SOCIO-ECONOMIC DETERMINANTS OF SUSTAINABLE VEGETABLE AND FRUIT PRODUCTION PROJECTS IN KADIBO DIVISION, KISUMU EAST DISTRICT, KENYA

BY

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DECLARATION

I, Jenipher A. Ndege Polo, hereby declare that this study is my original work and has not been presented for an award of a degree in any other university.

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DEDICATION

This Thesis is dedicated to the following people; my parents, for laying the foundation for my education and their commitment to it; my brother Dismas O. Ndege for role modeling for me in my formative years, my husband Julius Polo, in appreciation for his enthusiasm, tireless and unrestricted encouragement, financial and emotional support that enabled me to accomplish this work, and lastly to my children for their understanding.

ABSTRACT

About 45% of Kisumu East population are absolutely poor. These poor households face the problem of food insecurity which the government of Kenya and other donors seeks to address through sustainable agriculture, by establishing fruit and vegetable production projects. However, most of the projects fail to survive beyond their establishment and the few that survive seem to provide insufficient benefits to the target community. It is on this basis that the study sought to determine the socio-economic factors that affect sustainability of vegetable and fruit production projects in Kadibo division. The specific objectives of the study are to establish the effect of gender difference on resource allocation for vegetable and fruit production projects, determine the effect of farmer education level on the acquisition and utilization of resources for vegetable and fruit production, establish the effect of size of land owned on the allocation of land to fruit and vegetable, and finally to assess the effect of monthly income and investment on farm equipment on allocation of resources to fruit and vegetable production in the study area. This study was based on case study research design. Primary data were collected using questionnaires, interviews and focus group discussions. Secondary data were from government reports, journals and books. Purposive sampling technique was used to select 8 farmers' groups each representing the 8 locations of the Division. Saturated sampling technique was used to selected120 households. Snowball was used to identify key informants. Focus groups were also gotten from members of the eight groups. Qualitative data was analysed using themes. Quantitative data were analysed using both descriptive and inferential statistics. The descriptive methods include; means and frequencies. Correlation and regression analysis were the inferential statistics used. Findings revealed that males had a positive relationship with land allocated for vegetables and fruits ($\beta = 0.113$, $p = 0.037 < 0.05$). The study revealed that land allocation is biased against females who were the majority at 64%, and that gender of the producer had no significant influence on allocation of resources for fruit and vegetable projects. Household size, education level ($\beta = 0.198$, $p = 0.011 < 0.05$) and age ($\beta = .055$, $p = 0.431 > 0.05$), all had significant effect on the allocation of land to vegetables and fruits. Size of land owned, average monthly income and investment in farm equipment all had significant positive effects on the allocation of resources. The study concludes that social and economic factors affect resource allocation to fruit and vegetable projects but the magnitude differs. The study recommends emphasis on higher learning particularly to the females who are the major producers and at the same time ensure their financial empowerment so that they may invest more on production equipment and even acquire more land for the farming activities. The few men who are involved in the fruits and vegetables production should also be financially empowered and encouraged to further their education. Land ownership and utilization at the community level should be reviewed to give equal opportunity to the women. Further research using time series data is needed in this area and neighbouring divisions to establish long term effects of these social and economic factors in sustainable fruits and vegetables production projects.

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LIST OF ABBREVIATIONS

ACC	Administrative Committee on Coordination
ALEEF	Agriculture and Livestock Enterprise Expansion Fund
AIDS	Acquired immune Deficiency Syndrome
AVRDC	Asian Vegetable Research and Development Centre
CYMMIT	International Centre for Research on Maize
CIAS	Centre for Integrated Agricultural Systems
CIG	Common Interest Groups
DAO	District Agricultural Officer
DFID	Department for International Development
DSDO	District Social Development Officer
EPZA	Export Promotion Zone Agriculture
FAO	Food and Agricultural Organization
FFV	Fresh Fruits and Vegetables
FGD	Focus Group Discussion
FIVIMS	Food Insecurity and Vulnerability Information Mapping Systems
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
HCDA	Horticultural Crops Development Authority
IFAD	International Fund for Agricultural Development
KSPFS	Kenya Special Programme for Food Security
KARI	Kenya Agricultural Research Institute
MDG	Millennium Development Goals
MOA	Ministry of Agriculture

NALEP	National Agriculture and Livestock Extension Programme
NGO	None Governmental Organizations
NMK	Njaa Marufuku Kenya
POST	Parliamentary Office for Science and Technology
SHEP	Smallholder Horticulture Empowerment Programme
SSA	Sub Saharan Africa
UN	United Nations
UNDP	United Nations Development Programme
UNSCN	United Nations Standing Committee on Nutrition (United Nations)
UNCHS	United Nations Commission on Human Settlement
UNICEF	United Nations Children Education Fund
USDA	United States Department of Agriculture
WHO	World Health Organization

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OPERATIONAL DEFINITIONS

Community primarily refers to the inhabitants of a given area, in this case the inhabitants of Kadibo Division which is the study area.

Fruit is commonly, defined as the sweet fleshy, edible part of plants that contain seeds.

Vegetable is broadly defined as the edible portion of a plant (excluding fruits and seeds), such as roots, tubers, stems and leaves.

Gender refers to the socially constructed roles, behaviours, activities, and attributes that a given society considers appropriate for men and women, (Riley, 1997) while "**Sex** refers to the biological and physiological characteristics that define men and women (WHO).

Gender Equality - means that women and men have equal conditions for realizing their full human rights and for contributing to, and benefiting from, economic, social, cultural and political development.

Gender differences are social constructs, inculcated on the basis of specific society's particular perceptions of the physical differences and the assumed tastes, tendencies and capabilities of men and women, Gender differences are universally conceded in historical and comparative social analyses to be variants that are transformed over time and from one culture to the next, as societies change and evolve. While **sex** is obviously an essential variable for gender analysis, **age** is also fundamental in examining gender contributions and gender access to resources throughout an individual's life. Children and the elderly often make a substantial contribution in the production sector, especially on family farms.

The concept of **household** is based on the arrangements people make for providing themselves with food or other essentials of living. A household may be either one-person or

multiperson. The persons in the group may pool their incomes and have a common budget to a greater or lesser extent; they may be related or unrelated persons or a combination of both. **"Education**" here is taken to mean "schooling",

Project is the investment of capital in a time-bound intervention to create productive assets. The assets created may be human, institutional or physical, which are supposed to continue in operation to yield a flow of benefits after the project has been completed (Cusworth and Franks, 1993).

Project sustainability is the likelihood that the benefits from an intervention will be maintained at an appropriate level for a reasonably long period of time after the withdrawal of donor support" (Sida 2004:35)

Food Security is the ability of people at all times having physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life..", (World Food Summit,1996).

Undernourishment is when there is insufficient energy intake. It is also an indicator sometimes used to assess food security levels. Based on national food production figures, it is basically a measure of food availability (Parliamentary office on Science and Technology, (POST), 2006)

Malnutrition is the condition caused by deficiencies or imbalances in energy, protein and/or other nutrients. Signs include **wasting** (thinness), **stunting** (shortness), or being **underweight** (low weight for age due to wasting/stunting). Protein-energy deficiency is a leading cause of child death in developing countries. Deficiencies in micro-nutrients

(Vitamins and minerals) can also affect mental and physical health. For example iron deficiency anemia remains a major health problem and can negatively impact on health, Life-expectancy, work productivity and economies (POST, 2006).

The terms **horticulture**, **fresh fruits and vegetables**, **fresh produce**, and sometimes **FFV** are used interchangeably in the study.

CHAPTER ONE

INTRODUCTION

1.1: Background to the Study

Food security, defined as the "ability of people at all times having physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life", (World Food Summit,1996), remains a big challenge to many developing countries. Over 925 million people in the world are undernourished, while over 3 billion are malnourished in nutrient elements and vitamins. In sub-Saharan Africa an estimated 239 million people are chronically hungry, and this is aggravated by "hidden hunger" (FAO 2010). In Kenya, over 10 million people suffer from chronic food insecurity and poor nutrition, and between two and four million people require emergency food assistance at any given time. Nearly 40% to 45% of pregnant and nursing women in Kenya suffer from anemia while 25% to 30% of children under five are stunted and highly susceptible to infectious diseases (Kenya Republic of, 2008; WHO, 2002). However, Per Pinstrup-Anderson, (1994) showed from his studies that food insecure people are usually not able to meet their needs from the market as their purchasing power is also low, so ensuring food nutritional security is only possible if on-farm production is enhanced and sustained.

Fruits and vegetables are important components of a healthy diet and it is reported that regular consumption in adequate amounts could help prevent major chronic diseases such as cardiovascular diseases and some cancers (WHO 2002). Low fruit and vegetable intake is estimated to cause about 31% of ischaemic heart disease and 11% of stroke worldwide. Overall it is estimated that up to 2.7 million lives could potentially be saved each year if fruit and vegetable consumption was sufficiently increased (*ibid*). WHO/FAO (2002) recommended the intake of a minimum of 400g of fruit and vegetables per day for the

prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries. For these recommendations to be achieved, interventions geared towards increased production and consumption of fruits and vegetables should be enhanced.

Programmes to improve nutrition and reduce vitamin A deficiency were implemented in Niger and Viet Nam, where women were the principal producers and agents of behavioural change (FAO, 1995a); one of the major interventions was the promotion of home gardening, especially for the production of vitamin A-rich foods. Home production increased, and consumption of vegetables rose, especially among children under five years of age, an increase in the proportion of healthy children was noted in the project areas. The successful ingredients of this project appear to be a strong emphasis on increased production of vitamin A - and carotene-rich foods which are mainly vegetables and fruits and some tubers, and to ensure their increased consumption. This shows that such programmes and projects can actually improved agricultural productivity and improve food and nutrition security. However, such is not always the case with many projects collapsing after withdrawal of funding resulting in persistent food and nutrition insecurity. It is report that on average a typical developing country in Africa is assisted by about 30 aid institutions to implement food and nutrition security strategies, yet food and nutrition insecurity persists in the continent, (Eicher 2003; Heidhues *et al* 2004). Over 60% projects in developing countries fail after withdrawal of funding, and reasons include poor project design, lack of involvement of local communities in decision making, and poor targeting of the vulnerable (FAO, 2008; World Bank, 1989).

The agricultural sector in many developing countries is underperforming, in part because women, who represent a crucial resource in agriculture and the rural economy through their roles as farmers, laborers and entrepreneurs, almost everywhere, face more severe constraints than men in access to productive resources (FAO 2011). Horrell and Krishnan (2007) included an index of farm machinery as a control indicator in a study in Zimbabwe and found significant bivariate differences between male and de facto female heads of household but not between male and de jure female heads of household. Babatunde and colleagues (2008) also found significant bivariate differences between male and female heads of household in value of farm tools owned in a sample of 60 Nigerian households. These studies confirm the constraints faced by females in agricultural production.

Pender and Gebremedhin (2006) found that female heads of households are negatively associated with the use of draft animals (oxen) in Ethiopia. This study also found that female heads of household achieve 42 percent lower crop yields than male heads of household with similar use of labor, ox power, and other inputs. Hide and Kamani (2000), in a study of peri-urban agriculture in Nairobi reported that many women farmers found the water pumps in use too costly and not easy to operate or manage, thereby indicating a further gender-based disadvantage in productive use of inputs.

In Ethiopia, Tiruneh *et al* (2001) found that the male and female headed households had differences in endowments (land rights, education) and differential access to technologies, factors of production, and support services. Although the sizes of land owned were the same because land is given by the government, the areas cultivated by male headed households were bigger than those cultivated by female headed households**.**

A review of 24 studies of technological input use, access and adoption gave mixed results for female and male headed households. Whereas these reviewed studies included access to tools, the studies were carried out based on general agricultural productivity rather than specifically for fruits and vegetable, the results do not show a clear trend as to the effect of gender difference on resource allocation to vegetable and fruit production. In view of the above results, this study set out to establish the effect of gender differences in resource allocation for vegetable and fruit production in Kadibo Division.

Education is thought to be most important to farm production in a rapidly changing technological or economic environment (Shultz 1964; 1975). Hussain and Byerlee (1995) note that evidence is mounting (for Asia at least) that returns to schooling in agriculture may be as high as for urban wage earners. Lockheed et al (1980) reviewed 18 studies and found that most reported a significant positive effect of education upon output. Phillips (1994) reviewed an additional 12 studies using 22 data sets and was able to confirm the general trends noted above. However, Appleton and Balihuta (1996) point out that these surveys included only two studies on Kenya, and that education was not found to be significant in either. A review of several additional African studies found that the effect of schooling on agricultural output is usually not significant, though in some cases it can be large, indicating that there is substantial variation in returns to schooling both within and between the areas surveyed. These reviews illustrate the need for further investigations on the effects of education on farm productivity in Africa. This study focuses on the effect of farmer education level on resource acquisition and utilization for vegetable and fruits.

Land is the pivot of man's absolute existence. Sheng (1989) stressed this by asserting that through the past, in the present, and through the foreseeable future, soil continues to be the foundation of our food supply chain, which is a vital recurrent and capital nation. Decision of

allocation is generally based on expectations about the future outcomes and hence farmers tend to operate under imperfect knowledge (Williams, 1952). Shahaddudin et al (1986) and Chaplin (2000) both say small farmers are concerned not with objectives of maximization of profits but with maximum chances of survival. Kaumar (1996) reports that family size, number of dependants tend to decrease with the level of land allocated in favour of apples and cauliflower in Bangladesh, implying that increase in dependants resulting in increase in food requirement at home acts as constraint to increased allocation to vegetables and fruits. This study also reported a positive relation between land allocated to cauliflower and irrigation availability, and a positive relation between labour availability and land under vegetables. However, a positive relation was reported between increase in land under fruits and off-farm income. None of the studies has investigated the effect of size of land owned on land allocation to vegetables and fruits which is the objective of this study.

Not only is capital important to agricultural production, and agricultural development dependent on the economic environment, but agriculture is more cost-capital-intensive than non-agriculture. Capital is all the more important as a factor of production in that land (also important) varies little over time. The availability of agricultural capital determines whether the gap between available and applied technologies can be closed. As reported by Odhiambo *et al* (2004), income is the second most important production factor after labour in agricultural growth. Higher income farmers may be less risk averse, have more access to information, have a lower discount rate and longer-term planning horizon, and have greater capacity to mobilize resources (Hoekstra, 1985; CIMMYT, 1993). Off-farm income has also been reported plays an important role in allowing farmers to shift to higher-valued crops hence increase their agricultural productivity per unit of land. No study has been reported

done to establish the effect of investment on farm equipment on the allocation of resources to vegetable and fruit production. Studies done on technology.

