SOCIO-ECONOMIC DETERMINANTS OF HORTICULTURAL FARMING IN YATTA FURROW, MACHAKOS COUNTY, KENYA

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C50/CE/ 26070/2014

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENTS OF THE DEGREE OF MASTER OF ARTS (GEOGRAPHY) IN THE SCHOOL OF LAW, ARTS & SOCIAL SCIENCES OF KENYATTA UNIVERSITY

FEBRUARY, 2024

DECLARATION

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

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DEDICATION

This thesis is dedicated to my dear parents, Mary Kamene and Fidelis Muema for the financial and moral support they gave me throughout my study. God bless you.

ACKNOWLEDGEMENT

I thank the Almighty God for the gift of life, grace and His blessings upon me throughout the period of the study. My sincere appreciation to my supervisors; **Dr**. **Jackson Musau** and **Dr. Philomena Muiruri** of Geography department, school of Humanities and social sciences, Kenyatta University for their scholarly guidance throughout the research, without which this study would not have been a success..

I express gratitude to the ten Yatta furrow extension officers for their overwhelming support during the data collection process. I also want to express my gratitude to Felix Ali Kathini and other research assistants for their unwavering commitment to the data gathering procedure. I also owe my family great appreciation for their prayers and moral support during the studies. God, the Almighty, bless you all.

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OPERATIONAL DEFINITION OF TERMS

Access to credit: The capacity of the framer to acquire financial assistance from money lending institutions with the ability to repay the loan together with the accrued interests.

Access to market: The ability of the farmer to reach the buyer for his/her produce at the point where highest prices for the produce can be fetched, whether local markets or far markets situated far from the farms.

Farm investments: Specific areas in horticultural farming where farmers deem fit for financing e.g. purchasing of farm inputs such as fertilizers and farm tools.

Farm size: The total size (in acres) of land that is under horticultural farming that the farmer is able to cultivate while maximally utilizing the resources at his /her disposal

Furrow: A trench on the earth surface, with water flowing where farmers can get access to water for irrigation.

Horticulture: refers to the process of growing and selling fruits and vegetables. This study is restricted to the particular crops (vegetables, kales, cabbages, tomatoes and green pepper).

Household: A farming family unit comprising of blood related people, either in nuclear or extended family who practice horticultural farming.

Involvement in farmer organization: The engagement of farmer in farmer associations where they can share horticultural farming ideas and assist one another in aspects of financial problems**.**

Irrigation policies: Regulations that control horticultural farming and which farmers have to comply with, irrespective of whether they are small scale or large scale horticultural farmers.

Labor availability: The capacity of the farmer to get farm assistants either from the household or outside the household, who are available, willing and ready to work and appreciate the given wage rates.

Small scale horticultural famers: The horticultural famers who operate on farm size of less than five acres of land.

Socio economic factors: The social and economic characteristics of the respondents as described by aspects such as their age, income, education levels, house hold size, marital status and gender.

LIST OF ABBREVIATIONS AND ACRONYMS

ASALs:	Arid and semi-arid lands
C.I.D.P	County Integrated Development Plan
COMESA:	Common Market for Eastern and Southern Africa**.**
F.A.O:	Food and Agricultural Organization.
GoK:	Government of Kenya
H.C.D.A:	Horticultural Crop Development Authority
I.F.A.D:	International Fund for Agricultural Development
I.F.P.R.I:	International Food Policy Research Institute
KEPHIS:	Kenya Plant Health Inspectorate Services
M.D.Gs:	Millennium Development Goals
S.H.Fs:	Small Holder Farmers
SPSS:	Statistical Package for Social Sciences
SSHGs:	Small Self Help Groups

ABSTRACT

In many African nations, including Kenya, horticultural gardening has been regarded as one of the primary pathways to eradicating poverty and alleviating food insecurity. Nevertheless, despite the favorable climate, focused policy and program implementations through a number of technical advancements, its development has not been as anticipated. The sector ensures food security as well providing employment which raises income to many households in the country. Despite several production-improvement initiatives, small-scale farmers' expansion in horticulture farming inside domestic markets has lagged behind. Horticultural farming is still a significant part of Kenya's economy, but it has become stagnant, endangering domestic food security and household income. Majority of the studies have focused on technical aspects of adopting modern farming technologies among the farmers with little attention being given to the social and economic aspects that would improve innovation mechanisms to improve production among the farmers. In Kenya, socio economic factors are major concern affecting horticultural productivity. In attempt to address this, efforts have been fruitless. The sector has failed to expand and little has been done to solve the challenges arising from the socio-economic factors within the farmers. Specifically, in Yatta furrow, horticultural farming has declined significantly, with the farmers turning away from the sector to other viable economic ventures. The studies conducted only concentrated in climatic hazards, ignoring the human socio-economic part. This study therefore sought to examine how the prevailing socio-economic factors influence horticultural growth in Yatta furrow. The main objective of the study was to establish the socio economic factors influencing horticultural farming in Yatta furrow. The study targeted 109 farmers, computed using the Cochran's formula(1963) from the 526 farmers as per the 2019 horticultural report, selected using stratified random sampling across the three wards in Yatta Sub County. The study employed structured questionnaires to source information from the farmers. Interviews were conducted with the key informants being purposively selected. Quantitative data analysis was done using SPSS. Tables, frequencies, and percentages were used to create and show descriptive statistics. Thematic analysis and presentation of tables using qualitative data. The impact of socio economic determinants on the horticultural growth in Yatta furrow was investigated using a regression model. The findings of this research revealed that factors specifically age (p-0.001.), income, gender (p-0.911) education level (p-0.0403), household size (p-0.005) access to extension service (p-0.003),were statistically significant at 5% significant level. The study recommended that, of great concern is the creation of platform from which the socio-economic challenges can be addressed if horticultural growth was to be attained. Men and women should have equal access to training opportunities so they may learn about efficient manufacturing techniques. The study concluded that socio economic factors are significant components that continue to affect horticultural growth in Yatta furrow, and under whatever reasons, the effects are undesirable and therefore, there is the need to improve on socio economic aspects through the services of the relevant bodies.

CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Background of the Study

Horticultural farming is the art of cultivating flowers, fruits and vegetables. It entails growing of edible fruits and vegetables and non-edible plants such as ornamental plants. It is practiced on both large and small scale. On small scale, it is carried out purposely for domestic consumption on limited pieces of land, with little application farm inputs and no crop specialization. On contrary, large scale horticultural faming is purely commercial oriented, entailing specialization in one main crop, intensive application farm inputs, large outlay of capital, labor intensive and connection to a well-organized marketing systems (Parfitt et al., 2010). Horticultural farming, whether small scale or large scale is practiced through both open and enclosed field irrigation systems. Open field system involves cultivating the crops in open with water supplied through sprinklers. Enclosed irrigation systems entail use of green houses, where the conditions are controlled and drip irrigation is main mode of irrigation (ADB, 2001).

As an agricultural sector, horticultural farming is a foundation for economic growth, employment creation and foreign exchange earnings depending on the margin and scale of production. The sector contributes enormously to foreign exchange earnings and employs 10% of the world's population. Horticultural crops are high value crops that provide greater profits per unit of land than staple food crops, and the cash earned may be utilized for a variety of reasons, such as eradicating hunger by providing for basic needs like food. Horticultural farming therefore has improved livelihoods and employment for

households which has transformed many livelihoods around the globe. Further, horticultural farming is key in utilization of natural resources, basically land and water. It is important in improving the productivity of land especially in the ASALs of the world. Horticultural farming has remained a viable choice for diversifying livelihoods in arid and semi-arid regions that are facing exceptional rainfall variability, especially in light of the present crop failure due to climate change brought on by lower rainfall levels. Therefore, horticultural farming serves as the cornerstone of effective development and the foundation of small-scale farmers in Africa (IFAD, 2002); (World Bank, 2007).

Globally, horticultural farming is practiced in different parts, with Europe and Central Asia being the leading producers, estimated to contribute to 12% of the total global horticultural production. More than 55 billion euros are thought to have been produced in total in Europe in the form of fruits and vegetables (Fruit logista 2018), which is partly attributable to Europe's climate that has enabled production on a wider scale. According to IFPRI (2009), the world's leading horticultural producers are Asian and European countries.

Horticultural farming contributes significantly to food production, generates employment, and generates revenue as a result. In many African nations, it has been regarded as a sign of hope for the development of rural economies (AVRDC, 2004). Horticultural farming is now important in more African countries than it was in the mid-1990s, when it was mostly practiced in South Africa, Zimbabwe, and Kenya (Kurt, Ronald, and Florian (eds), 2009). It is important to note that Nigeria, Ghana, the Ivory Coast, Uganda, Ethiopia, and Egypt have also come in to play. Nigeria now produces most of the fresh

fruits in sub-Saharan Africa, contributing 22% of the region's total production, followed by Kenya at 12% and the Republic of South Africa at 15% (Yabs and Awuor, 2016). In Uganda, it has been noted that horticultural farming is an important agricultural subsector due to the returns the sector has, both locally and in the international markets. However, the performance is quite poor when compared to other African nations like Kenya, and one of the main causes of the struggled progress is the socio-economic factors. The necessary emphasis has not been given to socio-economic variables, which are crucial and complementing aspects. In reality, data suggests that throughout time, research into the socioeconomic variables influencing horticulture output has received less financing and attention (Bourne 2017). Adams et al. (2010) underlined the necessity for study to determine the degree to which as well as the contribution of socioeconomic variables to the growth of horticulture in Africa among smallholder farmers, in part because of this reason.

Fruits, cut flowers, and vegetables are all products of horticultural gardening in Kenya. Ngigi (2003) claims that it was founded in the early 20th century. Vegetables, which account for 44.6% of production, flowers, which account for 20.3%, fruits, which account for 29.5%, and medicinal and aromatic plants, which account for 5.9%, are the main crops cultivated in the industry, which has risen through time to currently account for 33% of the agricultural GDP. Like in other African countries, Kenya’s horticultural farming is mainly a rural venture due to availability of vast resources, basically land, water and labour (AFA, 2017). However, it should be mentioned that the industry has been dealt blow by a number of issues, not the least of which is the inability to export

enough high-quality goods. Despite the vast efforts by the government to improve its performance, the sub sector still performs poorly. On average, the country produces approximately 200 metric tons of horticultural produce annually, which is only 40% of the estimated potential of 500 metric tones per annum (HCDA, 2010). This, despite other factors, is attributable to socio economic factors that fail to improve the potential performance of the sector (Omiti et al., 2010). Therefore, the failure to analyze socio economic factors threatens to negate the continued hope of improving horticultural development as an important route to enhanced production.

Yatta Sub County is one of the rural areas of Kenya where horticultural farming is practiced due to the presence of Yatta furrow. The practice dates back to the colonial period with the venture being both subsistence and a commercial activity. Horticultural farming has been a fundamental economic activity, contributing to the livelihoods of the horticultural farmers, providing employment and income to the residents. In spite of this importance attributed to it, the sector has failed to expand among the farmers. Such failure has been attributed to the farmers' failure to address among other issues, the underlying socio economic aspects of horticultural farming. A large number of the farmers still produce inadequate produce, failing to expand their production capacities, hence, raising the need to investigate the influence of these factors on the current state of the venture

1.2 Statement of the Problem

Declining horticultural farming is an emerging issue in Yatta furrow. Evidences from past studies conducted in the furrow indicate that incidences of horticultural farming

abandonment have been on the rise and the efforts to improve horticultural farming by the government among the farmers have been futile, with farmers opting for other economic land use activities. As a result, the sectorial growth has declined significantly. Government-sponsored development initiatives haven't been able to significantly improve productivity. Although horticulture farming in Yatta furrow was clearly identified as a topic of attention in the County's integrated development plan (2018–2022), little has been accomplished so far. Generally, the horticultural production has been low. Horticultural farming has not well developed as its contribution to the livelihoods of the farmers has not been up to as expected. Even though other mitigation measures have been put to counter the decline of the sector, little has been done on the socio economic factors and their profound effects on horticultural farming. Therefore, there is need to empirically examine the socio economic reasons for the decline in the sectorial growth.

1.3 Justification and significance of the study

The influence of socio-economic factors in horticultural farming is a matter great concern to the livelihoods of the farmers. The failure to address socio economic factors would translate to stagnation of the venture and hence continued decline in income, food supplies and livelihoods standards of the horticultural farmers. This study was conducted Yatta furrow where horticultural farming is practiced. Horticultural farming has been a major source of income, employment and livelihoods to the farmers. However, in spite of the importance attributed to it, its growth has been on the decline. Apparently, the production levels have been generally low. In spite of researches on other factors

influencing the horticultural sector having been conducted, no research on socio economic determinants has been conducted, hence the need for this study

The results obtained from this study will help the community living in Yatta to sustainably deal with recurrent horticultural decline and raise their income levels from the horticultural venture. The results of this study will contribute to the examination of the socio economic determinants influencing the development of the horticultural sector and highlight the challenges that the farmers are facing. The study produced data on potential research and policy interventions and strategies that can be implemented by the county governments, horticultural NGOs and the national government in order to inform and raise awareness of various socio economic determinants that can be applied in other areas of horticultural production zones in the country. The research also made recommendations for interventions that, if put into practice, would probably have a significant positive impact on horticultural farmers' ability to increase their food security, earnings, and quality of life. The results will also be useful to the scholars and organizations involved in horticultural farming as a reference material. Further areas of research in horticultural production have also been suggested that would help in developing horticultural value chain.

1.4 Objectives of the study

1.4.1 General objective

The general objective of this study was to assess the socio-economic determinants of horticultural farming in Yatta furrow, Machakos County.

1.4.2 Specific Objectives

In order to achieve the general of the study, the following specific objectives were used to guide the study:

i. To establish the types of horticultural activities practiced by the farmers and reason for selection of the activity.
ii. To examine the socio economic determinants influencing the types of horticultural activities practiced by the farmers in Yatta furrow.
iii. To evaluate the benefits of horticultural farming to the farmers in Yatta furrow.
iv. To examine the challenges of horticultural farming faced by the farmers in Yatta furrow.
v. To assess the copying strategies adopted by the farmers to improve horticultural farming in the Yatta furrow

1.5 Research Questions

The study operated with the following research questions:

i. What are the types of horticultural of activities practiced by the farmers in Yatta furrow?
ii. What are the socio economic factors influencing the types of horticultural activities practiced by the farmers in Yatta furrow?
iii. What benefits does horticultural farming bring to the farmers in Yatta furrow?
iv. What challenges do the farmers face in the process of carrying out their horticultural practices?
v. Which strategies do the famers adopt to improve their horticultural production?

1.6 Research Hypothesis

In order to achieve the research objectives of the study, the research operated with the following hypotheses;

$H0_1$: The type of horticultural activity practiced by the farmer has no significant influence in horticultural farming in Yatta furrow.

$H0_2$: Socio economic factors do not have a significant influence on horticultural farming in Yatta furrow.

H03: Horticultural farming does not have any significant benefit to the farmers in Yatta furrow.

H04: Challenges faced by the horticultural farmers have no significant influence in horticultural farming in Yatta furrow

H05: The copying strategies adopted by the horticultural farmers in Yatta furrow do not have a significant influence on horticultural farming.

