DETERMINANTS INFLUENCING SUSTAINABILITY OF AGRICULTURAL PROJECTS: A CASE OF MWALA SUB COUNTY, MACHAKOS COUNTY, KENYA

FAITH MULEE MUTISO

A Research Project submitted in partial fulfillment of the requirements for the Award of the Degree of Masters of Arts in Project Planning and Management, University of Nairobi.

2015
DECLARATION

This research project is my original work and has not been submitted for any award in any other University

Signature:  

Date 6/8/2015

Faith Mulee Mutiso

L50/81495/2012

This research project has been submitted for examination with my approval as the University supervisor.

Signed:  

Date 6/8/2015

Dr John Mbugua

Lecturer, Department of Extra-Mural studies

University of Nairobi
DEDICATION

This research project is dedicated in the memory of my late parents, Julius Mutiso and Joyce Katumbi
ACKNOWLEDGEMENT

My gratitude goes my supervisor Dr John Mbugua who tirelessly guided me through to completion this research project, the Chairman Prof Charles Rambo and all the lecturers of Extra Mural Centre who have transformed and enhanced my way of looking into the world.

I also want to thank the University of Nairobi for giving me the opportunity to pursue my studies, I would also like to appreciate my sisters Anne and Victoria for their financial support and advice during my studies also recognize and appreciate the contribution of my student colleagues and friends, Lillian, Rosemary and Titus for their support in course work and also in the course of developing this research project.

Last not least to the Almighty God for the life, strength and protection He gave me.
# TABLE OF CONTENT

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td>Error! Bookmark not defined.</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>ii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iv</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>ix</td>
</tr>
<tr>
<td>ABREVIATIONS AND ACCRONYMS</td>
<td>x</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>xi</td>
</tr>
<tr>
<td>CHAPTER ONE: INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Background to the Study</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Statement of the Problem</td>
<td>7</td>
</tr>
<tr>
<td>1.3 Purpose of the study</td>
<td>9</td>
</tr>
<tr>
<td>1.4 Objectives of the study</td>
<td>9</td>
</tr>
<tr>
<td>1.5 Research question</td>
<td>10</td>
</tr>
<tr>
<td>1.6 Significance of the study</td>
<td>10</td>
</tr>
<tr>
<td>1.7 Limitation of the study</td>
<td>11</td>
</tr>
<tr>
<td>1.8 Delimitation of the Study</td>
<td>11</td>
</tr>
<tr>
<td>1.9 Basic Assumptions of the Study</td>
<td>11</td>
</tr>
<tr>
<td>1.10 Definition of Terms Used in the Study</td>
<td>12</td>
</tr>
<tr>
<td>1.11 Organization of the Study</td>
<td>13</td>
</tr>
<tr>
<td>CHAPTER TWO: LITERATURE REVIEW</td>
<td>14</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>14</td>
</tr>
<tr>
<td>2.2 Concept of Sustainability of Agricultural Projects</td>
<td>14</td>
</tr>
<tr>
<td>2.3 Credit Access and Sustainability of Agricultural projects</td>
<td>17</td>
</tr>
<tr>
<td>2.4 Influence of Input supply and Sustainability of agricultural projects</td>
<td>21</td>
</tr>
<tr>
<td>2.5 Training of Farmers and Sustainability of agricultural projects</td>
<td>25</td>
</tr>
<tr>
<td>2.6 Adoption of New Technology and Sustainability of agricultural projects</td>
<td>28</td>
</tr>
<tr>
<td>2.7 Theoretical Framework</td>
<td>31</td>
</tr>
</tbody>
</table>
CHAPTER THREE: RESEARCH METHODOLOGY ......................................................... 39
3.1 Introduction ................................................................................................. 39
3.2 Research Design ......................................................................................... 39
3.3 Target Population ....................................................................................... 40
3.4 Sample size and Sampling Procedure ..................................................... 40
  3.4.1 Sample Size ............................................................................................ 40
  3.4.2 Sampling procedure ............................................................................... 41
3.5 Research Instruments ................................................................................ 42
  3.5.1 Pilot testing of the Research Instrument ............................................ 43
  3.5.2 Validity of Instruments .......................................................................... 43
  3.5.3 Reliability of Instruments ...................................................................... 44
3.6 Data Collection procedure ......................................................................... 45
3.7 Data Analysis Techniques ......................................................................... 46
3.8 Ethical Considerations ............................................................................... 47
3.9 Operationalization of Variables ................................................................. 48
CHAPTER FOUR: DATA ANALYSIS, PRESENTATION, INTERPRETATION
AND DISCUSSION .................................................................................................................. 50
4.1 Introduction .................................................................................................. 50
4.2 Response Rate of Questionnaire ............................................................ 50
4.3 Background Information of the Respondents ........................................... 51
  4.3.1 Distribution of Respondents by Age ................................................... 51
  4.3.2 Distribution of Respondents by Highest Level of education .............. 52
4.4 Sustainability of Agricultural Projects .................................................... 52
4.5 Credit Access and Sustainability of Agricultural Projects ....................... 54
4.6 Input Supply Factors and Sustainability of Agricultural Projects ............ 55
4.7 Training of Farmers and Sustainability of Agricultural Projects ............... 57
CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

5.2 Summary of Findings

5.2.1 Influence of credit access on sustainability of agricultural projects

5.2.2 Influence of input supply on sustainability of agricultural projects

5.2.3 Influence of training of farmers on sustainability of agricultural projects

5.2.4 Influence of adoption of new technology on sustainability of agricultural projects

5.4 Conclusion

5.5 Recommendations

5.6 Areas of Further Research

REFERENCES

APPENDICES

Appendix I: Research Questionnaire

Appendix II: Letter of Transmittal

Appendix III: Letter of Introduction
LIST OF FIGURES

Figure 2.1: Conceptual framework .................................................................................. 36
LIST OF TABLES

Table 3.1: Summary of Cronbach’s Alpha Reliability Coefficients for Major Variables of the Study ................................................................. 45
Table 3.2: Operationalization of variables ................................................................. 49
Table 4.3: Response Rate ..................................................................................... 50
Table 4.4: Distribution of Respondents by Age Category ........................................ 51
Table 4.5: Distribution of Respondents by Highest Level of education .................. 52
Table 4.6: Sustainability of agricultural projects ..................................................... 53
Table 4.7: Credit Access ....................................................................................... 54
Table 4.8: Input Supply Factors ................................................................................ 56
Table 4.9: Training of Farmers ............................................................................... 57
Table 4.10: Influence of New Technology adoption ............................................... 58
Table 4.11: Adoption of New Technology ............................................................... 59
Table 4.12: Model Summary .................................................................................. 61
Table 4.13: Analysis of Variance .......................................................................... 61
Table 4.14: Coefficients of regression equation ...................................................... 62
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASAL</td>
<td>Arid and Semi-Arid Land</td>
</tr>
<tr>
<td>CBS</td>
<td>Central Bureau of Statistics</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture organization</td>
</tr>
<tr>
<td>FOs</td>
<td>Farmers’ Organizations</td>
</tr>
<tr>
<td>KALRO</td>
<td>Kenya Agricultural and Livestock Organization</td>
</tr>
<tr>
<td>KEPHIS</td>
<td>Kenya Plant Health Inspectorate Services</td>
</tr>
<tr>
<td>KFA</td>
<td>Kenya Farmers Association</td>
</tr>
<tr>
<td>KSC</td>
<td>Kenya Seed Company</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>NASEP</td>
<td>National Agricultural Extension Policy</td>
</tr>
<tr>
<td>NCPB</td>
<td>National Cereals and Produce Board</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental Organization</td>
</tr>
<tr>
<td>NSAC</td>
<td>National Sustainable Agriculture Coalition</td>
</tr>
</tbody>
</table>
ABSTRACT

The purpose of this study was to examine the determinants influencing sustainability of agricultural projects in Mwala Sub County, Machakos County by looking at the extent at which these variables influence sustainability of agricultural projects. These include: how credit access influences sustainability of agricultural projects; to establish how input supply influences sustainability of agricultural projects; to establish how training influences sustainability of agricultural projects and to determine how adoption of technologies influences sustainability of agricultural projects in Mwala Sub County, Machakos County. Kenya’s agriculture is mainly rain-fed and is entirely dependent on the bimodal rainfall in most parts of the country. Kenya’s agriculture is predominantly small-scale farming mainly in the high-potential areas. Production is carried out on farms averaging 0.2–3 ha, mostly on a commercial basis. This small-scale production accounts for 75 per cent of the total agricultural output and 70 per cent of marketed agricultural produce. In Mwala Sub-County of Machakos County, agriculture is relatively low compared to other parts of the country due to the aridity of the land, only 10.5 per cent can be used for crop production, and only 3 per cent is considered high potential land. 45 per cent of the population suffer under the yoke of poverty and starvation not just because of failed rains but because of poor planning and lack of farmer’s unity. To achieve this purpose, a descriptive survey research design was carried out. The target population of this study was 275 farmer groups because they are well organized with rules and regulations to govern them with a membership of 7150 farmers, consisting of a sample of 74 farmers. Primary data was collected using semi-structured questionnaire which was administered by drop and pick methods. Data from questionnaires was summarized, coded, tabulated and analyzed. Editing was done to improve the quality of data for coding. Coded data was then fed into the statistical package for social sciences (SPSS) version 21. Linear Regression Analysis was used to determine the relationship between the variables and sustainability of agricultural projects in Mwala sub-county Machakos County. The study found out that it is not that the area under study does not have enough rainfall but it is the farmers who do not have enough finances to buy the necessary farm inputs, certified seeds, the right skills, and do not adopt the new technologies which farmers are using to increase harvest in their farms. Multiple regression analysis was conducted as to determine the relationship between sustainability of agricultural projects and the four variables: \( Y = 0.260 + 0.512X_1 + 0.170X_2 + 0.051X_3 + 0.048X_4 \). The study recommends that more trainings to farmers by extension officers needs to be conducted as way of building their capacity thus increased productivity also it is through the trainings where farmers can be able to learn about new technologies this adopting to save time and money while increasing on production hence realizing higher profits. Finally a credible financial institution or a farmers’ Sacco needs to be brought on board to give credit to farmers to purchase farm inputs and also expand their acreages under farming.
CHAPTER ONE:
INTRODUCTION

1.1 Background to the Study
The word "sustain," from the Latin sustinere (sus-, from below and tenere, to hold), to keep in existence or maintain, implies long-term support or permanence (Schwarz, 2012). As it pertains to agriculture, sustainable describes farming systems that are "capable of maintaining their productivity and usefulness to society indefinitely (Cherfas and Hodgkin, 2011). Such systems must be resource-conserving, socially supportive, commercially competitive, and environmentally sound. Conventional farming systems vary from farm to farm and from country to country. However, they share many characteristics: rapid technological innovation; large capital investments in order to apply production and management technology; large-scale farms; single crops/row crops grown continuously over many seasons; uniform high-yield hybrid crops; extensive use of pesticides, fertilizers, and external energy inputs; high labor efficiency; and dependency on agribusiness (Schwarz, 2012).

Sustainability of agriculture projects are activities that seek to sustain farmers, resources and communities by promoting farming practices and methods that are profitable, environmentally sound and good for communities. Sustainable agriculture fits into and complements modern agriculture. It rewards the true values of producers and their products. It draws and learns from organic farming. It works on farms and ranches large and small, harnessing new technologies and renewing the best practices of the past (Gold,
In the case of livestock, most production comes from confined, concentrated systems.

Half of the world’s population works in agriculture. While 40 per cent of the agricultural workforce (some 440 million workers) are in waged employment; the other 60 per cent are self-employed as farmers – mainly as small farmers (Fyfe, 2002). In most African countries, agriculture accounts for 70 per cent of the labour force, over 25 per cent of GDP and 20 per cent of agribusiness. Agriculture remains largely traditional and is concentrated in the hands of smallholders and pastoralists (Economic Report on Africa, 2009). Smallholders generally rely on labour-intensive production methods and family labour, although they often have to hire labour, especially at key moments in the production cycle like harvesting. Since they are in a situation of poverty themselves, the working conditions of hired labourers are usually very poor. This challenges prompted farmers groups to organize themselves into cooperatives and producer associations for production and marketing (Christodoulou and Gray, 2007).

Overall, farming has been an important avenue through which farmers can access market and credit information as well as other important agricultural information like new agriculture technologies. They also form important avenues for mobilizing farmers around a common objective especially in delivery of services and formulation of policies that support agriculture development. In countries such as Tanzania and Ghana, farmers
are at the centre of the poverty reduction strategy, extension delivery and crop marketing (Jayne and Muyanga, 2006).

