total)			
26=pestle and mortar					51=Boat (rowing)			
53= Fishing hook					52=Motor boat/engine			
1=Head 2=Spouse	3=Household(all) 4=Head's father	5=Head's mother 6=Son	7=Daughter 8=Other joint (specify codes)			9=Other (specify) _____		

PRODUCTION DETAILS OF BANANA

XIII. Years of Experience in a) Farming _____ b) Cultivating Banana

XIV. Area under Banana:

1	2	3	4	5	6	7	8.		9.
Sl. No.	Name of the Variety	Area (Acres)	Age(years)	Decision making Authority (Husband/ Wife or other)	Spacing & Number of Trees/Ha.	Months to 1 st Harvest / Ripening	Average Yield (No. of Bunches harvested per year)	Average Weight per Bunch	Main End Use (code)
1									
2									
3									
4									
5									
6									

End Use code

Household Use.....1 Local Markets.....2 County Markets... 3 Associations.....4
 Export.....5 Individually Mkt Outside the county....6 others.....7 Specify

a. Which year did you plant your bananas_____

1	2	3	4	5	6	7
Sl. No.	Expenses towards	hired Labor	family labour	Unit	Unit Cost (KES)	Total cost 3*4
1	Field Preparation					
2	Digging pits					
3	Planting material					
4	Manures					
5	Fertilizers					
6	Irrigation					
7	Weeding					
8	Plant protection chemicals					
9	Herbicides (chemical weeding)					
10	Training and pruning					

Indirect cost includes all costs related to the application of labor for activities 1to8.

XVI. Cost of Banana Production per year

1	2	3	4	5	6	7
Sl. No.	Cost towards	Indirect Labor	Type of Direct labor Owned Hired	Quantity (kg/Ha.)	Cost (KES/Ha/Year)	Total cost 3*4
1	Manures					
2	Micro nutrient Mixture					
3	Irrigation					
4	Weeding(Manual)					
	Weeding (herbicides)					
5	Fertilizers					
	I					
	II					
	III					
	Total					
6	Plant Protection Chemicals					
	I					
	II					

	Total					
7	Growth Regulators					
	I					
	II					
	Total					
8	Training and Pruning Branches					
9	Harvest					
	I					
	II					
	III					
	Total					
10	Indirect Labor Cost					

Indirect labor cost includes all costs related to the use of labor for undertaking activities 1-9.

XVII. Major Pests, Diseases and Physiological Disorders in Banana and their Control Measures:

1	2	3	4	5	6	7	8
Sl. No.	Major Pest and Disease & Physiological Disorders	Type of Control Measures Adopted by the Farmers					
		Mechanical		Chemical		Biological	
		Quantity	Value	Quantity	Value	Quantity	Value
1	Major Pests – will modify						

	accordingly						
	I. Fruit fly						
	II. Aphids						
	III. Leaf caterpillar						
	IV. Thrips						
2	Major Diseases						
	I. Anthracnose						
	II. Stem end rot						
	III. Powdery mildew						
	IV. Cigar end rot						
	V. Sigatoka						
	VI. Root rot nematodes						
3.	Physiological Disorders						
	I. Micro- nutritional Deficiency						
	II. Spongy tissue						

3,5 & 7: Quantity – Milliliter/Hectare; 4, 6 and 8: Value – in KES.

XVIII. Pre/ Post Harvest Operations Undertaken by the Farmers:

1	2	3	4	5	6
Sl. No.	Expenses towards	Nature of Activity / Material	Unit Cost	Total cost	Person doing the Activity(M/F)
1	Pre harvest treatment				
2	Harvesting				
3	Field level cleaning				
4	Grading and Sorting				
5	Packaging				
6.	Handling				
7.	Other Charges				

5. Note: M-Male; F-Female

Indirect labor cost includes all costs related to the use of labor for undertaking activities 1-7 in the table

XIX. What are your major production constraints? (At least five)

1	2	3	4
Sl. No.	Constraints	Rank the Constraints According to Priority	Suggest the MAIN possible solution
1	Non availability of quality seedlings		
2	Lack of irrigation facilities during summer months during establishment		
3	Access to credit		
4	Incidence of pests		
5	Disease Infestation		
6	Non availability of inputs(pesticides, fungicides, growth regulators etc.) at right time		
7	Lack of institutional support such as policy, Infrastructure –(Specify)		
8	Non availability of suitable harvesting tools to reduce losses by bruising		
9	Scarcity of laborers to carryout farm operations		
10	Wind during flowering seasons		
11	High cost of institutional credit to meet working expenses		
12	Practical applicability of the recommended packages of practices		