1.7. Scope and Limitation of the study

Although there are other factors influencing horticultural farming in Yatta furrow, this study examined the social economic factors influencing horticultural farming with regards to the farmers. Besides other crops being grown in Yatta furrow such as maize and sugarcane, the study was limited to horticultural crops specifically tomatoes, french beans, onions, leafy vegetables (sukuma wiki, cabbages and spinach) and green pepper. A number of challenges were encountered during the study such as reluctance of sharing vital information such as income and lack of cooperation from the respondents as some respondents were shy of sharing their information. This was solved by elaborating to the

respondents the purpose and importance of the study while also assuring the respondent of ethical considerations and confidentiality.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

This chapter reviews the literature on socio economic factors and their influence on horticultural farming in Yatta furrow. The chapter explored a wide range of literature focusing on the specific objectives of the study. Literature was reviewed together with the associated sustainable livelihood approach theory in order to gain an insight of the research problem. Based on the theory and the literature review, a conceptual framework was developed to show the interrelationship between the different socio economic factors associated with horticultural farming and how they contributed to the current state of horticultural farming in Yatta furrow. The literature review was based on socio economic characteristics of horticultural farmers, benefits of horticultural farming to the farmers, horticultural activities carried out by the farmers, and socio economic challenges faced by the farmers and the copying strategies adopted by the farmers to improve horticultural production.

2.2 Horticultural activities practiced by farmers in relation to socio economic determinants.

Different horticultural activities are carried out by farmers for different reasons, covering different areas (farm size) and depending on income levels of the farmer, age and gender with the key influence on the choice of crops being farming experience, age of the farmer, knowledge of the farmer, farm size available, labor, market of the crop if its commercial and the expected profit margins depending on the investments made by the

farmer, Munasin and Jordan (2011). A research conducted by Sriram (2007), shows that differences in gender roles for men and women in horticulture play a significant role of the choice of the horticultural crops cultivated due to differences in resource control that horticultural crops require.

A study conducted by Shirozaki (2012) showed that horticultural farming in Sri Lanka faced an uphill towards its development as majority of the horticultural farmers were women small scale farmers who lacked access to land and had limited control over horticultural resources. Mostly, the male controlled households, access to training on horticultural production was set for men who controlled majority of the household resources. In South Africa, gender related differences concerning ownership of vegetable production resources among the farmers influenced greatly the choice of horticultural activities the farmers engaged on (Oni and Obadire, 2010). Different horticultural crops require different attention by the farmers and therefore less income earners in the industry become very selective on their choice of the crops to venture in to.

In Nigeria, a study conducted by Adebisi and Oyesoda (2013) established that there existed a very close relationship between horticultural crops grown, age of the farmer, income level of the farmer and the farm size under cultivation and household size ,with land fragmentation being a major concern. Horticultural crops whose production activities were simple dominated the sector. The changes in gender roles greatly affected the bargaining power in the women intra house hold resource allocation and affected either directly or indirectly the level of production.

As an agricultural sub sector, the choice of horticultural crops grown depends on socio economic characteristics of the farmer. Horticultural farming in Yatta furrow houses heterogeneous farmers cultivating a wide variety of horticultural crops. The choice of horticultural activities being dictated by gender roles, where gender inequalities in terms of age, market information, experience on horticultural production, access to training and extension services and land availability were factors that influenced horticultural farming (Joyce, 2011). According to Mburu (2015), despite weather related events mainly drought being a major concern, socio economic factors could have a key influence towards the expansion of the horticultural sector due to lack of enforcement of the related socio economic policies to improve productivity in the horticultural sector.

Even though there is limited literature showing how socio economic challenges influence horticultural activities carried out in Yatta furrow, there exist limited understanding of these factors which have contributed the current state of the sector. Little is known on the socio economic factors influencing the choice of horticultural activities by the farmers and the extent to which these constraints have influenced the choice of horticultural activities practiced. This study therefore assessed the socio-economic related factors that in one way or the other influenced the choices of horticultural activities engaged by the horticultural farmers in Yatta furrow with attention being given to the farmer's age, gender, education level, household size, income sources, access to extension services and markets. These factors, and their degree of their influence, determined the choice of horticultural activities engaged in by the farmers.

2.3 Empirical studies on socio-economic determinants of horticultural production and practices.

Horticultural farmers differ in their socio economic characteristics such as age, household sizes, education levels, farm sizes under horticultural farming, gender and access to credit. These factors determine their level of success and development in the horticultural farming (Guzman & Santos, 2001). These factors also determine the awareness of the risks and uncertainties that are involved in the horticultural farming, which in turn affect the use of horticultural productive assets (Nyangweso et al., 2007).

The age and gender of the farmers, as well as other aspects, have a significant impact on the farmers' ability to obtain and manage financial, social, physical, and social resources for horticulture resources (Mikalitsa, 2010). Women are more restricted in terms of access to horticultural productive assets than males are, particularly in terms of land, capital, and income. This is further exacerbated by a lack of horticultural education available through extension services and horticulture seminars (Clovers, 2003).

Social capital is accessible, which helps households that are members of farming groups or associations generate money (Katungi et al., 2010). This capital affects the performance of the farmer in the horticultural sector, which in turn influences the commercialization of the horticultural venture (Wambugu et al., 2010). Finally, the involvement of the horticultural farmers in producer groups ensures a better access to technical advice on matters relating to market participation, crop management and the right marketing channels (Komarek, 2010).

2.4 Challenges of horticultural farming

Socio economic factors strongly affect the extent and nature of horticultural production. The quick development and dissemination of high-value contemporary supply chains in horticulture farming has significant consequences for gender control over resource management (Martein & Swinnen, 2010). Gender roles play a very crucial role in accelerating growth of horticultural sector. Indeed, it has a great influence on land utilization, capital availability, land tenure and the choice of crops to grow (Shirozaki, 2012). Gender is a social factor whose influence affects greatly the development of the horticultural sector. The bulk of horticultural growers worldwide, generating more than 60% of the horticultural produce, are women, according to Mikalitsa (2010). However, the horticulture industry is significantly failing. Women are crucial to the horticultural labor force in Asian and African nations, where they can make up to 50% of the overall labor force in Sub-Saharan Africa. In Kenya, women work in horticulture farming, providing labor force of up to over 70% (Kimani and Murage et al., 2011), an indication that women are crucial to the development of horticulture.

In spite of playing a crucial role in horticulture systems all over the world, women are largely excluded from platforms through which horticultural information is disseminated, lack the understanding of horticulture standards demanded by the market and limited access to instruments for effective production (Oladele, 2010). Oladele (2011), established that female farmers are more inclined to accept and adopt modifications that can increase horticulture output since they are able to devote the majority of their income to ensuring the well-being of their families. However, other authors hold different views,

Omiti *et al.* (2010), observed that in Sri lanka, women contribute to horticultural decline because of inadequate information on proper horticultural crop diversification, storage and marketing. This shows that there lacks agreement on gender influence on horticultural farming, therefore a key area of focus.

In Ghana, Sasu and Egyir (2010) found out that there existed a very close relationship between productivity of the horticultural sector and duration of the land use. The gender roles directed towards horticultural farming was greatly influenced by the increased control of financial resources that led to decline in area occupied by small scale horticulture sector. Women are more likely to be socially and economically active in small-scale horticultural production. This is in line with the findings of Zorya et al. (2011), who found that women in sub-Saharan Africa, including Kenya, play a crucial role in horticulture production and household food security, which empowers them to take actions to improve horticultural farming.

As an agricultural sub sector, horticulture farming in Kenya contributes significantly to foreign exchange earnings. However, despite this significance, less than 2% is contributed by the small scale horticulture were the farmers operate on with focus on food security, Omiti *et al.* (2009). The limit in production of small scale horticultural farmer on domestic production is due land ownership issues, education level of the farmer, gender control of the related resources directed to horticulture. According to the World Bank (2011),age is a social factor whose influence seems to have a great influence in horticultural farming, different researchers have different views on. Age is not a factor in the management of horticultural operations, the adoption of new technology, or other

horticultural activities, according to Oladele, (2010). Other studies have established that this has a considerable, unfavorable impact on farmers' decisions to adopt new technology meant to increase horticulture productivity. In Ghana, studies by Akpan (2013) revealed that age influence agricultural activities especially in embracing technology meant to improve productivity. The elderly have a tendency to shun risks and are hesitant to explore new technology. The young, on the other hand, are enthusiastic and prepared to test out new ideas as well as accept new manufacturing technology. They are both open to and resistant to new ideas.

On another realm, the level of education of the farmer has a significant impact on horticulture farming. Increased horticultural productivity, according to I.F.P.R.I. (2012), is largely dependent on the farmer's education level and capacity to comprehend and accept the complex and innovative changes in the horticultural industry, which, according to Odi (2007), are challenging for horticultural farmers without education to master. Divergent researchers hold opposing opinions on how education affects horticulture farming. According to Mikalitsa (2010), education level of the farmer lead to awareness of the best farming practices enabling them to increase their production capacities. This is in conjunction with Opara (2010), who established that horticultural growth can either increase or decrease depending on the famer’s education level. An increase in education level results to increased adoption and application of improved methods of farming as it makes the farmer make informed decisions concerning their application. According to Kumar and Kalitsa (2017), inadequate horticultural knowledge contributes to a significant decline in horticultural produce in the developing countries. In India,

education was positively associated with higher productivity (Kumar and Pankar, 2012). By giving farmers guidelines in agricultural methods through seminars, workshops, and training sessions, they were able to obtain the right production technologies, which enhanced outputs. In Pakistan, Bashir et al. (2012) discovered that education gives the farmer access to knowledge about the optimal production techniques.

The income of the farmers plays a vital role in horticultural farming. This is seen on a worldwide basis, as Parfitt (2010) describes the causes of a drop in horticulture production in developing nations, where horticultural production is dominated by small-scale farmers with little access to financial resources. Additionally, technical and financial resources are frequently insufficient. In order to increase horticulture production, farmers must have the financial means to do so and be ready to spend for new technologies, according to the World Bank (2011). According to Oladele (2010), poor financial management and technological limitations are the major reasons of horticulture losses and waste in Nigeria. Hence, due to inability to invest in better production techniques, horticultural decline is inevitable. Likewise in Tanzania, the lack of alternative income sources influences the utilization of improved production methods. In Kenya, a study by Ngigi (1999) established that farmers' lack of financial incentives to produce horticultural produce contributed greatly to decline in the number of horticultural farmers in the venture.

Therefore, it has been noted that socioeconomic considerations have varying effects on horticulture cultivation across the world. However, there is no proof that a research like this one was done in Yatta furrow to ascertain how these factors affected the sector.

Horticultural farming in Yatta furrow is influenced by besides other factors, socio economic factors on its development. Horticultural expansion along the canal has failed to expand. Mburu (2015), cited that besides the climatic hazards mainly perennial drought experienced in the area, horticultural productivity in the furrow can be improved by addressing the perennial socio economic related implications among the farmers. Joyce (2011) noted that even though other factors come in to play in the dwindling performance of the sector, socio-economic factors have a hand towards the state of the sector, and therefore, there is need to look at the prevailing social related implications that influence the level of marketing, development of infrastructure required, credit availability to the farmer, level of technical advice required by the farmers and quality of the inputs required.

Despite vast studies having been undertaken, more is still lacking regarding the role of socio economic factors and how they impact horticultural farming. There is no literature connecting socioeconomic factors and their impact on horticultural farming given the enormous amount of information already available on the restrictions impacting horticulture farming in Yatta furrow. In addition, there is a lack of awareness of these socioeconomic issues, which has made it difficult to implement the right policies for the sector's expansion and development. This study therefore evaluated the socio economic constraints that are in one way or the other have influenced the state of the sector in Yatta furrow.

2.5 Copying strategies adopted by the horticultural farmers

Engagement into any other income generating activity to support horticultural farming is critical towards its growth especially in ASALs. According to Madisa and Obopile (2002), economic and social challenges force the subsistence farmers to engage in other activities to offset the pressures of the socio economic challenges faced in the process of improving horticultural activities. However, these activities may be unreliable and therefore cannot be dependent upon. In reference to Adam Collier and Ndungu (2010), horticulture in Kenya is dominated by smallholder farmers majorly in rural areas, whose capability to expand their production and improve their living conditions, technology adoption has been a challenge. Besides this, land ownership and land use decisions have been a great threat to horticultural sector, forcing the farmers to focus on alternative economic activities besides horticultural farming. Therefore, there is need to adopt alternative strategies to such problems to reduce the farmer vulnerability to losses (Okuthe et al., 2013).

Majority of horticultural farmers of Yatta furrow, being majorly small scale subsistence irrigation farmers may engage in alternative activities to counter the socio economic challenges that they come across due to socio-economic statuses Mburu et al. (2015). In trying to mobilize funds for instance, majority of small holder farmers resort to forming credit groups, through which they mobilize funds to loan each other. However, such funds are limited in amounts due to low fund mobilization restricted by membership and geographical spread, lowering their desire to expand their production bases.

Despite the efforts of the government to subsidize agricultural inputs such as fertilizers to improve production levels, this seems to be inefficient and ineffective as majority of the horticultural farmers are not able to access the services. This translates that the farmers therefore engage in other activities that would enable them cope with the challenges they face, (Ngugi et al., 2007). However, these alternative activities have never been outlined in any of the previous studies. There is little that actually has been done to identify the specific strategies used, their reliability and how they influence the development of the venture in Yatta furrow. Therefore, the question that arises is; which are these alternative strategies? How are they reliable and how do they influence the development of the horticultural farming? It is therefore in vain of this gap that this study would seek to identify the coping strategies that the horticultural farmers use to counter the socio economic challenges faced in horticultural farming in Yatta furrow.

2.5 Empirical studies on benefits of horticultural farming

Horticultural farming has been a significant economic activity worldwide with the global production of the horticultural produce totaling to over one million metric tons, valued at more than 1 billion us dollars (Sebalta et al., 2014), contributing greatly to the less vulnerable and a more diverse rural economies of the world, that provides opportunity to the farmers and improving their livelihood. With the current failure of other crops in agricultural sector, horticultural farming has remained to be a sustainable livelihood diversification option in the ASALs, providing food and incomes to millions of farmers. Globally, horticultural farming is an essential economic activity, with the employment to farmers of different socio economic statuses, in different horticultural sectors, from

production to consumption stages. Besides individual benefits, horticultural farming has proved to be an important foreign exchange earner, earning billions of money to the producing countries.

Africa's horticultural farming is practiced in rural areas, providing food ,income and employment to farmers. The sector is a major livelihood source, providing income to the rural population, leading to alleviating poverty among the African farmers. Through horticultural farming, countries such as Egypt have raised their Gross Domestic Product (GDP) to immense levels through irrigation, translating to raised farmers income.

In Kenya, horticultural sector is a highly potential sector in rural set ups, receiving a great deal of attention due to the rapid and sustained growth of exports, contributing to increased rural incomes, CIDP,(2017).It is an appropriate livelihood source, providing employment opportunities through the value addition chains. The farmers have been able to diversify their income sources through their different horticultural practices, through sale of their produce at directly market or to the middlemen. Horticultural farming therefore play a strategic role in poverty eradication in line with the country's long term plan, vision 2030.

Yatta furrow is one of the areas where horticultural farming is a common activity although its performance has not been as to the expectations. Different horticultural activities are practiced limited on land sizes by the farmers. The sectorial benefits to the farmers have not been clearly outlined and so an important aspect of study, hence the need to investigate the benefits of horticultural farming to the farmers in Yatta furrow.