1.2: The Problem Statement

Over 41 % of Kisumu East population (which includes the urban population) is chronically hungry and 45% are absolutely poor. Most of these people are within the urban and peri-urban areas of the city. Food self-sufficiency is desired by all, and is the aim of all organizations that support food security initiatives. As a step towards addressing the menace of food and nutrition insecurity, humanitarian partners, donors and the government of Kenya have employed developmental approaches that support building of livelihoods and its resilience. Despite the concerted efforts to monitor such developmental projects, most of the projects often fail to survive beyond their establishment after withdrawal of donor support.

Annual vegetable and fruit production in Kadibo Division remains very low. For example, only 6471.4 tons (Kenya Republic of, 2008) of fruits and vegetables was produced in 2008 against a population of 61328 people (Kenya Republic of 2010) that requires 8954 tons (FAO statistics) of vegetables and fruits per annum. Production is low in yields per unit area. The land sizes here are small, on average 2 ha per household with poverty levels of 45%. Empirical data show that effect of education on farm productivity vary in Africa, while studies on gender differences in agriculture have mainly concentrated in evaluating general productivity with none focusing on resource allocation. No empirical evidence exist on effect of size of land owned on its allocation to vegetables and fruit production and lastly. The study therefore set out to investigate whether gender difference, farmer's level of education, size of land owned and income and investment on farm equipment are the factors that affect sustainable production of vegetables and fruits. These discrepancies call for the current study.

1.3: Objectives of the Study

Main objective:-

The main objective of the study was to determine the socio-economic factors at community level that affect sustainable vegetable and fruit production projects in Kadibo Division.

Specific objectives were:-

i. To establish the effect of gender differences on resource allocation in vegetable and fruit production projects in Kadibo division.
ii. To determine effect of farmer education level on the acquisition and utilization of resources in vegetable and fruit production projects in Kadibo division.
iii. To establish the effect of the size of land acquired on the allocation of land to fruit and vegetable production projects in Kadibo division.
iv. To assess the effect of average monthly income and investment on farm equipment on the allocation of resources to fruit and vegetable production projects in Kadibo division.

1.4: Research Questions

The study attempted to answer the following questions:

i. What is the effect of gender differences on resource allocation to vegetable and fruit Production projects in Kadibo division?
ii. What is the effect of farmer education on the acquisition and utilization of resources in vegetable and fruit production projects in Kadibo division?
iii. What is the effect of the size of land owned on the allocation of land to fruit and vegetable production in Kadibo division?
iv. What is the effect of average monthly income and investment in farm equipments on the allocation of resources to fruit and vegetable production projects in Kadibo division?

1.5: Justification of the Study

Vegetables and fruits occupy a unique position in both domestic and foreign food trade of Kenya, and the crops are very vital for food and nutrition security. As other parts of Kenya improve their production, in Kadibo Division production is still very low resulting in low incomes as well as food and nutrition insecurity, despite many projects that have been formulated and implemented to increase their production. Lack of sustainable production implies there could be constraints at the farm level. These constraints could be things like resources accessibility or allocation, gender disparity or even human capital. Better understanding of the determinants of sustainable vegetable and fruit production projects will help reduce the high food and nutrition insecurity that exists in the study area through consumption and income generation. Sustainable production of vegetable and fruit has received insufficient scrutiny and institutional support compared with other crops like maize. In this regard, the study will be vital in providing important insights into what it takes for such projects to continue giving benefits to communities even after funding periods end. In addition, factors responsible for low vegetable and fruit production at the household level may be brought to the fore for policy consideration. Most studies on vegetables and fruit have been oriented towards testing varieties, agronomy and physiology and their marketing. This study will therefore be a prima facie in adding to the sparse knowledge that exists on their sustainable production.

1.6: Scope and Limitations of the Study

Physical area of the study was Kadibo Division of Kisumu East District, Kenya. The study focused on the community through farmers groups in this area which have participated, or are currently participating in food security projects targeting vegetables and fruits production. The study only investigated socio-economic factors that affect sustainability of vegetables and fruits production for food security at the community level. Due to limitations on time and

funds, the whole of Kadibo Division population could not be studied, but the sample of one 120 households made up from 8 farmer groups selected through purposive sampling technique one from each of the 8 locations of the division was used to give information on the effect of the socio-economic factors that affect the sustainability of vegetable and fruit production in Kadibo Division. The study also encountered difficulties during interview, due to low awareness level of the farmers who do not keep records of agricultural information that is needed in this study. To overcome the above problem, a lot of time was spent explaining to respondents the socio economic factors.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter reviews theoretical literature and empirical studies on the key variable related to agricultural production and factors that lead to its sustainability, and consequences of lack of sustainable production. In particular, the chapter focuses on gender factors in relation to resources allocation, farmer's educational level and economic factors and sustainability of vegetable and fruit production projects. The significant of this is to help develop a thorough understanding and insight into previous works and trends that have been recorded pertaining to the research problem.

2.2: Food Security

2.2.1: Food and Nutrition Security Definition, its Causes and Consequences.

Food security, at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996). Over 925 million people in the world are undernourished, while over 3 billion are malnourished in nutrient elements and vitamins. In sub-Saharan Africa an estimated 239 million people are chronically hungry (FAO 2010). Reports by FAO (2007) confirm that ten million hunger related deaths are recorded every year in the world with about half of them being in Africa. According to a report by United States Department of Agriculture (USDA), (2008), Sub-Saharan Africa (SSA) is the world's most food-insecure region. Half of the region's population was estimated to consume below the nutritional requirement of 2,100 calories per capita per day in 2008 and below 146 kg of fruit and vegetables per capita per year. In Kenya, currently over10 million people suffer from chronic food insecurity and poor nutrition, and between two and four million people require

emergency food assistance at any given time. Nearly 30% of Kenya's children are classified as undernourished, and micronutrient deficiencies are widespread (Kenya Republic of, 2008), and over 1600 food insecurity deaths are recorded annually, (Kenya Republic of, 2007). A growing problem of food and nutrition insecurity in Kenya is linked to agricultural production. About 80% of Kenya's population live in the rural areas where agriculture dominates.

Hunger is a major constraint to a country's immediate and long term economic, social and political development and UN (2005) estimates that losses in labour productivity due to hunger can cause 6-10% reductions in per capita gross domestic product (GDP), FAO (2004) also reports that undernourishment pre birth of young children is associated with poor cognitive development, resulting in lower productivity and lifetime earnings potential. United Nations Children's Fund (UNICEF) estimates that one third of the world's people do not reach their physical and intellectual potential due to micronutrient deficiencies caused by food and nutrition insecurity.

2.2.2: Urban and Peri urban Food Security

According to United Nations, it is expected that over half of the world's population will be staying in urban centres by the year 2015 (UN 1999), and according to the United Nations Department of Economics and Social Affairs, Population division, (2009), by 2030 the proportion of Africa's urbanized population is expected to reach 53.5 percent, compared to 39 percent in 2005, and by the same year, Kenya's urban population is expected to reach about 20.8 million. While insufficient data exists to accurately ascertain the magnitude of urbanization, available statistics indicate a current rate of urbanization in Africa is around 3.5 percent per year. That of Kenya and Kisumu in particular are 3.99% by 2010 (World Bank, 2012) and 2.8%, respectively. Urban poverty is increasing over much of the continent and

urban analysts believe the extent of urban poverty may be underestimated (Satterthwaite, 1995), and according to von Braun *et al*, (1993), the Urban poor spend a large part of their income on food. Maxwell argues that food security in African cities is relatively invisible to policymakers and is scarcely recognized in contemporary political debate. Atkinson (1995) also suggests that given the current trends of urbanization, the question of urban food security may become the "greatest humanitarian challenge of the next century"

Increased production, processing and marketing of high-value crops has the potential of enhancing dramatically the incomes of small farmers and creating employment for rural labourers and some urban poor in the developing countries, AVRDC (2007). Increased production also provides nutritional benefits to poor consumers. Thus, sustained vegetable and fruit production in the Kisumu peri urban where the study area falls is expected to be of great benefit to Kisumu city. If this study can determine the factors at the community level that hinder sustainability, it would have gone a long way in helping to ease the burden of food purchases at exorbitant costs as currently is the case in Kisumu city.

2.2.3: The Role of Vegetables and fruits In Food Security

Over 3 billion of the World's population is malnourished in nutrient elements and vitamins. According to Young and Jaspers (1995), malnutrition results from an inadequate intake of energy and protein, as well as other nutrients. The basic minimum requirement figure has been found to be 65 grammes of protein, and 2500 kcal of energy per capita per day, of which if consumed otherwise, leads to a state of malnutrition (WHO/FAO, 1993). In addition, WHO recommends 400g of fruits and vegetables per capita per day for a healthy life, and places low fruit and vegetable intake sixth among its 20 risk factors for global human mortality, just behind such better known killers as tobacco use and high cholesterol. The WHO/FAO report, "Diet, Nutrition and the Prevention of Chronic Diseases" recommends a population dietary

intake goal of more than 400 g per day for fruits and vegetables. A rapid analysis of the data from FAO in 2002 concerning the availability of fruits and vegetables (F&V) in the world, shows that North America, Europe, and Asia are over the critical level of 150 kg per capita per year (400 g/person/day), South-America just reaching this level, and Africa is staying far below with an average of around 100 kg per capita per year (Table 1, appendix 2). It is therefore, no wonder that micronutrient deficiency (mainly vitamins and minerals particularly iron, selenium, foliate, copper, zinc, iodine and vitamin A) is a serious problem in sub-Sahara Africa (Ayieko *et al.* 2003).

Kenya consumers take less fruits and vegetables as compared to FAO/WHO recommendations. Not just the quantities of vegetable intake are deficient; one of the other main nutritional problems in Kenya is the lack of variety in diet (Figueroa *et al.* 2009). Lasting long-term solutions to vitamin A deficiency rests on increasing the availability of vitamin A-rich foods sources such as leafy vegetables, yellow and orange fruits, since preformed sources of vitamin A such as eggs, milk, and animal livers are often inaccessible to the most vulnerable groups (Midmore et al, 1991). Household cultivation of vegetables and fruits (86% of the vitamin A intake in Asia and Africa comes from plant sources) has proved to be the most effective solution. In short, support for small-scale family food production can confer enormous health and economic benefits to the most deprived sectors of the developing world population at a relatively low cost while safeguarding the environment (*ibid*)

Horticultural production has been indicated as a sector that can provide real opportunities for enhancing farm incomes and reducing poverty in developing countries (Weinberger and Lumpkin, 2005). Aside from income generation, diversification of production increases employment for the rural poor (Von Braun, 1995). Ali and Abedullah (2002) demonstrated

the potential for rural employment that arises from diversification out of cereals to high-value commodities by comparing the labour intensity in both systems. High-value crops, compared to cereals, are more strongly interlinked with other sectors of the economy in terms of providing their outputs and receiving inputs from these sectors, and there is a stronger multiplier effect of the initial increase in income. It was estimated that a unit increase in initial income in cereals has a multiplier effect of two, while similar increase in vegetables will generate a multiplier effect of three (*ibid*). Joshi *et al* (2002) also reported similar results. Vegetables are said to provide about $650 value added returns to labour, land and management per farm yearly for peri urban vegetable farmers in Vietnam. Value added per hectare daily of vegetables is twice or more than the above figure for rice, providing employment for five or more times the number of workers despite very high labour use in rice (Jansen, 1996). Von Braun (1995), also showed that as a result of diversification to export vegetable production in Guatemala, employment increased by 45 percent on participants' farms. For these reasons, farmers all over the world may find it profitable to diversify their output into horticultural production. Most important is the fact that this diversified production will lead to food and nutrition security.

2.3: Socio-Economic factors and Food Production

2.3.1: Gender and Resource Allocation in Vegetable and Fruit Production

Much valuable research already exists on the different roles of women and men in various farm activities and non-farm activities like food preparation, household maintenance, and childcare, and there is now growing recognition that they often have very different rights and responsibilities with respect to resource use (Bryceson 1995; Dey 1981; McSweeny 1979; Whitehead 1985). In Sub-Saharan African countries, in which on average 29% of the gross domestic product (GDP) is generated by agriculture (World Bank, 2007), women contribute

about 60-80% (FAO, 1995) of the labour force used in the production of food destined for both household consumption and the market. However, due to customary norms, women's access and control over the resources of production are very limited. For instance, women's ownership and use of land is usually constrained by inheritance and land tenure laws, yet evidence has shown that agricultural production can be improved through equal access to production factors for men and women (Alderman *et al*.;1995; Quisumbing, 2003; Koopman, 2009). Horrell and Krishnan (2007) including an index of farm machinery as a control indicator and found significant bivariate differences between male and de facto female heads of household but not between male and de jure female heads of household. According to Gawler (2005), to promote sustainability of rural projects, the technology to be transferred must be selected on the basis of its appropriateness in terms of technical and financial criteria, plus social, gender and cultural acceptability. Since the 1990s, policymakers and development practitioners have highlighted the critical importance of gender in the implementation, evaluation, and effectiveness of programs across a range of social and economic sectors. *Gender and Agriculture*, a recent sourcebook produced by the World Bank (2009), and collaborating partners warn that the "failure to recognize the roles, differences and inequities [between men and women] poses a serious threat to the effectiveness of the agricultural development agenda". Similarly, the International Fund for Agricultural Development (IFAD) states that although female farmers are primary contributors to the world's food production and security, they are "frequently underestimated and overlooked in development strategies" (UN News Center 2010). In short, there is agreement that gender inequalities and lack of attention to gender in agricultural development contribute to lower productivity, lost income, and higher levels of poverty as well as under nutrition.

A review of 24 studies of technological input use, access, and adoption, majority of which examine more than one technological input, including 18 measures of fertilizer, 13 measures

of seed varieties, 7 measures of tools, and 3 measures of pesticide use, access, and adoption gave mixed results. Overall, where descriptive statistics for inputs were provided 19 (79 percent) found men have higher mean access and 5 (21 percent) found women have higher mean access to the given resource. Where further bivariate or multivariate analysis was conducted, 23 (59 percent) found gender indicators are not significant with respect to outcome measures when other factors are controlled for, while 15 (38 percent) found differences persist and men have higher outcome measures; one study (3 percent) found that women have higher outcome measures. These mixed results point to a need for further more focused investigations to identify real factors that determine sustainable production.

