Edith Cowan Peer Reviewed Journals & Books Publishers

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

Socio-Economic Factors Influencing Horticultural Farming In Yatta Furrow, Machakos County, Kenya

[1] Muema Victor Muli, [2]Dr. Jackson Musau, [3]Dr. Philomena Muiruri [*]

[1]Master of Arts in the School of Humanities and Social Sciences, Kenyatta University

[2],[3]Department of Geography, Kenyatta University

ARTICLE INFO

Article history:

Received Date: 14th April 2023
Revised Date: 25th May 2023
Accepted Date: 29th May 2023

Keywords: *Economic factors, social factors, horticultural farming, Policies regulating horticultural activities, Horticultural development, types of horticultural of activities*

ABSTRACT

Purpose: The study 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.

Methodology: The study targeted 109 farmers, computed using the Cochran's formula 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. SPSS was used to analyze the quantitative data. Descriptive statistics were generated and presented in tables and frequencies and percentages. Qualitative data was analyzed thematically and presented inform of narratives. A regression model as used to examine the effect of the socio-economic factors to the horticultural growth in Yatta furrow.

Results: 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

Unique contributions to theory, policy and practice: The horticultural farmers should be encouraged to adopt high value horticultural activities that would attract higher market value, besides the local markets in order to enjoy more financial benefits, rather than engaging in production of similarly low value-based crops that fetch low market prices and face stiff competition. 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. The government should provide subsidized farm inputs to encourage farmers application of the necessary inputs to enhance productivity. There is also the need to establish a cooperative society at the farm base, to encourage the farmers market their crops as a group and have a higher bargaining power against the middlemen.

[*]mullimuema@gmail.com

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

1.0 INTRODUCTION

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 system (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).

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. The total European production value of fruits and vegetables is estimated to be more than 55 billion Euros (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. In Africa, horticultural farming is majorly rural based, playing a vital role in food provision, creating employment and earning income as a result. It has been considered as a bright spot for rural economic transformation in many African countries (AVRDC, 2004). Currently, Nigeria is the largest producer of fresh fruits in Sub–Saharan Africa, accounting for 22% of the total production, followed by the Republic of South Africa with 15 % and Kenya at 12% (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, compared to other African countries like Kenya the performance is comparatively low, and of the major contributing factor to the slow development is the socio-economic aspects (Bourne 2017).

Kenya's horticultural farming constitutes fruits, cut flowers and vegetable production. It dates back in early 20th century (Ngigi,2003). The industry has grown over time and currently contributes 33% of the total agricultural GDP, with the crops grown being vegetables, accounting 44.6%, flowers,20.3% fruits 29.5% while medicinal and aromatic plants contribute 5.9%, (FAO, 2017). Kenya's horticultural farming is mainly a rural venture due to availability of vast resources, basically land, water and labour (AFA, 2017). However, it is noted that the sector has been facing various challenges among them inadequate exportability of the produce due to lack of good quality produce. Despite the vast efforts by the government to improve its performance, the sub sector still performs poorly because on average, the country produces approximately 200 metric tons of horticultural produce annually, which is only 40% of the estimated potential of 500 metric tons 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

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

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 canal. 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. This is in spite of the government's efforts to boost horticultural farming from the dominating subsistence activity to commercial activity (Mburu et al., 2015). Evidences from past studies that have been recently done in the furrow indicate that incidences of horticultural farming abandonment have been on the rise and the efforts to commercialize horticultural farming by the government among the farmers have been futile, with farmers opting for other economic land use activities to sustain their livelihoods. As a result, the sectorial growth has declined significantly. The decline in production has made the horticultural farmers remain in poverty and continued food insecurity. Various development interventions through the government have failed to stimulate more efficient horticultural farming methods on large scale. Although horticultural farming in Yatta furrow was well outlined as an area of interest in the County integrated development plan (2018-2022), (County government of Machakos, 2014) as an enterprise that can contribute to poverty eradication in the area, little has been realized so far. Generally, the horticultural production has been low in spite of the importance attributed to this sector. 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. To establish this, this study evaluated the socio-economic factors influencing horticultural farming in Yatta furrow.

1.3 Research Objective

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 factors influencing the types of horticultural activities practiced by the farmers in Yatta furrow.
iii. To examine 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.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

1.4 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?

1.5 Research Hypothesis

$H0_1$: Socio-economic factors such as age, gender, education level, household size, farming experience, farm size, access to credit and access to extension services have no significant influence on horticultural farming in Yatta furrow.

$H0_2$: Farm households and market characteristics such as distance from the household farms and prices do not significantly influence horticultural development in Yatta furrow.

2.0 LITERATURE REVIEW

2.1 Theoretical framework of the study

The study applied a sustainable livelihood approach on poverty reduction. The approach is a key drive to poverty reduction in the countries that characterize poverty and malnutrition. The theory was proposed by Sati (1990). The theory looks in to socio-economic aspects of livelihoods of farmers and suggests how agricultural production and productivity can be increased and livelihoods of people be improved. 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 food security and poverty reduction. According to this theory, poverty and malnutrition are common phenomenon in developing world where food supply is insufficient for the vast growing population and such approach is not applied. This situation exists in Asia, Africa and parts of South America. These areas are socially backward and economically under developed, where agriculture is the main source of livelihood. Agricultural practices are the major economic activities characterized by traditional cultivation which is insufficient to meet food requirements for the people. For sustainable livelihood to be attained, four basic types of livelihood assets need to be looked at namely social capital, financial capital, human capital and natural capital. 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.