In the Netherlands, sustainable agriculture for dairy farmers offers farmers a practical framework for understanding, evaluating, and continuously improving the sustainability of their dairy operations based on economic, social and environmental criteria (DeWalt, 2004). Farmers groups enables farmers to evaluate their farms against a comprehensive set of key criteria or “sustainability indicators”: Soil fertility and health, soil loss, nutrients, pest management, biodiversity, farm economics, energy, water, social human capital, impact on local economy and animal husbandry/welfare. The results from 2012 are consistent with the 2011 data indicating that the group of farms in the program are overall good financial managers, are focused on animal husbandry and are involved and supportive of their local economies (Van Mansvelt, Stobbealaa, and Hendriks, 2013; DeWalt, 2004).

In India, a network of community based grassroots level development organizations, farmers associations, farmer federations, and rural NGOs. This farmer group’s work with small and marginal farmer collectives and indigenous communities in the rain-fed, mountain slope farming and shifting cultivation areas (Ramakrishnan and Kumar, 2010). These farmers associations collaboratively organize, empower and educate the rural communities for self-reliance, poverty reduction and economic growth (Dollo, Chaudhury and Sundriyal, 2006). They promote farmer inspired and farmer owned
producer companies for quality production, value addition, storage and marketing. Quality extension services are also provided to farmers on organic farming, fair trade, certification, entrepreneurship for rural development, natural resource management and conservation of agricultural ecology and biodiversity (Ramakrishnan and Kumar, 2010).

In Uganda, the use of farming remains central to the agriculture transformation process. The five year Agriculture Sector Development Strategy and Investment Plan (DSIP) has four pillars: (i) enhancing production and productivity; (ii) improving market access and value addition; (iii) improving the enabling environment for agricultural sector; and (iv) institutional strengthening in the sector (Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) 2010). Under Pillar one and two, the existing farming are envisioned to play a key role in improving produce marketing, increasing access to financing and value addition and ultimately leading to agricultural transformation (Gadgil and Berkes, 2011).

Agriculture in Kenya dominates Kenya's economy. According to National Bureau of Statistics, (2009), 15–17 percent of Kenya's total land area has sufficient fertility and rainfall to be farmed, and 7–8 percent can be classified as first-class land. In 2006, almost 75 percent of working Kenyans made their living by farming, compared with 80 percent in 1980. About one-half of Kenya's total agricultural output is non-marketed subsistence production. Agriculture is also the largest contributor to Kenya’s gross domestic product (GDP). In 2005, agriculture, including forestry and fishing, accounted for about 24
percent of the GDP, as well as for 18 percent of wage employment and 50 percent of revenue from exports (Macharia, 2004; National bureau of statistics, 2009).

The effect of climate change has been felt mostly by the farmers especially due to dependence on rain-fed agriculture in the country. The changing and unpredictable raining seasons has greatly affected their ability to plan their farming activities. Areas which received adequate rainfall now receive insufficient rainfall reducing the land that can support agriculture. This brings the need for more exploitation on irrigation farming especially in ASALs. It is estimated that intensified irrigation can increase agricultural productivity fourfold and, depending on the crops, incomes can be multiplied 10 times (Mwanda, 2010).

The agricultural sector extension service plays a key role in disseminating knowledge, technologies and agricultural information, and in linking farmers with other actors in the economy. The extension service is one of the critical change agents required in transforming subsistence farming to a modern and commercial agriculture to promote household food security, improve income and reduce poverty. However there is limited access to extension services in most parts of the country with the National extension staff: farmer ratio standing at 1:1,500. This situation has hindered most farmers from keeping pace with changing technological advances. There is therefore need for recruitment of more extension staff and the involvement of NGO's to increase access of extension services to farmers (Macharia, 2004).
Poor rural roads and other key physical infrastructure have led to high transportation costs for agricultural inputs and products. It also leads to spoilage of perishable commodities during transportation (Mwanda, 2010). This causes high losses to farmers. This list of challenges facing Kenyan agriculture and farmers is not exhaustive. They are however the major challenges that can be solved if effective extension and advisory services accorded to farmers especially small scale farmers. The government also has a big role to play in solving some of these challenges like the poor infrastructure, strengthening research, extension and training and enhancing farmer access to affordable inputs and credit. Most of the challenges are caused by lack of information and knowledge on how to avoid them or how to solve or circumvent those that cannot be avoided (Kitetu, 2005; DeWalt, 2004).

The farmer group’s method was first brought up and introduced as the replacement for the Baraza approach which the Government had been taking since its independence in the early sixties and in the end was proven ineffective in improving the status, the out puts and the culture of the agriculture of Kenya. In response the failure of such top-down methods, the newly introduced Farmer Group Approach encouraged horizontal methods which encouraged individual farmers to come together to talk about problems and reach consensus, conclusions and solutions (Kitetu, 2005).
Mwala sub-county lies in the expansive Machakos County; with a population of 89,211 people. The sub-county covers an area of 852.9 km² (298.4 sq mi). Local people are mostly of the Akamba ethnicity. The local climate is semi-arid with hilly terrain with an altitude of 1000 to 1600 metres above sea level (National bureau of statistics, 2009). Subsistence agriculture is mostly practiced with maize and drought-resistant crops such as sorghum and millet being grown due to the areas semi-arid state. However, the County also plays host to the open air market concept with major market days where large amounts of produce are traded. Fruits, vegetables and other food stuffs like maize and beans are sold in these markets (Mwanda, 2010).

Governments and NGO’s are determined to develop and improve the agricultural sector to alleviate poverty and hunger through empowering small-scale farmers who are organized into groups. Though the approach, empowered farmers in Mwala that is still tormented of hunger, children sleep hungry and rampant relief food as time lapses. Contrary to these, there are countries in the world that receive less rainfall and have land patched with poor and uninhabitable climate and are less organized yet there large populations do not depend on food relief or die of hunger (USAID, 2013).

1.2 Statement of the Problem
Farming is the most important economic sector in Kenya. More than 70 per cent of the population in Kenya depends on agriculture for household food security, livelihoods, and incomes (Jayne and Muyanga, 2006). Kenya’s agriculture is mainly rain-fed and is
entirely dependent on the bimodal rainfall in most parts of the country. A large proportion of the country, accounting for more than 80 per cent, is semi-arid and arid with an annual rainfall average of 500 mm. Droughts are frequent and crops fail in one out of every three seasons. Kenya’s agriculture is predominantly small-scale farming mainly in the high-potential areas. Production is carried out on farms averaging 0.2–3 ha, mostly on a commercial basis. This small-scale production accounts for 75 per cent of the total agricultural output and 70 per cent of marketed agricultural produce (Kitetu, 2005).

In Mwala Sub-County of Machakos County, agriculture contributes around 20 per cent of formal employment (Mwanda, 2010), relatively low compared to other parts of the country, as well as providing work for casual labourers. Due to the aridity of the land, only 10.5 per cent can be used for crop production, and only 3 per cent is considered high potential land. 45 per cent of the population suffer under the yoke of poverty and starvation not just because of failed rains but because of poor planning and lack of farmer’s unity (National bureau of statistics, 2009; USAID, 2013). Although Mwala has got a well-developed agricultural research system, use of modern science and technology in agricultural production is still limited. (Jayne and Muyanga, 2006). Most farmers lack information on the right type of farm inputs to use and the appropriate time of application of the same. The cost of key inputs such as seed, pesticides and fertilizer, is high for the poor farmers. Most farmers therefore do not use them. This greatly reduces the yield that the farmers get (Kitetu, 2005). Pests and diseases have continued to cause a lot of losses to farmers. This is caused by lack of information by the farmers on how to control these
diseases. Post-harvest losses are caused by poor handling and storage facilities. Maize in Eastern Province has been affected by aflatoxins in the past due to inadequate drying and poor storage facilities. Extension services can be instrumental in helping reducing pre and post-harvest losses caused by Pest and Diseases (Jayne and Muyanga, 2006).

It is due to these problems that this research is seeking to find out whether there is a relationship between credit access, input supply, training of farmers and adoption of new technologies with sustainability of agricultural projects.

1.3 Purpose of the study
The purpose of this study was to examine the determinants influencing sustainability of agricultural projects in Mwala Sub County, Machakos County Kenya.

1.4 Objectives of the study
i. To establish the influence of credit access on sustainability of agricultural projects in Mwala Sub County, Machakos County.

ii. To examine the influence of input supply on sustainability of agricultural projects in Mwala Sub County, Machakos County.

iii. To assess the influence of training of farmers on sustainability of agricultural projects in Mwala Sub County, Machakos County.

iv. To determine the influence of adoption of new technologies on sustainability of agricultural projects in Mwala Sub County, Machakos County.
1.5 Research question

i. To what extent does credit access influence sustainability of agricultural projects in Mwala Sub County, Machakos County?

ii. How does input supply influence sustainability of agricultural projects in Mwala Sub County, Machakos County?

iii. To what extent does training of farmers influence sustainability of agricultural projects in Mwala Sub County, Machakos County?

iv. How does adoption of new technology influence sustainability of agricultural projects in Mwala Sub County, Machakos County?

1.6 Significance of the study

This study may be of great importance to farmers as it clearly outlines the determinants influencing of farmers on sustainability of agricultural projects in Mwala Sub County of Machakos County in Kenya.

The study may also determine how farmers affect economic growth and development and the impact of sustainability of agricultural projects in economic development. To the stakeholders, the study may be of importance since it will provide information that can be used to formulate policy.

To academicians and researchers, the study may be a source of reference material for future researchers on other related topics; it may also help other academicians who undertake the same topic in their studies.
1.7 Limitation of the study
The following limitations were faced by the researcher during the research study; logistic problems especially reaching out to the management to get authorization for carrying out the study. It was not be easy to convince the farmers that the information collected would be treated with utmost confidentiality because many said they have been misused before after by other people claiming to be researchers. The researcher explored all possible ways to solve or minimize these problems by explaining to the farmers that the information given will kept secret and used only for educational purposes.

1.8 Delimitation of the Study
The study was delimited to Mwala Sub-County because it a semi-arid and arid with an annual rainfall average of 500 mm. Agriculture is predominantly small-scale farming. The study was confined to available farmers in the area. The study was only concerned with determinants influencing sustainability of agricultural projects in Mwala Sub County, Machakos County only.

1.9 Basic Assumptions of the Study
The study assumed that all the respondents were honest and truthful when answering the questions. It is also assumed that the respondents was objective and competent in answering questions.
1.10 Definition of Terms Used in the Study

**Adoption:** is a process whereby a farmer acquires new technologies and practices it to increase productivity and farm incomes.

**Sustainability of Agriculture:** According to this study, sustainability of agricultural project is an activity that seeks to sustain farmers, resources and communities by promoting farming practices and methods that are profitable, environmentally sound and good for communities.

**Credit access:** is the trust which allows one party to provide money or resources to another party where that second party does not reimburse the first party immediately, but instead arranges either to repay or return those resources (or other materials of equal value) at a later date.

**Farmer:** a farmer is a person engaged in agriculture, raising living organisms for food or raw materials.

**Project:** an individual or collaborative enterprise or an activity that is carefully planned and designed to achieve a particular aim.

**Input supply:** it is agricultural production necessities such as feed, fertilizers, crop chemicals, and seed required by farmers to generate income and improve their livelihoods.

**New Technology:** is the collection of new techniques, methods or processes practiced by farmers to increase production in the farms.

**Training of farmers:** are agricultural teachings, or developing in oneself or others, any skills and knowledge that relate to specific useful competencies.
1.11 Organization of the Study

The study is organized into five chapters. Chapter one provides details on the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, limitations, delimitations, basic assumptions of the study and definition of terms used.

Chapter Two offers a review of the relevant literature on the influence of farmers on sustainability of agricultural projects, theoretical, conceptual framework and knowledge gap.

Chapter Three covers research methodology that is applied to source data. In this section the researcher identified the procedures and techniques which were used in the collection, processing and analysis of data. Specifically the following subsections are included: research design, target population, data collection instruments, data collection procedures, pilot testing and finally data analysis.

Chapter Four covered data analysis, presentation, discussion and interpretation of the study findings. This was followed by chapter five which contain summary of the findings, discussions, conclusions and recommendations. References and appendices are at the end of the report.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction
Chapter two presents’ scholars work on the factors influencing sustainability of agricultural projects. Thereafter the chapter looks at the empowerment theory inline with the study objectives. Specifically 2.2 Concept of Sustainability of Agricultural Projects; 2.3 Credit Access and Sustainability of Agricultural projects; 2.4 Influence of Input supply and Sustainability of agricultural projects; 2.5 Training of Farmers and Sustainability of agricultural projects; 2.6 Technology and Sustainability of agricultural projects; 2.7 Theoretical Framework; 2.8 Conceptual framework; 2.9 Knowledge gap and 2.10 Summary of the Literature Reviewed.