In the Zimbabwe study of agricultural differences in productivity, Horrell and Krishnan (2007) included an index of farm machinery as a control indicator and found significant bivariate differences between male and de facto female heads of household but not between male and de jure female heads of household. Babatunde and colleagues (2008) also found significant bivariate differences between male and female heads of household in value of farm tools owned in a sample of 60 Nigerian households. Pender and Gebremedhin (2006) found that female heads of households are negatively associated with the use of draft animals (oxen) in Ethiopia. This study also found that female heads of household achieve 42 percent lower crop yields than male heads of household with similar use of labor, ox power, and other inputs, thereby indicating a further gender-based disadvantage in productive use of inputs. These findings show the disadvantaged position of females in production.

Lado (1992) reports that women have been neglected in policies, programmes and services that are designed to improve food security. FAO (2011) further notes that limited access to agricultural inputs, especially for food crops, severely curtails women's potential productivity. A study done in Kenya reported that the average gross value of output per

hectare from male-managed plots was usually 8 percent higher than from female-managed plots, but when women used the same resources as men, their productivity would increase by 22 percent (Saito, 1994). The obvious results is the inability of women farmers to carry out their roles in agriculture and food security to optimum potential (IFAD 2007).

According to a study by GOK/GTZ, (2003), secondary position of women emerges repeatedly. First they are the most disadvantaged within the household- often having to ensure that they feed the rest of the family first before eating themselves, they are excluded from formal credit markets due to lack of collateral, or access to the title deeds for the land – and even when they manage to access the credit from informal sources, men sometimes demand a say in what the credit is used for. However, Altieri (2001) reports that "new sustainable agro ecosystems cannot be implemented without a change in the socioeconomic determinants that govern what is produced, how it is produced and to whom it is produced". In other words, to be effective, the development strategies should incorporate not only technological dimensions, but also social and economical issues. Based on the above, insertion of gender in the perspective of sustainable agro ecosystems both in its social and economical dimensions is very important. .

According to FAO, over 50% of the world's food, including vegetables and fruits, are produced by women, they also produce over 80% of food consumed in their households although these households make the over 925 million world population of food insecure people. Mosha, (1992) noted that in most developing countries, there are problems of a stereotypical model of society, where men are conceived to be dominant over women and therefore their needs and roles are different. The difference is, however, based on the intensity of work, decision making and access and control of resources. Men control most resources and decision making is vested in them. FAO/WHO (1992) states that access and

control of resources may be greater if the women earn the income, although this is not always the case, (World Bank, FAO, IFAD, 2009). In Kenya, it is said women are the core of agriculture production and it is estimated that 96% of rural women work on family farms; they provide 75% of labour in small holdings and are directly responsible for managing 40% of smallholding farms (Kilonzi 2007). This means that food security projects are clearly more equitable when they consider the different needs, constraints, opportunities and priorities of men and women. Gender disparities contribute to agricultural decline and harm society overall (Cleaver and Schreiber 1994; IFPRI 1995; Sigot et al (1995). Literature shows that when state or donor resources are largely directed at household, they are subjected to male control and this stops the women from accessing resources they need to improve their productivity (Koopman, 1992).

2.3.1.1 Gender Differences and Labour

Women often face difficult choices in their time allocation decisions. Although caution is needed in generalizing about people's time allocation patterns and burdens, recent data from different African countries support the popularly held belief that women not only work longer hours than men but also spend more hours in productive activities per day than men. According to Lastaria (2006), there has been a tendency over the last few decades for women to broaden and deepen their involvement in agricultural production as they increasingly shoulder the responsibility for household survival and respond to economic opportunities in commercial agriculture. FAO (1999) also shows that while the proportion of the labor force working in agricultural declined over the 1990s, the proportion of women working in agriculture increased, particularly in developing countries. In Africa and Asia, almost half of the labor force is women. According to FAO, over 50% of the world's food is produced by

women. This is supported by Quisumbing *et al.*, (1995) reporting that in Africa, female farmers provide most of the labor for food production.

In Kenya it is reported that women are the core of agriculture production where it is estimated that 96% of rural women work on family farms; they provide 75% of labour in small holdings and are directly responsible for managing 40% of smallholding farms (Kilonzi, 2007). Ayieko, (1995) also observed that females spent more time on agricultural food production than males in Njoro and Kikuyu areas. Women find themselves managing all crops on the farm and doing tasks, such as land preparation, that were traditionally male tasks (Njuki *et al*. 2004).these evidence show that women play a big role in agricultural production yet they are disadvantaged.

2.3.1.2 Gender and Access to Credit

A credit scheme study by Blackden *et al* (1999), showed that women work longer hours in the farms than men, and yet many agricultural credit schemes target men who are the title deed holders. In Africa, women are often farmers on their own, however, an FAO (1989), analysis of credit schemes in five African countries found that women received less than 10 percent of the credit awarded to male smallholder farmers.

2.3.1.3 Gender and Access to Land

FAO (1988) mentioned land as the most fundamental productive resource in the rural economy. In most developing countries women's lack of access to land rights whether as private property (inheritance), usufruct rights on common property resources or direct purchase/lease from the market, has an impact on their livelihood strategies, food security and social status, (Agarwal, 1994). Independent or joint land tenure for women can provide

them with access to collateral for bank loans (agricultural credit) in their own names or access to agricultural extension services and information systems which are typically targeted to men. But land reforms in several countries, while important for the poor and landless, have generally targeted male household heads, excluding women from legal tenure, which in turn, affects their claims to water for irrigation and their participation in community institutions (Deere and Leon 1998, van Koppen 1998). Horenstein (1989) reported that lack of land ownership limits the women's sense of security and motivation in agriculture, for example in cases of divorce, death or change of land use. Because of women's burden of other chores, they prefer to work on farms near the home as confirmed by a study by Bukh (1979). Generally, the agricultural labour force, mainly women, if deprived from land access leads to serious constraint on improving women's productivity and on the access of household to the important foods, which women produce (Dev, 1988). Joekes (1987) also asserts that any effort to increase food production and to raise food security of the poor rural households must address the needs of women.

2.3.1.4 Gender and Access to Irrigation

Irrigated agriculture provides some 40 percent of the world's food and consumes about 75 percent of the world's renewable freshwater resources (Chancellor *et al* 2003: 30).While women may share similar irrigation related needs on family plots – sufficient water for growing one or more crops a year – there may be differences of opinion regarding the timing and timeliness of water delivery (Zwarteveen, 1997). Women often have to balance other household tasks along with irrigation and usually find it difficult to irrigate at night, particularly if they are single women, because of social norms defining mobility and security concerns. Female-headed households usually have to hire (male) labour to help with irrigation or depend on social networks of family and friends during the peak season. Moreover, female farmers who grow the same crops as men, and should be entitled to receive

an equal amount of water, find it difficult to claim and receive their water entitlement, especially when water is scarce. In a study of peri-urban agriculture in Nairobi, a growing income-generating opportunity, many women farmers found the water pumps in use too costly and not easy to operate or manage (Hide and Kamani 2000). Women find themselves excluded from male networks, remaining at the back of queues for spare parts and repairs (Chancellor *et al*, 1999).

2.3.2: Education and Resource Acquisition and Utilization in Agriculture Production

The emphasis of education or public investment in the forms of human capital as a driving force for the growth of agricultural productivity can be dated back to the early 1960s (Schultz, 1963; Griliches, 1963). Education forms the basis for developing innovation science and technology which are useful in implementing both development and food security programs. Education may also indirectly increase output through its interaction with other institutional variables. For example, schooling may substitute for access to credit by providing the skills necessary to obtain waged employment, thereby generating cash to finance agricultural investments (Appleton and Balihuta 1996). Collier and Lal (1986) note the importance of non-agricultural income for farm productivity.

Some of the East Asian countries' growth in the agricultural sector appears to have been the result of remarkable gains in educational attainment (Jamison and Lau, 1982; Bosworth and Collins, 2007). Hussain and Byerlee (1995) note that evidence is mounting (for Asia at least) that returns to schooling in agriculture may be as high as for urban wage earners. Lockheed *et al* (1980) reviewed 18 studies representing 37 data sets (primarily in Asia) and found that most reported a significant positive effect of education upon output, though the results were mixed. They noted that a significant positive relationship was more likely to be found in areas where farmers are modernizing. On average for the studies considered, the increase in

production associated with having four years of schooling was 8.7 percent. However, for the group of studies concerned with the effects of education in traditional agriculture, the increase in output owing to four years of schooling was only 1.3 percent on average, as compared with a mean increase of 9.5 percent for studies of modernizing regions

Phillips (1994) reviewed 12 studies and was able to confirm the general trends noted above. However, his survey was sufficiently geographically diverse to show that (under certain conditions) the effects of schooling are stronger in Asia than in Latin America, irrespective of the degree of modernization. Appleton and Balihuta (1996) point out that two Kenya studies reviewed reported that education was not found to be significant in either. Appleton and Balihuta (1996) review several African studies and found that the effect of schooling on agricultural output is usually not significant, though in some cases it can be large, indicating that there is substantial variation in returns to schooling both within and between the areas surveyed. One of the reasons the authors suggest for these results is wide variation in the actual effects of education on agricultural output in different areas and under different farming systems. Schultz (1964; 1975) suggests that farmers operate more efficiently in steady state traditional agriculture than under the conditions of modernization, and that education may help farmers cope with 'disequilibria.' If this is true, more schooling is needed in a rapidly changing environment. Studies all focused on productivity and not resource allocation which is the focus of this study.

In a study of farm households in 14 Ethiopian villages, (Weir 1999) found positive and significant returns to additional years of formal schooling in terms of increased output of cereal crops. The aim of this study is to determine the effect of the level of education of a farmer on acquisition and utilization of resources for production of vegetables and fruits.

2.3.3: Economic Factors and Resources Availability for Agriculture Production

2.3.3.1: Land Ownership and allocation to fruits and vegetables

Land use as we see it today is, in many ways, a combination of both its natural genesis and the human influences which have been brought to bear on it in the past and of those which are still active in the present. This refers to any kind of permanent or cyclic human intervention. Land use then becomes the application of human controls, in a relatively systematic manner, to the key elements within any ecosystem, in order to derive benefit from it (Lundgren 1975). It has also been argued that with relevant technology, coupled with training, credit, access to the necessary inputs, appropriate pricing policies and assured access to markets, there are a wide variety of farming systems by which one hectare of land or less could provide a family with sufficient food and also supply a cash income for purchasing the necessities of life (Smith 1976).

Bondestand and Berston (1981) have actually argued that pressure on land has little to do with population growth and more to do with the inequitable distribution of this resource. In many farming societies, the amount of land available to the farmer is of great importance, particularly where the main factors of production are land and labour. While a number of processes determine the size of farm holding, family size is perhaps the single most important. Where population is increasing with no commensurate increase in the cultivated area, farms may get smaller.

Grigg (1980) has even argued that sub-division of farms, largely a culturally derived practice, does not necessarily lead to a fall in output. Productivity per hectare is higher on small than on large farms, as farmers are compelled to work their land more intensively or switch to high value crops to raise their incomes. Subdivision of land could reduce farm size to a level

where it is not possible to provide an adequate subsistence, and so a quasi-landless population grows. Land issues, ownership, fragmentation and land tenure are major obstacles to achieving food security says Thompson (1996). A study established that across all provinces in Kenya, the poor produce less than the non-poor because the latter hold less land but their yields are higher (Republic of Kenya, 1999). The same report further concluded that access to more production land, irrigation, access to credit are important determinants in peoples' ability to avoid food insecurity and hence avoid poverty.

Higher income farmers may be less risk averse, have more access to information, have a lower discount rate and longer-term planning horizon, and have greater capacity to mobilize resources (Hoekstra, 1985; CIMMYT, 1993). Masawe, (1992), also asserts that availability of financial services may enable a farmer to acquire credit, which is normally only acquired by risk averse farmers. According to Ntege-Nanyeenya *et al* (1997), awareness of profitability or potential preferential benefits of a new technology is necessary to trigger the diffusion of an agricultural innovation. However, for sustainability, the new technology must be compatible with farmers economic resources and supported by institutions responsible for providing inputs and technical advice.

A study by Wheeler and Ortman (1990) in Kwazulu found that the most success determining factors in cotton adoption were those that related to human capital endowments and economic status of the household. These findings are further supported by findings from CYMMIT (1993), that innovations that are perceived to be economically compatible with the farmer's values and resources are often readily adopted. Vegetable and fruits are high value crops whose production is labour intensive and quite a lot of agrochemicals like fertilizers and pesticides are used for high yields to be achieved. So the economic status of a household is likely to determine sustainable production or not.

A study by Von Braun, (1994), found that production of export vegetables and fruits by small-holder farms in Guatemala appear to have had a positive effect on household income and food security, particularly for the smallest farms. Another study by Songa and Gikonyo (2005) reported that through vegetable and fruit production, food security is assured, through employment, food availability and even through export earnings. Another study also showed that increase in vegetable acreage on small and marginal farms will not only provide gainful employment for under-utilized family labor but would also reduce income disparity among farms of differing sizes (Bathi, 1993).

Neghanjwa (2005) undertook a study to examine key variables affecting improvement of food security through livestock and reported that acquisition of formal education, land size owned are significant factors that enhance food security in livestock keeping households. The study further found out that men wield power over land and livestock ownership plus use of benefits with disadvantage accruing to women. Whereas this study looked at food security in terms of livestock rearing with a focus on gender relations and education, the current study is focusing on socioeconomic determinants of sustainable vegetable and fruit production resource availability for vegetable and fruit production.

Mativo (2002) carried out a study in Mumoni Division, Mwingi district to investigate the extent of household food insecurity among the small-scale farmers; to determine the relationship between selected demographic and socio-economic characteristics of the small-scale farmers and their households' food security; and to determine the relationship between selected farming practices and farm-related factors of the small-scale farmers and their households' food security. Significant differences in household food availability were noted for selected variables i.e. manure application, ownership of draught animals and the ownership of an oxen plough. This study confirms the importance of farm equipment and

inputs in sustainable production and thus the households food security, however the approach determined food availability where the current study uses the process of production approach

.