2.2 Socio-economic factors influencing horticultural farming.

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

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

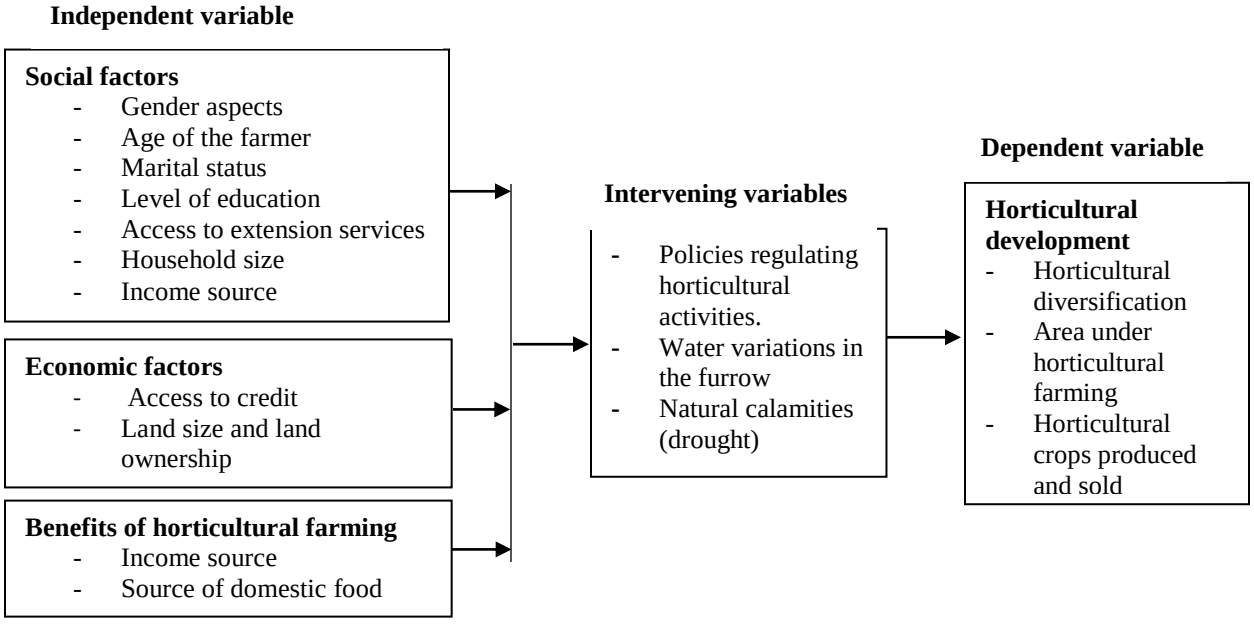
factors determine their level of success and development in the horticultural farming (Guzman & Santos, 2001). These factors also determine the awareness of the risks and uncertainties that are involved in the horticultural farming, which in turn affect the use of horticultural productive assets (Nyangweso et al., 2007).

Horticultural farmers production systems are strongly influenced by interaction of the crops and other off farm activities to sustain its ever-demanding financial support (IFPRI 2005). In Kenya, different horticultural farming households in rural areas are involved in one or more off farm income generating activities. These activities are major source of livelihoods among horticultural farmers in western parts of Kenya (Waithaka et al., 2010). The access to and control of financial, social, physical and social resources for horticultural resources highly depends on factors such as gender and age of the farmers (Mikalitsa, 2010). In terms of gender, women are more constrained by limited access to horticultural productive assets majorly land, capital and income. This is further catalyzed by inadequate access to horticultural information through access to extension services and horticultural seminars (Clovers, 2003).

The availability of social capital contributes to income generation for households that belong farmer organizations or associations (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).

2.3 Conceptual Framework for the study

The purpose of this study was to establish socio-economic factors influencing horticultural farming in Yatta furrow. The conceptual framework depicts how a sustainable livelihood of a farmer can be achieved based on the social, natural financial and human capital.



Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

Figure 1: A Conceptual framework showing interrelationship of the key variables for the study.

Source: Compiled from the literature review (Author 2019).

3.0 RESEARCH METHODOLOGY

The study targeted 109 farmers, computed using the Cochran's formula 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. SPSS was used to analyze the quantitative data. Descriptive statistics were generated and presented in tables and frequencies and percentages. Qualitative data was analyzed thematically and presented inform of narratives. A regression model as used to examine the effect of the socio-economic factors to the horticultural growth in Yatta furrow. A binary logistic regression model was used to identify the influence of the socio-economic factors in horticultural farming in the area. A binary logistic model was applied because the predictor variables were mixture of continuous and categorical variables (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 to be 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

4.0 FINDINGS AND PRESENTATIONS

4.1 Response rate

All the 109 questionnaires issued to the farmers were filled, providing adequate data for analysis. The high response rate was attributed to the efforts directed by the researcher and the assistants as they ensured a close supervision of the respondents while filling them. 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.

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

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

This section is in line with the first objective of the study which sought to examine the horticultural activities that are carried out by the farmers in Yatta furrow. The findings of this study revealed that farmers along the furrow practiced five horticultural activities as indicated in the table below;

Table 1: Horticultural activities carried by farmers

Horticultural activity	No. of farmers	Percentage (%)
Green vegetable growing	38	35
Tomato growing	34	31
Onion growing	17	16
French beans growing	14	13
Green pepper growing	6	5
Total	**109**	**100**

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

From the results above, green 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 factors contributed heavily on the choice of horticultural practices carried out by the individual farmer.

4.2.1 Tomato growing

Tomato growing was found to be practiced by 34 households among the sampled farmers, accounting for 31% of the sampled households. On average, the farmers were aged 33 years and above, a clear indication that tomato growing was a domain activity of the old. Besides, 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 minimal application of pesticides, 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.

4.2.2 Green vegetable growing

The study established that green 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.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

4.2.3 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. From the research findings, all the farmers were aged 30 years and above, with 85% of them having acquired post-secondary education, an indication that French bean farmers were educated and therefore likely to be receptive to modern production technologies required in horticultural farming, with 78% of the French farmers being male, an indicator that this venture was not popular among the women. Further, this indicates that men dominated the high value crops. 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 also 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. Despite this, French bean farming was practiced on small scale terms, with 79% of the total land being rented, with 21% being owned permanently. This study therefore concluded that this venture was a domain of the foreign farmers. Access to credit among the farmers was recorded highest among these farmers due to its capital-intensive nature.

4.2.4 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. The farmers were 18 years and above as it earned 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. The farmers had attained education level of secondary level and above, with 65 % having secondary while 35% had tertiary education. The farmers operated on land size less than 2 acres (82%) while 18 %, operated land size above 2 acres which was rented.

4.2.5 Green pepper

Green pepper was the least preferred horticultural crop, accounting for 5% of the cultivated crop. 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 rented. The farmers were 30 years of age and above. Compared to other horticultural crops, green pepper was least popular because of its low profit margins. The farmers expressed no interest of acquiring credit to facilitate its production.