2.2 Concept of Sustainability of Agricultural Projects
The long-term viability of our current food production system is being questioned for many reasons. The news media regularly present us with the paradox of starvation amidst plenty including pictures of hungry children juxtaposed with supermarket ads (Adams, Hamilton and Gibson, 2010). Possible adverse environmental impacts of agriculture and increased incidence of foodborne illness also demand our attention (Birkhaeuser, Everson and Feder, 2011). Farm crises seem to recur with regularity. Historically, farming played an important role in our development and identity as a nation. From strongly agrarian roots, we have evolved into a culture with few farmers (Delia, Oumar and Peter-Henning, 2008). Less than two percent of Americans now produce food for all U.S. citizens. Can
sustainable and equitable food production be established when most consumers have so little connection to the natural processes that produce their food.

The prevailing agricultural system, variously called conventional farming, modern agriculture, or industrial farming has delivered tremendous gains in productivity and efficiency (Birkhaeuser, Everson and Feder, 2011). Food production worldwide has risen in the past 50 years; the World Bank estimates that between 70 percent and 90 percent of the recent increases in food production are as the result of conventional agriculture rather than greater acreage under cultivation. U.S. consumers have come to expect abundant and inexpensive food (Delia, Oumar and Peter-Henning, 2008).

Conventional farming systems vary from farm to farm and from country to country (Ergano & Nurfeta, 2006). However, they share many characteristics: rapid technological innovation; large capital investments in order to apply production and management technology; large-scale farms; single crops/row crops grown continuously over many seasons; uniform high-yield hybrid crops; extensive use of pesticides, fertilizers, and external energy inputs; high labor efficiency; and dependency on agribusiness. In the case of livestock, most production comes from confined, concentrated systems.

Philosophical underpinnings of industrial agriculture include assumptions that: nature is a competitor to be overcome; progress requires unending evolution of larger farms and depopulation of farm communities (Birkhaeuser, Everson and Feder, 2011); progress is measured primarily by increased material consumption; efficiency is measured by
looking at the bottom line; and science is an unbiased enterprise driven by natural forces to produce social good (Adams, Hamilton and Gibson, 2010).

Both positive and negative consequences have come with the bounty associated with industrial farming (Ergano & Nurfeta, 2006). While considering these concerns, keep the following in mind: interactions between farming systems and soil, water, biota, and atmosphere are complex there is much to learn about their dynamics and long term impacts; most environmental problems are intertwined with economic, social, and political forces external to agriculture; some problems are global in scope while others are experienced only locally; many of these problems are being addressed through conventional, as well as alternative, agricultural channels; the list is not complete; and no order of importance is intended (Levi, 2001).

Kenya being largely an agricultural country began from the beginning to focus on agricultural sector. Agricultural extension service department was charged with working with farmers towards development (Pham, 2005). Using results of research carried out between 2003 and 2005, which looked at the communication strategies used in extension services, Pham, (2005) shows that initiatives of extension service providers, though noble, yet, in using the baraza (village gathering) mode of community mobilization, failed to take on board social factors and dynamics of human relations that is horizontal, dialogical and participatory strategies, which lead to commitment to given policies and ultimately development. The baraza mode is imbued with discourse features related to the exercise of power and officiality. Power and control is displayed at various linguistic
levels including, style, topic control, address forms, inclusive and exclusive pronouns and modality (Schwarz, 2012).

2.3 Credit Access and Sustainability of Agricultural projects
Agriculture is a dominant sector of our economy and credit plays an important role in increasing agriculture production. Availability and access to adequate, timely and low cost credit from institutional sources is of great importance especially to small and marginal farmers. Along with other inputs, credit is essential for establishing sustainable and profitable farming systems (Maitima, Rakotoarisoa and Kang’ethe, 2010). Most of the farmers are small producers engaged in agricultural activities in areas of widely varying potential. Experience has shown that easy access to financial services at affordable cost positively affects the productivity, asset formation, income and food security of the rural poor. The major concern of the Government is therefore; to bring all the farmer households within the banking fold and promote complete financial inclusion.

In India, the Government has initiated several policy measures to improve the accessibility of farmers to the institutional sources of credit. The emphasis of these policies has been on progressive institutionalization for providing timely and adequate credit support to all farmers with particular focus on small and marginal farmers and weaker sections of society to enable them to adopt modern technology and improved agricultural practices for increasing agricultural production and productivity (Ramakrishnan and Kumar, 2010). The Policy lays emphasis on augmenting credit flow at the ground level through credit planning, adoption of region-specific strategies and
rationalization of lending Policies and Procedures. These policy measures have resulted in the increase in the share of institutional credit of the rural households (Setboonsarng et al., 2005).

In order to ensure that all eligible farmers are provided with hassle free and timely credit for their agricultural operation, Kisan Credit Card Scheme for farmers was introduced in 1998-99 to enable the farmers to purchase agricultural inputs such as seeds, fertilisers, pesticides, etc. The Kisan Credit Card Scheme is in operation throughout the country and is implemented by Commercial Banks, Coop. Banks and RRBs. The scheme has facilitated in augmenting credit flow for agricultural activities (Ramakrishnan and Kumar, 2010). The scope of the KCC has been broad-based to include term credit and consumption needs. All farmers including Small farmers, Marginal farmers, Share croppers, oral lessee and tenant farmers are eligible to be covered under the Scheme. The card holders are covered under Personal Accident Insurance Scheme (PAIS) against accidental death/permanent disability (Dollo, Chaudhury and Sundriyal, 2006).

Further, GoI has recently accepted suggestions made by a Working Group (Bhasin Working Group) on Kisan Credit Card Scheme to convert it into a Smart Card cum Debit Card and revised guidelines have been issued by NABARD. Some of the major features are as under: For crop loans, no separate margin need to be insisted as the margin is in-built in scale of finance; No withdrawal in the account to remain outstanding for more than 12 months; no need to bring the debit balance in the account to zero at any point of
time; Interest subvention /incentive for prompt repayment to be available as per the Government of India and / or State Government norms; No processing fee up to a limit of Rs. 3.00 lakh; One time documentation at the time of first availment and thereafter simple; declaration (about crops raised/ proposed) by farmer; KCC cum SB account instead of farmers having two separate accounts. The credit balance in KCC cum SB account to be allowed to fetch interest at saving bank rate and disbursement through various delivery channels, including ICT driven channels like ATM/ Mobile handsets (Ramakrishnan and Kumar, 2010).

To mitigate the distress of farming community in general and small and marginal farmers in particular and to declog the institutional credit channels and make farmers eligible for fresh credit, the Debt Waiver and Debt Relief Scheme, 2008 was announced in the Union Budget for 2008-09. The scheme covered direct agricultural loans disbursed (i) between 31 March 1997 and 31 March 2007 (ii) overdue as on 31 December 2007 and (iii) remaining unpaid until 29 February 2008. In the case of small and marginal farmers, short term production loans (subject to a ceiling in respect of plantation and horticulture) and installments of investment loans overdue were covered, while in the case of the other farmers, one time settlement was extended under which a rebate of 25% of the eligible amount was given on the condition that the farmer repays the balance 75% in three installments (Fyfe, 2002; Dollo, Chaudhury and Sundriyal, 2006).
The type and amount of benefits acquired by farmers depend largely on the strength of their bargaining power. Small farms typically have limited bargaining power, particularly if they possess few assets and scarce alternative income opportunities (Key and Runsten, 2009). Farmers' groups can play an important role in the success of contract farming arrangements through the power of group clout (Glover, 2007; King, 2002). In an effort to reduce transaction costs, firms often prefer to organize farmers into groups or deal with existing farmer organizations. Farmers' groups appear not only to improve the bargaining power of smallholders, but also serve to lessen some of the criticisms of contract farming.

More specifically, farmers' groups can perform beneficial functions to facilitate and improve contract farming ventures, this might include: Facilitate communication between firm and farmer; Provide technical transfer and farmer training; Facilitate credit provision and group guarantee; Achieve economies of scale; Aid quality control and assurance and improve bargaining power and upgrade processes. Grosch (2014) asserts that government has substantial latitude to promote contract farming by: Making the establishment of estate agriculture difficult or impossible; Creating joint ventures with private firms that want to use contracting; Providing complementary infrastructure; Regulating the terms of the contract and using the police and court systems to help enforce the terms of the contract.

State promotion of contract farming can also serve to eliminate some of the negative effects associated with opportunistic behavior. Simmons (2002) has identified the role of
governments as market regulators to guard against agro-business abusing its market power. Pham (2005) asserts that government's role in promoting contract farming may improve conditions at both the macro and micro levels. Macro changes would be directed at reducing costs of contracting for all parties. Micro reforms may include training, arbitrating disputes, undertaking research, and providing extension services relevant to the expansion of contracting. Training programs for smallholders in literacy, accounting, and cash management may reduce miscommunication in contracts. Experience has shown that a government's ability to plan and execute economic policies can have significant effect on agrarian transition (Dollo, Chaudhury and Sundriyal, 2006).

2.4 Influence of Input supply and Sustainability of agricultural projects
One major impediment to improved smallholder agricultural productivity in Africa has been limited access to indispensable inputs such as improved seed varieties and fertilizer. This problem is exacerbated by a lack of efficient output markets and gaps in policy which impair the effectiveness of market systems for vulnerable households that have lost productive assets such as manpower, agricultural equipment and cattle for ploughing due to a variety of reasons that include HIV and AIDS and poverty. The immediate need is basic support in the form of seed and fertilizer to produce food for the family. Once this need is met, additional support in the form of assets, inputs, credit extension services and supportive policies is needed to help these households become more productive and enter commercial markets to generate income and improve their livelihoods (Jayne and Muyanga, 2006).
Africa’s consumption of modern inputs, particularly fertilizers, is comparatively very low. The FAO (2008) projects that the situation will not change much in the short run as Africa will account for less than 3% of world fertilizer consumption by the end of 2012. To understand the current low levels of modern input use in African agriculture one has to take into consideration the developments and factors that drive the demand and supply of these inputs. The demand and supply of agricultural inputs are influenced largely by changing and often interrelated factors: population and economic growth; agricultural production; prices; and government policy. These changes manifest themselves in the global macro-economic factors, the agricultural context, income growth and dietary change, bio-fuels, additional agricultural land cultivated, and technology. They are the main drivers of both agricultural input demand and supply. In addition, changes in technology are crucial in the supply of agricultural inputs (Muok, Kimondo and Atsushi, 2011).

Input subsidies appear to be the central theme in the discussion of agricultural input marketing and a successful input marketing strategy for agricultural development hinges on how input subsidies are handled. As noted by Dorward et. al. (2008), agricultural input subsidies were a common element in agricultural development in poor rural economies in the 1960s and 70s, including successful green revolutions. Although subsidies have continued, to a greater or lesser extent in some countries, conventional wisdom as well as dominant donor thinking in the 80s and 90s was that subsidies had an ineffective and
inefficient policy instrument in Africa, which contributed to government overspending and fiscal and macroeconomic problems.

Dorward et.al. (2008) observe a resurgence of interest in agricultural input subsidies in Africa, in recent years, together with the emergence of innovative subsidy-delivery systems. The case for the resurgence in interest in subsidies in input marketing appears strong in the literature. Subsidies play a primary role of promoting the adoption of new technologies and thus increase agricultural productivity in the process of agricultural development (Ellis 2012). This is possible because subsidies allow farmers to access purchased inputs such as seeds and fertilizers at lower cost, and reduce the disincentives to adoption that result from farmers’ cash constraints.

In spite of the strong case for subsidies, the literature also covers problems with subsidies. The most common problem is that costs of subsidies on inputs are very difficult to control, depending partly on the way they are delivered, for example, fertilizer production or import subsidies. Also, market distortions introduced by subsidies, and particularly parastatal involvement in subsidized input delivery, tend to crowd out and inhibit private sector investment in input markets and provide opportunities for corruption and rent seeking, and hence impede sustainable development (Dorward et. al. 2008).
The role of subsidies in input marketing in the successful Asian Green Revolutions has also been widely discussed in the literature. For example, the implementation of a subsidized credit-fertilizer-extension programme (Masagana programme) was a key part of the Green Revolution in the Philippines (Djurfeldt et. al. 2005). Areas with better than average production potential were selected for programme coverage in the early phase of implementation, but subsidies were later re-routed to the small-scale farm sector as it attracted priority.

Djurfeldt et. al. (2005) regard the Green Revolution in Asia as a state-driven, market-mediated and small-farmer based strategy to increase the national self-sufficiency in food grains in a string of Asian countries. They argue that technology was an important precondition for the results attained. States or governments drove the development of the food grain commodity chains towards the goal of self-sufficiency, a goal that was motivated not only by the threat of famine, but also by the volatile world markets for grain, which made vulnerable those countries that depended on imports. Dorward et. al. (2004) argue that sustained (but not indefinite) input subsidies were a major part of successful Green Revolution packages, making a critical contribution to thickening and thus kick-starting markets, first within staple-food supply chains and then in the wider rural economy. Gregory (2006) argues that fertilizer subsidies for staple crops are a critical requirement for this process to occur in Africa.
Input market policy reforms in Africa and other developing regions also receive attention in the literature. Lack of growth in agro-input business, particularly fertilizers, has been largely due to past governments’ over-involvement in its production, importation and distribution. Fertilizer subsidies were particularly expensive, thereby making heavy and growing demands on government budgets. These issues became the target of policy reforms in the agricultural sector, particularly from the mid-1980s.

Macro-factors affecting global demand and supply of agricultural inputs include: the economic context; oil; trade; freight rates; and exchange rates. In the economic context, developing countries and economies in transition continue their strong economic performance, and hence a continued increases in the demand for agricultural commodities and inputs (FAO 2008). High oil prices could depress the use of oil-based agricultural inputs (fertilizers and agro-chemicals) which have been behind much of the increases in farm production during the past half century (FAO 2007). At the micro (farm level) the income of farmers is the most important factor affecting their demand for agricultural inputs.

2.5 Training of Farmers and Sustainability of agricultural projects
Farmer training is an important tool widely utilized by development programs in developing countries (Birkhaeuser et al., 2011, Van den berg et al., 2007, Delia et al., 2008). In Uganda, government and privately run extension services as well as non-governmental organizations offer training packages to their farmers. Training procedures vary from one or two day workshops and seminars, on farm training and demonstration,
to field visits. Many rural households in Africa have some experience in rearing animals, especially small livestock such as goats and chickens, which are ubiquitous in the region (Adams et al., 2010). Training in animal management is desirable to farmers as they are often eager to improve their knowledge and practices and to have their knowledge affirmed by professionals. Therefore, training sessions are usually well attended. Trainings are an avenue for development workers to pass on new information and to correct misconceptions concerning animal management, as well as reassure the development workers that the animals will receive adequate care. Organizations that give animals to farmers usually require that the farmers receive some training before they are given the animals.

One of the popular extension strategies in developing countries is a ‘farmer to farmer approach’. Farmers chosen to be model farmers are selected based on criteria that is determined by the development organization. Usually the criteria include qualities such as; education level, leadership position, success at the enterprise, and personality traits (Muok et al., 2001). The model farmers are trained and given inputs such as animals and tools. Other farmers are encouraged to learn from the model farmer and the model farmers are required to encourage and train their peers by generously sharing their knowledge (Muok et al., 2001).

There are several initiatives to promote sustainable agriculture practices as environment-friendly and alternative to conventional agriculture. However, little has been done to
document the good agricultural practices or even lessons learnt from these initiatives. Farmers today still lack access to information on sustainable agriculture practices. Sustainable agriculture seeks an environmentally sound, socially equitable and economically viable ways to produce to meet the needs of the present without compromising those of future generations. Africa faces enormous challenges in feeding its population, around 40% of whom are malnourished and living in poverty. These challenges are escalating, given the threat to the region associated with climate change, land degradation, food crises, water scarcity and unequal resource allocation. Against this background, conventional agriculture is unlikely to hold the key to the region’s future food security the majority of farmers cannot afford to buy the high external inputs which conventional agriculture demands, and land degradation means that Africa produces less food per unit area than any other continent (Randolph et al., 2007).

There is a growing need for people-centred approaches in the context of sustainable development. Agricultural extension has long operated through a linear mode of technology transfer, conveying to farmers the latest technologies to improve production, with success measured by the rate of adoption (Worth, 2006). Historically, southern African research and extension systems were built on this research-design-disseminate-assimilate (RDDA) approach, although some changes have occurred over the last few decades. One of the key assumptions of the RDDA approach is that scientists do the research and design, extension workers disseminate and farmers consume (Leeuwis, 2004). However, the limitations of RDDA include being supply-driven by scientists; a
lack of consideration of local knowledge, diversity, sustainability and farmer needs; and
farmer inability to afford the kind of technologies being promoted. These limitations have
led to the development of farming systems approaches—which include the train and visit
approach, farmer first and participatory technology development all of which elicit
farmer participation and also pay attention to agro-ecological variations (Whiteside,
2008; Murwira et al., 2000; Mukute, 2010). People-centred strategies in agriculture are
“more appropriate to cope with diversity issues in both agro-ecological and socio-
economic terms” (Stoop and Hart, 2005). In this approach researchers see farmers as
innovators, partners and entrepreneurs; while farmers see scientists as one of many
sources of information available to them. The scope of research and learning goes beyond
the farm gate to include considerations of multi-functional agriculture, livelihoods, food
systems and value chains across multiple scales from global to local and over long time
frames. The main drivers are responsiveness to changing contexts such as markets,
globalization and climate change

2.6 Adoption of New Technology and Sustainability of agricultural projects
Technological change has been the major driving force for increasing agricultural
productivity and promoting agriculture sustainability. In the past, the choice of
technologies and their adoption was to increase production, productivity and farm
incomes (Van den berg and Jiggins, 2007). Over many decades, policies for agriculture,
trade, research and development, education, training and advice have been strong
influences on the choice of technology, the level of agricultural production and farm
practices. Agriculture is becoming more integrated in the ago-food chain and the global
market, while environmental, food safety and quality, and animal welfare regulations are also increasingly impacting on the sector. It is faced with new challenges to meet growing demands for food, to be internationally competitive and to produce agricultural products of high quality. At the same time, it must meet sustainability goals in the context of on-going agricultural policy reform, further trade liberalization and the implementation of multilateral environmental agreements as agreed to by OECD countries (Adams and Gibson, 2010; Ellis, 2012).

Historically, the focus of research and advice was to increase production, productivity and profits, whereas now the emphasis is on achieving those aims in a sustainable way, which often implies changing farm practices and using different technologies. As has often been the case, agriculture is drawing on and adapting technologies developed in or for other sectors of the economy (Jayne and Muyanga, 2006). Although research is increasingly “problem based” rather than seen as exogenous, it is not always clear which technologies are profitable for farming to develop and which farm practices will contribute to sustainable farming systems in the long-term. In the past, research was often directed at solving technical problems; now it is also aimed at defining research priorities and best technology to address current and future demands by society. Those priorities include biological pest control, biotechnology, information technology, bioremediation, precision farming, integrated and organic farming systems (FAO, 2008). Other issues, however, related to the educational and training system, institutions and the relative role of public and private research efforts are also important. Moreover, some sustainability
issues are not necessarily best addressed through technological options, but simply by changing the level and type of agricultural production and its location (Maitima, Rakotoarisoa and Kang’ethe, 2010).

Today, farmers, advisors and policy makers are faced with complex choices. They are faced with a wide range of technologies that are either available or under development; they must deal with the uncertainties of both the effects these new technologies will have throughout the agri-food chain and the impact that a whole range of policies will have on the sustainability of farming systems. In addition, there is increasing pressure on agricultural research and advisory budgets that must be accommodated (Kiser, 2008).

Research and extension organizations have moved from working with individual farmers to collaboration with groups and, increasingly, with farmers’ organizations. At the grass-roots level, farmers’ associations, producers’ groups and cooperatives, as well as specially created farmers’ groups, are all involved in research and extension activities. At higher levels, unions, federations and syndicates are implicated in multi-stakeholder platforms for planning research and extension services (Hogan, 2012). Nowadays FOs present a highly diverse picture: from the former, state-managed, cooperative societies and unions to the new, farmer initiated federations and syndicates, as well as market-driven farmers’ groups. As a consequence, links with public and private knowledge-for-innovation service providers are encountered at all levels, with various status, aims and function modalities. But the role of FOs in agricultural innovation goes much further than
simply participating in, and contributing to, research and extension. Support functions, such as guiding innovation processes (e.g. information on norms, regulations and markets), sharing experiences for learning purposes, providing complementary services (e.g. credit facilities) are equally important. FOs can therefore fulfill several roles, contribute to various functions that enhance successful innovation and increasingly provide services themselves (Speedy, 2003; Pole and Wasilwa, 2011).

The private-sector and/or public-private arrangements currently play an increasing role in research and extension. FOs are thus evolving in an environment where stakeholders’ interests diverge and/or converge (Pole and Wasilwa, 2011). However, the effective use of new technologies to become innovations is often defined by conditions other than simple access to knowledge and information; it often requires appropriate, innovative institutional and organizational settings. The agricultural innovation systems concept therefore considers links between actors, interactive learning processes, and the policy and institutional contexts that govern the system in order to better understand the generation, dissemination and application of knowledge. The agricultural innovation systems concept also emphasizes the need for all stakeholders to work together towards innovation for development (Maitima, Rakotoarisoa and Kang’ethe, 2010).

2.7 Theoretical Framework
This study will be guided by empowerment theory gained influence in the '80s by Friedmann. Although Friedmann himself was primarily interested politics of empowerment asserting universal human awareness and rights of people within a given
social setting. Given this approach, empowerment has become a buzzword in most
development and international agencies with most of its discussion centering on power
relations, awareness, control, poverty alleviation, development and empowerment. The
contributions of Friedmann, Rappaport, Zimmerman, Chambers, Myrdal and other
scholars of the same category will be of paramount importance.

However, greater emphasis will be placed on Friedmann’s (1980) work titled
‘Empowerment: The Politics of Alternative Development’ wherein he provides the basis
for an alternative development approach defined in the politics of empowerment asserting
universal human awareness and rights of people within a given social setting. The focus
is on the voiceless, marginalized, underprivileged, households and all classes of
disempowered people; men and women alike who constitute a majority in their political
communities. Friedmann (1980) does not negate the politics of sustainable economic
growth in his emphasis on the autonomy of power and self-reliance initiatives but rather
seeks to see a form of political, economic and social integration of communities
regardless of their social status in the overall decision making process.

Empowerment is a transformative process within human existence from the state of
powerlessness to the state of relative control over one’s overall existence by taking
control over his destiny and making use of his immediate environment for a sustainable
improvement in their livelihoods and better standards of living. Farming emerging as an
avenue of community empowerment and poverty alleviation surrounds the discussion of
Empowerment theory. Empowerment theory is an alternative development approach as a result of the failures of mainstream development theories in addressing the poverty situation in Third World countries due to their emphasis on growth, pursuit of industrialization and urban bias on holding unfulfilled small promises of a better life for the excluded and downtrodden majority (Ergano and Nurfeta, 2006).

Friedmann sees empowerment in terms of power relations, the abilities of people to take control over lives and environment and participate in the overall decision making processes that affect their livelihoods geared towards improving their standards of living; emphasizing on the needs of households. ’Alternative development must be seen as a process that seeks the empowerment of households and their individual members through their involvement in socially and politically relevant actions’ (King, 2002). He distinguishes three forms of power such as social power which has to do with awareness, knowledge, skills, participation in social organizations and access to financial resources without any form of societal discriminations. The second form of power being political power has to do with autonomy and active participation in the decision making processes. The last form of power is psychological power which portrays individual potentialities and sense of reasoning that influences both the social and political power. He moves further to explain that any deprivations of such rights infringes with individual basic existence and a negation of one’s very humanity (Schwarz, 2012).
Narayan agrees with the above perceptions of empowerment by Robert Friedmann and added that empowerment is ‘the expansion of assets and capacities of poor people to participate in, negotiate with, influence, control and hold accountable institutions that affect their lives’. Arguing that poor people are unlikely to take control without being empowered (Narayan, 2002). He further explains that ‘empowerment is a construct that links individual strengths and competencies, natural helping systems, and proactive behaviors to social policy and social change (Perkins et al., 2005).

Friedmann goes further to justify the application of empowerment theory as an alternative development approach given the fact that most of the poverty situations in developing countries affect mostly the households with the burden on women (Worner et al., 2009). He advocates for a complete structural change in the prevailing dominant political systems in the spheres of power (authority), patriarchy and peripheral capitalism aimed at ameliorating if not eradicate the poverty conditions of the disempowered poor with emphasis on the rural areas (Perkins et al., 2005). ‘The powerlessness of one farmer, which changes by means of his/her activism in collaboration with others in his/her situation, is a process that empowers the entire community of farmers’ (Christodoulou and Gray, 2007).

Despite the these constrains, the contribution of empowerment theory on development cannot be over emphasized taking into considerations the numerous emergence of sustainability of agricultural projects all around the World and their impacts on the local
community at large. A good example of the success of this theory is from the Grameen bank in Bangladesh and how its message has been transformed throughout the developing world leading to the emergence of Self Help Groups as is the case India, the Susu’s of Ghana, the Sacco’s of Tanzania and Ric Cameroon A/S in Central Africa all aimed at providing extension services to the rural poor farmers. Hence farmers have emerged as a paradigm changed in alternative development despite its challenges. This makes empowerment theory a perfect bottom-up approach on development in its manifestations on the convergence of power relation from top-bottom to bottom-up autonomy there by giving power and wider opportunities to the powerless so that they could use their initiatives, rights and capabilities for the common good of their social settings not only to better their lifestyles and improve their standards of living but gradually moving themselves out the deprivations of poverty in a sustainable manner (Djurfeldt and Jirstrom, 2005).
2.8 Conceptual framework

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Moderating Variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Access</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group guarantee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bargaining power</td>
<td></td>
</tr>
<tr>
<td>Input supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>pesticides</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fertilizer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>seeds</td>
<td></td>
</tr>
<tr>
<td>Training of Farmers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Topics covered</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of trainings</td>
<td></td>
</tr>
<tr>
<td>Adoption to new technologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved agricultural practices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rain Curtain Technology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drip system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Root Watering Series</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government policy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Funding</td>
<td></td>
</tr>
<tr>
<td>Sustainability of Agricultural Projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased farm Output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimal reliance to relief food</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.1: Conceptual framework
### 2.9 Knowledge gap

#### Table 2.1: Summary of the Knowledge gap

<table>
<thead>
<tr>
<th>Variables</th>
<th>Author(s)</th>
<th>Title of the Study</th>
<th>Findings</th>
<th>Knowledge Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adoption of new technology</td>
<td>Wabwoba and Wakhungu (2013)</td>
<td>Factors affecting sustainability corporations of farmer projects in Kiambu County, Kenya</td>
<td>The cost of key inputs such as seed, pesticides and fertilizer, is high for the poor farmers.</td>
<td>There is need to explore how adoption of new technology influence sustainability of agricultural projects</td>
</tr>
<tr>
<td>Input supply</td>
<td>Kitetu (2012)</td>
<td>Farmers’ groups Innovations for Sustainable Agricultural Development and crop yield estimation in central highlands of Kenya</td>
<td>Extension services can be instrumental in helping reducing pre and post-harvest losses caused by Pest and Diseases</td>
<td>The current study sought to find out how input supply influence sustainability of agricultural projects</td>
</tr>
<tr>
<td>Training of Farmers</td>
<td>Pole and Wasilwa (2011)</td>
<td>Empowering Smallholder Farmers in Kilifi and Malindi Districts of Kenya through sustainable production techniques,</td>
<td>The study findings were the focus of research and advice was to increase production, productivity and profits, whereas now the emphasis is on achieving those aims in a sustainable way</td>
<td>The study sought to find out how training of farmers influence sustainability of agricultural projects</td>
</tr>
<tr>
<td>Credit access</td>
<td>Cherfas and Hodgkin (2011)</td>
<td>Sustainability of rural development projects Best practices and lessons learned by IFAD in Asia</td>
<td>The study finds out that strategy in the country has the objectives of promoting economic growth, sustainable livelihoods and food security among poor rural people, especially women, and particularly among vulnerable and marginalized groups in upland areas</td>
<td>The researcher sought to understand how credit access influence sustainability of agricultural projects</td>
</tr>
</tbody>
</table>
2.10 Summary of the Literature Reviewed

This chapter has reviewed the Empowerment Theory and found the appropriate one for the study. The Empowerment Theory looks at the individual farmers as the unit of analysis. The development of the research instruments was based on the theoretical contributions of the theories. Four factors that influence sustainability of agricultural projects were considered for this study: credit access and sustainability of agricultural projects, influence of input supply, training of farmers and technology. Sustainability of agricultural projects was dependent variable and government policy had a moderating effect. A researcher sought to bridge this noticeable gap identified in the literature review.
CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction
This chapter sets out various stages and phases that were followed in completing the study. It involves a blueprint for the collection, measurement and analysis of data. In this section the researcher identified the procedures and techniques which were used in the collection, processing and analysis of data. Specifically the following subsections are included; 3.2 research design, 3.3 target population, 3.4 sample size and Sampling Procedure and 3.5 data collection instruments, 3.6 data collection procedures, 3.7 Data Analysis Techniques, 3.8 Ethical Considerations and 3.9 Operationalization of Variables.

3.2 Research Design
The design of this research was descriptive survey. A descriptive survey design seeks to obtain information that describes existing phenomena by asking individuals about their attitudes and values in accessing microfinance loans (Mugenda and Mugenda 2003). A descriptive research is designed to obtain information concerning the current situation and other phenomena and wherever possible to draw valid conclusion from the facts discussed. Descriptive survey attempts to describe or define a subject often by creating a profile of a group of problems, people or events through the collection of data and tabulation of the frequencies on research variables or their interaction as indicated. According to Paulin (2007), “descriptive research studies are based on some previous understating of the nature of the research problem”. A descriptive study design is deemed the best design to fulfill the objectives of the study.
3.3 Target Population
Ngechu (2004) defined a population as a well-defined or set of people, services, elements, and events, group of things or households that are being investigated. The study targeted all farmer groups in Mwala Sub-County of Machakos County, because they are well organized and have rules to govern them. There are 275 registered farmer groups in the Mwala sub-county, with a membership of 7150 members according to the District Gender, Children and Social Services department Mwala Sub-County, 2014).

3.4 Sample size and Sampling Procedure
This section includes Sample size and Sampling Procedure of the study:

3.4.1 Sample Size
The sample size in this study was 74, determined through approach based on precision rate and Confidence level as recommended by Kothari (1984). In this study the sample from a finite population, hence the formula to be used according to Kothari was:

\[ n = \frac{z^2 \cdot p \cdot q \cdot N}{c^2 \cdot (N-1) + z^2 \cdot p \cdot q} \]

Where:

- \( n \) = desired sample size
- \( z^2 \) = is the standard variate at the required confidence interval (C.I).
- \( p \) = is the sample proportion in the target population estimated to have the characteristics being measured.
- \( q \) = 1-p
N=size of the target population

e2=acceptable error (the precision)

In this study the researcher used confidence interval of 95%, P value of 0.05 (p =0.05) and acceptable error (the precision) of 0.05 (e = 0.05). Z was 1.96 as per table area under normal curve for the required C.I of 95% and N was 7150, number of registered farmers in Mwala sub-County.

Therefore, the desired sample was

\[ n = \frac{(1.96)^2(0.05)(1-0.05)(7150)}{0.05^2(7150-1) + (1.96)^2(0.05)(1-0.05)} \]

\[ n = \frac{1304.7034}{17.8725 + 0.182476} \]

\[ n = 73.75 \approx 74 \text{ farmers} \]

3.4.2 Sampling procedure

Sampling means selecting a given number of subjects from a defined population as a representative of that population. Sampling is the procedure a researcher uses to gather people, or things to study. It is a process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group (Orodho and Kombo, 2002).
The study adopted stratified random sampling to ensure the different farmer groups in the population are represented in proportion to their numbers in the population so that category with larger population have proportionally greater chance of being included in the sample.

### 3.5 Research Instruments

The data for this study was collected using a questionnaire. The questionnaire contained close ended items and open ended. The questionnaire were administered on a drop and pick later method to farmers. Data was obtained from individual farmers in their respective farmer groups using questionnaires. The closed ended questions were accompanied by a list of possible alternatives from which respondents was required to select the answer that best describes their situation. Likert scale was used to determine if the respondent agreed or disagreed in a statement.

The questionnaire contained four parts; Part A which covered the demographic and respondent’s profiles. The second section was followed by sustainability of agricultural projects; the next section examined the objective one which, establishes establish the influence of credit access on sustainability of agricultural projects in Mwala Sub County, Machakos County. Section four covered the second objective of the study which is the influence of input supply on sustainability of agricultural projects in Mwala Sub County, Machakos County. Section five covered the influence of training of farmers on sustainability of agricultural projects in Mwala Sub County, Machakos County. And section six covered the fourth objective which is the influence of adoption of new
technologies on sustainability of agricultural projects in Mwala Sub County, Machakos County.

3.5.1 Pilot testing of the Research Instrument

The research instrument was pre-tested before final administration to the respondents. Pilot Study refers to feasibility studies which are small scale versions or trial runs done in preparation for the major study. A pretest prior to the actual study was carried out to enable the researcher to access the clarity of the instrument and its ease of use. According to Mugenda and Mugenda, (2003) pre-testing allows errors to be discovered before the actual collection of data begins and 10% of the sample size is considered adequate pilot study that is one farmer equating to ten purposively selected respondents perceived to be knowledgeable on the influence of farmer groups for sustainability of agricultural projects in Mwala Sub-County.

3.5.2 Validity of Instruments

Validity determines whether the research truly measures that which it is intended to measure or how truthful the research results are Joppe (2009). Research instrument is valid if it measures what it is supposed to measure and when the data collected through it accurately represents the respondents’ opinion (Amin2005).
To enhance validity, a pilot study was done through administering questionnaire randomly to 10 selected respondents in Mwala sub-county area, the area has similar characteristic as the case under study. It was further enhanced by making necessary adjustments to the questionnaire based on the pilot study results.

3.5.3 Reliability of Instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. Reliability refers to consistency of measurement; the more reliable an instrument is, the more consistent the measure. (Mugenda & Mugenda, 2003). The researcher tested reliability of instruments using Cronbach’s alpha while conducting the research in order to obtain data that is consistent with the objectives of the study. Cronbach’s case is useful with attitude instruments that use Likert scale SPSS is often used to calculate Cronbach (Del Siegle 2002). An alpha score of 0.70 or more indicates the instrument were reliable. Data reliability plays an important role towards enhancing generalization of gathered data to represent the true characteristics on factors influencing sustainability of agricultural projects of farmer in Mwala sub-County since it aided the researcher in clearing any ambiguities and ensuring that the questions posed measure what it is intended. If the Cronbach’s alpha is high, the instrument is said to yield data that have high test reliability.

A pilot study was conducted to find out if the respondents could answer the questions without difficulty. A pre-test was done by administering the instrument to ten respondents conveniently selected from Mwala sub-county area. The ten respondents
were requested to evaluate the statement items for relevance, meaning and clarity. They were asked to evaluate the questions for relevance, comprehension, meaning and clarity. The instrument was modified on the basis of the pilot test before administering it to the study respondents. Cronbach Alpha was therefore used to test reliability of the instrument. A coefficient of 0.7 and above shows high reliability of data (Saunders, 2009). The Cronbach Alpha test of the instrument resulted in a value of 0.765 which is greater than 0.7, thus the questionnaires were reliable. This indicates that the data collected using the above mentioned instruments was reliable for analysis. The tests were conducted using SPSS.

### Table 3.1: Summary of Cronbach’s Alpha Reliability Coefficients for Major Variables of the Study

<table>
<thead>
<tr>
<th>Constructs/Variable</th>
<th>Number of Statements</th>
<th>Cronbach Alpha</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Access</td>
<td>7</td>
<td>0.800</td>
<td>Reliable</td>
</tr>
<tr>
<td>Input Supply Factors</td>
<td>5</td>
<td>0.755</td>
<td>Reliable</td>
</tr>
<tr>
<td>Training of Farmer</td>
<td>7</td>
<td>0.831</td>
<td>Reliable</td>
</tr>
<tr>
<td>Influence of Technology adoption</td>
<td>6</td>
<td>0.780</td>
<td>Reliable</td>
</tr>
</tbody>
</table>

Source: Researcher (2015)

### 3.6 Data Collection procedure

The researcher obtained a permit from National Council for Science and Technology based on authorization letter from The University of Nairobi. Once all the permissions are granted, the researcher visited the area of study to make appointments with the target population.
Data was collected using a self-administered questionnaire. Nevertheless, where it proved difficult for the respondents to complete the questionnaires immediately, the researcher left them and organized to pick on a later date. In the course of piloting, the researcher visited the area of the study and administered the instruments.

This research collected both primary and secondary data. Primary data is the information the researcher obtained from the field. Primary data were collected using semi-structured questionnaires. The questionnaires were administered by the help research assistance. The questionnaires were used because they allow the respondents to give their responses in a free environment and help the researcher get information that would not have been given out were interviewers been used.

### 3.7 Data Analysis Techniques

After the field work the researcher edited and counter checked completion of questions in order to identify items which weren’t not have been appropriately responded to. The completed questionnaires were edited for completeness and consistency, checked for errors and omissions. Quantitative data was analyzed using descriptive statistics where responses from questionnaire were tallied and analyzed using frequency distribution, mean and percentage in order to save time and money, while increasing accuracy of the results. Computer statistical program for social sciences (SPSS) version 21 was used in processing data. The results are presented in tabulated form for easy interpretation.

Interpretation refers to searching for meaning and implication of research instruments, in order to make inferences and draw conclusions. Table represents research instruments more clearly and economically than text presentations (Kasomo 2006).
A simple regression model was used in determining the level of influence the independent variables have on dependent variable as shown below:

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon \]

Where;

- \( Y \) = Sustainability of agricultural projects in Mwala Sub County (Dependent Variable)
- \( \beta_0 \) = Constant Term
- \( \beta_1, \beta_2, \beta_3, \beta_4 \) = Beta coefficients
- \( X_1 \) = Credit Access
- \( X_2 \) = Input Supply Factors
- \( X_3 \) = Training of farmers
- \( X_4 \) = Adoption of Technologies
- \( \epsilon \) = Error Term

### 3.8 Ethical Considerations

The study was conducted in an ethical manner. The respondents was explained the purpose of the study and they were assured that the information given was treated as confidential and their names were not divulged. Informed consent was also sought from all the participants that agreed to participate. A research approval was also sought. The researcher personally administered the questionnaire to the respondents.
Their confidential information was only accessed by the researcher and the supervisor. They were not required to provide any identifying details and as such, transcripts and the final report did not reflect the subjects identifying information such as their names, in case they are not comfortable with it. After the study has been completed and a final report written, the tools used to collect data was destroyed.

3.9 Operationalization of Variables
The operational of variables describes the independent and dependent variables measurement indicators of the study as shown in diagram below;
Table 3.2: Operationalization of variables

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Independent Variables</th>
<th>Measurement of indicators</th>
<th>Measurement scale</th>
<th>Tools of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>To establish the influence of credit access on sustainability of agricultural projects of farmer groups in Mwala Sub County, Machakos County.</td>
<td>Credit access</td>
<td>- Facilitate credit provision and group guarantee - transaction costs</td>
<td>-Ordinal scale</td>
<td>Mean, frequencies, mode, Standard deviation and regression</td>
</tr>
<tr>
<td>To examine the influence of input supply on sustainability of agricultural projects of farmer groups in Mwala Sub County, Machakos County.</td>
<td>input supply</td>
<td>- Seed and fertilizer access - credit extension services - Access to equipment - effectiveness of market of vulnerable households - Subsidies in input marketing</td>
<td>-Ordinal scale</td>
<td>Mean, frequencies, mode, Standard deviation and regression</td>
</tr>
<tr>
<td>To assess the influence of training of farmers on sustainability of agricultural projects of farmer groups in Mwala Sub County, Machakos County.</td>
<td>training of farmer</td>
<td>- sharing their knowledge - trainings on post-harvest handling. - Training on the best agricultural practices - training on practices of environment-friendly as an alternative to conventional agriculture</td>
<td>Ordinal scale</td>
<td>Mean, frequencies, mode, Standard deviation and regression</td>
</tr>
<tr>
<td>To determine the influence of adoption of technologies on sustainability of agricultural projects by farmer groups in Mwala Sub County, Machakos County.</td>
<td>Adoption of technology</td>
<td>- Number of farmers using various type of irrigation - Number of farmers using certified seeds - Number of farmers adopting new farming techniques</td>
<td>-Ordinal scale</td>
<td>Mean, frequencies, mode, Standard deviation and regression</td>
</tr>
<tr>
<td>The main purpose of the study was to examine the factors influencing sustainability of agricultural projects in Mwala Sub County, Machakos County Kenya.</td>
<td>Sustainability of agricultural projects</td>
<td>- Increased farm Output - Minimal reliance to relief food - Generation of profit</td>
<td>-Ordinal scale</td>
<td>Mean, frequencies, mode, Standard deviation and regression</td>
</tr>
</tbody>
</table>
CHAPTER FOUR
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction
This chapter focuses on data analysis, interpretation and presentation. The purpose of this study was to examine the factors influencing sustainability of agricultural projects in Mwala Sub County, Machakos County Kenya. The objectives of the study were to assess the extent to which credit access influences sustainability of agricultural projects; to establish how input supply influences sustainability of agricultural projects; to investigate how training of farmers influences sustainability of agricultural projects; and to determine how adoption of technologies influences sustainability of agricultural projects in Mwala Sub County, Machakos County.

4.2 Response Rate of Questionnaire
The response rate of the of respondents is presented in the table 4.3

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responded</td>
<td>70</td>
<td>94.59</td>
</tr>
<tr>
<td>Did not respond</td>
<td>4</td>
<td>5.41</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>74</td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

From Table 4.2, the researcher distributed 74 self-administered questionnaires to the sampled respondents, 70 questionnaires were returned and this represents 94.59% response rate which the researcher found sufficient to proceed with data analysis. Mugenda and Mugenda (1999) stated that a response rate of 50% and above is good for analysis and reporting.
4.3 Background Information of the Respondents

The researcher asked the respondents to indicate their age and educational background.

This information is provided in table 4.4 and 4.5.

4.3.1 Distribution of Respondents by Age

In this section the researcher sought to establish the age category of the farmer group members, this was researched to identify the most active age group. Their responses are highlighted in Table 4.4

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-25 yrs</td>
<td>10</td>
<td>14.3</td>
</tr>
<tr>
<td>26-35 yrs</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
<td>36-45 yrs</td>
<td>15</td>
<td>21.4</td>
</tr>
<tr>
<td>46-55 yrs</td>
<td>11</td>
<td>15.7</td>
</tr>
<tr>
<td>55 and above yrs</td>
<td>6</td>
<td>6.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

14.3% of the farmer group members were aged between 18 years to 25 years, 28 respondents representing 40% of the farmer group members were aged between 26 years to 35 years, 15 (21.4%) of the farmer group members were aged between 36 years to 45 years, 11 (15.7%) of the farmer group members were aged between 46 years to 55 years and 6 (6.6%) of the farmer group members were aged over 55 years. This shows that the largest population of the respondents belonged to the most vibrant age group (26 to 35 years).
years) this is the most energetic age group and are able to understand issues related to sustainability of agricultural projects.

### 4.3.2 Distribution of Respondents by Highest Level of education

The respondents were asked to indicate their academic background. Table 4.5 shows the study findings on the respondents' academic background.

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school</td>
<td>32</td>
<td>45.7</td>
</tr>
<tr>
<td>Secondary School</td>
<td>20</td>
<td>28.6</td>
</tr>
<tr>
<td>Diploma</td>
<td>10</td>
<td>14.3</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>8</td>
<td>11.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The study sought to establish the respondent’s level of education. Majority of the respondents 45.7% had primary level of education, 28.6% had secondary education, and 14.3% were diploma holders and 11.4% with bachelor’s degree, with none for masters and PhD graduates.

### 4.4 Sustainability of Agricultural Projects

Respondents of the study were asked to rate the extent at which the following factors conform to sustainability of agricultural projects in Mwala Sub County, Machakos County Kenya. The table 4.6 shows the research findings.
Table 4.6: Sustainability of agricultural projects

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Std.</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability of agricultural projects lead to improvements in food productivity</td>
<td>3.2500</td>
<td>0.36986</td>
<td>48</td>
<td>65</td>
</tr>
<tr>
<td>The need to develop technologies and practices that do not have adverse effects on environmental goods and services</td>
<td>3.3750</td>
<td>0.40484</td>
<td>50</td>
<td>68</td>
</tr>
<tr>
<td>Sustainability in agricultural systems incorporates concepts of systems to buffer shocks and stresses</td>
<td>3.1000</td>
<td>.51611</td>
<td>46</td>
<td>62</td>
</tr>
<tr>
<td>Sustainable intensification in avoiding environmental degradation</td>
<td>3.0000</td>
<td>.41611</td>
<td>44</td>
<td>60</td>
</tr>
<tr>
<td>Agricultural land has been lost to human uses and other consequences of unsustainable land management</td>
<td>3.3750</td>
<td>0.40484</td>
<td>50</td>
<td>68</td>
</tr>
<tr>
<td>Sustainable agriculture outcomes can be reduced by pesticide use and carbon balances</td>
<td>3.2500</td>
<td>0.43972</td>
<td>48</td>
<td>65</td>
</tr>
</tbody>
</table>

From the research finding, respondents of the study strongly agreed that there need to develop technologies and practices that do not have adverse effects on environmental goods and services, this was supported with a mean of 3.3750 and a standard deviation of 0.40484, respondents also pointed out that agricultural land has been lost to human uses and other consequences of unsustainable land management (measure=3.3750). Other significant factors were sustainability of agricultural projects lead to improvements in food productivity (measure=3.25) and sustainability in agricultural systems incorporates concepts of both resilience (the capacity of systems to buffer shocks and stresses) (measure=3.1). The least significant factor was sustainable intensification as an increase in the efficiency of the use of land, water, fertilizers and pesticides, while avoiding environmental degradation with a mean of 3.0.
4.5 Credit Access and Sustainability of Agricultural Projects
The researcher sought to address the first objective that looked at the extent at which the following factors on credit access influence sustainability of agricultural projects in Mwala Sub County, Machakos County. Data was collected using linkert scale of No extent (1), little extent, (2), Moderate extent (3), large extent (4) and Very large extent (5). The table 4.7 shows the results.

Table 4.7: Credit Access

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability and access to adequate, timely and low cost credit to small and marginal farmers</td>
<td>4.0372</td>
<td>.37097</td>
<td>60</td>
<td>81</td>
</tr>
<tr>
<td>Provision of soft loans to smallholder farmers</td>
<td>3.7442</td>
<td>.48961</td>
<td>55</td>
<td>74.8</td>
</tr>
<tr>
<td>Gender-based obstacles – conventional thinking, cultural and social values</td>
<td>3.4419</td>
<td>.33356</td>
<td>50</td>
<td>67.6</td>
</tr>
<tr>
<td>Lack of information on the cost of obtaining such services</td>
<td>3.1628</td>
<td>.47372</td>
<td>47</td>
<td>63.5</td>
</tr>
<tr>
<td>Lack of awareness of existing credit schemes</td>
<td>3.0465</td>
<td>.34548</td>
<td>45</td>
<td>60.3</td>
</tr>
<tr>
<td>High interest rates by institutions</td>
<td>4.1302</td>
<td>.43269</td>
<td>61</td>
<td>82.6</td>
</tr>
<tr>
<td>Lengthy and vigorous procedures for loan applications</td>
<td>3.0000</td>
<td>.38680</td>
<td>44</td>
<td>60</td>
</tr>
</tbody>
</table>

The respondents were asked to indicate how credit access influence sustainability of agricultural projects. The results show that the majority of the respondents indicated that
high interest rates by institutions had the highest mean score at 4.1302. This signifies that it is the most important factor that influences sustainability of agricultural projects thus hindering the smallholder farmers from accessing credit. Other significant factors were availability and access to adequate, timely and low cost credit to small and marginal farmers (measure = 4.0372) and the provision of soft loans to smallholder farmers (m=3.7442). Less significant factor was lengthy and vigorous procedures for loan applications (m=3.0).

Interviewees of the study argued that loans are charged relatively high interest rates by commercial institutions in the area, or even not available for farmers to access. When providing loans, these banks are often mindful of high transaction costs on small loans, or may be refused credit altogether due to lack of collateral - something very acute in Mwala sub-county. To provide a source of credit, farmers sometimes group together funds that can be loaned out to members which is not adequate to support agricultural activity.

4.6 Input Supply Factors and Sustainability of Agricultural Projects
Respondents were asked their views on the main source of input Supply. They pointed out that personal savings is the main source of input supply, this was agreed by 31 members, provision by NGO’s was also supported by 27 members and provision by the government was supported by 12 members. Respondents of the study were asked to rate the extent at which the following factors conform to input supply factors in their respective groups. Table 4.8, shows the research findings.
Table 4.8: Input Supply Factors

<table>
<thead>
<tr>
<th>Factors Under Consideration</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to indispensable inputs such as improved seed varieties and fertilizer</td>
<td>3.962</td>
<td>.37372</td>
<td>59</td>
<td>79</td>
</tr>
<tr>
<td>Access to extension services and supportive policies to help these households become more productive and enter commercial markets to generate income</td>
<td>3.346</td>
<td>.44548</td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>Access to equipment</td>
<td>2.930</td>
<td>.23269</td>
<td>43</td>
<td>58.6</td>
</tr>
<tr>
<td>Availability of inputs to vulnerable households</td>
<td>3.000</td>
<td>.28680</td>
<td>44</td>
<td>60</td>
</tr>
<tr>
<td>Lack of sustained contact and cooperation with other public organizations such as trade (labour) unions and farmer’s groups</td>
<td>3.441</td>
<td>.39589</td>
<td>51</td>
<td>68.8</td>
</tr>
</tbody>
</table>

From the research findings, access to indispensable inputs such as improved seed varieties and fertilizer has a significantly positive influence on Sustainability of Agricultural Projects in Mwala Sub County with a mean score of 3.9628. This signifies that they are the most important factors that determine Sustainability of Agricultural Projects in Mwala Sub County which are not accessible to farmers due to high cost and also scarcity of these inputs. Other significant factors are lack of sustained contact and cooperation with other public organizations such as trade (labour) unions and farmer’s groups (m=3.0) and access to extension services and supportive policies to help these households become more productive and enter commercial markets to generate income.
(3.3465). Less significant factor was access to equipment, to which the farmers agreed that nobody has ever provided to them (m=2.9302).

4.7 Training of Farmers and Sustainability of Agricultural Projects
From the questionnaire the researcher sought to find out if farmers were trained and 39 farmers said that they were never trained and 21 said they were trained. Those were never trained claimed that they were not aware whether such trainings takes place. Most of the farmers were trained during field days and agricultural shows, agricultural extension officers had the least in the trainings conducted because farmers claimed that they were not available to offer assistance.

Respondents were also asked to rate how the following factors that influences training of farmers for Sustainability of Agricultural Projects in Mwala Sub County, Machakos County. The Table 4.9 illustrates the research findings.

Table 4.9: Training of Farmers

<table>
<thead>
<tr>
<th>Factors Under Consideration</th>
<th>Mean Score</th>
<th>Standard deviation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharing their knowledge</td>
<td>3.7</td>
<td>0.47</td>
<td>55</td>
<td>74</td>
</tr>
<tr>
<td>Training on the best agricultural practices</td>
<td>4.0</td>
<td>0.51</td>
<td>59</td>
<td>80</td>
</tr>
<tr>
<td>Training on practices of environment-friendly as an alternative to conventional agriculture</td>
<td>4.2667</td>
<td>0.67</td>
<td>63</td>
<td>85</td>
</tr>
<tr>
<td>Trainings on new information and to correct miss-conceptions concerning use of fertilizers</td>
<td>4.0333</td>
<td>0.53</td>
<td>59</td>
<td>80</td>
</tr>
</tbody>
</table>
Factors Under Consideration | Mean Score | Standard deviation | Frequency | Percentage  
--- | --- | --- | --- | ---  
Trainings on soil and water conservation | 4.3667 | 0.40 | 65 | 87  
Training on post-harvest handling | 3.0 | 0.51 | 44 | 60  
Training on the best crops for your soils | 4.1000 | .28680 | 61 | 82.6  

From the respondents’ perspective, the statement on trainings on soil and water conservation, this was supported by a mean of 4.3667. Other significant factors were Training on practices of environment-friendly as an alternative to conventional agriculture (measure= 4.2667) and training on the best crops for your soils with a mean of 4.1000. This was also supported by the earlier question where respondents said that they rarely or have never received any training on farming.

4.8 Adoption of New Technology and Sustainability of Agricultural Projects

Table 4.10: Influence of New Technology adoption

<table>
<thead>
<tr>
<th>Technology</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal tillage</td>
<td>4</td>
<td>5.71</td>
</tr>
<tr>
<td>No tillage</td>
<td>3</td>
<td>4.28</td>
</tr>
<tr>
<td>Furrow/drip/sprinkler irrigation</td>
<td>10</td>
<td>14.28</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>13</td>
<td>18.57</td>
</tr>
<tr>
<td>Mixed cropping</td>
<td>26</td>
<td>37.14</td>
</tr>
<tr>
<td>Others</td>
<td>14</td>
<td>20.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
From the respondents it shows that most of the farmers practice mixed cropping with 26 farmers which translates to 37.14% which has low returns due to nutrients competition among the crops compared to no tillage which is adopted to 3 farmers hence this is the best technology towards Sustainability of Agricultural Projects not only in Mwala Sub County but for the entire world as a way of enhancing food security. Other technologies such as zaipits, terracing among others had 20%.

Among the recommendations made were: retention of plant residue with no tillage which prevents soil erosion, builds soil biodiversity, improves water infiltration and crop rotation which increase soil fertility by improving soil physical, chemical, and biological properties

Respondents were also asked to rate how the technological factors influence Sustainability of Agricultural Projects in Mwala Sub County, Machakos County. The table 4.11 illustrates the research findings.

**Table 4.11: Adoption of New Technology**

<table>
<thead>
<tr>
<th>Factors Under Consideration</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining research priorities and best technology to address current and future food demands by society</td>
<td>4.4419</td>
<td>.29589</td>
<td>66</td>
<td>88.8</td>
</tr>
<tr>
<td>Research and extension organizations to collaboration with groups and farmers’ organizations</td>
<td>4.3953</td>
<td>.25971</td>
<td>65</td>
<td>87.9</td>
</tr>
<tr>
<td>Extent of farmers using various type of irrigation</td>
<td>4.0930</td>
<td>.31760</td>
<td>59</td>
<td>80</td>
</tr>
<tr>
<td>Extent of farmers using certified seeds</td>
<td>4.3488</td>
<td>.38604</td>
<td>65</td>
<td>87.9</td>
</tr>
</tbody>
</table>
From the study findings, most respondents were in agreement that defining research priorities and best technology to address current and future food demands by society with a mean score of 4.4 influences Sustainability of Agricultural Projects. Other significant factors were research and extension to collaborate with farmers, use of various modern types of irrigation and use of certified seeds is necessary for sustainability of agricultural projects.

4.9 Regression Analysis
A multivariate regression model was applied to determine the relative importance of each of the four variables with respect to the sustainability of agricultural projects in Mwala Sub County, Machakos County Kenya. The regression model was as follows:

\[ Y = \beta_0 + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + \epsilon \]

Where:

- \( Y \) = Sustainability of agricultural projects in Mwala Sub County
- \( X_1 \) = Credit access
- \( X_2 \) = Input supply factors
- \( X_3 \) = Training of farmers
- \( X_4 \) = Adoption of technologies
- \( \beta_0 \) = constant (y intercept)
- \( \beta \) = coefficient
- \( \epsilon \) = error term
Table 4.12: Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.918(a)</td>
<td>.843</td>
<td>.805</td>
<td>.51038</td>
<td></td>
<td>.843</td>
<td>1.242</td>
<td>4</td>
<td>176</td>
<td>.000</td>
</tr>
</tbody>
</table>

*Predictors:* (Constant), Credit access, Input supply factors, training of farmers, Adoption of technologies

*Dependent Variable:* sustainability of agricultural projects

Analysis in table 4.12 shows that the coefficient of determination (the percentage variation in the dependent variable being explained by the changes in the independent variables) $R^2$ equals 0.843, that is, Credit access, Input supply factors, training of farmers and adoption of technologies leaving only 15.7 percent unexplained. The P-value of 0.000 (Less than 0.05) implies that the model of sustainability of agricultural projects is significant at the 5 percent significance.

Table 4.13: Analysis of Variance

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>.852</td>
<td>4</td>
<td>.213</td>
<td>1.242</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>20.35</td>
<td>176</td>
<td>.171</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22.64</td>
<td>180</td>
<td>.171</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Predictors:* (Constant) Credit access, Input supply factors, training of farmers, Adoption of technologies  *Dependent Variable:* sustainability of agricultural projects
ANOVA findings (P-value of 0.00) in table 4.13 shows that there is relationship between the predictors variables (Credit access, Input supply factors, training of farmers, Adoption of technologies) and response variable (sustainability of agricultural projects)

Table 4.14: Coefficients of regression equation

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>.260</td>
<td>.460</td>
<td>0.565</td>
<td>.231</td>
</tr>
<tr>
<td>Credit access</td>
<td>.512</td>
<td>.048</td>
<td>.254</td>
<td>2.729</td>
</tr>
<tr>
<td>Input supply factors</td>
<td>.170</td>
<td>.045</td>
<td>-.300</td>
<td>3.778</td>
</tr>
<tr>
<td>training of farmers</td>
<td>.051</td>
<td>.023</td>
<td>.113</td>
<td>2.217</td>
</tr>
<tr>
<td>Adoption of technologies</td>
<td>.048</td>
<td>.022</td>
<td>.093</td>
<td>2.182</td>
</tr>
</tbody>
</table>

Dependent Variable: sustainability of agricultural projects

Source Researcher (2015)

Multiple regression analysis was conducted as to determine the relationship between sustainability of agricultural projects and the four variables. As per the SPSS generated table 4.15, the equation the established multiple linear regression equation becomes:

\[ Y = 0.260 + 0.512X_1 + 0.170X_2 + 0.051X_3 + 0.048X_4 \]
Where
Constant = 0.260, shows that if Credit access, Input supply factors, training of farmers, Adoption of technologies all rated as zero, sustainability of agricultural projects would be 0.260

$X_1 = 0.512$, shows that one unit change in Credit access results in 0.512 units increase in sustainability of agricultural projects

$X_2 = 0.170$, shows that one unit change in Input supply factors results in 0.170 units increase in sustainability of agricultural projects

$X_3 = 0.051$, shows that one unit change in training of farmers results in 0.051 units increase in sustainability of agricultural projects

$X_4 = 0.048$, shows that one unit change in Adoption of technologies results in 0.048 units increase in sustainability of agricultural projects

Based on the findings of the regression equation, access to credit is low, this is supported by the fact that loans are charged relatively high interest rates by commercial institutions in the area, or even not available for farmers to access. When providing loans, these banks are often mindful of high transaction costs on small loans, or may be refused credit altogether due to lack of collateral - something very acute in Mwala sub-county. To provide a source of credit, farmers sometimes group together funds that can be loaned out to members which is not adequate to support agricultural activity.
Input supply is also low, probably caused by limited access to indispensable inputs such as improved seed varieties and fertilizer. This problem is exacerbated by a lack of efficient output markets and gaps in policy which impair the effectiveness of market systems for vulnerable households that have lost productive assets such as manpower, agricultural equipment.

Training of farmers was supported by 0.051, this an indication that trainings for development was used to pass on new information and to correct miss-conceptions concerning agricultural sustainability, as well as re-assure the development workers that the crops will receive adequate care.

Adoption of technologies was also embraced, which aimed at defining research priorities and best technology to address current and future demands by society. Those priorities include biological pest control, biotechnology, information technology, bioremediation, precision farming, integrated and organic farming systems.

4.10 Discussion
The Study finds that the major objective of the farmers was to assist in the development of the region through mutual self-help and the strengthening of farmer development. However while farmers could recognize their problems, especially those linked to small-scale production, most had difficulties in visualizing how to organize and manage a farmer led cooperative.
The Study established that, availability and access to adequate, timely and low cost credit to small and marginal farmers and the provision of soft loans to smallholder farmers. Respondents argued that loans are charged relatively high interest rates by commercial institutions in the area, or even not available for farmers to access. When providing loans, these banks are often mindful of high transaction costs on small loans, or may be refused credit altogether due to lack of collateral. This is supported by Maitima, Rakotoarisoa and Kang’ethe, (2010) who argued that credit is essential for establishing sustainable and profitable farming systems. Most of the farmers are small producers engaged in agricultural activities in areas of widely varying potential. Experience has shown that easy access to financial services at affordable cost positively affects the productivity, asset formation, income and food security of the rural poor.

On input supply, the study showed that access to indispensable inputs such as improved seed varieties and fertilizer has a significantly positive influence on sustainability of agricultural projects in Mwala County. Respondents also pointed out lack of sustained contact and cooperation with other public organizations such as trade (labour) unions and farmer’s groups and access to extension services and supportive policies to help these households become more productive and enter commercial markets to generate income. Jayne and Muyanga, (2006) posits that the immediate need is basic support in the form of seed and fertilizer to produce food for the family. Once this need is met, additional support in the form of assets, inputs, credit extension services and supportive policies is
needed to help these households become more productive and enter commercial markets to generate income and improve their livelihoods.

The study found out that trainings on soil and water conservation was found out to be the most significant factor on training farmers. Other significant factors were Training on practices of environment-friendly as an alternative to conventional agriculture and training on the best crops for your soils. This is in agreement with studies by Birkhaeuser et al., 2011; Van den berg et al., 2007; Delia et al., 2008 who argue that farmer training is an important tool widely utilized by development programs in developing countries. Government and privately run extension services as well as non-governmental organizations offer training packages to their farmers. Training procedures vary from one or two day workshops and seminars, on farm training and demonstration, to field visits.

In the minds of many farmers in the region technology adoption were viewed as collectivized, almost monopolistic structures based around Government intervention schemes and providing a wide range of services including, production, supply of inputs, provision of credit and the marketing of production. This is supported by Kiser, (2008) who argued that private sectors, NGOs and NPOs have been increasing their involvement in the Farmer-Group Approach. Maximizing the agricultural outputs is very important in Kenya because the economy, its development and the GDP of Kenya heavily rely on its agricultural outputs. As a part of the agricultural extension services to enhance sustainability of agricultural projects, the Government created the National Agricultural Extension Policy (NASEP) which has not helped the area under study.
CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction
This chapter presents the summary of findings, discussion and conclusions drawn from the findings and recommendations made. The conclusions and recommendations drawn were focused on addressing the purpose of the study, which was to examine the factors influencing sustainability of agricultural projects in Mwala Sub County, Machakos County Kenya.

5.2 Summary of Findings
The study established that there is a positive correlation on factors that influence sustainability of agricultural projects in Mwala Sub County, Machakos County Kenya.

5.2.1 Influence of credit access on sustainability of agricultural projects
The first Objective of the study sought to establish the influence of credit access on sustainability of agricultural projects in Mwala Sub County, Machakos County. The Study established that, high interest rates by institutions had the highest mean score at 4.1302. Other significant factors were availability and access to adequate, timely and low cost credit to small and marginal farmers (measure = 4.0372) and the provision of soft loans to smallholder farmers (m=3.7442). Respondents argued that loans are charged relatively high interest rates by commercial institutions in the area, or even not available for farmers to access. When providing loans, these banks are often mindful of
high transaction costs on small loans, or may be refused credit altogether due to lack of collateral - something very acute in Mwala sub-county.

5.2.2 Influence of input supply on sustainability of agricultural projects

The second objective sought to establish the influence of input supply on sustainability of agricultural projects in Mwala Sub County, Machakos County and the findings of the study showed that access to indispensable inputs such as improved seed varieties and fertilizer has a significantly positive influence on sustainability of agricultural projects in Mwala County with a mean score of 3.9628. Other significant factors are lack of sustained contact and cooperation with other public organizations such as trade (labour) unions and farmer’s groups (m=3.0) and access to extension services and supportive policies to help these households become more productive and enter commercial markets to generate income (3.3465). Less significant factor was access to equipment, to which the farmers agreed that nobody has ever provided to them.

5.2.3 Influence of training of farmers on sustainability of agricultural projects

The third objective sought to establish the influence of training on sustainability of agricultural projects in Mwala Sub County, Machakos County. Trainings on soil and water conservation was found out to be the most significant factor on training farmers, this was supported by a mean of 4.3667. Other significant factors were Training on practices of environment-friendly as an alternative to conventional agriculture (measure= 4.2667) and training on the best crops for your soils with a mean of 4.1000.
5.2.4 Influence of adoption of new technology on sustainability of agricultural projects

The last objective sought to determine the influence of adoption of technologies on sustainability of agricultural projects in Mwala Sub County, Machakos County and the findings showed that farming communities have practiced, tested and validated novel and innovative measures to adapt to changing climate. Among the recommendations made was retention of plant residue with no tillage which prevents soil erosion, builds soil biodiversity, improves water infiltration and crop rotation which increase soil fertility by improving soil physical, chemical, and biological properties which enhances sustainability of agricultural projects yet not practiced in the area of study.

5.4 Conclusion

Even though Mwala Sub County Machakos County receives erratic rainfall if farmers consider the key factors in agriculture they can make the sub county more food secure than it is at now, farmers here are stuck to the traditional ways of farming even with climate change being evident. This can be embraced by farmers adapting to new technologies such as use of zaipits, crop rotation, planting of drought tolerant, early maturing seed varieties crops among others which will see them have increased yields thus improving their livelihoods.

This sub County has great potential for agriculture which is not exploited due to the fact that majority of the population live below poverty line that is, earning less than one dollar per day which translates to farmers being less active in agriculture since they cannot
afford key farm inputs such as quality certified seeds and fertilizer and those who venture in it only manages small scale which is not sufficient to feed the growing population. If these farmers can be able to access credit from financial institutions such as Kenya Women Finance Trust, Kenya Commercial Bank among others they can be able to buy farm inputs and this guarantees timely planting as some farmers plant their farm one week after onset of rains. On the other hand with financial ability farmers can expand their farming in terms of acreage. For example if a farmer was farming on one acre can expand to 2 to 3 acre either by leasing or buying the land.

The researcher was able to find out that there was a wide gap between the farmers and the government agricultural extension officer most of the farmers were not aware whether such officers exist as they practice farming on their way without proper guidelines from experts point of view so if these officers can do close follow up and offer guidance to the farmers.

5.5 Recommendations
Based on the above findings the researcher recommends that more trainings to farmers by extension officers needs to be conducted as way of building their capacity thus increased productivity also it is through the trainings where farmers can be able to learn about new technologies this adopting to save time and money while increasing on production hence realizing higher profits.

On the area touching on credit access, the credit union can raise loans at better rates from commercial banks due to the cooperative having a larger associative size than an
individual farmer. Often members of a credit union will provide mutual or peer-pressure guarantees for repayment of loans. In some instances, these farmer cooperatives have credit unions as part of their broader business. Such an approach allows farmers to have a more direct access to critical farm inputs, such as seeds and implements. The loans for these inputs are repaid when the farmer sends produce to the cooperative.

The researcher recommends that the government needs to intervene and subsidize the price of quality seeds and fertilizer which are basic inputs in farming.

5.6 Areas of Further Research

The study recommends that further research should be done on the role of gender towards sustainable sustainability of agricultural projects in Mwala Sub county Machakos County. Is it male or female who are agriculturally productive?

Also further research can be done on the impacts of climate change to sustainability of agricultural projects in Mwala Sub County Machakos County
REFERENCES


Marketing and Information Dissemination to Ensure Poverty Reduction, Food Security and Creation of Employment.


APPENDICES

Appendix I: Research Questionnaire

Instructions
Please tick (√) the box that matches your answer or fill the space provided

Date

PART A: General Information

1. What is the name of your Farmer Group (optional?)

2. What is your Age Category?
   - Below 18 [ ]
   - 18-25 [ ]
   - 26-35 [ ]
   - 36-45 [ ]
   - 46-55 [ ]
   - 55 and above [ ]

4. What Educational background do you have?
   - Primary school [ ]
   - Secondary School [ ]
   - Diploma or less [ ]
   - Bachelor Degree [ ]
   - Master Degree [ ]
   - PH.D Degree [ ]

SECTION I: SUSTAINABILITY OF AGRICULTURAL PROJECTS

Note: For each of the questions, tick against your response or write your response in the blank space provided.
1. To what extent does each of the following factors influence sustainability of agricultural projects? Use the following scale: No extent (1), Little extent, (2), Moderate extent (3), Large extent (4) and Very large extent (5)

<table>
<thead>
<tr>
<th>Statements</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability of agricultural projects lead to improvements in food productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The need to develop technologies and practices that do not have adverse effects on environmental goods and services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainability in agricultural systems incorporates concepts of systems to buffer shocks and stresses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainable intensification in avoiding environmental degradation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural land has been lost to urbanization and other human uses, and other consequences of unsustainable land management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainable agriculture outcomes can be reduced pesticide use and carbon balances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SECTION II: CREDIT ACCESS

5. Using a Likert 1-5 scale, with 1 being ‘to no extent at all’, 2 being ‘to a small extent’ 3 being ‘to some extent’, 4 being ‘to a high extent’ and 5 being ‘to a very high extent’, to what extent are the following factors on credit access influence sustainability of agricultural projects in Mwala Sub County, Machakos County? Please tick (✓) all as appropriate
<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability and access to adequate, timely and low cost credit to small and marginal farmers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of soft loans to smallholder farmers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender-based obstacles – conventional thinking, cultural and social values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of information on the cost of obtaining such services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of awareness of existing credit schemes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High interest rates by institutions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lengthy and vigorous procedures for loan applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In a scale of 1 to 10, with 1 being the lowest and 10 being the highest, rate the extent to which access to credit influences sustainability of agricultural projects in Mwala Sub County, Machakos County.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

**SECTION III: INPUT SUPPLY FACTORS**

2. Please tick your main source of input Supply

Personal savings [ ]

Provision by the government [ ]

Provision by NGO’s [ ]
7. How often does the Government or the NGO’s provide inputs?

Not AT ALL  [ ]
Rarely  [ ]
All the time  [ ]

8. Using a Likert 1-5 scale, with 1 being ‘to no extent at all’, 2 being ‘to a small extent’ 3 being ‘to some extent’, 4 being ‘to a high extent’ and 5 being ‘to a very high extent’, to what extent are the following Input supply factors influence sustainability of agricultural projects in Mwala sub-county? Please tick (✓) all as appropriate

<table>
<thead>
<tr>
<th>Factors Under Consideration</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to indispensable inputs such as improved seed varieties and fertilizer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to extension services and supportive policies to help these households become more productive and enter commercial markets to generate income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effectiveness of market of vulnerable households</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of sustained contact and cooperation with other public organizations such as trade (labor) unions and farmer’s groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In a scale of 1 to 10, with 1 being the lowest and 10 being the highest, rate the extent to
which supply of inputs influences sustainability of agricultural projects in Mwala Sub County, Machakos County.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

SECTION IV: TRAINING OF FARMERS

9. Have you ever participated in any training on agriculture?

Yes or No [ ]

If yes how many times

Once [ ]

Twice [ ]

Several times [ ]

If No a give reason..................................................................................................................

10. Which training materials were used during the training sessions

Newsletters [ ]

Posters [ ]

Exhibitions [ ]

Leaflets [ ]

Extension officers [ ]

11. Using a Likert 1-5 scale, with 1 being ‘to no extent at all’, 2 being ‘to a small extent’ 3 being ‘to some extent’, 4 being ‘to a high extent’ and 5 being ‘to a very high extent’, to what extent do the following factors on training influence sustainability of agricultural projects? Please tick (✓) all as appropriate

82
Factors Under Consideration | 1 | 2 | 3 | 4 | 5
---|---|---|---|---|---
Sharing their knowledge | | | | | |
Training on the best agricultural practices | | | | | |
Training on practices of environment-friendly as an alternative to conventional agriculture | | | | | |
Trainings on new information and to correct misconceptions concerning use of fertilizers | | | | | |
Trainings on soil and water conservation | | | | | |
Training on post-harvest handling | | | | | |
Training on the best crops for your soils | | | | | |

In a scale of 1 to 10, with 1 being the lowest and 10 being the highest, rate the extent to which training of farmers influences sustainability of agricultural projects in Mwala Sub County, Machakos County.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
---|---|---|---|---|---|---|---|---|---|

SECTION V: TECHNOLOGY

12. Which of the following farming technologies (practices) ‘would you use’, ‘have used’?

Minimal tillage [ ]

No till [ ]

Farrow, drip or sprinkler Irrigation [ ]
Crop rotation [ ]
Mixed cropping [ ]
Others [ ]

13. Using a Likert 1-5 scale, with 1 being ‘to no extent at all’, 2 being ‘to a small extent’ 3 being ‘to some extent’, 4 being ‘to a high extent’ and 5 being ‘to a very high extent’, to what extent are the following technological factors influence sustainability of agricultural projects in Mwala sub-county? Please tick (✓) all as appropriate

<table>
<thead>
<tr>
<th>Factors Under Consideration</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>policies for agriculture, trade, research and development, education, training and advice have been strong influences on the choice of technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defining research priorities and best technology to address current and future food demands by society</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research and extension organizations to collaboration with groups and farmers’ organizations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of farmers using various type of irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of farmers using certified seeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In a scale of 1 to 10, with 1 being the lowest and 10 being the highest, rate the extent to which adoption of technologies influences sustainability of agricultural projects in Mwala Sub County, Machakos County.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

Thank you for your time and cooperation
Appendix II: Letter of Transmittal

Faith Mulee Mutiso,
P.O Box 2067-00100
GPO,

4th March, 2015

Dear Respondent,

RE: DETERMINANTS INFLUENCING SUSTAINABILITY OF AGRICULTURAL PROJECTS: A CASE OF MWALA SUB COUNTY, MACHAKOS COUNTY, KENYA

I am a Master’s student at the School of Continuing and Distance Education, University of Nairobi currently conducting a research study as entitled above.

I wish to inform that you have been selected as one of the respondents to assist in providing the essential data and information for this activity. I kindly request you to spare a few minutes and answer the attached questionnaire. The information obtained will be used for academic purposes only, will be treated with utmost confidentiality and will not be shared with anyone whatsoever. Do not write your name anywhere on the questionnaire.

I therefore request you to respond to all questions with utmost honesty.

Thank you, most sincerely for your support.

Yours Sincerely,

Faith Mulee Mutiso
Appendix III: Letter Of Introduction

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA-MURAL STUDIES
NAIROBI EXTRA-MURAL CENTRE

Your Ref:
Our Ref: Main Campus
Telephone: 318262 Ext. 120 Gandhi Wing, Ground Floor
P.O. Box 30197
NAIROBI

28th April, 2015

REF: UON/CEES//NEMC/21/093

TO WHOM IT MAY CONCERN

RE: FAITH MULEE MUTISO - REG NO - 150/81495/2012

This is to confirm that the above named is a student at the University of Nairobi, College of Education and External Studies, School of Continuing and Distance Education, Department of Extra-Mural Studies pursuing Master of Arts in Project Planning and Management.

He is proceeding for research entitled “determinants influencing agricultural sustainability” A case of farmers groups in Mwala sub county, Machakos county, Kenya.

Any assistance given to him will be appreciated.

CAREN AWILLY
CENTRE ORGANIZER
NAIROBI EXTRA MURAL CENTRE

[Signature]

29 APR 2015