Omonona and Agoi, (2007) carried out a study on food security among Nigerian urban households in Lagos State. The study used Food security index to classify households into food secure and food insecure categories. Results indicated that food insecurity decreased with increase in household income, but increased with increase in age; is higher at female headed households, and decreases with increase in level of education. Whereas this study at the per capita food expenditure and not household crop resource allocation for food production, although the two studies focus on socio economic factors at the household level.

Pandit et al (2012) carried out a study aiming to examine the food security trends in Pakistan in general, and to find out the household level food security and its key determinants in the rural areas of the Punjab Province. In stage one the food security status of households was calculated using the caloric intake method. The second stage focused on identifying the socio-economic factors affecting food security using the logistic regression. The secondary data revealed that Pakistan is a food sufficient as well as food secure country at the national level. Econometric analysis revealed that monthly income, livestock assets, joint family system and education levels were positively impacting the rural household food security. Greater household heads' age and family size had negative impacts on household food security. Although this study looked at the socio economic factors at household level, the focus was on livestock assets rather than crop production and in particular, vegetable and fruit production.

Tefera (2010) carried out a study to assess the role of urban agriculture in attaining urban food security with special reference to smallholders in Adama town. Household food balance

model was used to analyze the household per capita dietary energy contribution of urban agriculture in Adama. The study found that urban agriculture plays a great role in attaining urban household food security. Over 40% of the surveyed sample households were obtaining well over the nationally set minimum dietary energy requirement only from their urban farmlands. This study confirms the fact that household food production can help in assuring food security, it did not go down to look at factors that affect the production, and in particular the socio economic factors.

Knowledge gaps

The studies have also identified the disadvantaged positions of women and the youth in terms of resource allocation. This researcher would like to find out how education influences resource acquisition and utilization for sustainable production of vegetables and fruits. Sustainability of agricultural-based projects has been hampered by resource scarcity as has been found out by many studies conducted on sustainable food security programme to ascertain if these findings are true for vegetables and fruits and for Kadibo Division and help generate knowledge on how to cope with these issues to ensure sustainable food security. This researcher had set out to look at food security with emphasis on sustainable vegetable and fruit production projects. There have been a lot of research on vegetables and fruits but many have focused on agronomy, varieties and other aspects while none has looked at socio economic determinants of their sustainable production for food security. A lot has also been researched on gender differences but they have mainly focused on general agricultural output whereas the current study intended to establish resource allocation that results in to production. This study therefore, seeks to fill the highlighted gaps in knowledge.

2.4: Situation Analysis of Vegetable and Fruit Production and Availability in the Study Area and Kisumu City

The situation analysis of vegetable and fruit production in the study area shows the current level of production compared to the demand for the commodities within the study area as well as the list of organizations and NGO which are supporting interventions on vegetable and fruit production in various ways in the study area

2.4.1: Vegetable and Fruit Production in Kadibo Division

Despite the potential that exists for vegetable and fruit production in the study area, the production levels are still very low both in terms of area and yield.

Table 2.1: Annual Vegetable and Fruit Production in Kadibo Division - 2008

Crop	Target Ha	Target yield (tons/ha)	Target Production (tons)	Ach (Ha)	Ach (Tons/Ha)	Ach Production (tons)
Tomatoes	450	40	18000	35.4	11	389.4
Kales	750	30	22500	118.2	16	1891.2
Capsicum	55	10	550	2.8	3	8.4
Asian Vegetables	50	10	500	0.3	6	1.8
Local Vegetables	200	10	2000	60	6	360
S/potatoes	250	25	6250	360	10 T	3600
Butternut	10	19	190	5.2	18	93.9
Water Melon	42	20	840	12.7	10	127
Totals			50,830			6471.4

Source*: Kadibo Division Annual Report 2008& FAO Statistics*

Note: Ach – achieved, Ha – hectares, S/potatoes – sweet potatoes, Nat – National, A-vegetable

Tables 2.1 above. Shows area under these crops during the year was far below what was targeted during the year 2008. Except for sweet potatoes, none of the crop targets in terms of area under crop were achieved and for many of the vegetables and fruits, the achievements fell far below the targets for the year under review. The total production of annual vegetables and fruits is only 6471.4 tons against a population of 61328 people which requires 8954 tons of vegetables per annum (Kenya republic of, 2010). There is a shortfall of 2482.6 tons.

Table 2.2: Kadibo Perennial Fruit Production for the year 2008

Crop	**Target (Ha)**	**Target y/ha**	**Achieved** (Ha)	**Yields/Ha (Tons)**	**Tot. Prod (Tons)**
Mangoes	1	15	11.5	12	138
Bananas	15	25	55	22	1210
Avocadoes	2	14	0.3	12	3.6
P/fruits	4	10	10	10	100
Pawpaw	2	25	7.5	22	165
Pineapples	3	43.8	4	14	56
Citrus	2		3	5	15

Source*: Kadibo Division Annual Report 2007.*

As is evident from Table 2.2, the production levels for fruits are very low. Achievement in hectares in column 4 and yields in column 5 giving a very low total production as shown in column 6 both fall far below the targets for the period reviewed. To meet the demand for these crops within the study area and in Kisumu town, traders, have to seek the produce from very far off districts. This makes the commodities very expensive for the resource poor inhabitants both in the study area and in Kisumu city, and aggravates the food and nutrition insecurity. Climatic conditions n the area can allow for production of a number of vegetable crops from the same plot in a year. Projects that have been implemented in the study area include *Njaa Marufuku Kenya*, a pro-poor project whose main objective was to eradicate hunger and poverty (MDG1**.** *National Agriculture and Livestock Extension Programme*,

(NALEP) a government programme which aims at building capacity of farmers' agricultural production for income generation and food security. *Orphaned Crops Project* targets traditional vegetables, cereals and root crops for food security. Gains made by the project have not been sustained as food insecurity persists.

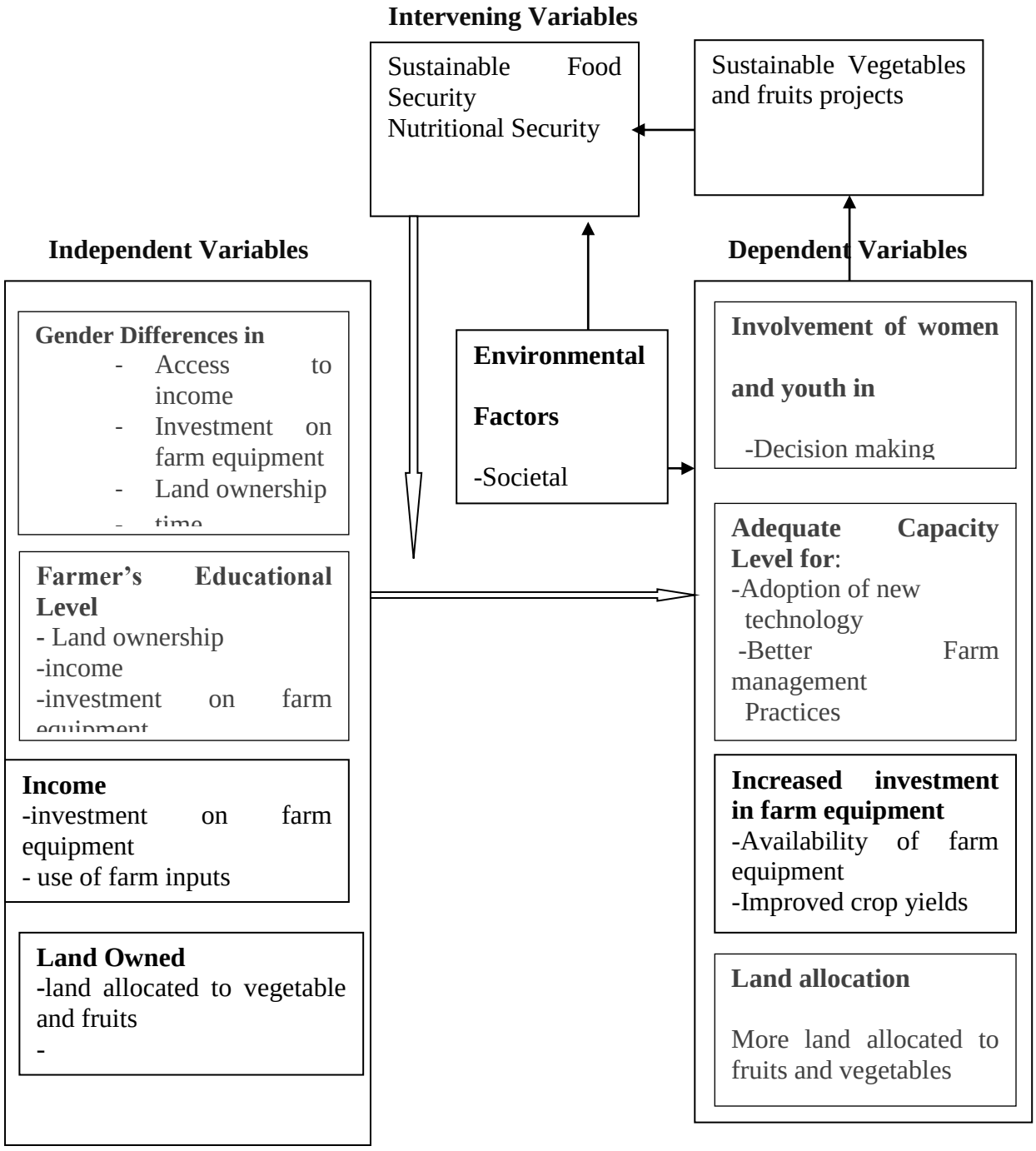
Table 2.3: Stakeholders in Vegetable and Fruit projects in the Study Area

Stakeholder	**Activities**	**Remarks**
Sana International	Capacity building and Environmental conservation	Works with peri – urban and rural farms especially youths
Care-Kenya	Training and seed supply	Capacity building in marketing
VIRED International	Inputs (seeds) provision	Works with groups
Ministry of Youth Affairs	Provides loans to youth groups for crop production	
Catholic Church	Capacity building and vegetable seed provision	Targets youths widows In the study area
Lake Basin Development Authority	Provision of Fruit tree seedlings	
HCDA	Capacity building and advice on marketing	Promotes production and marketing of horticultural crops
Kodiaga Prison	Supply of fruit seedlings	
SCC-VI	Provide horticultural seeds	
AGROFORESTRY	also capacity building	

Source: *Kadibo Divisional Annual Report 2008*

There are a number of stakeholders providing all sorts of support from capacity building to seed provision in the study area, as can be seen from Table 2.3 above. The high stakeholder concentration should have improved production in order to have sustainable food production. Although many of the players record success at the end of their programmes, the gains have not been sustained.

2.5: Conceptual Framework



Source: Researcher's Own Conceptualization

Figure 1: Conceptual Framework of Socioeconomic Determinants of Sustainable Vegetables and Fruits Production

It has been confirmed that production and consumption of vegetables and fruits contribute significantly to food and nutrition security. The framework above shows the relationships

between the determinants of sustainable vegetable and fruit production projects and food and nutrition security. Gender differences determine access to resources like land, income and investment of farm equipment. If all farmers have access to these factors, then females and the youth will be involved in production decision making and more accessibility to production resources, there by leading to increased and sustainable production of vegetables and fruits. The conceptual framework hypothesizes that the gender differences determine whether women and the youth are involved in important decision making that may determine their access to resources for sustainable production of vegetables and fruits. If they get involved, then they can access all these resources and this will result in sustainable vegetable and fruit production project which finally results in food and nutrition security.

Education, on the other hand, determines the extent to which the farmer can access and have control of production resources like land, income and farm equipment. The framework hypothesise that education influences peoples' attitudes and knowledge, thereby making them able to see things differently, and thus may be able to make more informed decisions. Informed decision may help in ownership of more land, income and farm equipment. It is also hypothesized that educated farmers are able to make better allocation of resources in such a way that may lead to sustainable vegetable and fruit production for attainment of food and nutrition security. Income is hypothesized to determine resources availability for sustainable vegetable and fruit production as this makes it possible to purchase other production inputs as well as investing in modern technology. Investment in farm equipment also affects resource available for sustainable production. Land ownership is further hypothesized to influence resource availability for sustainable production of vegetable and fruits. When the farmers have own enough bigger parcels of land, it is expected that they are able to allocate more for vegetables and fruits.

Environmental conditions can create chronic vulnerability in several ways. If the natural resource base is poor or deteriorating, people often have limited opportunities for earning their livelihood. Environmental factors therefore, are the extraneous variables that may affect sustainability either positively or negatively. Lastly, there is also an intervening variable in the form of sustainable food production itself. Sustainable food availability results in food and nutrition security for people to be able to go to school and learn, to acquire income for investment in farming and even to be able to acquire any resources that can be used in production.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter provides an overview of the research methodology employed by the study. It gives a description of the research design used, the target population studied, the sample size and sampling procedure applied, data collection methods and instruments used. Validity and reliability of the instruments used are also featured in this chapter together with data analysis and presentation procedures.

3.2: The Study Area

3.2.1: Location and Size

Kadibo Division is located in Kisumu East District, Nyanza Province in the Republic of Kenya. It is located between longitudes 30° and 35° East of the Greenwich meridian. It is situated along Lake Victoria and has an area of 162.7 Sq. Km, with a population of about 54,845 people (Republic of Kenya, 2010). The division has 11, 054 households which formed the unit of analysis. Part of the division lies within Kisumu Municipal Council boundaries. It was chosen for the study because of two reasons namely, it represents many areas in Nyanza, and Kenya at large; with high potential for vegetable and fruit production, high food insecurity and yet there have been many programmes and many stakeholders targeting food security especially in terms of vegetable production with little sustainability. The study area is adjacent to Kisumu city which has a population of approximately 500,000, high urban poverty levels of 45%, and unemployment level of 30%. The food poverty level is 41%, compared to Nairobi (8.4%) Mombassa (38.6%) and Nakuru (30%) . The rate of urbanization of Kisumu city is an all time high of 4 percent per annum, and so sustainable food security is a major socioeconomic issue. Many residents of the study area rely on the city for menial jobs for income and for the market for their produce.