2.6 Theoretical framework of the study

In order achieve the objective of this study, a sustainable livelihood approach was used. The idea for the hypothesis came from Sati V. (1990). The theory examines socio-economic elements of farmers and makes recommendations on how to raise agricultural productivity while also enhancing people's quality of life. According to the theory, sustainable livelihoods in agricultural sector are achieved when the farmers acquire the right farm inputs, diversify their horticultural activities and access viable markets for their produce. It is therefore useful in addressing socio economic factors in response to declining horticultural productivity. This idea contends that raising production in agricultural sector is key to reduced poverty and malnutrition in the developing world. If there is inadequate food for the region's substantial population growth, such a strategy can be applied. The primary means of subsistence in these economically under developed regions is agriculture. According to the theory, there are our fundamental categories of livelihood assets; social capital, financial capital, human capital, and natural capital, that need to be examined in order to achieve sustainable livelihood. Social capital is the social cooperation among the farmers and the government assistance to raise agricultural production. Human capital is the literacy levels, education status and human skills applied in agricultural production. Financial capital refers to the sources of income for the farmers to boost agricultural production. Natural capital is the agricultural land and water where farming takes place. According to the theory, sustainable livelihood approach can only be attained if there is a successful interaction of the four types of capital.

Based on this approach, the theory applied to the study as it helped uncover the key variables for the study. The four types of capital formed a basis for the independent variable which were the socio economic variables for the study. The key variables from the types of capital under this approach were income sources, land size, and ownership, education level, extension service delivery, household size ,gender as well as age factor. The interaction of these socio economic factors have a great bearing on the horticultural growth.

2.7 Conceptual Framework for the study

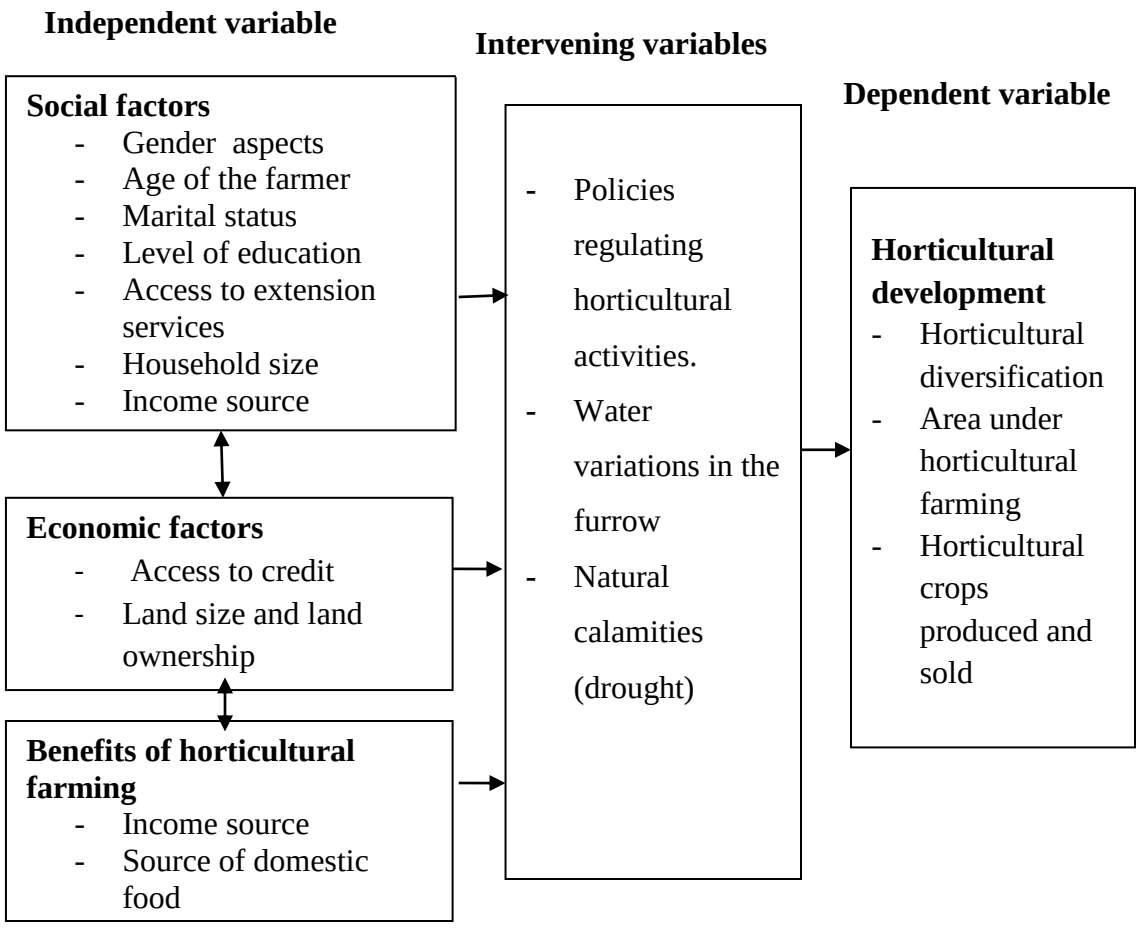

Figure 2.1: A Conceptual framework showing interrelationship of the key variables for the study.
Source: Compiled from the literature review; (Author 2019)

The aim of this study was to establish the socio economic factors influencing horticultural farming in Yatta furrow. Gender is probably going to have an impact on who has access to knowledge, how much money is available for investment, what kinds of crops should be grown, and how big a farm should be. Younger, more educated farmers are more likely than their older colleagues to embrace the skills required to improve horticulture farming. Young educated farmers are better able to understand new knowledge and are therefore more eager to use horticulture resources. Having knowledge and skills required in horticultural farming is the first and most important stage in horticultural production. Education level of the farmer is a likely indicator of access to knowledge and information concerning horticultural farming. The amount of labor that is available for the farms is determined by household size. Farmers are more likely to acquire the necessary horticultural expertise if they have excellent communication with extension agencies and trainings. Bigsten et al. (2003) claim that the number of farmers participating in the enterprise is greatly influenced by extension services provided through visits made or training obtained before to and throughout the production season. The farm size under horticulture is likely to be influenced by the labor needed for the farm activities. Likewise, the house hold size influence the quantity of labor needed based on the family labor available. Farmer organizations may help the farmer share production ideas as well as assist in marketing of their produce. Experience in horticultural farming enables the farmer to make well informed decisions. It was therefore expected that the farmers with long experiences in horticultural farming are more likely to enhance their horticultural activities.

It was expected that horticultural farming would contribute greatly to the improvement of the farmers' welfare through job creation, hence raising their livelihoods. However, the development of horticultural farming is not a smooth process. Challenges such as inadequate access to credit facilities and inadequate information hinder the farmers from undertaking the necessary measures such as purchasing of right quality inputs. Furthermore, even with the necessary support from the government, the farmers still fail to expand their horticultural activities. Such has been attributed to the high cost of production, which may compel the horticultural farmers to abandon horticultural farming. Such constraints must be addressed or significantly reduced in order to promote viable horticultural farming in Yatta furrow. Therefore, based on these variables, this framework depicts the important variables that are likely to influence horticultural development in Yatta furrow.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter gives an insight on the study area, research design, sampling procedure and sample size, data collection, data analysis, data presentation and ethical considerations.

3.2 Research Design

This study employed a descriptive research approach. A descriptive research design, according to Orodho (2004), is a strategy for gathering data about people's attitudes, opinions, or any number of educational or societal concerns. Further, a descriptive research design produces clear and specific descriptions of the phenomena in the question, (Grimes & Schultz 2002). This research design was applicable in this study because it involved itself in gathering information on the farmers' socio-economic characteristics and how they influence horticultural farming in Yatta furrow. The study design therefore assisted in determining if the socio economic related challenges among the farmers had any influence towards horticultural growth in Yatta furrow.

3.3 Study area

3.3.1 Location of the Study Area

The study was conducted in Yatta furrow irrigation scheme in Yatta sub-county, Machakos County. The furrow lies between longitude 37º25'00''E to 37º35'00 E and latitude 01º10'00'' S to 01º15'00' S .It is 58.8 km long and 2 km from Kithimani town and approximately 100 km from Nairobi along Thika - Garrissa highway(figure 3.1).

The area covered by the canal has an altitude of 1525 metres above the sea level in Yatta sub county, covering a land area of 1057 square kms. The terrain is gentle, allowing easy flow of water by gravity along the canal. The canal covers three wards namely Yatta, Kithimani and Matuu wards in Yatta constituency. It is a source of livelihood because it provides water for domestic and small scale irrigation purposes for the residents in the area, (CIDP 2017). Its source of water is Thika river and extends to Yatta Sub County.

3.3.2 Physical features

With an average temperature of 15 to 30 degrees Celsius, the region has a semi-arid climate experiencing two distinct rainy seasons with an average yearly rainfall of 700 mm; long rains from March to May and brief/short rains from October to December (CIDP, 2017). Geologically, the area has two types of rocks, namely sedimentary and igneous rocks. The soil types are mainly lithosols, ultisols, oxisols and acrisols, which have low plant nutrient and highly subjective to erosion. The natural vegetation mainly comprises of semi arid type of vegetation, with scrubs and scattered trees dominating due to the low rainfall experienced (County government of Machakos, 2017)

3.3.3 Population distribution and livelihoods

The Yatta sub county has a land area of 1057.3 square kilometers, a population of 191,597 (94,451 males and 97,146 females), and a population density of 181 persons per square kilometer, according to the 2018-2022, Machakos County Integrated Development Plan. There were 46,153 households, each containing an average of 3.7 people. The land use activities contributing to the livelihood of the residents range from livestock farming, bee keeping and crop farming, (Machakos County Integrated Development Plan, 2018-

2022). The crops grown include drought resistant crops such as sorghum millet and drought resistant maize varieties. Horticultural farming is a common economic activity, especially along the furrow since colonial period where it forms an integral part of livelihoods for the farmers. The horticultural crops grown being vegetables, tomatoes onions, French beans and green pepper. These crops are common among the farmers because of their short maturity and high demand both at the household level and in the local market. However, majority of the horticultural activities are predominantly low quality based, practiced on small scale with the average size of less than five acres. There is minimal use of farm inputs and application of up to date horticultural technologies in horticultural activities. The land is permanently owned by household heads who are decision makers on the land use activities. In some cases, some households may lease the land to other farmers at annual renewal fee being applicable. Within the farmers, there lacks organized marketing system such as cooperatives, a situation that force the farmers to market their produce independently at the farm gates, creating a huge disparity in marketing of the produce. The produce is sold in the local market, mainly Kithimani, Matuu and mamba and Kisiiki markets.

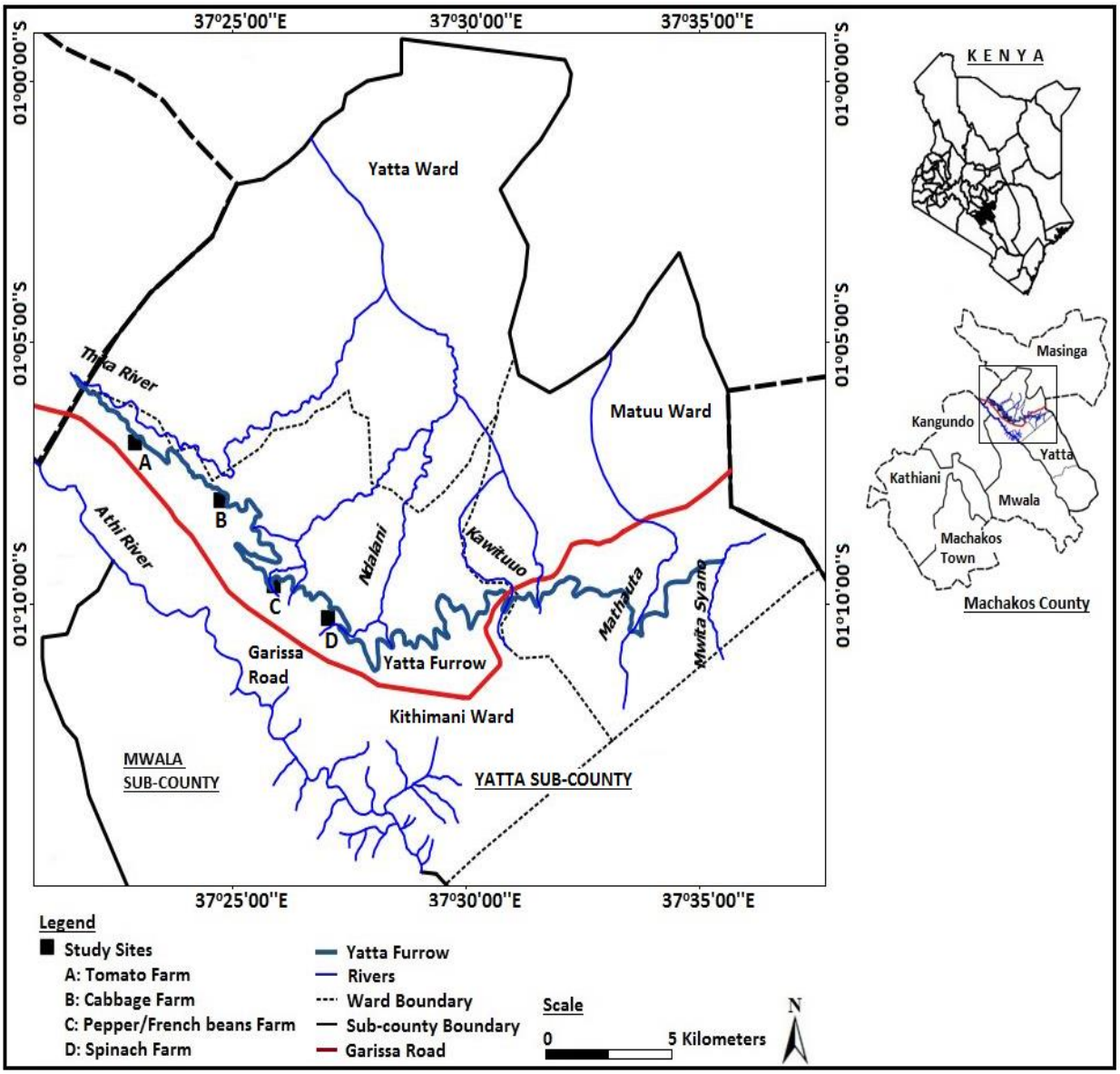

Figure 3.1: Map of the Study Area Showing the Location of Yatta Furrow in Yatta Sub-county

Source: Topo sheets for Ol Doinyo Sapuk (149/2) and Kangondi (150/1)

3.4 Target Population

The target population of the study were the horticultural farmers in the Yatta sub county. According to the Machakos CIDP, (2018), there were 526 registered horticultural farmers who practiced horticultural farming along the furrow, both in small scale and large scale. The study also sought to interrogate the sub county administrators (chiefs) and the officials from the agricultural sector in the sub county.

3.5 Sampling Technique and Sample Size

3.5.1 Sampling Techniques

Yatta furrow covers three wards namely Yatta ward, Kithimani ward and Matuu ward. The administrative location of each ward was identified using the CIDP. The study area was stratified in to three strata; with each strata representing one ward. To determine the number of respondents from the three wards, the proportional allocation technique by Mead & Currow (1983) was used. This was so because the number of registered horticultural farmers varied in the three wards, hence ensuring a better representation. The formula states that;

$$n_1 = \frac{n \, x \, p_1}{N} \text{ .. (eqn 3)}$$

Where n_1 is the desired sample size in each stratum.