XX. Nature of Pre and Post-Harvest Losses at the Farm Level

1	2	3	4
Sl. No.	Nature of pre-harvest Losses	Quantity (bunches per year)	Value
1			
2			
3			
4			
5			
	Nature of Post-harvest losses		
1			
2			
3			
4			
5			

XXI. Method of selling banana at the farm level

1	2	3	4	5	6	7
Sl. No.	Market Functionary	Quantity (bunches) /Year	Price/bunch	Value (KES.)	Nature of Packaging Material	Cost of the Packaging Material per year
1	Wholesaler					

	/broker						
2	Retailer						
3	Commission Agent						
4	Processor						
5	Exporter						
6	Consumers						
7	Cooperative						
8	Others						

XXII. Marketing costs incurred by the farmers. KES/bunch)

1	2	3	4	5	6	7	8	9
Sl. No.	Market Operations	Wholesale Market/broker	Retail Market	Commission Agent	Processor	Exporter	Consumer	cooperative
1	Handling charges (Loading & unloading)							
2	Packaging charges							
3	Transport cost							
4	Commission							

	Charges							
5	Market fee							
6	Other market related transaction costs							
7	Others							

7. Activities done for extending shelf life/Improving the keeping quality etc.

XXIII. Marketing Constraints (at least five)

1	2	3	4
Sl. No.	Constraints	Rank the Constraints According to Priority	Suggest MAIN for way improvement
1	Cartel among traders		
2	Un remunerative/ low price		
3	Lack of institutional support in establishing local and export market		
4	Complicated institutional procedures to facilitate export of fruits to overseas market		
5	Non availability of adequate numbers of processing units near the production catchments		

6	Lack of cold storage facilities to enhance the shelf life		
7	Meagre marketable surplus		
8	Lack of market intelligence and information		
9	Distance to the market		
10	Logistical support and services		

XXIV. Subjective Assessment of Fruit Quality by the Farmers

1	2	3	1.Degree of softness or crispness. It is a subjective measure of firmness with the fingers 4. Uniform and characteristic shape 5. Defect such as cuts, bruises, disease, low-temperature injury, and physiological disorders 6. Gloss is a visual aspect of quality that depends on the ability of a surface to reflect light
Sl. No.	Character	Rank the Constraints according to Priority	
1	Firmness		
2	Characteristic color		
3	Size		
4	Appearance/shape		
5	Absence of defects		
6	Gloss		
7	Ripeness		
8	Taste		

XXV. Level of Awareness about the Knowledge on banana production Good Agricultural and Management Practices

1	2	3
Sl. No.	Awareness	Responses
1	Integrated pest and disease management	
2	Precision farming (Need based application of inputs)	
3	Time lag between chemical spray and harvest of fruits	
4	Safe handling and application of chemicals	
5	Organic farming of Banana/Pawpaw	
6	Harvesting fruits at physiological maturity	
7	Food safety norms (pesticide residue, mycotoxins etc.)	
8	Value addition technologies	
9	Potential market for raw and processed mango products	
10	Eco-friendly waste management and recycling	

(1 = Very much aware; 2= Moderate awareness, 3= Not aware at all)

XXVI. Suggestions to Improve the Shelf Life of the bananas

1	
2	
3	

XXVII. What was the household consumption level of the following food items?

	Food items	Did you consume the following food items last week? Yes=1 No= 2	What is the quantity of consumption in last week (at the onset of rains) (specify units)	Major source of food items 1=own farm 2=purchased 3=Other(specify)_____
A=Cereals	Maize (githeri)			
	Maize flour (ugali)			
	Wheat flour (chapati)			
	Rice			
	Sorghum/ millet			
	Other (specify)			
B=Root & tubers	Irish Potatoes			
	Sweet potatoes			
	Cassava			
	Arrow roots			

	Yams			
	Other (specify)			
C=Vegetables	Sukuma wiki			
	French beans (
	Spinach			
	Cabbages			
	Local vegetables			
	Other (specify)			
D=Fruits	Bananas			
	Oranges			
	Paw paws			
	Water melon			
	Others (specify)			
E=Meat Poultry	Beef			
	Goat meat			
	Chicken			
	Other meat(specify)			
F=Eggs	Eggs			
G=Fish &	Fish			

Seafood	Other sea food (specify)			
H=Pulses/ legumes / nuts	Beans			
	Other pulses			
I=Milk & milk products	Milk			
	Others (specify)			
J=Oil/ fats	Edible oils			
K= Sugar / honey	Sugar			
	Honey			
Miscellaneous (specify)				

XXVIII. Group Membership details and related costs

- Are you a member of a banana production and marketing group? Yes No
- If yes, what is the main reason for joining
- If no, Give the main reason for not joining the group.
- If Yes, state the year of joining _____ and the registration fee (KES)_____
- Estimate the Cost per year of;

Item	Value per Year	Remarks (mode of transport)
Number of meetings per year		
Time spent traveling to and from meeting (hrs.)		
Cost of transport to and from the meetings(KES)		
Time spent in the meetings (hrs.)		
Incidental expenses e.g. food and drinks taken (KES)		

XXIX. Access to credit (both formal and informal)

a. Have you ever used credit for growing and marketing bananas? 1=Yes 2=No (if No, go to E1.3)	b. Major Source of credit (Codes)	c. Major form of credit (codes)	d. Amount	e. Interest (rate (percent))
Major source of credit			Major form of credit	

1 = Government fund/agency e.g. AFC	5 = Donor / NGO/MFI's	8= input	1=Money
2 = Buyers	6 = Groups (farmer	dealers	2=Material(s) and/or inputs
3 = Commercial bank	groups, ROSCAS)	9=Other	3=Other (specify)
4=Shylocks	7= Relatives/friends	joint	
		(specify	
		codes)	

		-	
		10 =	
		Other	
		Specify__	

f. If No (*question b*), why haven't you obtained credit? (Rank codes) [] [] [] []

1=Not needing any loan	3. Not a member	4. High cost to obtain the loan/credit
2= No collateral as	of the	5. Other
required	(Microfinance	(specify)_____
	institution (MFI)	

XXX: Market Access Details

What is the distance to the nearest main market center from the farm? (Kms)_____

a. What is the type of road from the farm to that main market? [] (codes)

Road type codes

1=All seasons tarmac,

3=Seasonal murram road,

2=All seasons murram road

4=other (specify) _____

What is the distance to the Banana collection center from the farm? (Kms)_____.

How far is your farm from the nearest input shop in walking (hrs.)? _____

b. What is the distance from your farm to the nearest health center (Kms)? _____

c. What is the cost of transport to the most important to the market center (specify means of transport) (KES)? _____

XXXI: Access to Extension Services

a. Did you receive extension contact for bananas of the farm crop for the last one year? 1=Yes 2=No (If NO, go to G)	b. If yes, who was the provider? (Codes) RANK.	c. What types of services were provided? (codes)
Extension services provider 1 = Government 2 = NGO/donor 3= Local traders 4= Input dealers 5= Farmer group 6=Co-operative society 7 = Other specify	Types of services provided 1=Product handling 2=Pest management 3=Soil and water use 4=chemical handling 5=Record keeping 6=Field hygiene 7= others (specify_____	

XXXII: Income and Expenditure

Source of income	Amount	Income mainly managed by H, W or HW
Bananas		
Other horticultural crops		
Other farm crops		
Livestock and livestock products (e.g. milk)		
Other farm activities (e.g. bee keeping, brew making, charcoal burning etc)		
Wages/ salaries/ non-farm, pension and business activities		
Remittances/ gifts from absent family members and other external income		
Other sources, specify:		

b. Estimate your annual expenditure for the following;

Food KES_____	Medicare KES_____	Purchase of assets_____
Clothing KES_____	Entertainment KES_____	Savings _____
School fees KES_____	Donations KESs._____	Other(specify).KESs_____

Appendix III: Breusch - Pagan test for heteroscedasticity

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

Ho: Constant variance

Variables:

$\chi^2(12) = 2.04$

Prob > $\chi^2 = 0.1529$

Appendix IV: Correlation matrix for multicollinearity

Correlation matrix of coefficients of regress model

e(V)	INfixe-s	INasset2	INlive-2	INtot-e2	INoff-e	total-d	XXXI_E-t	XXXIX_~s	XXXVII-p	IV_Gen-d	V_Hhou-e	VI_4Age1
INfixedinp-s	1.0000											
INasset2	-0.3202	1.0000										
INlivestock2	-0.0900	-0.0487	1.0000									
INtotalinc-2	0.0552	-0.1718	-0.0028	1.0000								
INofffarmi-e	-0.1618	-0.0082	0.2319	-0.2545	1.0000							
totaland	-0.2751	0.0840	-0.0742	-0.2511	0.0168	1.0000						
XXXI_Exten-t	-0.0372	0.0787	0.2409	0.0120	0.1860	-0.0039	1.0000					
XXXIX_Cred-s	-0.1563	0.1010	0.1615	-0.1760	0.0034	0.0549	0.1533	1.0000				
XXXVII_Gro-p	-0.1344	0.0634	-0.0339	-0.2992	0.0976	-0.0424	-0.1474	-0.0292	1.0000			
IV_Genderh-d	0.0385	0.1002	0.0278	0.0327	-0.0017	0.0648	0.1732	0.1233	0.0427	1.0000		
V_Houldsize	-0.0602	-0.0902	0.1083	0.1089	0.0006	-0.0833	0.0711	-0.1166	-0.1664	-0.0623	1.0000	
VI_4Age1	0.1025	-0.1616	0.0801	0.1137	-0.0067	-0.1957	0.1578	-0.0051	-0.0758	0.0662	0.0427	1.0000
VI_6School-1	0.0238	-0.2262	-0.0377	0.0078	-0.0939	-0.0607	-0.1091	-0.0481	-0.1274	-0.1998	-0.0800	0.3192
VI_4Age2	0.2152	-0.0712	-0.0511	0.0744	-0.1861	-0.1126	-0.1352	-0.1433	-0.1079	-0.1951	0.0830	-0.4506
VI_6School-2	0.1434	-0.0359	-0.1227	-0.0350	-0.0112	-0.0116	-0.1486	-0.2476	0.3282	0.0851	-0.1132	-0.2541
XIII_Exper-g	-0.0724	0.1176	-0.2059	0.0687	0.1155	0.0598	-0.2108	-0.0937	0.0733	0.0158	-0.0968	-0.6072
_cons	-0.0634	-0.1309	-0.3367	-0.7610	0.1178	0.2562	-0.1849	0.1183	0.2153	-0.3035	-0.2259	-0.3254

e(V)	VI_6Sc-1	VI_4Age2	VI_6Sc-2	XIII_E-g	_cons
VI_6School-1	1.0000				
VI_4Age2	-0.2010	1.0000			
VI_6School-2	-0.6269	0.2489	1.0000		
XIII_Exper-g	-0.0336	-0.0552	0.1847	1.0000	
_cons	-0.0032	-0.0218	0.0431	0.0868	1.0000



Appendix V: Marginal effects (standard error) and significance levels of variables influencing intra-household land allocation in banana-producing households along gender lines

Variable	Joint	Husband	Wife
Sex of household head	3.1462*** (0.2676)	0.1550 (0.2034)	-0.3848** (0.1448)
Household size	0.3167** (0.1191)	-0.2619** (0.1039)	0.0274 (0.0881)
Age of the wife	-0.2995** (0.1458)	0.0842 (0.1431)	0.1015 (0.1333)
Access to extension	0.0518 (0.0325)	-0.0285 (0.0297)	-0.0113 (0.0198)
Log total cost of inputs	0.4578* (0.2404)	-0.2119 (0.1732)	-0.1977* (0.1185)
Education of wife	-0.3959** (0.0715)	0.2414*** (0.0923)	0.1713** (0.0759)
Group membership	-0.0927** (0.0421)	0.0872* (0.0471)	0.0032 (0.0273)
Access to credit	0.0320*** s(0.0093)	-0.0194** (0.0095)	-0.0158** (0.0057)
Log non-agricultural assets	-0.1216 (0.2413)	-0.2934 (0.2236)	1.1577*** (0.3523)
Log value of livestock	0.8199* (0.4742)	0.1407 (0.2545)	-0.6880** (0.2663)
Log Off-farm income	0.0390 (0.0416)	-0.0362 (0.0366)	0.0024 (0.0403)

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Appendix VI: Marginal effects (standard error) and significance levels of variables influencing intra-household allocation of capital assets in banana-producing households along gender lines

Variable	Joint	Husband	Wife
Sex of household head		0.1893(0.1606)	-0.0042(0.0596)
Household size			-0.0724(0.1522)
Education of wife	-0.1487**(0.0721)	0.0374(0.0893)	0.1014**(0.0500)
Age of the wife	0.1503(0.1272)	-0.4026*** (0.1487)	0.2572*(0.1522)
Group membership	-0.0635**(0.0301)		0.0183(0.0294)
Access to extension		0.0466*(0.0275)	-0.0244*** (0.0062)
Log nonagricultural assets	-0.0982(0.2239)	0.2677(0.2426)	-0.1897*(0.1020)
Log livestock value	0.5777(0.3702)		-0.2211*(0.1259)
Log Off-farm income			-0.0414**(0.0184)
Log total income	1.1245**(0.4604)	-0.7165**(0.3464)	
Log of total land	0.0524(0.0573)	-0.0090(0.0560)	-0.0416**(0.0189)

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$