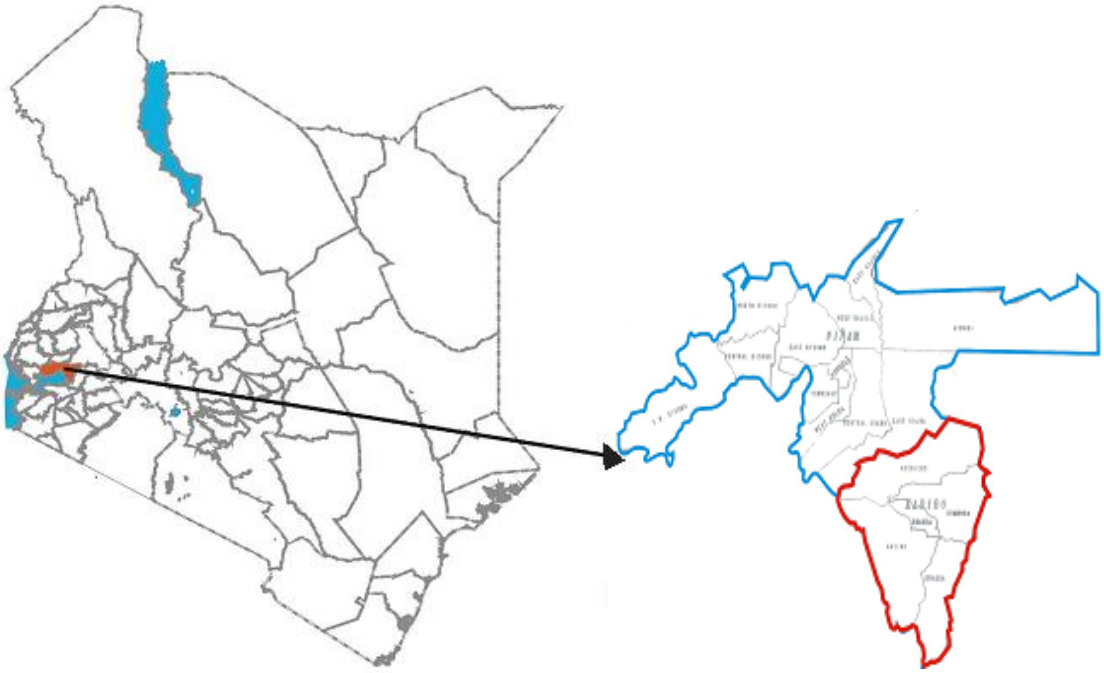


Figure 2: Map of Kenya Showing Kisumu East and the Study Area

Source: Adopted from Kenya Districts Map (2008)

In the map of Kenya above to the left, Kisumu East District is shown shaded red, and in the enlarged Kisumu East District map, the study area is marked with a red boundary.

3.2.2: Topography

Kadibo Division falls within the Kano plains, which is a low depressed area poorly drained and prone to flooding. Its altitude is 1600m above see level. The flooding results into heavy siltation giving rise to extensive lakeside permanent and/or seasonal swamps. This normally destroys crops, houses and animals and also exposes the population to waterborne diseases. The major soil type is the black cotton soils which gets water logged during the rainy season.

3.2.3: Rainfall

The lowland forms a trough of low rainfall, receiving mean rainfall of 600mm – 1630mm per annum. The division experiences two rainy seasons with long rains coming in March/May and short rains in August/September. The short rains are much less averaging 450mm –

600mm. January- February is generally dry although the division does not experience a completely dry month. Rainfall is unreliable and poorly distributed making rain fed agricultural production very unreliable.

3.2.4: Economic Attributes

Residents of Kadibo Division are small scale farmers with average farm holdings of 1 ha. Farming forms the main livelihoods of the area. The main crops grown are sorghum, maize, paddy rice in two major irrigation schemes, West Kano and South West Kano. The West Kano Irrigation scheme is managed by the National Irrigation Board and in the recent past has done so well since the board received the economic Stimulus Funding for rice development. The only challenge is that the bulk of the harvested rice finds its way right out of the district leaving the farmers still food deficit. South West Kano on the other hand is a smallholder irrigation scheme where there is a board of directors that manage the farmers' affairs. Cotton is grown, but due to marketing problems, production of the crop has been on the decline. Various vegetables and fruits are grown in the study area to a very small scale. Tomatoes, water melon and butternut are picking up in the irrigation schemes during the rice off season. Fishing is practiced only by those who reside along the lake shore, but even those who fish still engage in some form of farming as well. Fish catches have been going down due to overfishing and use of wrong fishing gear. Being a peri-urban division with high poverty levels and low agricultural productivity, many of the residents get employment in the adjacent Kisumu city for their livelihoods, however the city also does not offer much due to lack of industries.

3.3: The Research Design

The study was conducted through a case study research design. Merriam (1988) defines a case study as "an examination of a specific phenomenon, such as a program, an event, a process, an institution, or a social group", and further points out that the case study's unique

strength is its ability to deal with a full variety of evidence, including documents, artefacts, interviews and observations. This study used documents, interviews observations and Focus Group Discussions. The multiplicity of the evidence used makes this study conform to a case study. However, Stake (in Denzin & Yin (1984) offers a more technical definition by equating a case study with an empirical enquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used. The purpose of a case study is to gain an in-depth understanding of the situation and meaning for those involved. The interest is in process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation (Laws and McLeod, 2006). Sander's (1981) commented that, "case studies help us to understand processes of events, projects, and programmes and to discover context characteristics that will shed light on an issue. In this case the aim was to understand the process of vegetable and fruit production projects which involves use of inputs and management, and to understand the social factors that play in the production. Kenny and Grotelueschen (1980) supported choosing a case study design when doing an evaluation as it enabled "better understanding of the dynamics of the programme. The design was most suitable for this study because the study took vegetable and fruit production projects as a case of food and nutrition security projects, and the groups that formed the sample as a case of the many groups within the division that are involved in these projects. The design made it possible to understand determinants of sustainable food security projects in Kadibo Division through the case of vegetable and fruit projects. The study was divided into three parts, namely; review of document and other relevant literature, field work for primary data collection, and lastly data analysis, discussions, conclusions and recommendations. Respondents were assured of confidentiality and their informed consent was sought before data collection started.

3.4: Population and Sampling Procedures

3.4.1: Target Population

This study was conducted in the peri-urban division of Kadibo, with a population of 61,328 people, however, the target population was the 120 people.

3.4.2: The Sampling Frame

The population was represented by a sample of households from farmers groups and focus groups from the same groups. The farmer groups were chosen for the study because of two reasons. First, the groups are common throughout the study area, and are widely recognized as grassroots units through which change can be initiated. They are considered important especially with regard to family food production and nutrition because in most cases they are made up of women. Secondly, the groups have been used by several projects as entry points to the community and a lot of funding for food security initiatives has been disbursed through these groups. The study worked with 8 farmers groups, one from each of the eight locations of the study area, this meant that all the locations were represented in the study.

3.4.3: The Sampling Technique and Sample size

The researcher used the Divisional Agricultural office to identify groups in every location which has been involved in vegetable and fruit production projects, either by NGO or government. Purposive sampling technique was then employed to obtain 8 farmer groups, (one from each of the 8 locations of the study area). Purposive sampling ensured that study only dealt with farmers groups which have been involved in implementation of vegetable and fruit production projects. It also ensured that each location of the division was given an equal chance of participation. The membership of these 8 farmer groups formed the sampling frame. Through a saturated sampling technique, all members of these 8 groups formed the 120 households that were interviewed (approximate group membership is 15 people). Saturated sampling ensured that every member of the groups identified was included in the

study. Group officials together with opinion leaders and other relevant village members then formed focus groups for discussions. Snowball sampling was used to get key informants that were interviewed.

3.5: Data Collection Instruments

Secondary data collection involved evaluation of literature on vegetable and fruits, food security and the socio-economic factors that are involved in their sustainable production. The sources of secondary data included academic reports, journals, periodicals, government reports, newspaper articles that address the subject of food security in the world, Sub-Saharan Africa, Kenya and even Kisumu. The literature was sought at the Maseno University Library, District Information Development Centre Kisumu and the internet. Primary documentary data was collected from District Agricultural office while primary field data was collected by the use of a pre-coded questionnaire with both closed and open ended questions. Focus Group Discussions (FGDs) guide (Bader & Rossi, 1998), and interview schedule were used for data collection from Focus Groups and key informants respectively. These enabled collection of both qualitative and quantitative data on various social and economic characteristics such as farming resources, land ownership, age, education, lan allocated to vegetable and fruit production and others, for the study.

3.6: Validity of Instruments

Validity is the degree to which a study actually measures or reflects what it intends to measure while reliability refers to the consistency and conformability of a research finding. In an effort to increase validity and reliability of the data the effect that researchers, participants, measuring instruments and contexts have on the quality of data were taken into account. One factor that can affect validity and reliability was wrong perception of respondents. Some of the respondents were suspicious of the study, mistaking it for an initiation of another project. However, in spite of the above mentioned problems the following precaution measures were

taken in order to maintain and ensure the reliability and validity of the outcome of this research. A pretest of the instrument was done for verification purposes. The revised questionnaires and interview schedule were then used for field data collection. The questionnaire were administered in the home environment to minimize any unwillingness to participate; Focus groups discussions were used to obtain opinions on issues related to vegetable and fruit projects and food security in general projects effectiveness. The insights obtained from both the combined use of qualitative and quantitative methods simultaneously increase the strength of the conclusion.

3.7: Data Analysis and Presentation

Qualitative data gathered from key informants and the review of documents was compiled, organized, summarized and interpreted on the basis of vegetable and fruit production for sustainable food and nutrition security and the specific objectives. The questionnaire was edited to check on clarity, completeness and consistency in answering the research questions. Quantitative data were analysed using descriptive statistics such as means and percentages. Correlation was used to assess the association between the study variables. This was meant to test for the existence of multicollinearity before establishing their relationships. Regression analysis was used to establish the relationship between dependent variables and the independent factors and to show the magnitude of effects of the independent factors on the dependent variables. The results were presented using percentages, tables and graphs.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1: Introduction

This chapter presents the results of the analyses carried out on the various study variables and discussion of the results. The first part gives an overview of the factors that the study sought to investigate. The subsequent sections cover the results of the study which are organized according to themes derived from the study objectives.

4.2: Overview

This study investigated socio-economic determinants of sustainable vegetable and fruit production projects in Kadibo Division. This is in light of the food insecurity that persists in the urban and peri urban parts of Kisumu East despite numerous food security projects that have been and are being implemented in the area. The chapter presents the results of analyses, and discussions on the same.

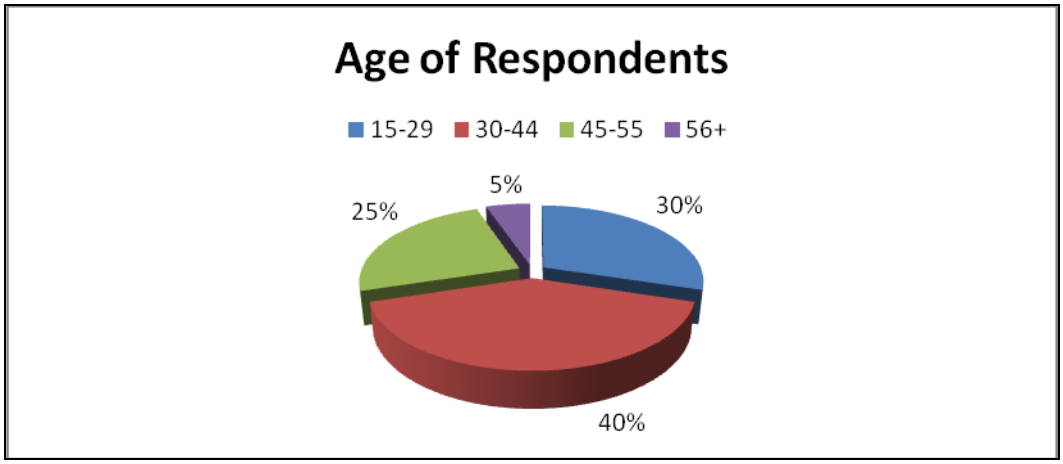
4.3: Gender Difference and Resource Allocation in Vegetable and Fruit Production at Community level.

The first objective of the study was to examine how gender differences affect resource allocation for vegetable and fruit production at the community level. The resources to be examined here are land, income and investment in farm equipment, the farm equipment looked at were ox plough, irrigation kit and knapsack sprayer, all which are very important for horticulture production. To achieve this, the sex, and age of each respondent was recorded. The respondents were also asked questions on their marital status, their average income and amount invested on farm equipment, which specifically was valued at the cost of an ox plough, a simple knapsack sprayer and an irrigation water pump. Data collected was analyzed under the research question “How does gender difference affect resource allocation for vegetable and fruit production at the community level?” Regression was used in order to

determine the magnitude of effects of gender on the utilization of land for fruits and vegetables production. As required in statistics, a dummy variable was used, where in the first case, the females respondents were assigned one (1) while the males were assigned zero "0" and in the second case, the males were assigned one (1) and the females assigned zero "0". These together with other social factors were keyed into the SPSS computer package and a regression model established. The results were presented here below;

4.3.1 Resource Allocation and Age

The following are the findings on objective one which sought to answer the question on gender difference and resource allocation.



Source: *Field Data, July 2009*

Figure 3: Age of Respondents in years.

Figure 3 shows the age of the respondents. Response on objective 1 reveals that up to 40%, fall in the age group 30 – 44 years. There is a fairly big percentage (30%) falling in the age group of 15 – 29 years, which represents the youth involved in vegetable and fruit production. Those in age 45 – 55 years is 25% and 56 plus is 5%. This is an active age group that can engage in farm production and be able to sustain production. The findings imply that age is not a hindering factor for production because most of the respondents fall within the active age group where they can reasonably engage in agricultural production.

Table 4.1: Average Monthly Income and Age

Age (years)	**Mean(KShs)**	**N**	**Std. Deviation**
15 – 29	4581.08	37	1777.61
30 – 44	4903.13	48	2542.92
45 – 55	4687.72	29	1908.69
56+	3166.67	6	983.19
Total	466.95	120	2132.16

Source: *Field Data, July 2009*

Table 4.1 above indicate that average monthly income is highest at age 30 to 44 years at Kshs. 4903.12, followed by age 45 to 55 years at Kshs. 4687.73. The lowest monthly income is seen at age 56 plus. This is lower than that of 15 – 29 at Kshs 4581.08. The crops of the young males were reported from all group discussions to do better than crops of the other farmers because they are the ones who have enough money to purchase the necessary farm inputs for vegetable and fruit production.