N= Total population size (526)

P_1 = The proportion of the population in each stratum

n= Sample size for the study (109)

Therefore, using the above formula, the sample size in each stratum was as computed as in the table below;

Table 3.1: Determining of the sample size

Ward	Registered	Sample size
Yatta	218	45
Kithmani	226	47
Matuu	82	17
Total	526	109

Besides the farmers, key informants were also identified. They comprised the 10 extension officers the Yatta sub county.

3.5.2 Sample Size

Yatta furrow houses 526 horticultural farmers in the three wards covered by the furrow in the sub county (Machakos county CIDP, 2017).The sample size was calculated from the data of the number of farmers as per the CIDP horticultural report (2018). The research used this sampling frame to determine the sample size. The sample size was calculated using Cochran's formula which states that;

$$n=\frac{z^2PQ}{e^2} \quad \text{....(eqn 1) where;}$$

n= sample size

z= standard normal score of 1.96 at .95% confidence level.

P= proportion in the target population assumed to have the measured characteristics

q= 1-p,.

the denominator e, was the desired level of precision at 5%

The sample size was computed as follows:

$$\frac{1.96\ x\ 0.9\ x\ 0.1}{0.05^2} = 138$$

The sample size was adjusted using the formula in equation 2 below where

$$n_1 = \frac{n_\theta}{1+\left(\frac{n_\theta}{N}\right)} \text{ ….. (eqn 2), where;}$$

n1 = is the adjusted sample size

n_θ = original sample size

N = the total population

Therefore the adjusted sample size was;

$$n_1 = \frac{138}{1+\left(\frac{138}{526}\right)} = 109.350 = 109 \text{ respondents}$$

3.6 Data Collection Tools

The study used a variety of methods to gather data. With the use of interview guides and structured questionnaire, primary data was gathered. The structured questionnaire (APPENDIX 1) was the major tool used to gather primary data. It had both open-ended

and closed-ended questions. The questionnaire was given to each of the 109 farmers. The inquiries mostly centered on the particular goals. Additionally, using an interview outline made it easier to get additional information from the key informants. The key informants were the all the 10 extension officers from the Yatta sub county agricultural offices. They were all interviewed based on the specific objectives of the study. More information was gathered from the Machakos County CIDP.

3.6.1 Questionnaire

The horticulture farmers were given the questionnaire. It had both open-ended and closed-ended questions and was segmented into various parts based on the goals of the research. Each segment of the questions sought information related to a certain goal and was divided into distinct questions. The first portion looked at the horticultural activities that the farmers engaged in. Section two sought information on the socio economic factors influencing horticultural farming which included age, gender education level of income, marital status, farm size and farming experience. Section three looked at the benefits of horticultural farming to the farmers while section four investigated the challenges that the farmers face in carrying out their horticultural activities.

3.6.2 Interview Guide

The interview guide was administered to the ten extension officers in the sub county offices .It facilitated collection of information from the key informants. This provided more in depth and reliable information that that complimented the information obtained from the questionnaire.

3.7 Piloting of the Research Instrument

For the research, a pilot study was carried out. According to Sorzano et al. (2017), 10% of the research sample should be made up of a pilot sample. In order to test the study tools, 11 respondents from the nearby Kabaa irrigation scheme were employed. Pre-testing the study questionnaire improved its validity, reliability, and consistency of the responses. The training of the research assistants included the use of pretesting tools of research. This made sure that everyone received the instructions fully and that all potential answers to the questions were adequately recorded. The questions were changed to make them more objective and consistent with the goals of the research based on the pilot's findings.

3.7.1 Validity of Research Instruments

The appropriateness, accuracy, and significance of the chosen research results' specific implications constitute the research instrument's validity (Frankel & Wallen, 2004). The researcher closely worked with the supervisors to verify that the instruments addressed the study's intended subject area because content validity was the study's main goal.

3.8 Data Analysis and Data Presentation

Both qualitative and quantitative analyses of the gathered data were performed. To fit into the appropriate themes, the qualitative data was cleaned, coded, and classified. The quantitative data analysis using SPSS software. The socio-economic characteristics of horticultural farmers were described and summarized using descriptive statistics like cross-tabulation and frequencies. To draw inferences and make generalizations on the required data of horticultural farmers, inferential statistics, primarily chi-square, was

utilized. To determine the impact of the socio-economic determinants on horticulture cultivation in the area, a binary logistic regression model was utilized. Because the predictor variables were a combination of continuous and categorical variables, a binary logistic model was used (Karl, 2015). Following Gujarati (1995), the logistic regression model was specified as;

$$L_i = i_n \frac{(p_i)}{1-p_i} = \beta_0 + \beta_1 X_{1i} + \beta_{2i} X_{2i} \ldots\ldots \beta_k X_{ki} + e_i$$

Where

L_i = the log of the odds ratio in favor of horticultural development

E= error term

B= parameters estimated

For this study, the regression model was specified as;

HF = β_0 + β_1 Age, + β_2 Gender, + β_3 Experience + β_4 Education + β_5 Extension services

+ β_6 Household size + β_7 Credit + β_8 Access to Market + β_9 Land ownership + e_i

HF= Horticultural development

β_0 = constant term

β's= coefficient of the independent variables

E^e = error term

3.9 Ethical Considerations

Following ethical rules was vital in conducting this research. The researcher obtained letter of authorization from the university, NACOSTI and from local offices that enabled him carry out the research. The data was collected using the various methods with the informed consent of the respondents. Careful attention was observed regarding the respect of rights, needs and values of the respondents as well as maintaining confidentiality of the information and acknowledging sources of information.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the study and discussion. The chapter focuses on the findings of the study based on objectives of the study, specifically the socio economic characteristics of the farmers, horticultural activities carried out by the horticultural farmers, the benefits of horticultural farming and the socio-economic challenges influencing the horticultural activities practiced by the farmers.

4.2 Questionnaire response rate

The farmers filled all of the 109 questionnaires given to them, which provided sufficient data for analysis. The high response rate was credited to the efforts of the researcher and the research assistants who closely monitored the respondents while they completed the questionnaires. All the targeted respondents were reached in their respective areas and issued with the questionnaires in the form of self-administered or interview administered questionnaires to ensure that both literate and illiterate famers were captured and gave their responses effectively. The farmers also showed free interest in the participation of the research. The researcher also conducted interviews with 10 key informants from the sub county agricultural offices at Kithimani.

4.3 Types of horticultural activities practiced by the farmers along the Yatta furrow

This part fits in with the study's initial goal, which was to analyze the horticultural practices used by the farmers in Yatta furrow. According to the study's findings, farmers along the canal engaged in five horticultural pursuits, as shown in the table below;

Table 4.1: Horticultural activities carried by farmers

Horticultural activity	No. of farmers	Percentage (%)
Green leafy vegetable growing(`	``	35
Tomato growing***(Solanum lycopersicum)***	34	31
Onion growing***(Allium cepa)***	17	16
French beans growing ***(Phaseolus vulgaris)***	14	13
Green pepper growing***(Capsicum annum L)***	6	5
Total	**109**	**100**

Source: Field Survey Data, (Author,2019).

From the results above, green leafy vegetable farming was the most preferred horticultural activity (35%) while green pepper was the least preferred(5%).Other horticultural activities were tomato growing(31%),onion growing (16%) and French bean growing(13%). The influence of socio-economic factors on horticultural farming was confirmed by the nature of horticultural activities carried out by the farmers. Farmers indicated that the socio economic factors contributed heavily on the choice of horticultural practices carried out by the individual farmer. Each of these horticultural practices were as discussed below;

4.3.1 Tomato growing

Tomato growing was found to be practiced by 34 households among the sampled farmers, accounting for 31% of the sampled households. Tomato growing was low among the female farmers because they lacked the control of the basic horticultural assets especially the land. Some of them only provided labor not only in their household farms, but also in other farms to earn income for their families. The farmers' aim of production was both marketing and consumption with selling being done at both local markets and far away markets. Besides inadequate information on the best production methods, the study further established that environmental factors also contributed to the declining production, with drought and diseases being a threat, which the farmers could not properly control as a result of financial and knowledge inefficiencies. There was poor application of pesticides among the farmers, leading to farm losses. With domestic consumption being major goal of most horticultural farmers, this could be probably one of the reasons why tomato growing wasn't heavily invested by most households.

4.3.2 Green leafy vegetable growing

The study established that green leafy vegetable farming was the most popular horticultural activity among the farmers in Yatta furrow, accounting for 35% of the total sampled farmers. The vegetables were established to be kales (Sukuma wiki), cabbages and spinach, grown on limited land size of less than two acres as indicated by the 63% of the farmers. The produce was both domestically consumed and marketed in the nearby markets of Matuu, Kithimani, Mamba and Kisiiki markets by the farmers and the middle men.

4.3.3 French bean growing

French bean cultivation was found to be less popular horticultural activity among the farmers in Yatta furrow. This was so because the venture required heavy investments than any other crop in the area both through physical monitoring and financially. The study revealed that French bean cultivation was market (export) oriented, an indication that they were likely to be receptive to modern production technologies required in international horticultural markets. French bean farming was dominated by farmers who got financial, advisory and marketing support from horticultural companies, mostly Kakuzi company It was also noted that French bean farmers were active in attending agricultural seminar organized by the extension officers in the area. French bean growing was under supervision of Kakuzi company that provided quality seeds to the farmers and ensured very close monitoring of the farms from planting to harvesting stages, hence ensuring quality output among the farmers. The company would also provide quality training to the farmers, equipping the farmers with skills. This was evidenced by one French bean farmer, that;

"The quality of the seeds provided by foreign companies mainly Kakuzi is better compared to the ones sold in the local markets. Most of the farmers prefer the services of Kakuzi since we are assured of a ready export market rather than the local market ,quality training and extension services such as monitoring of the crop from the initial up to the harvesting stages".

French bean farming was conducted by non locals, who would lease the land for cultivation, therefore concluding that this venture was a domain of the non local farmers whose aim was profiting, rather than consumption. Access to credit among the farmers

was recorded highest among these farmers due to its capital intensive nature and great support from the company.

4.3.4 Onion growing

Onion growing had attracted greater attention among horticultural farmers in Yatta furrow. It has proved to be better income earner as it is sold both locally and far away markets besides being consumed domestically. Of the three wards, onion growing was found to be distributed across all the age level of the farmers. Both the youths and adults actively engaged in the activity, even though on a small scale. It was a source of income to the household beside domestic food supplies.

Onion farmers expressed that access to credit was not a necessity to facilitate its growing, hence it was an option to many as the market was also limited

4.3.5 Green pepper

Green pepper was the least preferred horticultural crop because of the low demand and lo profit margins, accounting for 5% of the cultivated crops. It is grown mainly for commercial purpose but on a small scale with all the farmers having less than two acres of land, which was leased. The farmers were 30 years of age and above. The farmers expressed no interest of acquiring credit to facilitate its production.

4.4 Socio-Economic determinants of horticultural farming.

Socio economic considerations had a crucial role in comprehending the study's principal goal. Therefore, a study of the farmers' age, gender, education level, marital status, household size, access to extension services, farming experience, land size under

horticulture, and land ownership was conducted, with the results summarized in the table below;

Table 4.2: Summary of the socio economic characteristics of the farmers

Variable	Category	Frequency	Percentage
Age	Below 18 years	15	14%
	19-34 years	31	28%
	35 years and above	63	58%
	Total	109	100%
Gender	Male	69	63%
	Female	40	37%
	Total	109	100%
Educational level	Dropped out of primary school	5	5%
	Primary school	9	8%
	Secondary school	62	57%
	Tertiary	33	30%
	Total	109	100%
Marital status	Single	5	5%
	Married	104	95%
	Total	109	100%
Household size	2-4 members	26	24%
	5-7 members	59	54%
	Above 7 members	24	22%
	Total	109	100%
Land size	Below two acres	82	75%
	Above two acres	27	25%
	Total	109	100%
Land ownership	Permanently owned	73	67%
	Rented	21	19%
	Leased	15	14%
	Total	109	100%

Source: field data (2019)

4.4.1 Age of the respondents

The farmer's age was considered to be a significant element affecting horticultural growth. The purpose of this study was to determine whether the age of the farmer affected horticulture farming in any way. Age influenced the type of horticultural activities carried out by the farmers, ownership of horticultural asset (mainly land) and the likelihood of adoption of modern technologies required in horticultural farming as younger farmers are likely to embrace new technologies in horticultural farming, Caswell et al. (2001). According to the data in the table, 58% of the farmers were 35 years of age or older, 28% were between the ages of 18 and 34, and 14% were under the age of 18. This shows that in the Yatta furrow, horticulture cultivation is a common practice among farmers of all ages. This can be attributed to the study's rural setting, where farming continues to be the primary source of income for the vast majority of the locals.

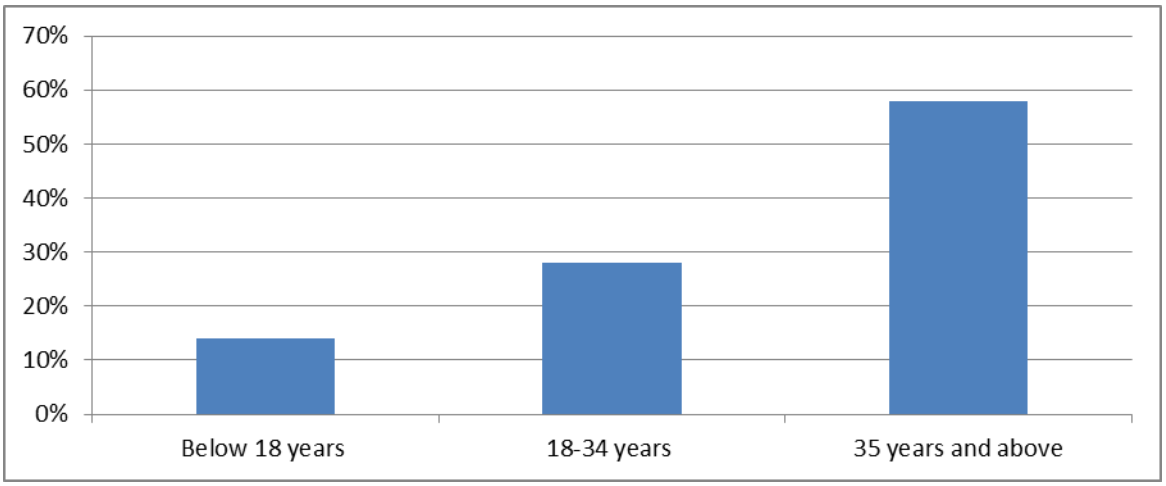

Figure 4.1: Distribution of farmers by Age

Source: Field Survey Data (2019).

To determine the influence of age on horticultural growth, a chi square test was run between the age and the mentioned factors and results were as in the **table 4.2** below;

Table 4.3: Relationship between Age of the farmer and horticultural production

		Below 2.75 acres	Above 2.75 acres	χ^2 (chi square)
Age	Below 18 years	15	0	χ^2=15.841a (p=0.001)
	18-35 years	15	16	
	above 36 years	24	39	

Source: Field Survey Data (2019).