4.3 Socio-Economic factors influencing horticultural farming.

socio-economic factors were significant components in understanding the main objective of the study. An analysis was therefore made on the demographic and socio-economic characteristics of the farmers based on age, gender, education level, marital status, household size, access to

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

extension services, farming experience, land size under horticulture and land ownership and highlighted as in the table below

Table 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%
Gender	Male	69	63%
	Female	40	37%
Educational level	Dropped out of primary school	5	5%
	Primary school	9	8%
	Secondary school	62	57%
	Tertiary	33	30%
Marital status	Single	5	5%
	Married	104	95%
Household size	2-4 members	26	24%
	5-7 members	59	54%
	Above 7 members	24	22%
Land size	Below two acres	82	75%
	Above two acres	27	25%
Land ownership	Permanently owned	73	67%
	Rented	21	19%
	Leasing	15	14%

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

4.3.1 Age of the respondents

The age of the farmer was factored as an important factor influencing horticultural growth. This study sought to establish whether the age of the farmer had any influence on horticultural farming. Age influences 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). From the results in table, 58% of the farmers were aged 35 years and above, 28% were aged between 18 and 34 years while 14% were below 18 years. This depicts that horticultural farming is a prevalent activity among farmers of all ages within the Yatta furrow. This is attributable to the rural set up of the study were engagement in farming remains the main a source of livelihood for majority of the residents.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

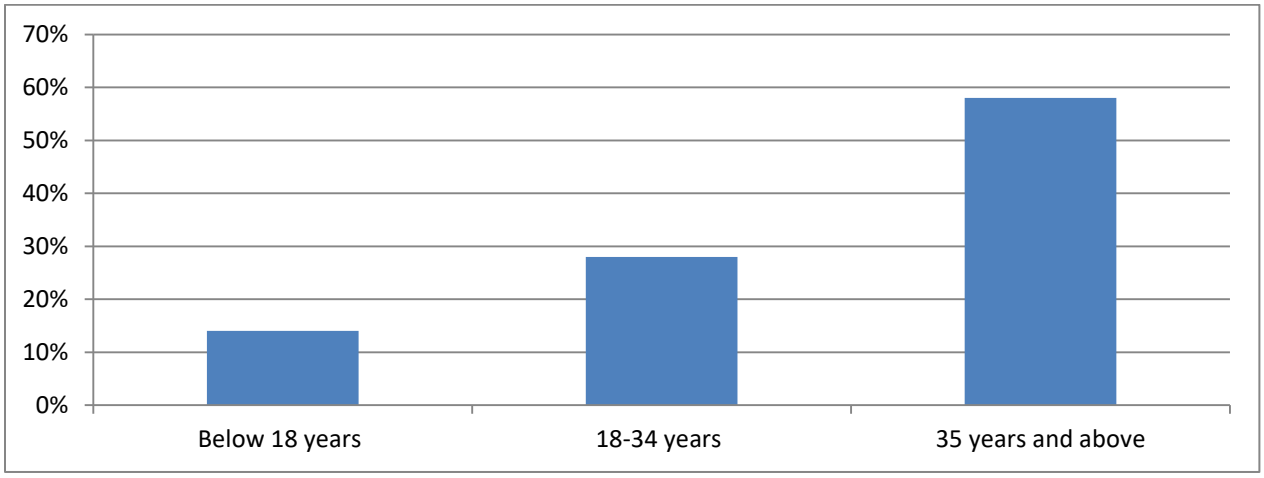


Figure 2: Distribution of farmers by Age
Source: Field Survey Data (2019).

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 Table 3;

Table 3: Relationship between Age of the farmer and horticultural production

Variable		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 35 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 ones. From the results above, it is clear that the youths are not actively involved horticultural farming as 57.7% of the total farmers were aged above 35 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 income and raising of their households. These findings agree with those of Oladele (2010) which established that majority of indigenous fruits and vegetables

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

farmers are older people, who produce them for providing for their families. The results also concur with a study conducted by Vorster et al. (2005), which established that the production of leafy vegetables was domain of older and women farmers. This was attributed by the important role of the vegetables in poverty alleviating and ensuring food security of the rural households.

However, from other studies reviewed, there is a contrary contention on the direct effect of age on horticultural growth in Yatta furrow. The study findings of this research established that younger farmers were more likely to adopt horticultural innovations than older farmers despite lacking control of important factor inputs necessary for growth of horticultural venture. This is supported by Biwott & Tawei (2016) who established that the use of farm information sources tend to decrease with increase in age. In this study, older farmers were found to be the majority, hence adoption of the relevant technologies and innovations is less. In another study by Rodgers (2003), older farmers were found to lack receptivity towards newly introduced technologies due to failure to change their old ways of carrying on their horticultural activities. Further, in addition, since farmers perception towards a specific technological development and subsequent benefits require time, to realize it, older farmers often reduce the older farmers interest in the new technology because of farmers advancement in years, hence the possibility of not enjoying it (Caswell et al., 2001).

4.3.2 Gender influence on horticultural farming in Yatta furrow

The gender of the farmer was an important factor in determining horticultural farming in the study area. The findings showed that 63% of the respondents were male while 37 % were females as shown in the table 4.1 above. The results indicate that horticultural farming is a male dominated activity. This agrees with Omonona et al. (2006) who established that although horticultural farming was initially a women's domain when its focus was subsistence oriented, men have joined the venture more vibrantly since its promotion as a commercial activity. The increasing participation of men in horticultural farming is attributed to by men's ownership of horticultural assets, mainly land and being the primary decision makers and having more access to and control over vital production resources than women. 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: Distribution of Gender roles in horticultural farming aspects.

Statements	Category	Frequency	Percent (%)
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).

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

Table 5: A Regression analysis between Gender of the farmer and horticultural farming.

Gender	Category	Below 2.75 acres	Above 2.75 acres	χ^2 (chi square)
Gender	Female	9	19	(χ^2= 0.120a,
	Male	41	40	p=0.911)
Decision Making regarding Size of land for horticultural farming	Female	14	37	(χ^2= 2.472a,
	Male	36	22	p=0.002)
Decision Making regarding types of horticultural crops to be grown	Female	14	21	(χ^2= 4.145a,
	Male	36	38	p=0.042)
Decision Making regarding number of crops to grow	Female	14	21	(χ^2= 4.145a,
	Male	36	38	p=0.042)
Who attends mostly the training	Female	0	0	(χ^2= 0, p=N/A)
	Male	1(100%)	15(100%)	

(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 regression results 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) were 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 were grown, men had a greater influence in production, while women only influenced production of vegetables for household consumption. This revealed that men typically control and managed production of

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

horticultural crops with higher returns and organized marketing channels such as tomatoes and French beans (Table 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). 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 result coincides with the study conducted by Njuki *et al.* (2011) which found out that women are more likely to receive and control income from horticultural commodities that have lower average returns whereas men dominate in commodities sold in the formal markets and generated higher revenues. In conclusion, from this finding, the study concluded that gender does affect horticultural farming not only in asset

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

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.

4.3.3 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 3 below;

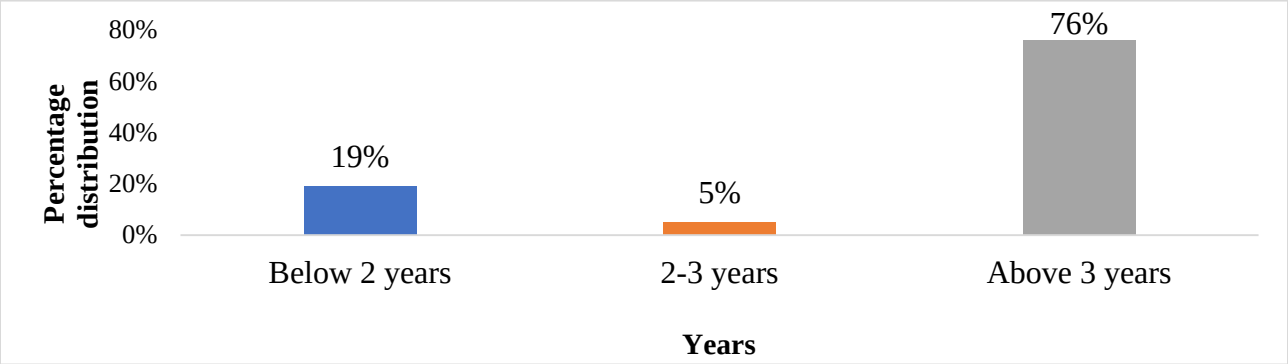


Figure 3: Distribution of farmers by the number of years in horticultural farming.

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 finding is in line with that of Al Shadiedah *et al.* (2010) that established that although farmers with longer experience of farming would be conversant with the challenges affecting tomato production, an improvement in horticultural productivity was not a guarantee, and therefore the decline in production could be attributed to other factors.

4.3.4 Education Level of the Farmer

Education is an important factor because it improves farmer's ability to make informed decisions and choices regarding horticultural practices. It has the capacity to hinder or influence the acceptance of improved farming practices such as the use of modern technologies. As observed

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

by Okoedo Okoji *et al.* (2009), education facilitates the horticultural farmers' adoption of innovations which are necessary in improving the horticultural productivity. Horticultural farmers with higher academic levels, and the relevant horticultural farming knowledge are in a better position to understand and apply new technologies in horticultural farming compared to those with lower academic levels, Okoedo et al. (2009). This study sought to establish whether academic qualifications of the farmers had any influence on the types of crops grow, farm size and growing patterns. In view of this, farmers were asked to state their highest academic qualifications and responses were as in the table below;

Table 6: Relationship between Level of education horticultural farming.

Variable	Category	Frequency	Percent (%)	χ^2 (chi square)
No. of years in school	0	5	5%	**(χ^2=**
	1-8	9	8%	1.818a
	9-12	62	57%	**p**=0.0403)
	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. The results showed a fairly high level of literacy given that 87% of the respondents had attained secondary school and above. The findings of this study showed that 5% of the farmers had not attended any education institution,8% had primary education, 57% had secondary while 30% had tertiary education. This implies that the mean education level was secondary education. High levels of education tend to go hand in hand with high levels of awareness and ability to understand processes and make informed decisions based on the information given to them. This is bound to influence the farmers attitudes and thoughts, making them open, more rational and able to analyze critically the benefits of the technologies needed in expanding horticultural venture (Mwangi & Kariuki, 2015). Therefore, the high levels of education among the farmers portrayed that 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 with tertiary education, horticultural farming was an alternative economic activity since they had formal jobs to attend to. From the chi square results, (p-0.0403), education level had a positive and a significant influence on horticultural production, meaning that as the education level increases, the farmers could also adopt modern farming technologies in horticultural farming. These 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.

Formal education meant that the farmers became knowledgeable on the production practices that would increase productivity and comprehend not only what they got from extension services, but also individually look for better and improved production practices rather than depending on extension officers. These findings are in line with the findings of Opara (2010) that farmers with higher education levels are better equipped in making better informed decisions in horticultural

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

farming aspects, and active participants in economic, social and cultural dimensions of development.

From the findings of this study, education assisted the farmers to acquire knowledge on several aspects such as marketing strategies, and production management before embarking on their horticultural activities. This concurs with a study by Maurice et al. (2009), that farmers increase in education level is a catalyst to the process of information flow and exposure to a wider field of knowledge concerning horticultural farming. Further, Weir and Knight (2000), support this by asserting that to a larger extent, educated farmers are more likely to be willing to adopt advanced technologies required in horticultural farming that the less educated may find it hard to acquire.

4.3.5 Farm size

Land is a major factor of production and therefore the centre around which horticultural activities revolve. The farmers were asked to give an estimate of their land that was under horticultural farming and whether their size had any influence on horticultural farming. From the results, 75% of the farmers had farm size below two acres while 25% had more than two acres. The prevalence of small holdings among the farmers implies limited undertaking of horticultural activities indicating that, although the farmers had embraced horticultural farming, they still allocated portions of land to other land use activities that they considered integral to their livelihoods, basically cereal growing, livestock rearing and settlement. The dominance of small horticultural farms was also attributed to the small land sizes owned by the families and the increasing family sizes that lead to subdivision of the land into to smaller sizes, that only support small scale horticultural farming which forced individual farmers to resort 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 sought to assess the relationship between the individual farmers farm size and horticultural farming. A chi square test was conducted to ascertain the relationship and the findings indicated a significant correlation, ($p<0.005$), meaning that horticultural farms were likely to increase with increase in land size at the disposal of the farmer. This finding is supported by Mwaura *et al.* (2013), who found out that farmers with smaller land holdings were more likely to engage in vegetable growing compared to the farmers with larger pieces of land. From the findings, farmers with larger farm sizes were more likely to expand horticultural farming than those with small 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 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

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

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 fail to utilize farms to maximum, hence an increase in farm size was not a guarantee of improved horticultural productivity (Oni *et al.*, 2010). The relationship between productivity and farm size was therefore negatively associated. These findings, however are not in line with the findings of Angula (2000) who asserted that an increase in cultivated farm size boosted horticultural crop production.

4.3.6 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;

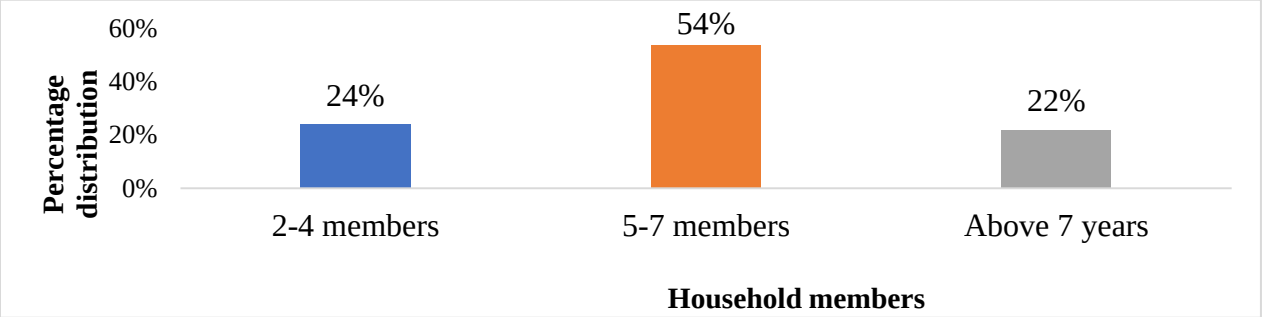


Figure 4: Distribution of horticultural farmers by Household size

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 provides more labor required in the management of the farms. From the results (Table 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 in the nearby markets 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 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 the large size of the household, much of the produce was domestically consumed (Table 7), leaving little for marketing. This finding is also in conjunction with the study conducted by Ernete and Igbokwe (2009) which found out that the larger the household size, the higher were the domestic consumption needs. Similarly, Oni *et al.* (2010) established that many small-holder horticultural

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

farmers in South Africa farmed with an aim of commercial purposes but larger proportion of the farm products was consumed domestically at 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. This finding is in total agreement with the findings of Shadiadeh *et al.* (2012) that one of the most important factors influencing horticultural production and productivity of small-scale famers is the family size. 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.

Variable	Category	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)

4.4 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 8: Benefits of horticultural farming

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

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.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

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.

4.5 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.

4.5.1 Marketing 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 9: Relationship between Marketing of horticultural produce and horticultural farming.

Market	Category	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 worked individually. The farmers decision to market their produce individually leaves 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

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

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 non profitable 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 cooperative has greatly empowered the middle middlemen leaving the farmers exposed to their exploitation".*

The lack of organized marketing system restricted the farmers access to other markets with better prices. The farmers reported to fetch low prices due to oversupply in those markets and few bulk buyers. This is accompanied by exploitative pricing by the buyers, taking advantage of farmers' fear of their produce going to waste as a result of the perishability of the produce and lack of storage and preservation facilities. From the results in table 4.9, the study revealed that majority of horticultural farmers did not have a well-established marketing system in Yatta furrow, which greatly affected the sustainability of the venture. 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 road's 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. Boda bodas, 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.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

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. Distance to the market was found to have a negative influence to horticultural production in Yatta furrow. This implied that the longer the distance to the market, the lesser the horticultural crops marketed in the nearest market centers of Kithimani and Matuu. This is in consistent with the findings of Omiti *et al.* (2009) that found out that the number of agricultural crops. Similarly, studies by Osebeyo and Aye (2014) and Sebalta *et al.* (2014) established that market distance was among the factors that dictated the level at which farm households participated in the markets. The small holder farmers who have further away from the markets have lower market participation and sold smaller quantities of their output, due to the high transaction costs involved as revealed by Reyes *et al.* (2012). According to Komarek (2010), decrease in the distance the market led to low transaction costs and hence generated larger sales volumes compared to longer distances.

4.5.2 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.)

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 3). This is in line with the findings of FAO (2012) that in rural societies, commercial horticultural production is mainly a male's responsibility. The land ownership, control and usage situation translate 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 to those who had farms far 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.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

Table 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).

4.5.3 Engagement in 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 boda boda operations. However, despite the importance of these activities, the study established that engagement in off-farm activities was found to had 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 findings are in total variance with a study conducted by Ajani and Igbokwe (2012) that established that engagement in other income generating activities besides and away from horticultural activities boosts horticultural farming as it assured households of food security, more incomes, and poverty reduction and enabled them to invest more in horticultural farming.

4.5.4 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. 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 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**

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

Source: Field Survey Data (2019).

Table 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%)	35(83.3%)	1	1	1	1	(χ^2= 7.540a, p=0.006)
	Yes	1(1.7%)	7(16.7%)	0.025	11.6	1.369	98.286	

Source: Field Survey Data (2019).

From the results only 8% of the respondents had access to credit facilities to enhance horticultural farming while 92% lacked the access to. The above findings depict a farmer population that is deficient and disempowered as far as working capital is concerned. Thus, 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 development. The study revealed that the farmers the farmers who had access to credit had a high probability of increasing their production capacities. This backs the reason why the sector is dominated by few large-scale farmers.

The study aimed at ascertain whether the respondents' access to credit had any influence in horticultural development. From the above results, access to credit had a significant influence on productivity (χ^2= 7.540a, p=0.006). This is an indication that farmers with easy and enhanced credit are better placed to adopt the necessary technologies required in improving horticultural farming, hence access to credit would greatly improve horticultural productivity. This finding is in line with what was established by Strasberg (1999) that the review of credit system in Kenya whether formal, informal or non forma credit system can enhance agricultural productivity especially for the low-income famers. Similarly, HB (2011); Parick (2002); Pederso (2003) and FAO (2006) cited that timely provision of credit to the small-scale horticultural farmers can fuel rise in household income if directed to 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 desired by loan lenders (Table 12). As a result, majority of the farmers could not access credit due to long procedures involved in acquiring credits and lack of collateral securities required. 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. Access to credit therefore stood out as a critical factor among the farmers in expanding their horticultural enterprises. Without access to credit at lower interest rates, the farmers are often unable to invest in adoption of the relevant technologies or expand their farming enterprises and therefore diversification into new crops is not possible. These findings are in line a study by Nzomoi et al., (2007), who established a positive relationship between access to credit and adoption of export oriented horticultural

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

farming in Kenya. In the study, financial incapacitation was identified as the major hindrance in their operations.

Access to financial capital was therefore identified as the by the current study as the major problem faced by the horticultural farmers in their quest for expanding their enterprises. Further, as a result of inadequate collateral security needed by the lenders, many farmers were scared away from accessing the much-needed capital as reported by one respondent; *"Fulfilling requirements surrounding the access to credit is really a challenge to many farmers because they may end up losing the security, they had used in case of crop failure. Again, as a result of low value of some assets, the amount of loan that can be acquired from such is very minimal."*

4.5.5 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 passed 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 access to extension and personnel was assessed in terms of frequency of contact between the farmer and the extension service providers. The results were as in the table below;

Table 13: Distribution by access to extension services

Category	Frequency	Percentage
Accessed	28	26%
Did not accessed	81	74%
Total	**109**	**100%**

Source: Field Survey Data (2019).

Table 14: Relationship between Access to extension services and horticultural farming.

Access	Size of land	Below 2.75 acres	Above 2.75 acres	χ^2
Access to training services on horticultural production	No	58(100%)	35(70%)	(χ^2= 20.206a, p=0.003)
	Yes	0	15(30%)	

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

The findings revealed that 74% of the farmers did not have access to extension services. In reference to the extension service providers,74% of those assessed the services reported to provide by the government's MOA while 24% were served by NGOs. Low education levels were a contributing factor that led to the huge disparity among those who accessed and those did not access extension services. Despite the governments and NGOs concerted efforts to provide extension services, the respondents access to these services was not as extensive as expected, given the substantial proportion (74%) reported not to have access to extension services. The low accessibility to the extension services was attributed to the high farmer to the extension officer's ratio that hinders the farmers ease of accessing the officers. From the above findings, it is evident that the extension services are available, however, it is the procedure for accessing those services that makes it a n inhibitor to the respondents. Further, since most of the seminars were not conducted in the local language, (Kikamba), only those who had the capability to understand the language used attend.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

This study sought to ascertain whether access to extension services influenced the farmers horticultural growth. A chi square test was run and the relationship between access to extension services and productivity was found to be statistically significant (χ^2= 20.206a, p=0.003). These findings are in line with that of Beets (1990), who alluded to the centrality of extension services to the development of horticultural farming. He argues that horticultural technologies largely be disseminated to the farmers through proper extension service system. Which is chronically lacking to most farmers. More and effective dissemination of horticultural technologies require better coordination between the various agencies in particular the MOA, Development planning and Rural development. This finding is also in line with Owen *et al*. (2010), that the farmers ability to effectively diversify their farming activities is hugely influenced by their degree of contact with the extension officers.

The results of this study reported huge differences between women farmers and men farmers access to extension services, with the findings showing that women farmers have the least access. According to African Development fund (2007), although women play a key role in horticultural production, they receive only 7% of the horticultural extension information. According to this study, extension agents have been found to engage male farmers more than women, because of the social norms that restrict women from accessing extension agents. Time constraint and lower levels of education were found to prevent women from participating in extension service meetings and attendance of field meetings, seminars and other gatherings, unless they were specifically meant for women. 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 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 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 p-0.121. Thus, the null hypothesis was accepted that the nature of the household has no significant influence on

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

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 66: 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) = $\beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots\ldots\ldots \beta_8 X_8 + \varepsilon$,

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 practising horticultural farming.

β_0 = constant term of regression

$\mathbf{B_1 - \beta_{11}}$ 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.

Among the variables, age, gender farming experience and access to training were statistically significant. Gender characteristics possessed positive coefficient and were statistically significant at 5%,.an indicator that men are more likely to engage in horticultural farming than women. This is because men were more likely to get information on horticultural farming through making key decisions than their female counterparts.

The farmer's age was statistically significant at 5%, indicating that older farmers had a higher likelihood of carrying out horticultural farming. The results further indicated that education, access to credit and access to training were statistically significant at 5%, with a positive coefficient.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

The overall result of the regression model shows a significance at 5%. This implies that the explanatory variables were important variables in influencing horticultural development in Yatta furrow. Therefore, the hypothesis one, that there is no significant relationship between socio-economic factors influencing horticultural farming in Yatta furrow was rejected.

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The study assessed socio-economic factors influencing horticultural farming in Yatta furrow. By so doing, the study aimed at four specific objectives which were to establish the socio-economic characteristics of the farmers, identify the specific horticultural activities carried out in Yatta furrow, identify the challenges faced by the farmers and their influence to horticultural farming in Yatta furrow and finally the challenges experienced in carrying out their horticultural activities in Yatta furrow. The study adopted a descriptive research design where a representative sample of 109 respondents were drawn from the 526 farmers in the furrow. To accomplish the main objective of the study both primary and secondary data were collected. The primary data was collected from the farmers and key informants using questionnaires and interviews respectively. The collected data was subjected to descriptive analysis using chi square and regression analysis. Results on socio-economic factors revealed that age (p-0.001), gender roles (p-0.04) education level (p-0.04) family size (p-0.005) land size (p-0.001) access to extension services (p-0.003), had a significant influence horticultural farming in the furrow. However, the results revealed that farming experience among the farmers had no significant influence on the horticultural farming.

5.2 Conclusions

From the results of data analysis, there was statistically significant relationship between socio-economic 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. The study however revealed that gender and farming experience had insignificant influence, their 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.

In conclusion 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. There is the need for a more range of socio-economic programs for the horticultural farmers to enhance skills, income and reduce their vulnerability to horticultural retardation. There is the need to improve on the mentioned socio-economic aspects mainly their education levels access extension services and access to credit through the services of relevant bodies mainly policy developers, horticultural agencies, central government and county governments, NGOs and micro financial institutions.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

However, horticultural growth will not change abruptly without major changes in the broad fabric of the horticultural sector because some challenges such as access to extension services and horticultural asset ownership specifically land are historical based on tradition and culture. Finally, the successful implementation of the suggested strategies will depend on the effective cooperation of the named stakeholders to work together an develop and implement the necessary policies to address the existing socio-economic root causes for horticultural under development.

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 sensitize women on their important roles towards enhancing horticultural growth.

The engagement in other income generating activities meant that horticultural farming was not a priority; hence it is right to conclude that the decline in the sectorial growth is probably contributed to these activities as those engaged do not make horticultural farming a priority. In examining the types of horticultural activities practiced, the study revealed only French beans farming had the capacity for export. The other crops were either domestically consumed or sold in the nearby markets. This is a reflection that the produce is of low quality and quantity. As a result of this revelation therefore, this study concludes that the horticultural activities are low value based and hence the chances of their expansion are minimal.

Secondly, in examining the influence of socio-economic factors, the study found out that these factors, to a larger extent, contribute significantly to the declining productivity. Although the farmers indicated that they were trying their level best to improve their production levels, the extension officers held that socio-economic factors are the much bigger problem that negatively impacts the sector. This study thus concludes that socio-economic factors have a bearing on the current decline in horticultural farming in Yatta furrow.

Thirdly, the study assessed the challenges that the farmers faced in carrying out their horticultural activities. This study found out that land control and ownership, access to credit facilities, inadequate extension services and the existence of other attractive economic activities in the area pose a great threat to the survival of horticultural farming in the area. In view of this, the study concludes that the failure to address these challenges has contributed to the, the sectorial under performance.

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 and 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 recommends the following;

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

i) From the research findings, the study established that the horticultural activities carried out are of low value based with an exception of French bean, which is practiced by very few farmers. This translates to limitation of market and profits obtained from them, hence minimal financial benefits. The horticultural farmers should be encouraged to adopt high value 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 similarly low value-based crops that fetch low market prices and face stiff competition.

ii) The research findings established the benefits of attending seminars organized by extension officers, where farmers were helped to understand the current trends in the horticultural farming. Thus, there is need for integration of both genders, 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) Access to credit was established to be a hindrance to the expansion of the farmers production capacity. Access to credit depended on the farmers capacity to repay the loan and the interests. However, this proved to be a challenge as very few farmers had the access. There is therefore the need to provide subsidized farm inputs to encourage farmers application of the necessary inputs to enhance productivity.

iv) From the findings of this study, marketing of horticultural crops by the farmers was less profitable as the farmers were exploited by the middlemen. There is the need to establish a cooperative society at the farm base, to encourage the farmers market their crops as a group and have a higher bargaining power against the middlemen.

REFERENCES

ADB (2001). *Asian Development Bank, Impact evaluation study on ABD's Rural Credit Assistance in Bangladesh, Peoples Republic of China*, Indonesia, Nepal, Sri-lanka and Thailand. IES: REG 2001-04, ABD.

Action Aid (2013). *Investing in Women Smallholder horticultural Farmers: An Action Aid International Briefing.* Retrieved 20/01/2013, 10:30 am from http://www.actionaid.org/sites/files/actionaid/policy_briefing_investing_in_women_smallholder_farmers.pdf.

Adam, C.S., Collier, P.J. and Ndungu, N.S. (2010). Kenya Policies for Prosperity Africa: Policies for Agricultural Output and Investment. *Journal of development studies*, 22 (1986): 503-539.

African Development Fund (2007). *Republic of Kenya Small-scale horticulture development project appraisal report.* Nairobi: AFDB. Retrieved 5/4/2017 at 8:45 am. From www.afdb.org

Agriculture and Food Authority (AFA) (2017). *Creating Wage Employment in Horticulture Sector in Kenya.* Agriculture and Food Authority.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

AVRDC. (2004). *Global horticulture; Now is the time for action.* Washington, USA: The World Vegetable Center Publication No. 04-438.

Beets, C.W. (1990). *Raising and sustaining productivity of smallholder farming systems in the tropics: A Handbook of Sustainable Horticultural Development.* Washington, USA: AgBe Publishing.

Benin, S., John Pender,J. and Ethui (Eds)(2009). policies for sustainable land management in the East African highland: *Proceedings of conference at the United Nations Economic Commission for Afric*a (PP. 17-23). IFPRI: Washington, D.C

Biwott, D.K. and Tuwei, J.C. (2016). Determinants of Small-scale Horticulture farmers' decision to join farmer-based organizations in Nandi County, Kenya. *International Journal of Economics, Commerce and Management,* Vol IV, issue 4, April 2016. http://ijecm.co.uk/ISSN 23480386.

Caswell, M., Fuglie, K., Ingram, C., Jans, S. & Kascak, C. (2001). *Adoption of Agricultural Production Practices: Lessons learned from the US. Department of Agriculture area studies project.* Washington D.C. US Department of Agriculture, Resource Economics Division, Economic Research Service, Agriculture Economic Report No. 792.

Das, A. Senapati, M.J. & John, J. (2009). Impact of agricultural credit on agriculture production: An empirical analysis in India. *Reserve Bank of India Occasional paper*, 30(2): 75-107.

Dolan, C., & Sutherland, K. (2002). *Gender and Employment in the Kenya Horticultural value* chain (Discussion paper8). United Kingdom.

Dong, F., Lu, J. & Featherstone, A.M. (2010). *Effects of Credit Constraints on Productivity and Rural Households Income in China Centre for Agricultural and Rural Development*. Lowa State University.

FAO. (2006). *Food and Agriculture Organization*. FAMO Statistic Division, Rome

FAO. (2012). Food and Agriculture Organization of United Nations for a World without Hunger. http://faostat.fao.org/default.aspx site visued on 17/3/2019.

FAO. (2007). *Food Security districts profiles*. Nairobi: Food and Agriculture Organization (FAO).

FAO. (2010). World food dietary assessment. Washington International Network of Food data systems of the food and agricultural organizations of the United Nations. http://www.fao.org/infoods/software.

Frankel, J.R., & Wallen, E. (2004). *How to Design and Evaluate Research in Education*. Graw-Hill International.

Fruit logistica (2018). *European statistics handbook*. Berlin: Messe Berlin GmbH 2018.

GOK. (2012). *National Horticultural Policy*. Nairobi: Republic of Kenya, Ministry of Agriculture.

GOK. (2010) *National Climate Change Response Strategy*.(NCCRS)

GOK. (2019) *National horticultural report*.Nairobi:Republic of Kenya ,Ministry of Agriculture.

Gujarati, D.N. (1995). *Basic Economics* (3rd ed.). New York: Mc Graw-Hill.

Guzman, J. and Santos, F. (2001). The booster function and entrepreneurial quality. An application to the province of service. *Entrepreneurship and Rural Development*, 13; 24- 228.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

HCDA. (2010). *Horticultural validated report 2010. Horticultural crops development authority* (HCDA): Nairobi.

IFAD. (2013). *African agricultural development: Opportunities and challenges.* Statement by IFAD President at the 6th Africa Agriculture Science Week and FARA General Assembly.

IFPRI. (2005). *The future of small farms, proceedings of a research workshop*. wye, UK. International food policy research institute: Washington D.C

IFPRI. (2009). *The future of horticultural small farms proceedings of research workshop*. Wye, UK.: International Food Policy Research Institute, Washington. D.C.

IFPRI. (2012). Gender differences in access to extension services and Agricultural productivity. ESSP working paper 49. Ethiopia Strategy Support Programme, Ethiopia. http://www.ifpri.org/sites/default/fiels/pubications/esspwp49.pdf site visited on 26/7/2019.

Katungi, E., Farrow, A., Muthoki, T., Gebeyehu, S., Karanja, D., Almayelu, F., Sperling, L., Beebe, S. J., Rubyogo, J.C. and Buruchara, R. (2010). Improving common bean productivity. *Analysis of socio-economic factor in Ethiopia and Eastern Kenya*. Baseline Report Tropical Legumes (II) CLAT . Cali; Colombia.

Karl. (2015). *Binary logistic regression with SPSS.* Retrieved form http://core.ecu.edu/psyc/wuenschk/MV/Multreg/Logistic-SPSS.PDF

Maurice, J., Wilfred, N. & Mahmud, Y. (2009). Production Risk and Farm Technology Adoption in Rain-Fed, Semi-Arid Lands of Kenya. *Environment for Development Discussion Paper Series* RfD DP 09-22.

Mburu, K., Kungu, J., Muriuki, N. (2015). Climate Change adaptation strategies by small scale farmers in Yatta district, Kenya.

Mwangi, M. & Kariuki, S. (2015). Factors Determining Adoption of New Agricultural Technology by Smallholder Farmers in Developing Counties. *Journal of Economics and Sustainable Development*, Vol. 6, No. 5, 2015 pg 208-216. www.iiste.org ISSN 2222-2855 (ONELINE).

Mwaura, S. N., Muluvi, A. S. & Mathenge, M.K. (2013). African Leafy Vegetables and Household Well-being in Kenya: A Disaggregation by Gender. Invited paper presented at the 4th International Conference of the African Association of Agricultural Economists, September 22-25, 2013. Hammamet, Tunisia.

Ngigi, S.N. (1999). Evaluation of Irrigation Research and Development Activities in Kenya: Towards Promoting Small-Scale Irrigation Technologies. Draft Project Proposal for LWMI.

Njuki, J., Kaaria, S., Chamunorwa, A., and Chich, W. (2011). Linking smallholder farmers to markets, gender and intra-household dynamics. Dues the choice of commodity matter and quest. *EUr.J. Dev. Res.*, 23, 426-443.

Nyangweso, P. M., Odhiambo, Odunga, P., Korir ,M.K., Kplsalt, M. J. and Serem, A. K. (2007). Household food security in village, district, Kenya determinants of dieting diversity. *Africa food science conference proceedings*, 8, 1383-1389; African food science society Ël-minia , Egypt.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

Nzomoi, J.N., Byaruhanga, J.K., Maritim, H.K. & Omboto, P. (2007). Determinants of Technology adoption in the production of horticultural export produce in Kenya. *African Journal of Business Management*, Vol. 1(5) pp. 129-135, August 2007. Available at http://www.academicjournals.org/ajbm.

Okoedo-Okojie, D.V.g Onemoease, E Ag 80 Olnes (2009). Factors affecting the adoption of yam storage technologies in the Nonuern Ecological zone of Edo State. *Nigerian Journal of Human Ecology*, 27 (2) 155- 160.

Oladele, O.I. (2010). Non- agricultural information needs and seeking behaviour among rural dwellers in Oyo State, Nigeria. *Journal of Rural Development India*, 29(3); 279-285.

Omiti, J., Otieno, D., Nyanamba, T and McCullough, E. (2009). Factors influencing intensity of market participation by smallholder farmers: A case study of rural and peri-urban areas of Kenya. *African journal of agricultural and resource economics*, 3(1); 57-82.

Omiti, J., Otieno, D., Nyanamba, T. and McCullough, E. (2002). Factors influencing the intensity of market participation by small holder farmers.: A case study of rural and peri-urban areas of Kenya. *African journal of agricultural resource and economics* 3 (1), 57-82.

Omonona, B., Oni, O., and Uwagboe, O. (2005). "Adoption of improved cassava varieties and its impact on Rural Farming households in Edo State, Nigeria". *Journal of Agriculture and Food Information*, 7 (1): 40-45.

Opara, U.N. (2010). Personal and Socio-economic Determination of Agricultural Information use by Farmers in the Agricultural Development Programme (ADP) zones of Imo State, Nigeria. http://unlib.unl-edu/llp/opara.html site visited on 27/7/2019.

Osebeyo, S., O. and Aye, G.C. (2014). Translation costs and marketing decisions: A case study of smallholder tomato farmers in Makurudi, Nigeria. *Urban, planning and Transport research journal*, 2(1) 333-340.

Otieno, D.J., Omiti, J., Nyanamba, T. and McCullough, E. (2009). Market participation by vegetable farmers in Kenya: A comparison of rural and peri-urban area. *African journal of agricultural research*, 4(5); 451-460.

Parfitt, J., Barmel, M. & Macnaighton, S. (2010). Food wastage within food supply Cheinsi Quantification and potential for change to 2050. Philosophical Transauas of the royal society of Linden, *B. Biological Sciences*, 365 (1554); 3065-3081.

Pederso, G. (2003). Rural finance institutions, markets and policies in African Pre-IAAE Conference on African Agricultural Economics, Bloemfontein, South Africa.

Pender, J. (2002). *Policies for sustainable land management in the East Africa highlands: Research background objectives, conceptual framework and activities*.

Ragasa, C. (2012). Gender and Institutional Dimensions of Agricultural Technology Adoption: A Review of Literature and Synthesis of 35 case studies. Selected poster prepared for presentation at the international association of agricultural economists (IAAE) Triennaial Conference, Foz do Iguacu, Brazil 18-24 August, 2012.

Reyes, By, Dornavan, C., Bersten, R. and Maredian, M. (2012). Manua participation and sale of potatoes by small holder farmers in the Central highlands of Angola, A Double Hurdle approach paper presented at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguacu, Brazil, 18-24 August 2012.

Global journal of geographical sciences
ISSN: 2790-055X
Vol. 7, Issue No. 1, pp 26- 58, 2023
www.edithcowanjournals.org

Rious, A.R., Masters, W.A. and Shivly, G.E. (2008). Linkages between market participation and productivity: Results from Multi-Country farm household sample paper presented at the Amercian agricultural economics association annual meeting, Orlando, Florida, July 27-29, 2008.

Rodgers, E.M. (2003). *Diffusion of Innovations* (5th Ed.). New York: Free Press.

Serem, A. (2010). *Challenges in production and marketing of horticultural produce in Kenya*. Nairobi: HCDA.

Shadiadeh, A.N., Mchammady, F.M and Abu-Zahrah, T.R. (2012). Factors influencing adoption of protected tomato farming practices among farmers in Jordan valley. *World applied sciences Journal*, 17 (5); 572-578.

Singha, A.K., Barvah, M.J., Bardoloi, R., Dutta, P. and Saikia, U.S. (2012). Analysis on influencing factors of technology adoption of different land-based enterprises of farmers under diversified farming system. *Journal of agricultural science*, 4(2); 139-146.

Sriram, M.S. (2007). Productivity of Rural Credit: A Review of Issues and Some recent Literature. *International Journal of Rural Management*, 3(2): 245-268.http://dx.doi.org/10.1177/097300520800300204

Strasberg, P.J., Jayne, T.S., Yamano, T., Nyoro, J., Karanja, D. and Strauss, J. (1999). Effects of agricultural commercialization on food crop input use and productivity in Kenya. Michigan, *MSU International Development Working* pp.1- 43.

Temu, A.E., Temu, A.A. (2005). High value Agricultural Products for Small holder Markets in Sub-Saharan Africa. Trends, opportunities and research priorities. Paper prepared for the workshop "How can the poor benefit from the growing markets for high value agricultural products?" International Center or Tropical Agriculture: Cali, Combondia.

Waithaka, M. M., Therriton, P-K., Herrero, M. and Shepherd, K.D. (2006). Bio – economic evaluation of farmers perception of viable farms in western Kenya. *Agricultural systems*, 90 (1) 243-271.

Wambugu, S.N., Okello, J.J. and Nyikal, R.A. (2010). Effect of social capital on performance of small holder organization in western Kenya. *Journal of Agricultural Science and Technology*, 4(6), 10-19

Weir, S. & Knight, J. (2000). *Adoption and Diffusion of Agricultural Innovationsin Ethiopia: The Role of Education. Working Paper Series 2000-5*. Addis-ababa: Centre for the Study of African Economies.

Yabs, J.K. & Awuor, E. (2016). Market Orientation and Performance of Fruit Exporting Firms in Kenya: A Theoretical Perspective. *European Journal of Business and Management*, Vol. 8, No. 9, 2016 pg. 23-33.