Table 4.2: Investment on Farm Equipment by Age

Age **(years)**	Mean**(KShs)**	N	Std. Deviation
15 – 29	3432.43	37	5654.60
30 – 44	5127.71	48	5718.77
45 – 55	2782.79	29	4609.95
≥56	2000.00	6	3478.51
Total	3881.92	120	5409.29

Source: *Field Data, July 2009*

Table 4.2 reveals investment levels of different ages. The investment on farm equipment is highest at ages of 30 – 44 years with Ksh 5127.71 while it is lowest at 56+ years with Ksh 2000 only. Participants in focus group discussions also reported that the young males are the

owners of both water pumps for irrigation and spray pumps for crop protection, as such the other farmers normally hire the equipment from them and for women, and they also provide the labour for spraying as well as labour for irrigation.

Table 4.3: Amount of Land Acquired by Age

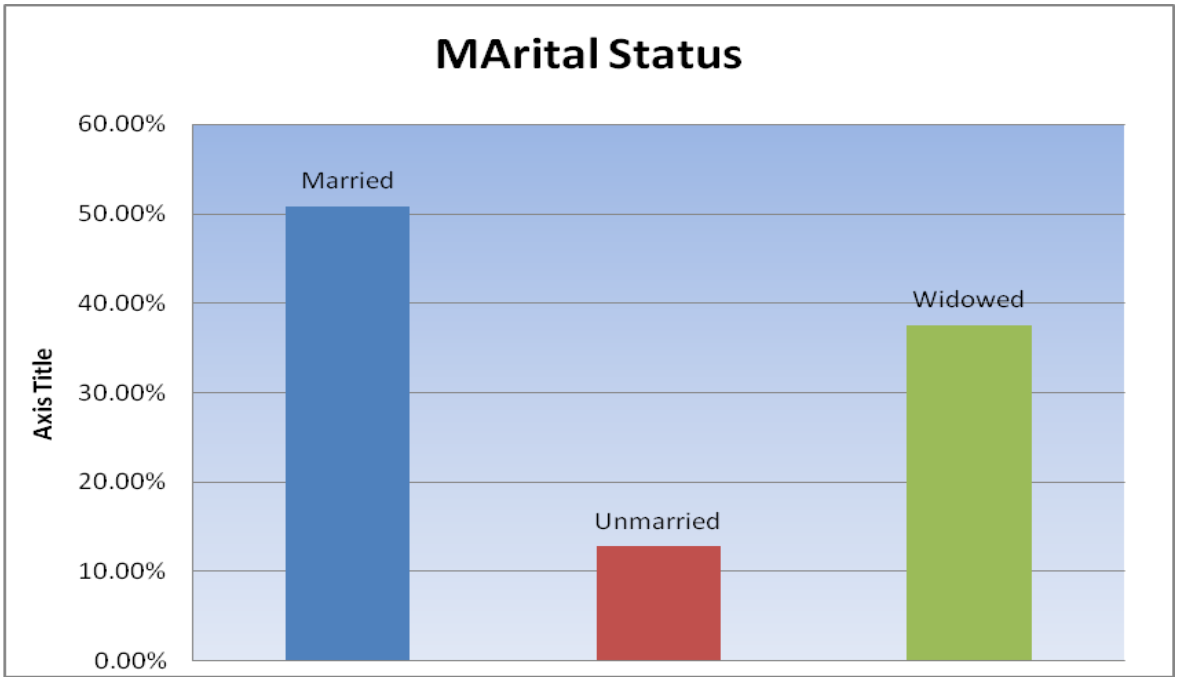
Age (years)	Mean (acres)	N	Std. Deviation
15 – 29	1.91	11	.70
30 – 44	2.00	60	.84
45 – 55	2.09	33	1.01
56+	2.13	16	.81
Total	2.03	120	.87

Source: ***Field Data, July 2009***

Table 4.3 on the previous page shows the amount of land acquisition by age. As age increases, the amount of land owned also increases. Those of age 15 to 29 years had the smallest land parcels while those of age 56 plus had the biggest parcels. This implies that land is still held by the old people unless a young person buys his/her own. These findings on age imply that there is certain age at which farmers are disadvantaged for vegetable and fruit production. Age 30 – 44 years is the most favoured in terms of all factors. Age 56 and beyond are only favoured in terms of land but they do not have enough income to invest in production. The results therefore imply that the disadvantaged group cannot produce sustainably hence the persistent food insecurity in the study area.

4.3.2: Resource Allocation by Marital Status

The study looked at resource allocation against marital status. The tables that follow below give the findings of this aspect of ender.



Source: *Field Data, July 2009*

Figure 4: Marital Status of the Respondents

Figure 4 above shows the marital status of the respondents. From this, it can be said that the majority of respondents are married. However, there is a big percentage of widowed respondents at 37.50%. This could be a big challenge for production as these group of people normally have several socioeconomic challenges.

Table 4.4: Average Monthly Income by Marital Status

Marital status	Mean (KShs)	N	Std. Deviation
Married	3819.67	61	2366.49
Single	4466.67	15	1797.49
Widowed	3545.45	44	1620.43
Total	3800.00	120	2057.37

Source: *Field Data, July 2009*

Table 4.4 above indicates that those who are single have the highest monthly income followed by those who are married at Kshs. 3819.67 and the widowed have the lowest monthly income at Kshs. 3545.45. The implication here is that the widowed are

disadvantaged in terms of capital that can be used for purchase of farm inputs. They may have the use of land but lack other vital production resources, and this would be a big hindrance to sustainability of any food security initiative. The implication of these findings is that in the study area, although the widowed respondents make a big percentage of the population, they are seriously disadvantaged for vegetable and fruit production.

Table 4.5: Investment on Farm Equipment by Marital Status

Marital Status	Mean (Kshs)	N	Std. Deviation
Married	5142.64	61	5563.08
Single	3366.67	15	6104.64
Widowed	2309.77	44	4558.90
Total	3881.93	120	5409.29

Source: *Field Data, July 2009*

The findings on marital status and investment on farm equipment are presented in Table 4.5 above. The findings imply that in the study area, although the widowed respondents make a big percentage of the population, they are seriously disadvantaged for vegetable and fruit production as a result of low investment on farm equipment. Yet vegetable production, according to Nurah (1991) is capital intensive; equipment is needed to till the land, to irrigate the crops, to apply crop protection chemicals and to process the harvested products. When a farmer is disadvantaged in income and investment, they cannot participate in sustainable production. Although the study has not established the significance of the difference, the results show an indication that disparities exist amongst the different marital status.

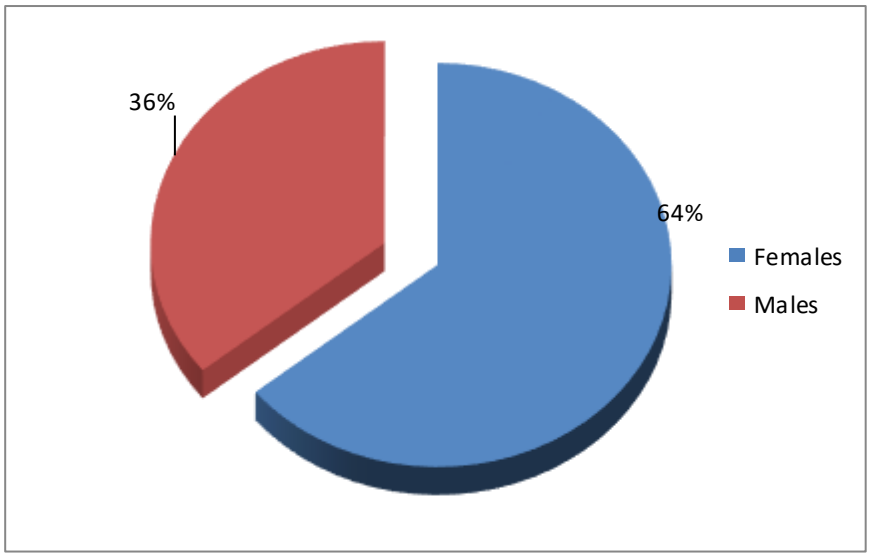
Table 4.6: Amount of Land Acquired by Marital Status

Marital Status	Mean(acres)	N	Std. Deviation
Married	2.6	61	1.37
Single	2.50	15	0.71
Widowed	2.41	44	1.05
Total	2.57	120	1.30

Source: *Field Data, July 2009*

Analysis of Marital status and amount of land acquired shows that those who are married have bigger sizes of land at a mean of 2.6 acres, followed by single at 2.5 acres, then the widowed have the smallest sizes of land at 2.4 acres, this is shown in Table 4.6 above. Because majority of respondents are women, it means that the majority of the widowed are also women. The study has not established whether or not the means were significantly different, however, these findings show some kind of disparities in land ownership. This finding could therefore imply a disinheritance of the widowed women once their spouses die or sale of land to take care of other urgent needs like school fees.

4.3.3: Resource Allocation and Sex of the Respondent



Source: *Writer's sample survey, July 2009*

Figure 5: Sex of the Respondents

Figure 5 shows the representation of sexes in the groups that were studied. These findings implies that the farmers groups have higher numbers of females, thus most food security projects are implemented by females them.

Table 4.7: Average Monthly Income by Sex

Sex	Mean(KShs)	N	Std. Deviation
Female	4516.80	77	1912.49
Male	6643.00	43	1912.49
Total	4664.95	120	2132.16

Source: *Field Data, July 2009*

Table 4.7 shows that males have average income of Ksh. 6643.0 while the females have only Kshs.4516.81.

Table 4.8: Average Investment on Farm Equipment by Sex

Sex	Mean(KShs)	N	Std. Deviation
Female	3404.29	77	5244.45
Male	4737.23	43	5654.00
Total	3969.43	120	4630.28

Source: *Field Data, July 2009*

Average investment by sex is shown in Table 4.8 above. These findings were also confirmed from focus group discussions where women reported that they lack money to purchase the right farm inputs in time and lack essential farm equipment for vegetable and fruit production, thus their vegetable yields are always low. These finding agrees with Babatunde et al (2008) who also found significant bivariate differences between male and female heads of household in value of farm tools owned in a sample of 60 Nigerian households, and Saito et al (1994) who in a household survey in Kenya found that the value of farm tools and equipment owned by women across three districts was 18 percent of the value of the same

implements owned by male farmers. In addition, in a review of gender and agriculture inputs and productivity, Quisumbing (1994) concluded that farmers who use tools and other equipment may be more likely to adopt other technologies, which speaks directly to the interactive and synergetic aspects of agricultural inputs.

The study has revealed bias against females, the youth and the widowed in resource allocation, thus, the males have higher amounts of income, land and investment in farm equipment. This agrees with the report of Centre for Integrated Agricultural Systems (CIAS), (2004) that women are faced with many constraints which range from lack of access to farm credit, loans, low level of income, to shortages of input supply and other economic resources, thereby limiting their contributions to household farming decisions. On the other hand, males aged 30 to 44 years, and single have the highest advantage in terms of income that can be put to production.

4.3.4: Effects of Gender on the allocation of resources to fruits and vegetables production

To establish the effect of gender differences on resource allocation in vegetables and fruits production, the researcher used land as the key resource. Hence, regression models were established to show the effects of gender and other social- economic factors on land use for fruits and vegetables production

Model 1: Case of Female Respondents

Table 4.9 on the model summary shows that 49.8% variations in the land use for vegetables and fruits production can be explained by the independent factors in the regression model.

Table 4.9: Model Summary for the Case of Female Respondents

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.513[a]	.498	.467	.27828

a. Predictors: (Constant), household size, education level, female, age

The ANOVA Table 4.10 shows that F (4,115) = 3.125 at $p = 0.018 < 0.05$, an indication that the model fits the research data well. The researcher can also reject the general form of research hypothesis that none of the independent variables is a significant predictor of the dependent variable (i.e. H_0 = None of the independent variables is a significant predictor of the land under vegetables).

Table 4.10: ANOVA results for the case of female Respondents

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.968	4	.242	3.125	.018[a]
	Residual	8.906	115	.077		
	Total	9.874	119			

a. Predictors: (Constant), household size, education level, female, age

b. Dependent Variable: land under vegetables

From the regression coefficients in Table 4.11, household size ($\beta = 0.135$, $p = 0.007 < 0.01$) and education level ($\beta = 0.198$, $p = 0.011 < 0.05$) all had significant positive effect on the allocation of land to vegetables and fruits production. With high levels of education, farmers are able to manage vegetables and fruits which are high value crops that need knowledge and investment in order to farm efficiently. The insignificant positive effect of age ($\beta = 0.055$, $p = 0.431 > 0.05$) simply means that the younger people do not have enough access to land to allocate to vegetables and fruits as the older people who may allocate more land to vegetables and fruits. The other implication is that these young people allocate only small sizes of land

for vegetables due to low income levels. The female (β= -0.113, p = .037< 0.05) had significant negative effect on the size of land allocated to vegetable and fruits production.

Table 4.11: Estimated Coefficients of social factors affecting land allocation to fruits and vegetable production

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	.304	.069		4.057	.005
	Female	-.113	.059	-.189	-2.026	.037
	Age	.055	.070	.087	.790	.431
	education level	.198	.054	.163	3.67	.011
	household size	.135	.049	.311	2.735	.007

a. Dependent Variable: land under vegetables

Model 2: Case of Male respondents

The inverse relationship between the female and land use for fruits and vegetable production suggests that the females had relatively small portions of land for the production of fruits and vegetables and hence lack of sustainability. This could therefore be a determining factor in sustainable production just as UNDP (2003) indicates that implementation of projects on agriculture are also influenced by physical access to land, insecure land ownership, limited use of fertilizers and weak support services of research extension and finance.