From the results above, age of the farmer had a significant effect with a p-value of 0.001, an indication that age of the horticultural farmer had a significant influence in horticultural farming. It implied that the probability of the farmer engaging in horticultural farming increased as the age increased, but declined with a decrease in age. The results further imply that younger farmers are less likely to be actively involved in horticultural farming compared to older farmers. From the results above, it is clear that the youths are not actively involved horticultural farming as 58% of the total farmers were aged above 36 years and above. From the findings of this study, age played an important factor influencing respondents' engagement in horticultural farming. However, as an important factor, younger persons lacked significant amounts of capital and control of important horticultural resources such as land to spur horticultural growth, where mass production can be undertaken. This was further evidenced by the following response from a respondent;

> "*Horticultural farming in this area is the domain of the old, who are the controllers of the land and capital resources. In most cases, the young may not deeply engage in horticulture as they lack permanent ownership of the land which is controlled by the parent, further inefficient outlay of capital pushes the younger*

farmers away from expanding their farm unless they acquire assistance from their parents.."

The report indicates that horticultural farming is a domain of older people who probably depend on the horticultural farming for livelihoods. These findings agree with those of Oladele (2010) which established that majority of indigenous fruits and vegetables farmers are older people, who produce them for providing for their families. The findings also support a research by Vorster et al. (2005) that found elderly and female farmers dominated the production of vegetables. This was explained by the significant contribution that vegetables provide to reducing poverty and guaranteeing the food and income security of rural communities.

Contrary claims on the direct impact of age on horticultural growth in Yatta furrow have been made from other research that have been investigated. The study's findings showed that younger farmers, while not having control over key inputs required for the expansion of horticultural ventures, were more inclined than older farmers to adopt horticultural advances. This is collaborated by Omonona et al. (2006), who discovered that younger farmers were more inclined to adopt new technology than older farmers due to their better educational attainment and exposure to innovations. This is further supported by Biwott & Tawei's (2016) study on the factors that influence small-scale horticultural producers' decisions to join farmer-based organizations in the county of Nandi. According to their findings, the usage of farm information sources tends to decline as people get older. Older farmers made up the majority in this research, therefore there is less adoption of the pertinent technology and developments. In a different study

conducted by Rodgers in 2003, it was shown that elderly farmers lacked receptivity to newly introduced technology because they refused to alter their traditional methods of carrying out their horticultural operations. Additionally, because farmers' perceptions of certain technical developments and their eventual advantages take time to materialize, older farmers frequently lose interest in the new technology as they age, which increases the likelihood that they will not profit from it (Caswell et al., 2001).

4.4.2 Gender influence on horticultural farming in Yatta furrow

A key variable in affecting horticulture farming in the study area was the farmer's gender. According to the results, 63% of respondents were men and 37% were women, as stated in table 4.1 above. The findings suggest that males predominate in the field of horticulture farming. This is in line with the findings of Omonona et al. (2006), who found that although horticulture farming was initially a women's domain when it was primarily focused on domestic food sustenance, males have actively participated in the enterprise since it was promoted as a commercial activity. Males owning horticulture assets, primarily land, being the principal decision-makers, and having more access to and control over key production resources than women are all factors that contribute to the growing engagement of men in horticultural farming. This study established that the participation of women in horticultural farming is quite inferior as they are only involved in peripheral roles . They only engaged in labor provision, whether family labor or hired labor in other farms, with limited access to control of horticultural resources and decision making.

Table 4.4: Distribution of Gender roles in horticultural farming aspects.

Statements	Category	Frequency	Percentage(%)
Gender of the respondents			
	Female	28	25.7
	Male	81	74.3
Decision Making regarding Size of land for horticultural farming	Female	51	46.8
	Male	58	53.2
Decision Making regarding types of horticultural crops to be grown	Female	35	32.1
	Male	74	67.9
Decision Making regarding number of crops to grow	Female	35	32.1
	Male	74	67.9

Source: Field Survey Data (2019).

Table 4.5: A Summary of gender influence/implications on horticultural farming.

Gender		Below 2.75 acres	Above 2.75 acres	χ^2 (chi square)
	Female	9	19	(χ^2= 0.120a,
Gender	Male	41	40	p=0.911)
Decision Making regarding Size of	Female	14	37	(χ^2= 2.472a,
land for horticultural farming	Male	36	22	p=0.002)
Decision Making regarding types of	Female	14	21	(χ^2= 4.145a,
horticultural crops to be grown	Male	36	38	p=0.042)
Decision Making regarding number of	Female	14	21	(χ^2= 4.145a,
crops to grow	Male	36	38	p=0.042)
	Female	0	0	
Who attends mostly the training	Male	94(100%)	15(100%)	(χ^2= 0, p=N/A)

(The first category was used as a reference category)
The Chi square results on who attends mostly the training were not computed since all of the respondents who responded to the question were male.
Source: Field Survey Data (2019).

As established by findings above, gender roles regarding decision making on the size of land to be used in horticultural farming had significant positive influence with a p- value

of 0.002, an implication that decision making among men hindered women participation in horticultural farming. Gender influence was also paramount in deciding the types of crops to be grown with a p-value of 0.042, an indication that that the dominance of low value horticultural crops along the furrow could be due to males dominance in the sector or priority in domestic food production and the number of horticultural crops to grow as determined by land size under horticultural farming, evident by a p value of 0.042. As established by Moses and Fecton (2007), female asset ownership of horticultural resources can enhance their participation and is significantly higher in producing domestic foods rather than commercial oriented crops. In understanding how the commercialization of the horticultural farming in Yatta furrow affects gender management of resources, food and income security, gender relationship is critical in addressing the challenges that hinder development of horticultural farming in Yatta furrow. This is in line with FAO *et al.* (2010), that addressing gender inequalities in management of agricultural resources is an important factor in addressing agricultural productivity in the rural communities.

From the results, the ownership and control of horticultural resources among the household was purely a male's decision. Specifically, land utilization decisions (selling and leasing) was purely males' decisions across the three wards. This was attributed to by the society's socio cultural aspects where men are the controllers of the family's assets. As evidenced from the study, men dominated all aspects of horticultural farming including decision making regarding the types of horticultural crops to grow and size of

land to be occupied by the crop. This was further evidenced by a key informant who stated that;

> *"Men inherit the land as per the customs here. It is their prerogative to give access to their wives for cultivation''* **(KII, SEP 2019***)*

In the households where French beans, tomatoes and green pepper (chillies) were grown, men had a greater influence in production, while women only influenced production of vegetables for household consumption. This revealed that men typically controlled and managed production of horticultural crops with higher returns and organized marketing channels such as tomatoes and French beans (**table 4.4**).The study further revealed that each crop was allocated a plot with women consulting men where the plot was jointly owned by the household members.

The study also established that women have lesser access to horticultural training services offered in the area, (**Table 4.4).** Although the trainings are rarely conducted, men usually attend seminars and share information to their wives. This is an implication that women farmers are not equally equipped with information compared to their male counter parts. As revealed by Temu and Temu (2005) women in developing countries are discriminated against accessing agricultural information which greatly hampered its growth. In this study, access to horticultural information was established to be a hindrance to the expansion of the sector. It was found out that of the total respondents, only 26% of the total farmers had the right information on horticultural farming and of which majority were men. This disparity was caused by the inefficient extension service delivery from

the extension officers and the inequalities in accessing information brought about by gender disparities among the farmers.

Inadequate market information was also found to be a factor that contributed to low women participation in horticultural markets in Yatta furrow. In the study area, limited women's access to information dissemination centers such as barazas and field trainings was reported. This, in the long run was seen as a constraint in their ability to acquire the necessary information as reported by a female respondent that;

"At times, meetings are held within our farm region, although we, women, who are majority of the labor providers, we rarely find time to attend them because of occupation by household chores." (41 year old female respondent.)

From this respondent, it is evident that women were not adequately equipped with horticultural information. From the results in **table 4.3,** 74% of men attended training services compared to female members 26%, hence more men have more formal information in horticultural farming compared to women who rely on informal information sources which are rarely accurate. However, women are more involved in provision of labour in both of those of their own plots and in other household's plots. Women usually do this in order to subsidize domestic food requirements (Dolan, 2011). Where the household is involved in commercial horticultural production, much of the labour is provided by the women. If the household needs to hire labour, whose cost is ever rising, women lack the economic resources to hire the required labour (Muriithi & Matz, 2004).

Since men had better access to market information than women, men would negotiate for higher prices while the women would just accept the prices offered at the farm gates. In some cases, men would even travel to further markets such as Masii and Kithyoko to secure higher prices, which was difficult for the women, who preferred selling them at the farm gates or at the nearby Matuu and Kathimani markets. Further, the study established that men controlled the marketing of high value commercial crops mainly French beans, tomatoes and cabbages while women controlled low value crops such as kales. This finding is consistent with a research by Njuki et al. (2011) that indicated that while males predominate in products sold in formal markets and earn larger revenues, women are more likely to receive and manage income from horticulture commodities that have lower average returns.

In conclusion, from this finding, the study concluded that gender does affect horticultural farming not only in asset ownership and management, but also in impartiality in decision making of key areas such as and marketing aspects, access to information and exclusion from acquiring of financial resources to boost their efforts in horticulture. This proved to be a big hindrance to the success of horticultural farming.

4.4.3 Farming experience (Number of years in horticultural farming.)

Farming experience referred to the number of years the famer has been practicing horticultural farming. Farming experience, as an important aspect of horticultural farming enables the farmer to know the dynamics of the sector such as policies affecting crop production, marketing, production and current varieties of horticultural crops. The study aimed at establishing if the number of years the farmer had in horticultural farming had

any influence towards development of the sector and the findings were as summarized in figure 4.2 below;

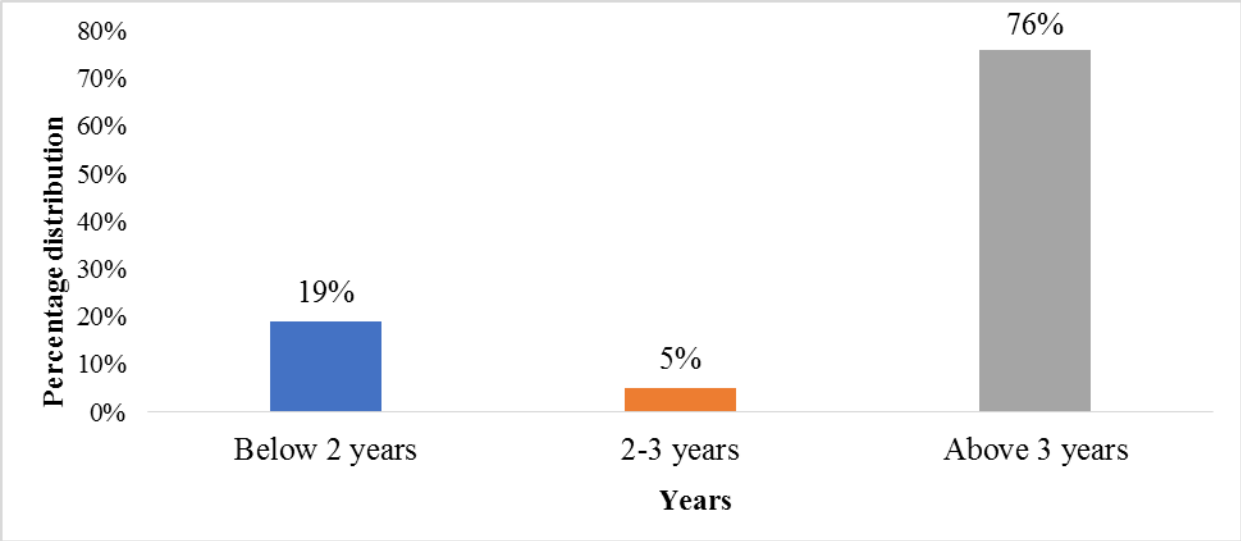

Figure 4.2: Distribution of farmers by the number of years in horticultural farming.

Source: Field Survey Data (2019).

From the results, 76% of the farmers had been practicing horticultural farming for over three years while 19% and 5% had farming experience of below 2 years and between 2-3 years respectively. The presence of farmers with farming experience of more than 3 years implied that horticultural farming has been an important aspect of livelihoods for a long period of time. The study established that farming experience influenced only the type of horticultural activity the farmer engaged in, where and to what extent. However, the fairly long experience in horticultural farming among most of the respondents was not an indication of extend of expanding horticultural farming. The fairly long experience by the respondents wasn't a guarantee of increased productivity in horticultural farming, hence, the decline in growth of the sector could probably be attributed to other factors.

This result is consistent with that of Al Shadiedah et al. (2010), who found that while farmers with more farming experience would likely be familiar with the difficulties affecting tomato production, an increase in horticultural productivity was not a given, and the decline in production could therefore be attributed to other factors.

4.4.4 Education Level of the Farmer

Education is a significant aspect since it enhances a farmer's capacity to decide and choice regarding horticulture operations with knowledge. It has the power to prevent or sway public adoption of better farming techniques including the application of contemporary technology. Education makes it easier for horticultural farmers to implement the relevant technological innovations that are required to raise horticulture output, as noted by Okoedo Okoji et al. (2009). According to Okoedo et al., horticultural farmers with higher academic backgrounds and the necessary horticultural farming skills are better able to comprehend and use new technologies in horticulture farming than those with lesser academic backgrounds. This study aimed to determine whether the farmers' educational backgrounds had any bearing on the types of crops grown, the size of farms, and growth practices. Farmers were asked to list their highest academic degrees in light of this, and the results are shown in the table below;

Table 4.6: Relationship between Level of education horticultural farming.

Category				χ^2 (chi square)
No. of years in school	0	5	5%	(χ^2= 1.818a **p**=0.0403)
	1-8	9	8%	
	9-12	62	57%	
	Above 12	33	30%	

(The first category was used as a reference category)
Source: Field Survey Data (2019)

From the results, the respondents were found to have varying levels of education ranging from nil to more than 12 years of schooling. Given that 57% of the respondents had attained secondary level of education school, the results indicated a rather high level of literacy as 37% had also attained post-secondary education. According to the study's findings, only 5% of the respondents had not attended any educational institution, 8% had completed elementary school, 57% had completed secondary school, and 30% had completed university education. This suggests that secondary education was the typical level of schooling.

High levels of education often correlate with high levels of awareness, the capacity to comprehend processes, and the capacity to make wise judgments based on the knowledge provided. This is certain to have an impact on farmers' attitudes and ideas, making them more logical, open, and capable of critically evaluating the advantages of the technology required for developing horticulture ventures (Mwangi & Kariuki, 2015). Therefore, the high levels of education among the farmers portrayed those horticultural farming cuts across farmers of all levels of education and status. For the respondents who had nil to secondary education, horticultural farming was their main economic activity while for

those who had attained tertiary education, horticultural farming was an alternative economic activity since they had formal jobs beside horticultural farming. From the chi square results,(p-0.0403), education level had a positive and a significant influence on horticultural production, meaning that with an increase in education level, the farmer could adopt modern farming technologies in horticultural farming. This findings were similar to those established by Singha et al. (2012), who established that education empowers the farmers to evaluate the risks and benefits in applying modern technologies in horticultural farming rationally, therefore enabling them to make informed decisions on what to apply in the management aspects of horticultural farming.

Through formal education, farmers learned about production techniques that would boost productivity and could comprehend not only what they learned from extension services but could also independently look for better and more effective production techniques rather than relying solely on extension officers. These results are consistent with those of Opara (2010), who found that farmers with greater levels of education are better suited to make better-informed judgments about some areas of horticulture farming and are more engaged in the development of the economy, society, and culture.

According to the study's conclusions, education helped farmers gain information on production, management and marketing techniques, before starting their horticulture operations. This is in line with a research by Maurice et al. (2009) that found that horticultural farmers' higher levels of education act as a catalyst for information flow and exposure to a larger range of knowledge. Furthermore, Weir and Knight (2000) bolster this claim by claiming that educated farmers are more likely to be open to adopting

cutting-edge farming technology that those with less education may find challenging to get.

4.4.5 Farm size

Since land is a key component of horticultural production, horticultural activities center around it. In this research, the farmers were asked to give an estimate of their land that was under horticultural farming and whether the size had any influence on horticultural farming. According to the findings, 25% of the farmers had farms larger than two acres, while 75% had farms less than two acres. Although the farmers had embraced horticultural farming, they allocated greater portions of their land to other land use activities that they considered essential to their livelihoods, primarily cereal growing, livestock rearing, and settlement. The prevalence of small holdings among the farmers implies limited undertaking of horticultural activities. The small land sizes owned by families and the growing family sizes that led to the subdivision of the land into smaller sizes, which only support small scale horticultural farming, were also factors for the dominance of small horticultural farms, forcing individual farmers to turn to small farm sizes. One respondent confirmed this by noting that:

> *"As the family increases in size, the land becomes smaller due to subdivision among the family members. As the land becomes smaller, family members resort to small scale horticultural farming in order to support their families and at different seasons than if they were to plant seasonal crops. It is mainly farmers with larger portions who still plant other crops, but for those with less than two*

acres of land, horticultural farming has become a trend'……(a 57 year old respondent).

This study aimed to evaluate the connection between horticulture farming and the size of the individual farmer's land. A chi square test was used to determine the association, and the results showed a significant correlation (p 0.005), indicating that horticultural farms were likely to grow as available farmland grew in size. Mwaura et al (2013)'s research, which indicated that farmers with smaller land holdings were less likely to produce vegetables than those with bigger parcels of land, supports this conclusion. The results showed that horticulture farming was more likely to be practiced among farmers with bigger farms than among those with smaller farms. This is also in tandem with Angula (2010) in examining the socio economic factors of the respondents practicing horticultural farming reveals that farm sizes of the respondents had a positive influence on the nature of horticultural activities they carried.

However, besides the in availability of farms for horticultural expansion among the farmers , this study further revealed a contrary view that farmers preferred small farm sizes because they were better manageable compared to large farm sizes that required more labor, more outlay of capital and improved irrigation infrastructure, which was not at the disposal of the farmers since horticultural farming needs proper management in terms of agronomic practices such as watering, staking, and pest control. Farmers with larger farms and low outlay of financial support failed to utilize farms to maximum, hence an increase in farm size was not a guarantee of improved horticultural productivity.

However, these results differ from those of Angula (2000), who claimed that larger cultivated farms produced more horticultural crops.

4.4.6 Household size

The study sought to establish whether household size had any influence on horticultural farming and the findings were as indicated in the figure below;

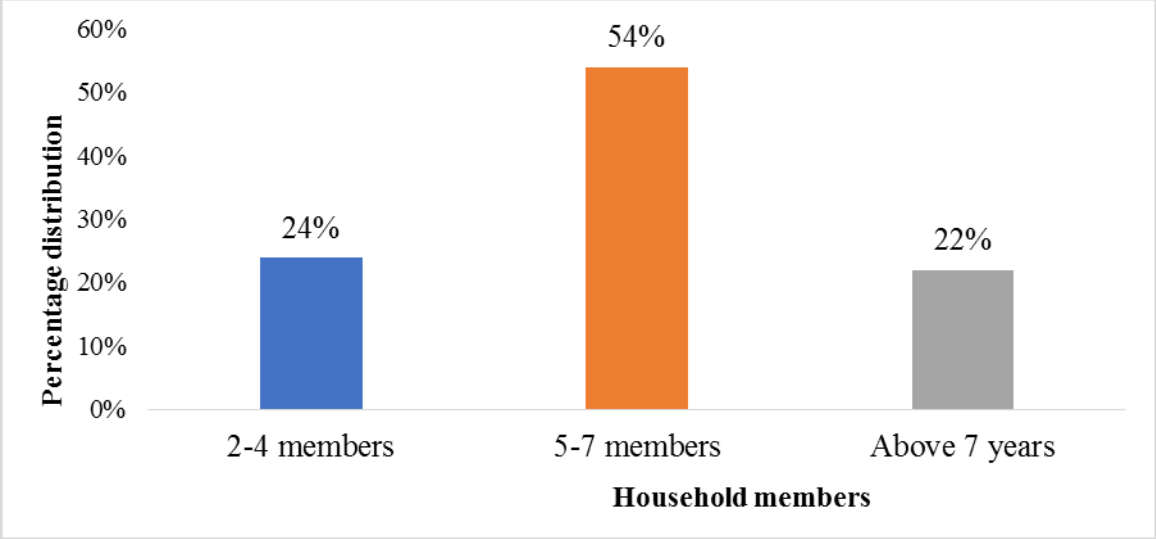

Figure 4.3: Distribution of horticultural farmers by Household size

Source: Field Survey Data, (Author 2019).

The study revealed that household size influenced significantly horticultural farming specifically on the land that was allocated to horticultural farming. The greatest percentage of the households (54%) had 5-7 members. The findings indicated that the household size influenced horticultural farming due to the fact that it was the a source of labor required in the cultivation of the farms. From the results (Table 4.6), household size had a significant and positive influence on horticultural production. This could probably be attributed to the role of horticultural farming in the provision of domestic foods, either

through direct consumption or trading for financial benefits, meaning that as household size increased, the higher the chances of engaging in horticultural farming as indicated by the results (χ^2= 20.524, p=0.005).Therefore, it can be concluded that large households positively influenced horticultural farming as they were likely to rely on the venture for domestic food needs. This finding is in consistent with the findings of Vorster and Rosenburg (2005), which established that larger households tended to rely on vegetables for income and consumption. Large households also provided immediate cheap labor force which would supplement the hired labor. According to Opara (2010), larger households would have enough labor to practice horticultural farming and are able to provide adequate management for the horticultural practices than smaller households. However, due to the large size of the household, much of the produce was domestically consumed **(Table 4.8**), leaving little for marketing. This conclusion is also in line with a 2009 study by Ernete and Igbokwe, which discovered that domestic consumption requirements increased with household size. Similar to this, Oni et al. (2010) found that while many smallholder horticulture farmers in South Africa planted with an eye toward selling their produce, a higher percentage of agricultural goods were actually consumed internally at the household level.

From the findings, 24% of the farmers belonged to household size of 3-6 members, followed by 22% who had more than 7 members. This implied that the smaller the household, the lesser the produce obtained from horticultural activities. However, it was revealed that this scenario was only applicable where all the households were engaged in horticultural farming for domestic purposes. The size of the family is one of the most

significant factors impacting the horticultural production and productivity of small-scale farmers, according to Shadiadeh et al. (2012), and this conclusion is completely consistent with their findings. Hence, families with relatively larger members and all engage in horticulture have advantage which makes them to leave enough produce for household consumption and use cheaper labour for horticultural production activities.

Table 4.7: Relationship between Household of the farmer, household prioritization of horticulture and horticultural farming.

		Below 2.75 acres	Above 2.75 acres	χ^2
Nature of household	Nuclear family	59(100%)	48(96%)	(χ^2= 2.404a, p=0.121)
	Extended family	0	2(4%)	
Does your household prioritize horticulture	No	59(100%)	35(70%)	(χ^2= 20.524, p=0.005)
	Yes	0	15(30%)	

(The first category was used as a reference category)
Source**: **Field Survey Data(2019)

4.4.7. Association between socio economic determinants and horticultural farming

There was a statistically significant association between a number of horticultural determinants and horticultural farming with an exception of farming experience. Consequently, the hypothesis that socio economic determinants do have a significant influence on horticultural farming in Yatta furrow was rejected. Therefore socio economic determinants have contributed significantly to the current decline in the horticultural production in the sector.

4.5 Benefits of horticultural farming

Horticultural farming in Yatta furrow plays an important role in the livelihoods of the farmers. The study aimed at identifying the economic benefits that the farmers derived from the venture and the results were as in the table below;

Table 4.8: Benefits of horticultural farming

Use/benefit	Frequency	Percentage (%)
Source of food	69	63
Source of income	40	37

Source: Field Survey Data(2019)

From the results, 63% of the farmers directly benefited from horticultural farming through provision of food supplies to the household. This is an indication that that horticultural farming was a domestic oriented venture for many farmers. The dominance of the subsistence farming was attributed to by the small farm sizes put under horticultural farming, high cost of production that could not be met by the farmers in the production of high value marketable crops and lack of subsidized farm inputs. This situation was further amplified by dominance of old farmers (above 35 years) whose aim was provision of food for the families. This finding is in consistent with the finding of Sriram (2007) who established that the existence of domestic oriented horticultural farming in Kenya was attributed to by the small farm sizes of the farmer plots and the expensive nature of the high value crops that the farmers could not venture in it.

The results further indicated that 27% of the farmers engaged in horticultural farming as a profitable venture that provided income to them for the domestic needs such as payment of school fees and meeting other domestic needs. To a larger extent, some farmers leased the land for purely commercial purposes. This involved specialization in certain crops such as tomatoes, leafy vegetables green pepper and onions and French beans.. Although few farmers engaged in commercial farming, their land sizes were considerably larger compared to those were domestic oriented. The results established commercial farming enabled the farmers to acquire farms inputs and therefore widened their scale of production. This finding is in line with that of Opara (2010),who found out that horticultural farming as a source of employment and income, is an important source of livelihood.

4.6 Challenges facing horticultural farming in Yatta furrow

In the process of carrying out their horticultural activities, the farmers identified the following challenges in horticultural farming.

4.6.1 Marketing challenges of the horticultural produce.

Marketing of horticultural produce was identified as one of the challenges facing horticultural farming. The results are as indicated in table 4.8 below:

Table 4.9: Relationship between Marketing of horticultural produce and horticultural farming.

Market		Below 2.75 acres	Above 2.75 acres	χ^2 (chi square)
Where do you sell your produce?	On farm	0	3(6%)	(χ^2= 5.254a, p=0.027)
	Local(village) markets	2(3.4%)	0	
	Both	57(96.6%)	47(94%)	
Whom do you sell your produce to?	Direct consumers	30(50.8%)	4(8%)	(χ^2= 23.150a, p=0.005)
	Middlemen	29(49.2%)	46(92%)	

(The first category was used as a reference category
Source: Field Survey Data (2019).

From the results, marketing of horticultural produce was done locally with minimal participation in away markets. The local market included other households who did not participate in horticultural farming. The middle men were traders from Kabaa, Matuu Kithimani and Thika who specialized in selling horticultural produce by buying the produce from the farmers at the farm bases and selling to the consumers in the nearby markets of Kisiiki, Matuu and Kithimani. The involvement of middlemen was catalyzed by lack of organized marketing system such as cooperatives to enable group marketing of the produce by the farmers and enhance collective bargaining power for better prices among the farmers. As a result of such situation, every farmer marketed the produce individually, leaving them exposed and vulnerable to exploitation by the middlemen whom would buy for as low as Ksh.20/ a kilo of leafy vegetables which discourages the farmers. As individual sellers, their bargaining power becomes limited. Further, due to

perishability and lack of storage facilities the farmers are forced to sell at throw away prices for the fear of losses. One of the respondents reported that;

> *"Selling of horticultural produce as an individual farmer is not highly profitable as expected especially in the local markets. The middlemen have disrupted the market with their low prices. At times, due to high supplies, the farmers are forced to sell at a throw away price. The in availability of marketing cooperatives has greatly empowered the middle middlemen leaving the farmers exposed to their exploitation".*

The absence of organized marketing system restricted many farmers access other markets where the produce would fetch better prices. Due to an overstock in such market places and a lack of large markets, the farmers reported receiving poor prices. This is complemented by purchaser charging farmers unfair prices, preying on their concern that their crops would go to waste due to the produce's perishability and a lack of storage and preservation facilities. According to the findings in table 4.9, the majority of horticulture producers in Yatta furrow lacked a solid marketing strategy, which had a significant negative impact on the venture's viability. The farmers , even though they cultivated on small scale, had the desire to market the little they would produce. However, they failed to successfully identify the market for their products due to lack well organized marketing channels which made it difficult to effectively sell their produce.

Distance to the market was identified as another challenge that greatly hampered marketing of the horticultural produce. The study established that 66% of the farmers were more than 5km away from the market centers. Such farmers had to incur high transportation costs given the poor state of the roads connectivity in the area. Roads such

as Mamba-Kisiiki, Kisiiki-Matuu, Mamba-Sofia and Sofia-Matuu(along the furrow) are not tarmacked, and impassable during rainy periods, hence a great threat to transportation of the produce. Motorcycle taxis, bicycles, animal and human portage are the alternative means of transport used. Few large scale farmers have their own means of transport. This situation leaves many farmers at the mercy of middlemen who have their own means, meaning that the produce may delay reaching the market in time, fetch low profits due to transport costs or be forced to sell the produce to the intermediaries. This finding is in line with that of Serem (2010), who found out that nearly 50% of the horticultural farmers, spend more time to get to the market due to challenges associated with impassable roads. This is further advanced by Kibet *et al.* (2011), by holding that distances away from the farms increases transaction costs involved in marketing of the horticultural produce. The higher the transaction cost, the lower the profitability, hence having the farms at greater distances away from the markets reduces the expected profit margins and this limits the expansion of the farmers horticultural enterprises. Some of the farms, are located far away from the main market centers (Kathimani and Matuu) and hence experienced marketing difficulties due to long distances to the market centers especially from Kaluluini, Kisiki, Ndalani and Mamba regions, with farmers opting to walk to Kithimani to sell their produce, which proved to be difficult. The farmers expressed that establishment of processing plants near farms could minimize losses that arose from the long distance and poor infrastructure. Tarbjam and Bharat (2012), IFAD (2001); Bhalla (2000) expressed similar views regarding improvement of infrastructure in relation to agricultural produce and accessibility to market.

As a result of poor transport infrastructure, the farmers who live far away from the market experienced transport challenges resulting in loss of quality of the horticultural produce as well as late delivery, which in turn leads to lower prices.

It was established that the horticultural productivity in Yatta furrow was negatively impacted by the distance to the market. This suggested that the quantity of horticulture crops sold in the closest market centers of Kithimani and Matuu decreased with increasing distance to the market. This agrees with research by Omiti et al. (2009) that discovered the number of agricultural crops. In a similar vein, research by Osebeyo and Aye (2014) and Sebalta et al. (2014) revealed that market distance was one of the elements that determined the amount of market participation among farm households. According to Reyes et al., smallholder farmers who are farther from the marketplaces participate in the market less and sell lesser amounts of their produce as a result of the high transaction costs. According to Komarek (2010), markets with shorter distances have lower transaction costs, which resulted in higher sales volumes than markets with greater distances.

4.6.2 Land ownership challenges

Another challenge identified by the farmers was access to land. The access to and control of land was established to have a major influence towards horticultural growth. The study revealed a huge gender disparity in land ownership ,control and usage. From the findings of this research 73% of the farmers owned land permanently and were men. Female ownership of land was significantly lower in horticultural farming (table 4.4.)

From the study results in table 4.4, women are rarely involved in land management, renting and utilization aspects. Land ownership influenced land utilization including leasing and selling, which are mainly undertaken by men across the three wards covered by the research study. The study revealed that men owned 73% of the horticultural plots across the study areas. In areas where horticultural crops were meant for market, men had a greater dominance on the type of crops grown while women had control over production of domestic crops.