Participants in all Focus Group Discussions both make and females agreed that women face challenges in the study area in terms of land they can put under vegetables and fruits, and that women and the youth may not make decisions on plots for vegetables and/or fruits unless their husbands and parents, respectively, agree to it. Although the married women agree that they own land when asked, according to the participants, it is the men who actually make

decisions on land use within the family. The participants however reported that widowed women are free to make these decisions if they already have land left to them by their dead husbands. Peterman et al (2010) also reported that gender inequalities and lack of attention to gender in agricultural development contribute to lower productivity, lost income, and higher levels of poverty as well as under nutrition. It is also stated by Horenstein (1989) that lack of land ownership limits the women's sense of security and motivation in agriculture. This can be a bottleneck in sustainable vegetable and fruit production, as reported by United Nations (2000) that land ownership as one of the bottlenecks in eliminating food security in the horn of Africa.

Table 4.12 below on model summary shows that the model can explain up to 49.8% variations in the land use for vegetables and fruits production. This is similar to the one of female respondents, an indication that the explanatory power of the model does not vary with the Gender of the of the individual respondent. In this new model, the male respondents have replaced the female respondent while the other explanatory factors remain the same.

Table 4.12: Model Summary for the case of Male Respondents

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.513[a]	.498	.467	.27828

The ANOVA in Table 4.13 shows that F (4,115) = 3.125 at $p = 0.018 < 0.05$, an indication that the model fits the research data well. The researcher can also reject the general form of research hypothesis that none of the independent variables is a significant predictor of the dependent variable (i.e. H_0 = None of the independent variables is a significant predictor of the land under vegetables).

Table 4.13: ANOVA Results for the case of Male Respondents

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.968	4	.242	3.125	.018[a]
	Residual	8.906	115	.077		
	Total	9.874	119			

a. Predictors: (Constant), household size, education level, male, age

b. Dependent Variable: land under vegetables

Table 4.14 on page 56 shows that just like in the case of female respondents, household size (β= 0.135, p = 0.007), education level (β= 0.198, p = 0.011<0.05) and age (β= .055, p = 0.431> 0.05) had significant positive effects on the size of land allocated to vegetable and fruits production. However, in this case, the male respondents had significant positive effect on the land under vegetables and fruits (β= 0.113, p = 0 .037<0.05). The positive relationship between the male and land use suggests that male producers had relatively large portions of land for fruits and vegetables production, a scenario that could be attributed to land ownership differences. This result agrees with Babatunde et al (2008) who also found significant bivariate differences between male and female heads of household in value of farm tools owned in a sample of 60 Nigerian households. The implication here is that males have more land but the groups which are the entry points for projects are made up of mainly women, who do not have as much land as the males to utilize for sustained production. The implication for projects then is less land put under vegetables and fruits.

Table 4.14: Estimated Coefficients of social factors affecting land allocation to fruits and vegetable production

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.304	.069		4.057	.005
	male	.113	.059	.189	2.026	.037
	age	.055	.070	.087	.790	.431
	education level	.198	.054	.163	2.621	.011
	household size	.135	.049	.311	2.735	.007

a. Dependent Variable: land under vegetables

The sex of a farmer, has been shown, can increase or decrease adoption rate of a technology by Nanyeenya et al, (1997). Preibisch et al, (2002) also submitted that women producers face constraints such as less access to land, credit, and technical assistance, use less farm inputs and do more weeding by hand, and Fontana (2011) reported that while both men and women in developing countries experience constraints in accessing these resources, gender inequalities exacerbate constraints for women, leading to "gender-intensified constraints

4.4: Effects of Farmers Educational Level on Acquisition and Utilization of resources in Vegetable and Fruit production

The second objective of the study was to establish effects of farmer's educational level on acquisition and utilization of resources in vegetable and Fruit production projects in the study area. The resources addressed under this objective were land, farm equipment and incomes. The respondents were, therefore, required to answer questions on the average income mode of land acquisition, land utilization and investment on farm equipment. Data collected was analyzed under the research question "How does the farmer's educational level affect

acquisition and utilization of resources in vegetable and fruit production? The results are presented in the subsection below.

4.4.1: Education Level

Data on level of education was collected and weighted on likert scale from 0 the lowest to 3 which is the highest score. Respondents with no education were given a rate of 0, with primary, secondary and university/college education rated at 1, 2 and 3 respectively.

Table 4:15: Education Levels of the Respondents

	Frequency	Percent
Never	8	6.7
Primary	73	60.8
Second.	34	28.3
Univ/C	5	4.2
Total	120	100.0

Source: *Field Data, July 2009*

Table 4.15 shows that majority of respondents only have primary levels of education. This makes 60.8% of the total sample while another 28.3% are of secondary level of education. Those of university or other tertiary colleges form only 4.2%. Those who have not gone to school make up 6.8% of the respondents. This implies that majority of the respondents can read and write, they can be able to comprehend extension messages and utilize some modern technology, furthermore, they are trainable. However 60.8% with only primary level of education may have low farm management skills and use of modern technology thereby reducing their farm productivity and farm incomes. The low incomes can only mean lower levels of investment on farm equipment or no investment at all. A further implication is that these are people who may not be able to acquire meaningful off-farm income which is said boosts farm productivity due to disposable income that can be invested on modern farm equipments.

Table 4.16: Education and Income Acquisition by the respondents

Level of Education	Mean(KShs)	N	Std. Deviation
Never	3666.67	8	1414.22
Primary	4257.66	73	1726.19
Secondary	5235.29	34	2345.97
University/college	7750.00	5	3029.03
Total	4664.95	120	2132.16

Source: *Field Data, July 2009*

Table 4.16 shows that average monthly income increases with increase in level of education. Those who have not gone to school have mean monthly income of Kshs. 3666.67 while college/ university level have the highest mean monthly income of Kshs. 7750.0 This finding implies that people with higher levels of education have more income to invest in modern farming thereby increasing productivity and sustainability. According to Weinberger and Lumpkin, (2007) producing and marketing of vegetables and fruits for local and regional markets require a range of knowledge and technology. The study has not established whether or not there is significant difference in income amongst the different education levels but the results indicate obvious disparities in the income levels.

4.4.2 Education and Land Acquisition

Table 4.17: Education and Land Acquisition by Respondents

Level of Education	Mean(acres)	N	Std. Deviation
Never	2.86	8	1.42
Primary	2.31	73	1.14
Secondary	2.90	34	1.47
University/college	3.40	5	1.52
Total	2.57	120	1.30

Source: *Field Data, July 2009.*

Table 4.17 shows findings of effect of level of education on land acquisition. Average land acquired increases with increase in level of education from primary level of education. Those who have not gone to school have acquired a mean of 2.86 acres but from primary level of education onwards, the mean amount of land acquired increases from a mean of 2.31 acres and reaches a high mean of 3.40 acres at university/college level of education. The fact that those who have not gone to school have a mean of 2.86 acres, more than that of primary level of education could imply that education has no significant effect on land acquisition. This could mean that land acquisition here is still majorly dependent on inheritance.

4.4.3: Education and Investment on Farm Equipment

Findings on investment and education are presented in Table 4.18 below.

Table 4.18: Education and Investment on Farm Equipment

Level of Education	Mean (Kshs)	N	Std. Deviation
Never	1555.56	8	1844.67
Primary	3596.21	73	4420.46
Secondary	4794.12	34	4989.56
Univ./college	7333.33	5	6022.18
Total	3969.43	120	4630.28

Source: *Field Data, July 2009*

Investment in farm equipment increases with increased level of education as shown in Table 4.18. The highest investment is at the highest level of 3 which is university level of education at Kshs. 7333.3, and the lowest investment is for those with no education at all, with average investment of only at a mean of Kshs. 1555.56. This clear indicates a relationship between schooling and investment on farm equipment. It shows that education has a positive and significant influence on agricultural investment of farm equipment. Lockheed et al (1980) reviewed studies which found that most reported a significant positive effect of education

upon agricultural output. The findings is supported by Kidane (2006) who indicates that educational attainment by the household heads could lead to awareness of the possible advantages of modernizing agriculture by means of technological input, read and understand documentation, read instructions on the fertilizer packs, and diversification of household income which in turn would enhance household food supply.

Participants in all focus group discussions also agree that educated people do better than the uneducated farmers because they are able to get employment which enables them to get off-farm income which they invest on modern farm equipment and inputs. They further reported that educated farmers do record keeping in their farming, and they have advantage since they understand other languages and so are able to get information from many sources.

Formal schooling is hypothesized to play a more important role in determining allocative ability (the farmers' ability to be able to allocate scarce resources in the best way for increased productivity) than worker ability according to Cutler, (2008). It can be said therefore that low schooling level in the study area has also affected the allocative ability of the farmers resulting in poor allocation of resources for production as hypothesized by Cutler (2008). Respondents with higher education are able to make better allocative decisions, thus the higher incomes and the higher investment on farm equipment compared to those with lower level of education. Moreover, education encourages movement into more remunerative non-farm work, thus increasing household in-comes, as reported in focus group discussions in this study, and hence improving the level of food security.

4.4.4 Regression results on the effects of farmer level of education on the Utilization of Land in Fruits and Vegetables Production

In order to establish the effect of farmer level of education on the utilization of land for vegetables and fruits production, all the determinants of land utilization were captured so as to avoid spurious regression that would lead to type I or type II error. However, the emphasis on the level of education. The model summary in Table 4.19 shows that 53.3% changes in the land utilization for fruits and vegetables production is explained by the explanatory factors. The remaining 46.7% could be attributed to other factors not captured in the model.

Table 4.19: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.682[a]	.533	.519	.25780

a. Predictors: (Constant), House hold size, Level of education, individual income, level of investment, size of land acquired

The ANOVA Table 4.20 shows that F (5,114) = 6.912 at $p = 0.00 < 0.01$, an indication that the model fits the research data well. The researcher can also reject the general form of research hypothesis that none of the independent variables is a significant predictor of the dependent variable ((i.e. H_0 = None of the independent variables is a significant predictor of the land under vegetables).

Table 4.20: ANOVA Results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.297	5	.459	6.912	.000[a]
	Residual	7.577	114	.066		
	Total	9.874	119			

a. Predictors: (Constant), Household size, Level of education, monthly income, level of investment, size of land acquired

b. Dependent Variable: land under vegetables

From the regression coefficients in Table 4.21, a part from the house hold size (β= .017, p =.061 > 0.05), all the other independent factors had significant positive effects on land under fruits and vegetables; the average monthly income (β= 0. 229, p = 0.041< 0.05) and the level of education (β= 0.447, p = 0.000 < 0.01). This shows that with higher levels of education the land under vegetables and fruits are expected to go up. This implies that the levels of education of the farmers in the study area is low, hence the smaller sizes of land put under vegetables and fruits. This agrees with Muendo et al, (2004), found that farmers with higher education are able to produce and sell more vegetables than those with lower levels of education. Level of investment (β= 0.325, p = 0.000 < 0.01) and the size of land acquired (β= 0. 305, p = 0.000< 0.01) all had significant positive effects on the size of land allocated to vegetables and fruits production. These findings imply that level of education, monthly income, level of investment on farm equipment and size of land acquired all determine how much land is allocated to fruits and vegetables.

Table 4.21: Effect of Education Level on the Utilization of Land for Fruits and Vegetables Production

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.486	.239		2.036	.044
	Av. monthly income	.229	.028	.086	2.038	.041
	level of investment	.325	.006	.071	2.849	.000
	Level of education	.447	.051	.078	4.930	.000
	size of land acquired	.305	.066	.388	4.598	.000
	Household size	.017	.009	.159	1.895	.061

a. Dependent Variable: land under vegetables

Formal schooling is hypothesized to play a more important role in determining allocative ability (the farmers' ability to be able to allocate scarce resources in the best way for increased productivity) than worker ability, (Cutler 2008). It can be said therefore that low schooling level in the study area has also affected the allocative ability of the farmers resulting in poor allocation of resources for production as hypothesized by Cutler. Respondents with higher education are able to make better allocative decisions, thus the higher incomes and the higher investment on farm equipment compared to those with lower level of education. These results confirm earlier findings by Appleton and Balihuta (1996); Cotlear (1990) that improved attitudes, beliefs and habits may lead to greater willingness to accept risk, adopt innovations, save for investment and generally to embrace productive practices. Macharia, (2007) in his study conducted in Kiambu, Kirinyaga and Maragwa districts also established that the education level of households heads was an important factor in influencing what development projects people would initiated collectively, which new farming technologies would be adopted and what farming enterprises to undertake.

4.5: Economic Factors and Resource use for sustainable Vegetables and Fruits production.

The third objective sought to establish the effect of the size of land acquired on the utilization of land in fruit and vegetable production projects in Kadibo Division while the fourth objective was to determine the effects of income size and investment in farm equipments on the utilization of land for fruit and vegetable production projects in Kadibo Division. To achieve these objectives, the respondents were asked to answer several questions on their incomes, savings, and investments on farm equipments and amount of land acquired. Data collected was analyzed under the research question "How do economic factors affect resource availability in vegetable and fruit production at the community level?" inferential statistics on

the same variables were also determined through correlation and regression analyses. The results are presented here below:

4.5.1: Income and resource availability

Data on income, investment on farm equipment, amount of land acquired, savings per month and land under fruits and vegetables was analyzed and the tables that follow show the result from the analyses.

Table 4.22 below reveals the relationship between use of farm inputs and incomes of respondents. It shows that respondents who use farm inputs have higher mean average income at Kshs. 4706.73 compared to those who do not use farm inputs whose mean average income are Kshs. 4411.76. This implies that income determines whether the farmer can modernize agriculture or not.

Table 4.22: Average Monthly Income and Use of Farm Inputs

Use Of Farm Input	Mean (Kshs)	N	Std. Deviation
No	4411.77	17	2399.45
Yes	4706.73	103	2094.81
Total	4664.95	120	2132.16

Source: *Field Data, July 2009*

Table 4.23: Average Income and Investment on Farm Equipment

Amount Invested In Farm Implement (Kshs)	Mean (Kshs)	N	Std. Deviation
.00	3884.25	48	1590.06
3500.00	4354.84	31	1853.80
5000.00	5356.67	15	2170.65
8500.00	5500.00	7	2101.59
10000.00	5833.33	12	2815.00
13500.00	6875.00	4	2897.56
18500.00	7333.33	3	2516.61
Total	4664.95	120	2132.16

Source: *Field Data, July 2009*

Table 4.23 shows that at the lowest mean average monthly income of Kshs. 3884.25, respondents invested nothing on farm equipment, but from mean average monthly income of Kshs. 4354.83, investment started at the lowest level of Kshs. 3500 and this increased as average incomes increased, up to a high of Kshs. 18500 at mean average monthly income of Kshs. 7333.33. These agree with the regression analysis that has shown a positive association, although weak, between average monthly income and investment in farm inputs. What this means for this study is that maybe it is inadequate incomes that result into lack of sustainable production of vegetables and fruits because there is no adequate investment to support sustainable production. This compares well with the findings of Wheeler and Ortman (1990) that the most success determining factors in cotton adoption were those that related to human capital endowments and economic status of the household.

Table 4.24: Mean acreage of land utilized for vegetables and Fruits and incomes of Respondents

Land under Vegetables and Fruits	Mean (Kshs)	N	Std. Deviation
0-0.5 acres	4500.00	48	1910.22
0.6 – 1 acres	4558.16	49	2183.30
1.1 – 1.9 acres	4666.67	3	1527.53
2 – 3 acres	5322.20	20	2570.16
Total	4664.95	120	2132.16

Source: *Field Data, July 2009.*

Analysis of income and land utilized for vegetables and fruits reveals that the area increases with increase in average income levels as can be seen in Table 4.24 above. At the lowest area of less than 1 which represents area of up to 0.5 of an acre, the mean average monthly income are only Kshs. 4500, while at the largest area of 2 - 3 acres, mean average monthly income of respondents is Kshs. 5322.20. This implies that as farmers put more land under vegetables, their incomes increase, but it could also imply that those who are able to put more land under

vegetables and fruits are those with higher incomes because they are the ones who are able to use farm input and able to save for purchase of the necessary farm equipment.

4.5.2 Savings and Resource Availability

The study also sought to find out if the level of savings had any influence on the size of land utilized for vegetables and fruits and here below are the results.

Table 4.25: Average Savings per month and Use of farm Inputs

Use of Farm Input	Mean (Kshs)	Std. Deviation
No	446.81	653.04
Yes	802.82	888.33
Total	661.02	818.80

Source: *Field Data, July 2009.*

Table 4.25 shows that those respondents who reported use of farm inputs saved a mean of Kshs. 802.82 while those who reported they did not use farm inputs saved only a mean of Kshs. 446. This shows a clear positive relationship between savings and use of farm inputs. The implication is that if farmers save more money, then they are able to purchase more farm inputs for production hence will be able to sustain project gains.

Table 4.26: Average Savings and Investment on Farm Equipment

Savings per month	**Mean (Kshs)**	**N**	**Std. Deviation**
0	2320.72	69	4608.29
1000	5250.00	32	5293.03
2000	7247.42	19	6351.48
Total	3881.92	120	5409.29

Source: *Field Data, July 2009, July 2009*

Analysis further found that Investment on farm equipment increased with increase in savings per month. Table 4.26 shows that those who did not save any money at all only invested a mean of Ksh. 2320.72 on farm equipment while those with the highest mean savings at Kshs.

2000 had a mean investment of farm equipment of up to Kshs. 7274.42. This implies that savings determine investment on farm equipment. A culture of saving therefore can boost vegetable and fruit production there by solving the food insecurity problem, as a farmer who saves is able to invest in the necessary equipment for increased production.

4.5.3 Land Acquired and Resource availability

Table 4.27: Amount of Land Acquired and Investment on Farm Equipment

Amount of Land Owned	Mean (Kshs)	N	Std. Deviation
<1acre	1863.64	11	3139.20
1 – 2acres	4041.67	60	4329.93
3 -4 acres	4267.61	33	5482.34
>5	4531.25	16	4674.29
Total	3969.43	120	4630.28

Source: *Field Data, July 2009***.**

Investment on farm equipment increases with the increase on amount of land acquired. Table 4.27. This could imply that amount of land acquired has a very small influence on investment on farm equipment. It could also mean that those who invest more on farm equipment do not own large all the land they use but they lease it for production purpose, or they do intensive production through use of modern technology. However, those who acquired large pieces of land allocated relatively large portions of the same to fruits and vegetable production, yet their productivity could be low.

4.5.4: Correlation Analysis of economic determinants of sustainable vegetable and fruit projects

Association between the various economic factors and land use in fruits and vegetables production is indicated in the Table 4.28 below. The table shows that there is a weak significant positive association between land under vegetables and fruits and the mean monthly incomes ($r = 0.298$, $p = 0.036 < 0.05$). This implies that increase in mean income may not necessarily determine result into increase in land under vegetables but it may have

an effect on production through other inputs like investment in farm equipment and even use of modern farm inputs like fertilizers. In other words, the increase in income may result into intensive production for increased productivity, but on the small size of land available.

There is also a positive but weak association between land under vegetables and fruits and level of investment ($r = 0.236$, $p = 0.039 < 0.05$). The weak positive association may imply one does not necessarily affect the other but investment in farm equipment will surely improve productivity even on the small size of land allocated to vegetables and fruits. What this means for the study is that if the land allocated to vegetables remain small, the only way productivity can be improved is through investment in modern farm equipment and other technology. So investment may be the determining factor here. The finding could therefore imply that lack of sustainable vegetable and fruit projects is as a result of low or total lack of investment in the right equipment for production.

This findings imply that level of education ($r = 0.356$, $p = 0.009 < 0.01$), and household size ($r = 0.207$, $p = 0.024 < 0.05$), amount of land acquired ($r = 433$, $p = 0.000 < 0.01$) and savings level ($r = 0 .279$, $p = 0.002 < 0.01$). Mean monthly savings on the other hand has significant positive association with mean income level ($r = 0.142$, $p = 0.047 < 0.05$) a clear indication that one can only save if they have adequate incomes. This implies that when incomes levels are low then there is no saving yet it is only through savings, that farmers may not be able to acquire farm equipment and other farm inputs. The implication for the study then is that the income levels affect sustainable production after funding of projects stop. During the funding of a project, some projects normally provide things like seeds and fertilizer for free. It then follows that if the funding period ends, the farmers are unable to acquire the necessary inputs to enable them continue with production thus the lack of sustainability. Savings has also been shown to have a significant positive association with investment level ($r = 0.261$, $p = 0.004 <$

0.01) indicating that it savings that provide the funds required for investment on farm equipment. Savings also has a positive significant association with education level ($r = 0.226$, $p = 0.013 < 0.05$) implying that a farmer with a higher level of education is more likely to save some money as compared to one without or with a lower level of education.

Investment had a positive association with the level of income($r = 0.307$, $p = 0.009 < 0.01$).This implies that those who invest on farm equipment are able to earn higher incomes and vice versa. This agrees with Manyong et al (2009) that one of the critical elements of physical capital in agrarian societies is a portfolio of physical tools used in the production process. Investment on farm equipment among the respondents is a pointer to the fact that mechanization in this area is very minimal, because of low incomes and this is a critical element in any sustainable production. Income had a positive association with the level of education ($r = 0.228$, $p = 0.005 < 0.01$). A weak insignificant negative association also exists between the household size and the income level ($r = -0.054$, $p = 0.554 > 0.05$), a likely indication that low income households have large number of people while the households with high incomes have few people. For the study, this implies that low education levels may be resulting in to low incomes which results into lack of savings which means no, or very little investment on farm equipment culminating into low productivity or low project sustainability.

Table 4.28: Correlation amongst the Variables

Correlations

		land under vegetables	individual income	savings level	size of land acquired	level of investment	Level of Education	Household size
land under vegetables	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	120						
individual income	Pearson Correlation	.298*	1					
	Sig. (2-tailed)	.036						
	N	120	120					
savings level	Pearson Correlation	.279**	.142*	1				
	Sig. (2-tailed)	.002	.047					
	N	120	120	120				
size of land acquired	Pearson Correlation	.433**	.017	.108	1			
	Sig. (2-tailed)	.000	.851	.241				
	N	120	120	120	120			
level of investment	Pearson Correlation	.236*	.307**	.261**	.087	1		
	Sig. (2-tailed)	.039	.009	.004	.347			
	N	120	120	120	120	120		
Level of Education	Pearson Correlation	.356**	.228**	.226*	.174	.058	1	
	Sig. (2-tailed)	.009	.005	.023	.057	.531		
	N	120	120	120	120	120	120	
Household size	Pearson Correlation	.207*	-.054	.107	.102	.157	-.027	1
	Sig. (2-tailed)	.024	.554	.244	.269	.087	.772	
	N	120	120	120	120	120	120	120

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The findings agree with findings that the most success determining factors in cotton adoption in Kwazulu were those that were related to human capital endowments and economic status of the household (Wheeler and Ortman, 1990). Another study established that across all provinces in Kenya, the poor produce less than the non-poor because the latter hold less land but their yields are higher, (Republic of Kenya, 1999). The study further established that those who use farm inputs had relatively smaller pieces of land which is 2.51 acres while those with bigger parcels of 2.65 acres do not use farm inputs.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Overview

This study investigated the socio-economic determinants of sustainable vegetable and fruit production projects in Kadibo Division. This is in light of the food insecurity that persists in the urban and peri urban parts of Kisumu East despite numerous food security projects that have been implemented in the area. This chapter gives a summary of the finding, conclusion made from the findings and a recommendation for sustainable food production. The chapter also gives suggestion of further research in this area.

5.2 Summary of Findings

Objective one sought to establish the effect of gender differences on resource allocation in vegetable and fruit production. In the second analysis land was used as the key resource and the study revealed that land allocation is biased against females who were the majority (64%) of the respondents, and who owned an average of 2.51 acres against the male who had an average of 2.58 acres, since the explanatory power of the two models for male and female are the same in both cases (49.8%), it can therefore be concluded that gender of the producer has no significant influence on the allocation of resources to fruit and vegetable production projects. However, land ownership differences between the male and female differs and has significant influence on the allocation of land to fruits and vegetables production projects.

Objective two looked at the effects of farmer education level on the acquisition and utilization of resources in vegetable and fruit production projects in Kadibo Division. The study revealed that the farmer's level of education had significant positive association with resource allocation (land use for vegetable and fruit production projects) ($r = 0.356$, $p = 0.009 \leq 0.01$) in Kadibo Division. It also had significant positive effect on the acquisition and land

use for vegetable and fruit production in the case of male and female producers ($\beta = 0.447$, $p = 0.000 < 0.01$) . Household size also had significant positive influence on the utilization of land for fruit and vegetable production.

The third objective sought to establish the effect of the size of land acquired on the utilization of land in fruit and vegetable production. The study revealed that size of land acquired had positive association with the land use for fruit and vegetables production projects ($r = 0.433$, $p = 0.000 < 0.01$). It also had a positive significant effect on the land use for fruits and vegetables production ($\beta = 0.305$, $p = 0.000 < 0.01$). This implies that those who acquired large pieces of land allocated relatively large portions of land to fruits and vegetables production.

Fourth objective was to determine the effects of income size and investment in farm equipments on the resource allocation to fruit and vegetable production projects in Kadibo division. The results show that income size and investment in farm equipments both had positive although significant association ($r = 0.298$, $p = 0.036 < 0.05$) and ($r = 0.236$, $p = 0.039 < 0.05$) respectively with the utilization of resources (land for fruits and vegetables production) in Kadibo Division. The two factors also had significant positive effects on the utilization of land for fruits and vegetables production where income size had $\beta = 0.229$, $p = 0.044$ while investment had $\beta = 0.35$, $p = 0.000$. This implies that those with higher incomes and higher investments on farm equipments allocated larger portions of their resources to fruits and vegetables production projects. The results further show that savings had a significant positive association with investment ($r = 0.279$, $p = 0.002 < 0.01$), a likely indication that those who invested more in the farm equipments could generate more and save more.

5.3: Conclusions

Based on the results on objective one which sought to establish the effect of gender differences on resource allocation in vegetable and fruit production projects in Kadibo Division, the study concludes that land allocation is biased against females who were the majority and that gender of the producer had no significant influence on the allocation of resources to fruit and vegetable production. However, land ownership differences between the male and female differs and has significant influence on the allocation of land to fruit and vegetable production projects.

From objective two which sought to determine effect of farmer education level on the acquisition and utilization of resources in vegetable and fruit production projects in Kadibo Division, the study concludes that the higher the level of education of an individual farmer, the higher the amount of resources allocated to fruit and vegetable production projects. Thus, those who attained higher levels of education tend to allocate more resources to fruits and vegetables production.

Objective three sought to establish the effect of size of land owned on the allocation of land to fruit and vegetable production projects in Kadibo Division. Since the size of land acquired had significant positive effect on the portion of land allocated to fruits and vegetables production, those who acquired large pieces of land allocated relatively large portions of land to fruits and vegetables production. However, the individuals with small pieces of land invested more on farm inputs to increase their yields as opposed to those with larger pieces of land.

The last objective sought to assess the effect of income size and investment level in farm equipments on the allocation of resources to fruit and vegetable production projects in Kadibo division. Based on this objective, it can be concluded that individuals with higher incomes and higher investments on farm equipments allocated more resources to fruit and vegetable production and that those who invested more in the farm equipments could generate more and save more.

5.4: Recommendations

1. Horticultural production is a high-value crop enterprise and female-headed households with small parcels of land can use it to increase their incomes and ensure food and nutrition security. However, these households suffer from serious disadvantages. They tend to have land and capital constraints and are less likely to own necessary farm equipments. Special programs are needed tailored to their needs. Policies should be put in place for proper targeting whenever there is intervention. There is also need for the govermnet to come up with policies that would make it easy for females to access credit.

2. Given objective two, it is recommended that adult literacy classes be encouraged for both men and women and extension services be intensified the purpose of gaining of schools for farmers who are already producers. This may ensure sustainability of the fruits and vegetable production projects in the region.

3. Objective three looked at land ownership. Sensitization and advocacy is very necessary to enable the men allocate land to females and the youth. Technologies that use limited area of land and intensive production should be encouraged so that the small pieces of land that are accessible become more productive.

4. Individuals should be encouraged to invest more in the farming equipments since through this, more incomes may be generated which when ploughed back to the production of fruits and vegetables, may ensure sustainability of the projects. Famers should be encouraged to diversify their sources of income e.g. in order for sustainable production of vegetables abd fruits

5.5: Recommendations for Further Research

Further research using time series data is needed in this area to establish long term effects of these social and economic factors in sustainable fruits and vegetables production not only in this region but also in other neighbouring divisions.

Since farmers groups are being used as entry points by many development actors into the communities and many of these groups are made up of majority women, a study should be carried out on socio economics and group performance, to find out which social and economic factors determine group success for sustainable food security.

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