The study further revealed that although women have substantial share of horticultural land ownership (17%) especially in vegetable production, men dominated in all management aspects of horticultural farming (table 4.3).This is in line with the findings of FAO (2012) that in rural societies, commercial horticultural production is mainly a males responsibility. The land ownership, control and usage situation translates that improvement of horticultural farming lies in the domain of the owners, who, based on their socio economic status, would be difficult to achieve the desired development levels. Further leasing of horticultural land is still low as indicated by the 14% of the total farmers. The farmers who leased the land cited high annual cost of leasing that ranged between 25000/ -30000/ per acre irrespective of the distance from the furrow. Hence high costs were incurred by those who had farms long distance away from the furrow, especially pumping of the water. This means that the attraction of other farmers from other regions to expand horticultural sector is still low, horticultural growth may be difficult to be achieved.

Table 4.10: Distribution of farmers by Land ownership

Land ownership status	Frequency	Percentage (%)
Permanently owned	73	67%
Rented	21	19%
Leasing	15	14%
Total	109	100%

Source: Field Survey Data (2019).

4.6.3 Influence of off farm activities by the farmers

Off farm activities referred to other economic activities that the farmer engaged beside horticultural activities. Off farm activities were considered as alternative income source to the farmers through which the farmers can boost their income besides horticultural farming. The farmers were asked to state whether they had any other off farm generating activities besides horticultural activities that negatively affected horticultural growth and give the influence of such activities to their horticultural activities. The study revealed that besides horticultural farming, they engaged in formal employments, entrepreneurship and motorcycle taxi operations. However, despite the importance of these activities, the study established that engagement in off-farm activities was found to have a significant but negative influence on horticultural farming in Yatta furrow (χ^2= 25.441a, p=0.000). The farmers who engaged in other off-farm activities were less likely to take horticultural farming seriously. They only produced horticultural produce in small scale, only for domestic consumption as they did not have any thought of expanding for commercial purposes, hence their production capacities remained small scale.

The engagement in off-farm activities by the farmers provided limited time for horticultural farming by those involved as it led to rural-urban migration, which limited access to farmlands most of the time, thereby limiting participation in horticultural

activities. Non-farm activities enabled the household to obtain additional income this assured the households food security and additional incomes. These results are completely at odds with a study by Ajani and Igbokwe (2012), which found that engaging in income-generating activities aside from and separate from horticultural activities increases horticultural farming because it ensures households' food security, increases incomes, and reduces poverty while enabling them to increase investment in horticultural farming.

4.6.4 Inadequate access to credit facilities

Access to horticultural credit is a paramount factor in enhancing horticultural production. It enables the farmer to purchase the necessary tools and inputs intended to keep the venture a viable sector to be depended upon. In this study, access to credit was looked in terms of the number of times the farmer sought credit band was able to acquire ,based on the conditions stipulated by the lender.. Further, credit accessibility was looked at in terms of the profits that the farmer would get from the sale of the outputs. This was confirmed by a respondent farmer that;

"Credit demand in this area is low because the lenders have strict collaterals that only commercial farmers can withstand. The repayment period given is usually short and credit available is low only to sustain for one planting season, this makes the small scale farmers shun away from the lenders. We also fear getting credit since we do not have security against loans in case of crop failure" .

From this response, the study therefore concluded that credit was a reserve of the commercial farmers, and not common to the majority of the small scale farmers. This

study endeavored to find out how access to credit from the lending institutions had influence on horticultural development. The respondents were asked to state whether they accessed credit or not and the results were as tabulated below;

Table 4.11: Distribution of farmers by access to credit facilities.

Distribution by access to credit facilities	Frequency	Percentage
Accessed	9	8
Not accessed	100	92
Total	**109**	**100**

Source: Field Survey Data (2019).

Table 4.12: Relationship between Access to credit and horticultural farming.

Size of land		Below 2.75 acres	Above 2.75 acres	P value	OR	LOWER CI	UPPER CI	χ^2
Access to credit to supplement personal horticultural financing	No	58(98.3%)	42(84%)	1	1	1	1	
	Yes	1(1.7%)	8(16%)	0.025	11.6	1.369	98.286	(χ^2= 7.540a, p=0.006)

Source: Field Survey Data (2019).

From the results only 9 farmers, out of the 109 sampled had, access to credit facilities to enhance horticultural farming while 92% lacked the access to. According to the aforementioned data, the farmer population is lacking a key input in horticultural expansion. This explains the high abandonment of the venture to other less capital demanding activities. The farmers depended on their own alternative ways of financing the horticultural ventures, an aspect that has been seen to slow down the pace of horticultural expansion in the area. From the study, it is clear that the farmers who had

access to loans were far more likely to increase their production capacity. This backs the reason why the sector is dominated by few large-scale farmers.

The purpose of the study was to establish if the respondents' access to credit had any bearing on the advancement of horticulture. According to the aforementioned findings, production was significantly impacted by loan availability (2= 7.540a, p=0.006). This shows that access to credit will significantly increase horticulture output since farmers with simple and increased credit are better positioned to embrace the key technology required in enhancing horticultural farming. This result is consistent with what Strasberg (1999) found, which is that a review of Kenya's credit system, whether official, informal, or formal, can improve agricultural output, particularly for low-income farmers. Similarly, timely loan distribution to small-scale horticultural producers has been noted by HB (2011), and FAO (2006) to contribute to an increase in household income when oriented into horticulture.

Limited access to credit financing presented a big barrier to majority of the respondents. From the qualitative work of this research, where capital was deficient, the farmers resorted to cheap and substandard inputs and consequently a great loss to the famers. From the qualitative work of this research, men take the lead in role in decision making on the type and amount of credit to be accessed, as they are the controllers of the production assets, basically the land as demanded by loan lenders as security,**(table 4.12**). Access to credit was also a challenge due to the farmers' inability to predict the amount of income they expected to get from horticultural produce due to sensitivity of the crops to adverse environmental and adverse weather conditions. This was portrayed

by the farmers in the downstream parts of the canal, from Kithimani to the lower parts of Matuu areas, where water variations in the furrow would affect production cycles. Therefore, among the farmers, having access to loans emerged as a key factor in expanding their horticultural capacities. Without access to finance , farmers frequently are unable to invest in adopting the necessary technology or growing their agricultural businesses, making it impossible to diversify into other crops. These results support a research by Nzomoi et al. (2007) that found a link between financing availability and the adoption of export-oriented horticulture cultivation in Kenya. The investigation found that the biggest obstacle to their activities was financial incapacity.

Therefore, the current study highlighted access to financial resources as a challenge to expansion of their horticultural activities.

4.6.5 Inadequate access to extension services

Access to extension officers is a critical factor in horticultural farming. It is through extension services that information on better horticultural practices is disseminated to the farmers. However, the timely access and adequate provision of these services to the farmers is vital to the development of the sector. The level of communication between the farmer and the extension service providers was used to evaluate the farmer's access to extension and people. The outcomes are shown in the following table;

Table 4.13: Distribution by access to extension services

Category	Frequency	Percentage
Accessed	12	11%
Did not access	97	89%
Total	**109**	**100%**

Source: Field Survey Data (2019).

Table 4.14: Relationship between Access to extension services and horticultural farming.

	Size of land	Below 2.75 acres	Above 2.75 acres	χ^2
Access to training services on horticultural production	No	82(100%)	12(44%)	(χ^2= 20.206a, p=0.003)
	Yes	0	15(56%)	

(The first category was used as a reference category)
Source: Field Survey Data (2019).

From the findings, only 12 of farmers had access to extension services. Regarding the extension service providers, the government's MOA supplied the services, as well as the NGOs. The stark difference between individuals who used extension services and those who did not was caused, in part, by low awareness of their existence. Despite the governments' and NGOs' combined efforts to offer extension services, the respondents' access to these services was less widespread than anticipated, given the significant percentage (74%) who reported not having access to extension services. The high farmer to extension officer ratio, which makes it difficult for farmers to reach the officers, and inadequate awareness on their availability were blamed for the inadequate accessibility to extension services.

This study aimed to determine if farmers' horticultural growth was impacted by their access to extension services. The link between having access to extension services and

production was determined to be statistically significant (2= 20.206a, p=0.003) after a chi square test. These results are consistent with those made by Beets (2015), who contented to the significance of extension services in the growth of horticulture farming. He contends that an effective extension service system should be used to primarily distribute horticultural innovations to farmers, which the majority of farmers consistently lack. More and effective dissemination of horticultural technologies require better coordination between the various agencies in particular the Ministry of Agriculture(MOA), Development planning and Rural development. This result is consistent with Owen et al. (2010), who found that farmers' levels of engagement with extension agents had a significant impact on their capacity to successfully diversify their agricultural operations.

Women farmers have the least access to extension services, according to the study's findings. According to the African Development Fund (2007), although playing a significant role in horticulture output, women only receive very little information provided by horticultural extension officers. Due to societal conventions that prevent women from accessing extension agents, it has been established in this study that extension agents engage male farmers more frequently than they engage female farmers. Women were noted to be less likely to attend field meetings, seminars, and other events unless they were specially targeted at them due to time constraints and lower levels of education. This concurs with a study by Ragasa (2012),that women farmers have generally lower chances of accessing horticultural information and consequently lower chance of adopting horticultural technologies.

4.6.6 Association between socio economic challenges and horticultural farming in Yatta furrow

From the results discussed above, there was a statistically significant relationship between the socio economic challenges and the declining horticultural production in Yatta furrow, all with a P- value below 0.005. The null hypothesis that socio economic challenges had no influence on horticultural farming was consequently rejected. This implies that the challenges that the farmers encounter in the process of carrying out horticultural have significantly led to the current state of the horticultural farming in Yatta furrow.

4.7 Hypothesis testing for socio economic factors influencing horticultural farming in Yatta furrow

The null hypothesis of the study was that socio economic factors had no significant influence on horticultural development in Yatta furrow. Hypothesis testing was done at 5% significant level. From the chi square result in the socio economic discussions above, it was indicated that age had a statistically significant influence, gender aspects, education level, household size, access to extension services and access to market had a p value of not more than 5%,meaning that they had a significant influence on horticultural farming, and therefore the null hypothesis was rejected. However, farming experience and access to credit had an insignificant influence on horticultural farming. Age had a statistically significant at p-0.001.gender,and level of education had a statistically significant influence on horticultural development, although gender on its own had insignificant influence at p- 0.911,gender aspects such as land ownership and

decision making regarding farming had a key influence and were statistically significant at 5% level of significance at p-0.043.Household size had a significant but a negative influence on the horticultural development.(table 4.6). However, household prioritization of horticulture had a significant at p-0.005. In relation to access to market, the study established that access to market had a significant influence at 5% significant level. Access to credit facilities also had a significant influence at p-0.006, hence the null hypothesis was nullified and the alternative adopted. Nature of the household had an insignificant influence t p-0.121. Thus the null hypothesis was accepted that the nature of the household has no significant influence on horticultural farming.

Since majority of the socio economic factors had a significant influence, the study rejected the null hypothesis.

Besides chi square, the study used a regression model based on the significant factors to show the influence of socio economic factors based on the significant socio economic parameters. The regression model was as presented below

Table 4.15: Multiple regression model of factors that affect horticultural farming

Variables in the Equation	β	S.E.	Sig.
Gender	-0.536	0.969000	0.088
Marital status	19.672	36555.99	0.531
Age	-42.129	63754.85	0.812
Level of education	-19.804	94398.62	0.090
Size of land in acres	-42.828	52208.97	0.009
Land acquisition	-22.343	40192.91	0.068
Nature of household	-0.201	46349.21	0.781
Access to extension services	21.311	10377.78	0.001
Access to marketing	-0.277	40515.09	0.003
Source of income	19.527	40192.96	0.021
Access to credit	22.343	40192.97	0.005
Constant	**4.681**	**91274.35**	**0.999**

Dependent variable =. horticultural farming.

Therefore, based on the conceptual logistic model specified as;

Prob G (Yes=1, No=0) = $\beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots\ldots\ldots\ldots \beta_8 X_8 + \varepsilon$,

The model can be applied as:

Prob G = **4.681** - $0.536X_1$ + $19.672X_2$ - $42.129X_3$ - $19.804X_4$ - $42.828X_5$ - $22.343X_6$ - $0.201X_7$ + $21.311X_8$ – $0.277X_9$ + $19.527X_{10}$ + $22.343X_{11}$

where

Prob G =. Probability of practicing horticultural farming.

β_0 = constant term of regression

B_1 – β_{11} are the parameters estimated representing gender, marital status, age, level of education, size of land in acres, land acquisition, nature of household,

access to training services, access to marketing services, source of income and access to credit to supplement respectively.

Age, gender, agricultural experience, and access to training were among the factors that were statistically significant. Men are more likely than women to work in horticulture farming, as indicated by the gender characteristics' positive coefficient and statistical significance at 5%. This is because men were more likely to get information on horticultural farming through making key decisions than their female counterparts.

Older farmers had a higher chance of engaging in horticulture farming, according to the data, which also showed that education, access to financing, and access to training were statistically significant at 5% with a positive coefficient.

The total outcome of the regression model demonstrates a significance level of 5%, which suggests that the explanatory variables were significant factors in determining horticultural growth in Yatta furow. As a result, the first hypothesis—that there is no discernible connection between the socioeconomic variables impacting horticulture cultivation in Yatta furrow was disproved.

4.8 Summary

The research findings of this study identified the major socio economic factors influencing horticultural farming in Yatta furrow. Generally, the results revealed that there is a significant relationship between a greater number of the socio economic factors and horticultural farming in Yatta furrow. Among the respondents' socio-economic factors, age (p-0.001) gender aspects specifically decision making on size of land to be used (p-0.002), types of crops to be grown (p-0.042) and the land size occupied by the crops grown(p-0.042),education level(p-0.0403) access to extension services (p-

0.003),household size (P-0.005) and access to market (0.005) were found to significantly influence horticultural farming. This was because these factors have not been addressed and could continue to affect the performance of the sector if not addressed. The results showed no significant relationship between access to credit, p-0.06), farming experience, and gender (p-0.9) and horticultural farming.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusion based on the research findings of this study.it also gives recommendations for policy interventions aimed at enhancing horticultural farming Particularly in Yatta furrow. And be implemented in other horticultural growing zones in the country. Further areas of research are also recommended.

5.2 Conclusions

In examining the types of horticultural activities carried out by the farmers, this study established that the horticultural activities carried out by the farmers are of low quality with an exception of French bean farming. The horticultural activities carried out are majorly for domestic and local marketing, with few being marketed outside the production zones, a suggestion that the sector is dominated by small scale farming with less intention of expansion and external marketing.

From the results of data analysis, there was statistically significant relationship between socio-economic factors and horticultural farming. Factors such as age, labour availability (household size), farm size, education level, access to extension services, households' size, land ownership and farm size under horticultural farming were statistically significant and had a positive influence on horticultural farming. The study however revealed that gender and farming experience had insignificant influence, gender aspects

specifically on decision making on horticultural aspects had a great significance on the venture. Institutional factors such as access to credit and access to market also showed statistical significance with horticultural farming. Therefore, the findings of this study established that socio economic factors are significant components that in reality continue to affect horticultural farming in Yatta furrow. These factors have profound effects on horticultural farming leading to its slow growth. Under whatever reasons for the continued retardation in growth, the effects are undesirable. The findings that women and the older farmers experienced lower production levels is linked to their less acquired knowledge in horticultural farming. Women, despite being encumbered with domestic roles have a higher chance of implementing the knowledge acquired compared to men and therefore, there is the need to sensitize women on their important roles towards enhancing horticultural growth.

In examining the challenges facing the horticultural farming, this study found out that land control and ownership, access to credit facilities, inadequate extension service provision and lack of awareness on their existence and the availability of other attractive economic activities in the area pose a great threat to the survival of horticultural farming in the area. The engagement in other income generating activities translates that horticultural farming was neither an attractive economic activity nor a priority ,hence it was right to conclude that these activities have a great influence to the sectorial decline beside other factors.

Lastly, the study examined the benefits of horticultural farming to the farmers .It was revealed that in deed, horticultural farming is an important source of livelihood despite

the challenges that are encountered by the farmers. However, for it to be fully depended upon, more efforts are needed at the farmers level, county government and at national level to make it a vibrant and a competitive economic sustainable livelihood source.

5.3 Recommendations

In view of the research findings and conclusions of this study, the study recommend the following;

i) The horticultural farmers should be encouraged to adopt high quality horticultural activities such as French bean farming that would attract higher market value, besides the local markets in order to enjoy more financial benefits, rather than engaging in production of similar low quality crops that fetch low market prices and face stiff competition.

ii) There is need for integration of both gender, irrespective of their social and economic characteristics in the training of horticultural farming so as to give each equal opportunity to acquire new and relevant knowledge aimed at improving horticultural productivity in Yatta furrow. There is need to clearly inform the youth that agriculture is not for the old, but a sustainable venture like any other economic activity. Information flow should be clear on the benefits of horticultural production compared to other sources of income.

iii) The Ministry of Agriculture should encourage the farmers to produce high quality crops not only for domestic consumption, but with view of marketing in order to acquire income, to raise their incomes and avert cases of abandonment from the venture.

iv) There is need for the ministry of agriculture both at the county level and national level to provide subsidized farm inputs to enable the farmers to cope with the challenges of high cost of credit terms and make it attractive than the off farm economic activities.

5.4 Suggestions for further research

The researcher would like to recommend a number of topics that require more research based on the study's breadth and limitations. This study therefore suggested the following areas for further research;

i) Considering the findings of this study regarding horticultural asset ownership, there is need for more studies to investigate the existing cultural factors regarding asset ownership attributing to current state of the horticultural sector in the Yatta furrow.

ii) It would be desirable to investigate how the livelihoods of the farmers are affected by the horticultural circumstances that change overtime once they abandon the horticultural venture.

iii) Examine factors behind the non-participation of the youths in horticultural farming in Yatta furrow.

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APPENDICES

Appendix I: Research questionnaire

Please tick where appropriate

A) Social issues

Gender: Male [ ] Female [ ]

What implications does gender ha on the following horticultural aspects?

Asset ownership…….

Decision making concerning horticultural farming…….....

Size of land under horticulture ……

Access to extension services……

Marketing horticultural produce……..

Age: Below 18 years [ ] 18-35 years [ ] above 36 years[ ]

What implications does age factor has on the following aspects of horticultural farming?

Access to credit/capital……..

Asset ownership…….....

Adoption of modern horticultural technologies …….

Highest education levels: Primary [ ] secondary [ ] Tertiary [ ]

Not attended any formal education ( )

What implications does education has on horticultural farming?

B. Land factors

1 What is the size of the land is under horticultural crops?_(approx.. in acres)_____

2 What horticultural activities are you engaged in?

3 For what purpose do you produce horticultural produce? Home consumption ( ) commercial( ) Both ( )

4 How did you get the land you use for horticulture?

Own land [ ]

Borrowing [ ]

Inherited [ ]

Leasing [ ]

For how long do you lease the land and at what cost annually?

5 Is the land adequate to meet your potential horticultural output?

Yes [ ] No [ ]

6 Give reason for your answer _____

7 Do you intend to expand horticultural production in future? Yes [ ] No [ ]

If yes, by how many acres?_____

If no, why?_____

8 In relation to men and women, who makes the following decisions? Decision Making regarding

Size of land for horticultural farming?_____

Types of horticultural crops to be grown?_____

Amount of crops to grow?_____

C) Household size

1. What is the nature of your household?

   Extended family [ ]

   Nuclear family [ ]

2. Is the household male headed/female headed?

   Male [ ]

   Female [ ]

Does your household prioritize horticulture?

Yes [ ] no [ ]

If yes, how? _____

If no, why.....

What size of land does your household own? (Acres)_____

Is it adequate for all of the members? Yes [ ] No [ ]

If no, why _____

What are the challenges faced by your household in the process of carrying out our a horticultural activities?

D) Training on horticultural production

Do you have access to training services on horticultural production? Yes [ ] No [ ]

If yes, how often? _____

What aspects of horticultural production were you trained on? _____

How would you describe the training towards enhancing horticultural farming?

Adequate [ ] Average [ ] Inadequate [ ]

Who attends mostly the training? Female [ ] male [ ]

After the training, do you share the information to other horticultural farmers? Yes [ ]

No [ ]

If No, why? _____

If yes how often? _____

Are there extension officers in this ward? Yes ( ) No ( )

If yes, how many are they?

Are they enough to cater for the needs of all the farmers in the furrow? Give reason for your answer.

How often do you get contact with them? Frequently ( ) Less frequent ( ) Not at all ( )

How do you rate the advice given by the extension officers? (useful/not useful)

Marketing

Do you belong to any organized horticultural marketing system? Yes ( ) No ( )

What percentage of your produce is sold? _____

Where do you sell your produce?

In the farm ( ) Local market [ ] both [ ]

What is the average distance in KM to the nearest market from your farm?.....

Whom do you sell your produce to? ……

Direct consumers [ ] Middlemen [ ] Both [ ]

Why do you prefer to sell to the choice above?

What challenges do you face while marketing your produce?

B. Economic issues

What benefits do you obtain from horticultural farming?

Apart from horticultural farming, what other sources of income do you have?

None [ ] Formally employed [ ]

Any other (specify) _____

How reliable are these sources of income to horticultural financing?

If they are not, do you have access to credit financing to supplement personal horticultural financing?

Yes [ ] No [ ]

If Yes, from where?

If no, what challenges do you encounter while accessing the credit…….?

How have the above mentioned challenges affected;

- The Choice of horticultural crops to grow? _____
- Production levels?_____
- Market size_____
- Income from the horticultural activities?_____

As a result of the above challenges, what copying strategies do you apply in your horticultural activities? _____

Are these strategies effective? Yes [ ] No [ ]

If yes, how?_____

If No, Why?_____

Do you receive loan to carry out horticultural farming? (yes) (no)

If yes, what was the purpose of the loan?

Was the loan sufficient for the purpose intended?

Did you have any difficulties in accessing the loan?

If yes, how?

Do have difficulties I repaying the loan? If yes, which problems?

Are the repayment terms of the loan reasonable? If no, explain

Are you a member of any credit group currently? Yes [ ] No [ ]

If yes, what is the name of the group?_____

What are the collateral requirements for entry into these credit groups?_____

What benefits do you receive from these groups?_____

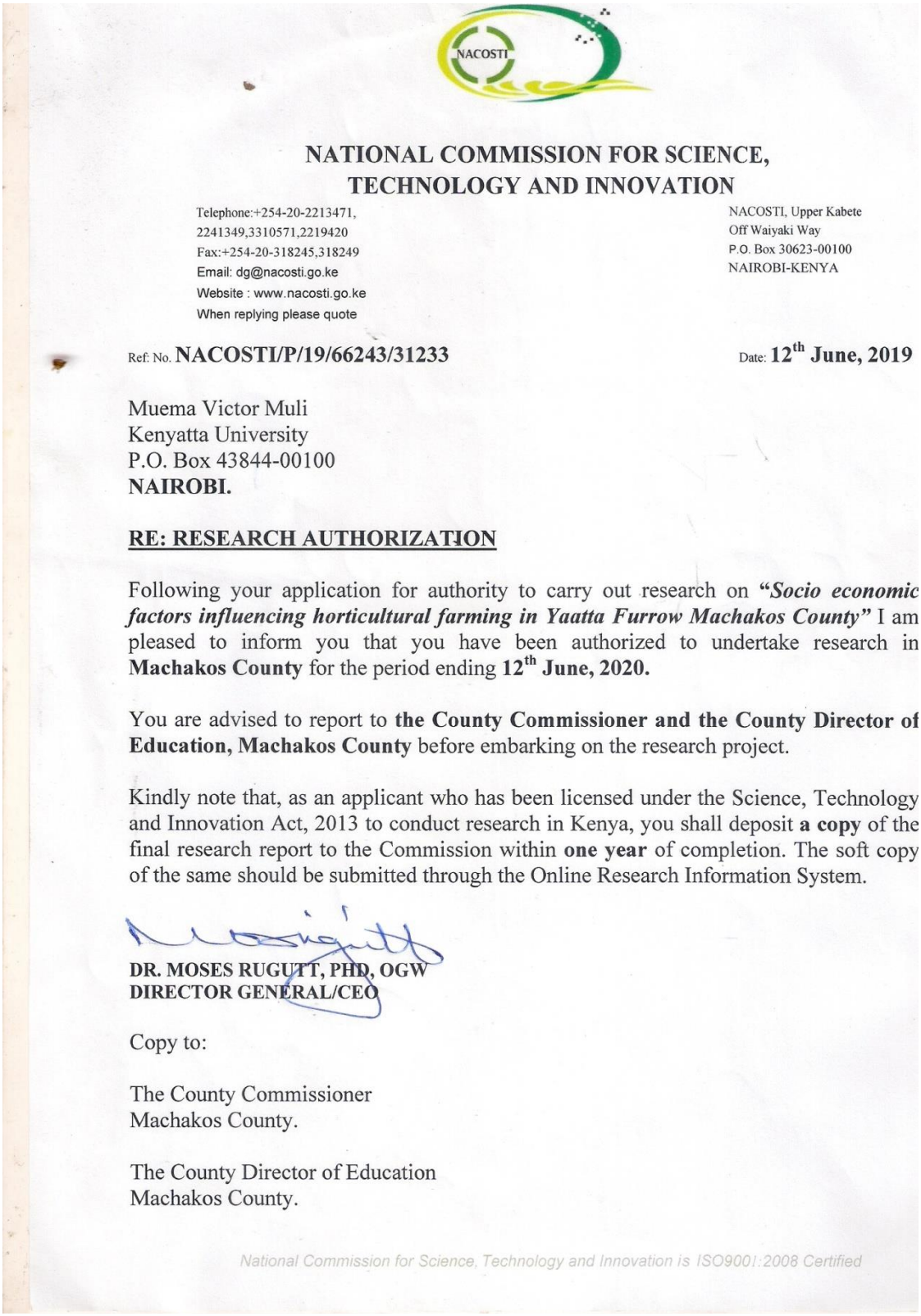
If no, what hinders you from being a member? _____

Appendix II : MOA Officials (Extension Officers) Interview Guide

1. What is the distribution of horticultural extension staff in the canal?
2. How many horticultural extension officers are there in the 3 wards?
3. How do you facilitate the extension staff to make their service delivery effective to the farmers?
4. Is there any established supervision system for the extension staff in their duties?
5. Are the extension officers enough to cater for the needs of all the farmers? Yes/No

   If No, how do you offset the gap of shortage of staff.
6. Do you produce reading materials to farmers through the extension staff? Yes/No. If NO, why?
7. What support/motivation does your staff give to the farmers?
8. What is the situation of farm input provision to the horticultural farmers?
9. What is the situation of horticultural marketing in Yatta canal (developed/ less developed)

Appendix III: Research Authorization Letter from NACOSTI



NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/66243/31233**

Date: **12th June, 2019**

Muema Victor Muli
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Socio economic factors influencing horticultural farming in Yaatta Furrow Machakos County"*** I am pleased to inform you that you have been authorized to undertake research in **Machakos County** for the period ending **12th June, 2020.**

You are advised to report to **the County Commissioner and the County Director of Education, Machakos County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. MOSES RUGUTT, PHD, OGW
DIRECTOR GENERAL/CEO

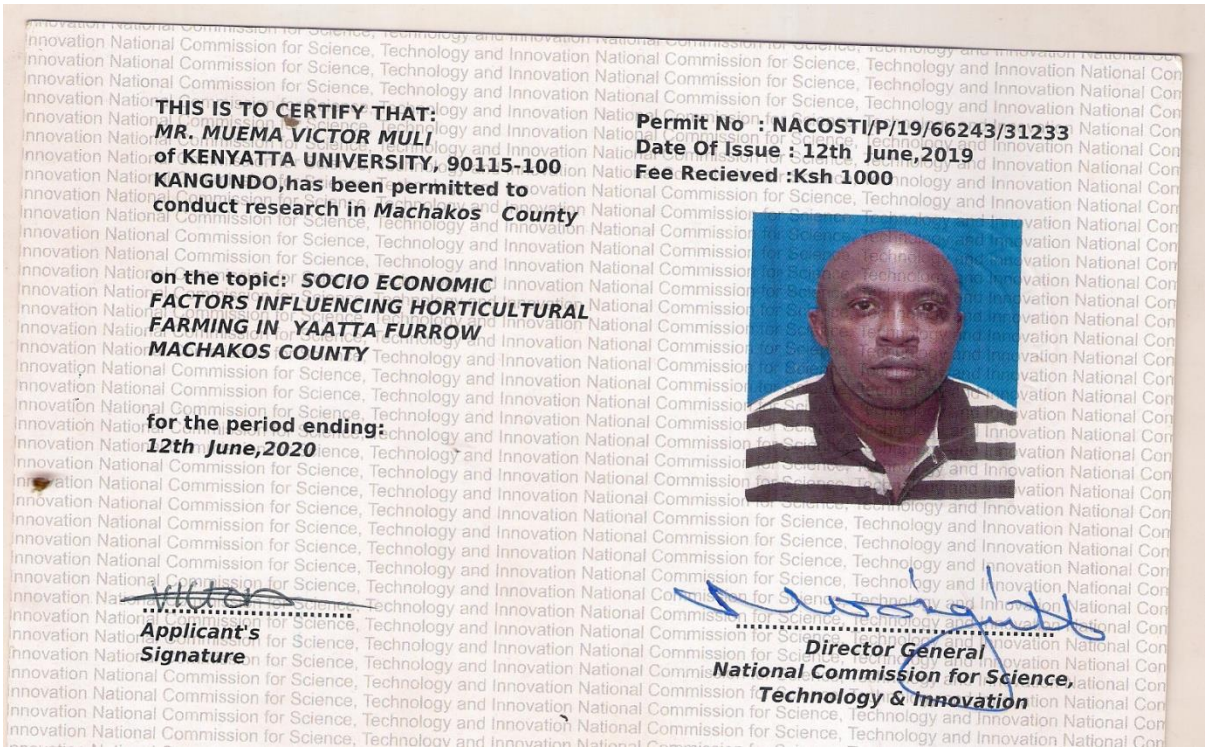
Copy to:

The County Commissioner
Machakos County.

The County Director of Education
Machakos County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

Appendix IV: Research Permit



THIS IS TO CERTIFY THAT:
MR. MUEMA VICTOR MULI
of KENYATTA UNIVERSITY, 90115-100
KANGUNDO,has been permitted to
conduct research in *Machakos County*

on the topic: *SOCIO ECONOMIC FACTORS INFLUENCING HORTICULTURAL FARMING IN YAATTA FURROW MACHAKOS COUNTY*

for the period ending:
12th June,2020

Permit No : NACOSTI/P/19/66243/31233
Date Of Issue : 12th June,2019
Fee Recieved :Ksh 1000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation