

**INFLUENCE OF CREDIT FARM INPUT ON IMPROVEMENT OF SMALL  
SCALE FARMER OUTPUT IN BUNGOMA COUNTY KENYA.**

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## **DECLARATION**

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

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

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## **DEDICATION**

I dedicate this work to my parents, Mr. Eliud Nyabera and Pamela Nyabera for paying my school fees through secondary education and natured me to be an enlightened person. I also want to dedicate this work to my son Reagan Okoth for bearing with me during the period of developing this research project.

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# TABLE OF CONTENT

## Contents

<b>DECLARATION</b> .....	<b>ii</b>
<b>DEDICATION</b> .....	<b>iii</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>iv</b>
<b>ABBREVIATIONS AND ACRONYMS</b> .....	<b>x</b>
<b>ABSTRACT</b> .....	<b>xi</b>
<b>CHAPTER ONE</b> .....	<b>1</b>
<b>INTRODUCTION</b> .....	<b>1</b>
1.1 Back ground of the Study .....	1
1.2 Statement of the Problem.....	5
1.3 Purpose of the Study .....	6
1.4 Objectives of the Study.....	6
1.5 Research Questions.....	7
1.6 Assumptions of the Study .....	7
1.7 Significance of the Study .....	8
1.8 Limitation of the Study.....	8
1.9 Delimitation of the Study.....	9
1.10 Definition of Terms .....	9
1.11 Organization of the Study .....	10
<b>CHAPTER TWO</b> .....	<b>11</b>
<b>LITERATURE REVIEW</b> .....	<b>11</b>
2.1 Introduction .....	11
2.2 The Concept of Farm Input Credit Facilities offered to Farmers. ....	11
2.3 Provision of Seeds on Credit and Improvement of Small Scale Farmer Output.....	13
2.4 Provision of Fertilizer on Credit and improvement of Small Scale Farmers’ Output.....	17
2.5 Provision of Agro-chemicals on Credit and improvement of Small Scale Farmers’ Output.....	20
2.6 Provision of Training by credit providers to small scale farmers and influence on productivity .....	24
2.7 Summary of Literature Review .....	29
2.8 Theoretical Framework .....	31
2.9 Conceptual Framework .....	32
<b>CHAPTER THREE</b> .....	<b>34</b>
<b>RESEARCH METHODOLOGY</b> .....	<b>34</b>
3.1 Introduction.....	34
3.2 Research Design.....	34

3.3 Target Population .....	35
3.4 Sample size and Sampling procedure.....	35
This section presented sampling procedure and sample size. ....	35
3.4.2 Sample Size .....	35
3.4.1 Sampling Procedure .....	35
3.5 Research Instruments .....	36
3.5.1 Pilot Testing .....	37
3.5.2 Validity of the Research Instrument.....	37
3.5.3 Reliability of the Instrument.....	37
3.6 Data Collection Method .....	38
3.7 Data Analysis Technique .....	38
3.8 Ethical Consideration .....	39
3.9 Operational Definition of Variables.....	39
<b>CHAPTER FOUR.....</b>	<b>40</b>
<b>DATA ANALYSIS, PRESENTATION AND INTERPRETATION.....</b>	<b>40</b>
4.1 Introduction.....	40
4.2 Questionnaire Return Rate .....	40
4.3 Socio-demographic Characteristics of Study Participants .....	41
4.3.1 Gender of respondents.....	41
4.3.2 Marital status of respondents.....	42
4.3.3 No of dependents of the respondents .....	43
4.3.4 Age of respondents.....	44
4.3.5 Level of Education of respondents.....	45
4.3.6 Reasons why farmers practiced farming .....	46
4.4 Provision of seeds on credit and improvement of small scale farmers' output.....	47
4.4.1 Frequency of provision of farm input credit facilities to farmers .....	47
4.4.2 Access of information about Credit farm input.....	48
4.4.3 Provision of Seeds on Credit.....	49
4.4.4 Amount of land used, Number of packets of seed received and the output of bags of maize .....	50
4.4.5 Frequency of receiving credit farm inputs .....	52
4.5 Fertilizer Provision on Credit and improvement of small scale farmers' output. ....	53
4.5.1 Number of bags of fertilizer, amount of land used, the output of bags of maize and the range of cost of fertilizer provided by input credit firms .....	53
4.6 Agro-chemicals provision and improvement of small scale farmers' output.....	55
4.6.1 Agrochemicals on credit offered by organizations.....	56
4.6.2 Number of bags of maize and beans stored by the pesticide.....	56
4.6.3 Duration of storing the bags of maize and beans .....	58

4.6.4	Number of packets of pesticide received by respondents .....	59
4.6.5	Output of Number of bags of maize.....	60
4.6.6	Output of Number of bags of beans .....	60
4.6.7	The benefits of farm input credit.....	61
4.7	Training of small scale farmers and improvement of small scale farmer output .....	62
4.7.1	Respondents received training.....	63
4.7.2	Frequency of usage of training on new farming methods .....	64
4.7.3	Willingness to continue receiving training.....	65
4.8	Rating of influence of credit input on improvement of small scale farmer output.....	66
	<b>CHAPTER FIVE.....</b>	<b>70</b>
	<b>SUMMARY, CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>70</b>
5.1	Introduction .....	70
5.2	Summary of Findings .....	70
5.2.1	Influence of seed provision on credit and improvement of small scale farmers’ output.....	70
5.2.2	Influence of fertilizer on credit and improvement of small scale farmers’ output. ....	70
5.2.3	Influence of provision of Agro-chemicals on credit and improvement of small scale farmers’ output. ....	71
5.2.4	Influence of training of small scale farmers in utilization of new farming methods and improvement of farmers’ output.....	72
5.3	Conclusions .....	74
5.4	Recommendation.....	75
5.5	Areas for Further Research.....	76
	<b>REFERENCES .....</b>	<b>77</b>
	<b>APPENDICES .....</b>	<b>84</b>
	Appendix i: Questionnaire for Small Scale Farmers .....	84
	Appendix ii: Interview For Senior staff at input credit organization .....	88

## List of Figures

Figure 2.1: Conceptual Framework.....	26
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## List of Tables

Table 3.1 Operational Definition of Variables.....	39
Table 4.1 Questionnaire Return Rate.....	40
Table 4.2 Gender Characteristics of Respondents.....	41
Table 4.3 Distribution of Respondents by marital status.....	42
Table 4.4 Number of Dependents of respondents.....	43
Table 4.5 Distribution of Respondents by Age groups.....	44
Table 4.6 Distribution of Respondents by Highest Level of Education.....	45
Table 4.7 Reasons why Farmers practiced farming.....	46
Table 4.8 Frequency of provision of Farm Input Credit facilities to Farmers.....	47
Table 4.9 Access of information about Credit farm input.....	48
Table 4.10 Provision of Seeds on Credit.....	49
Table 4.11 Amount of land used, Number of Packets of seed received and output Of bags of Maize.....	50
Table 4.12 Frequency of receiving Credit Farm Inputs.....	52
Table 4.13 Number of bags of fertilizer, amount of land used, the output of bags and the range of cost of fertilizer provided by input credit firms.....	53
Table 4.14 Agro-chemicals on credit offered by organizations.....	56
Table 4.15 Number of bags of maize stored by the pesticide.....	56
Table 4.16 Number of bags of beans stored by the pesticide .....	57
Table 4.17 Duration of storing the bags of maize and beans.....	58
Table 4.18 Number of packets of pesticide received by respondents.....	59
Table 4.19 Output of number of bags of maize.....	60
Table 4.20 Output of number of bags of beans.....	60
Table 4.21 The benefits of farm input credit.....	61
Table 4.22 Respondents received training.....	63
Table 4.23 Frequency of usage of training on new farming methods.....	64
Table 4.24 Willingness to continue receiving training.....	65
Table 4.25 Rating of credit farm input and small scale farmer output.....	67

## **ABBREVIATIONS AND ACRONYMS**

ADLI	–	Agricultural Development Led Industrialization
CDB	–	Cotton Development Board
COWAN	–	Country Women Association of Nigeria
FFS	–	Farmer Field Schools
GCCL	–	Ghana Cotton Company Limited
GDP	–	Gross Domestic Product
KFA	–	Kenya Farmers Association
KSC	–	Kenya Seed Company
MOA	–	Ministry Of Agriculture
N	–	Nitrogen
PADETES	–	Participatory Demonstration and Training Extension System
WHO	–	World Health Organization

## **ABSTRACT**

Credit farm input has been provided by several firms to support small scale farmers by giving them subsidies which reduce their cost of production and in turn increase their farm yields. Most small scale farmers aren't able to access inputs which affects farm productivity because farmers facing binding capital constraints use lower levels of inputs in their production activities. The study was aimed to examine the influence of credit farm inputs on improvement of small scale farmers' output in Bungoma County. The objectives of the study were to determine the extent to which provision of seeds on credit influence improvement of small scale farmers' output in Bungoma county, to determine how provision of fertilizer on credit influence improvement of small scale farmers' output in Bungoma County, to investigate how provision of Agro-chemicals on credit influences improvement of farmers' output in Bungoma County and lastly the study examined how provision of training to farmers on utilization of new farming methods by credit providers influence improvement of small scale farmers' output in Bungoma County. The target population for this study was 2,505 individuals consisting of 2,500 small scale farmers in Bungoma County and 5 senior staff from farm input credit firms. The study used descriptive research design, questionnaires were used to collect data which adopted both quantitative and qualitative approaches. Systematic sampling procedure was used to gather data from 100 small scale maize and beans farmers in Bungoma south. Purposive sampling was used to select 5 senior staff from input credit firms to be interviewed. Data was analyzed using SPSS, descriptive and inferential statistics which included correlation. It was found that majority of small scale farmers, (62.33) % owned small sizes of land between 0.5 and 1 acre and produced maximum, those that had larger land sizes did not use the optimal recommended level of inputs since they couldn't access enough inputs and this influenced their yields negatively. It was concluded that the use of seed and fertilizer coupled with provision of training gave moderate production of between 12-19 bags of maize of 90 kg, per acre. Majority of the respondents (62.00) % received agro-chemicals used for storage purposes only, therefore the study shows that agro-chemical provision on credit did not have an influence on farmer output. Recommendations for further research were first, factors that influence small scale farmer productivity apart from farm input credit and factors influencing accessibility of farm input credit by small scale farmers.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Back ground of the Study

In the United States, an estimated 9 million households do not have a savings or checking account while another 21 million households have bank accounts but rely on costly alternative financial service providers such as payday lenders or check cashing outlets. In developing countries, approximately 72% of adults lack access to the formal financial system (Atieno, R. (2001). Financial markets fail to meet the needs of the poor and marginalized population because of varied reasons including inappropriate financial products and services offered, the delivery system is unresponsive to their needs and policies and regulatory system are poorly designed and implemented, (Ford Foundation 2014). In an effort to combat the stated challenges in the US, organizations like Ford Foundation seek to improve access to affordable and responsive financial products and services to help poor and low income households build and maintain assets. There has been an effort to fund research to test innovative products that meet the needs of poor households; building infrastructure to make these products and services widely available and funding advocacy for supportive policy and regulation. Millions of people worldwide suffer from hunger and under nutrition.

Malawi's input subsidy programme saw production increase from around 1 ton/ha in 2005 to 3 tonnes/ha in 2009/2010, enough for Malawi to export surplus maize to neighboring countries. Food security increased as well as rural wages, (Dorward and Chirwa 2011), but the high cost of Malawi's programme raises questions about its sustainability. Dorward and Chirwa (2011) argue that when the indirect benefits of the subsidy scheme are taken into account, the economic returns to the programme have been satisfactory. The authors caution that any application of Malawi's subsidy experience to other countries needs to take into

account of special characteristics of the Malawi maize economy and of measures needed to raise such programmes' effectiveness and efficiency and ensure their best fit with the contribution to sustainable development policies.

In Ghana there was an effort towards management of credit facilities granted to Cotton Farmers. Cotton is the world's oldest commercial crop and is one of the most important fiber crops in the global textile industry. The economics of some of the world's poorest countries are highly dependent upon cotton and its export earnings are a significant contributor to Gross Domestic Product (GDP). For instance cotton exports on average generated between 4% and 7% of GDP in Benin, Chad, Mali, Burkina Faso and Togo (Battes & Coelli, 1995). Economically, cotton has a significant potential for rural economic growth. This has a tendency of going a long way to attaining the number one United Nations Millennium Goals – eradication of extreme poverty and hunger. The realization by the government of Ghana on the importance of cotton production established the Cotton Development Board (CDB) in 1968 to help encourage farmers to grow cotton so as to feed the local industries. Low cotton productivity was attribute to inadequate inputs, problems of marketing the products due to low prices, labour unrest stemming from poor remuneration

The decreasing output was majorly due to a number of reasons; cotton companies failed to ensure repayment of input loans granted to farmers, farmers who failed to pay back their loans moved from company to company year after year. Screening of farmers and monitoring of their activities to ensure high yield for loan recovery were ineffective, high farmer loan evasion rate, rivalry between cotton companies and under cuttings (Strasberg, P.J. et al, 1999). For instance, a company would buy cotton from a farmer it did not sponsor. This also means the sponsoring company could not recover the loan from such a farmer who would have cotton. The privatization of the Cotton Development Board and the subsequent liberalization

of the cotton industry in 1986 were attempts by government to introduce entrepreneurship and private capital into the industry to achieve rapid expansion in the production of seed cotton with its attendant benefits.

The cotton production system used in Ghana involves two parties engaged in a form of quasi-contracting - farmers on one side and GCCL on the other side. The farmers supply land and labour and beyond this bear no other risk or responsibility in the production of seed cotton, which is the main raw material for the production of lint cotton and cotton seed. Ghana Cotton Company Limited, on the other hand, supply and pre-finance all the other production inputs including land preparation, cotton seed, fertilizer and pesticides on credit (loan) to the farmers and bear all the associated economic risks. Effectively cotton companies solely bear over 95% of the risks involved in the growing of seed cotton, (Ghana Cotton Company Business Plan, 1996). The questionable issue here is: Do cotton companies actually pay much attention to the management of loans granted to cotton farmers? There is evidence on record of increasing unpaid loans which have directly affected seed cotton production over the years in the cotton companies.

The main economic activity in Bungoma County is subsistence agriculture with maize, sunflower, sugarcane, coffee, tobacco, potatoes and beans being the main crops, (Ralph et al. 2005). The main factors affecting current productivity situation in the county include high cost of inputs especially seeds, fertilizers, fuel and feeds. Low use of fertilizer and use of uncertified seed has reduced productivity per unit area especially among the small holder farmers. Most farmers in Bungoma County have found it difficult to access agricultural credit, a situation that did not improve with the liberalization of the agricultural sector. Lack of financing to farmers translates to inadequate working capital at the farm level where farmers are unable to finance farm operations by cash. This limits the farmer's ability to purchase the

productivity enhancing inputs like seed, fertilizer, pesticides, land preparation and weeding. Among the factors affecting food production in Bungoma County include shortage of varieties of seed for example, farmers receive H505 from western seed while they preferred Kenya seed variety like H614, H6213, (Bungoma North crop livestock and fisheries assessment report for medium and high rainfall areas, 2011). Pests and diseases, mainly fungal have also affected productivity, unpredictable weather patterns and high cost of inputs.

In a research study carried out by Tegemeo Institute to analyze trends in Western region agricultural productivity, trends are discussed and analyzed to show the major drivers of productivity, key among them being the use of inputs and adoption of advanced planting techniques. Findings reveal that some households did not use inorganic fertilizers and the defining feature of these households is location in semi-arid areas where fertilizer use on maize may be risky and unprofitable. The study was done to show the trends realized from this study over a period of four years, 1997, 2000, 2004 and 2007, (Betty K. et al, 2008). Statistical findings showed that the overall maize yield over the four years stated in Western lowlands was 3.5 bags per acre, in the Western transitional zone, the yield was 8 bags per acre while in high potential zones, the average yield was 12 bags per acre per season. This output was captured during the main season. This study reveals a progressive slight increase in maize yield over the specified years, although the yield did not reach the ideal output of 20-30 bags per acre. This shows dwindling patterns in maize productivity even though there was a slight improvement over the four years in which the study was done.

The impressive growth in maize productivity is attributed to several factors including increased input use with high yielding seed varieties. While high yielding seed varieties contribute towards improved crop productivity, their use must be supplemented by other productivity enhancing inputs mainly fertilizer to exploit their full productivity potential.

Analyzing patterns in simultaneous use of fertilizer and high yielding seed varieties on maize can shed more light on the observed productivity trends and provide information that can be useful in proposing measures to improve agricultural productivity. Despite this increasing trend in productivity, small scale farmers haven't reached their potential of the ideal number of 20-30 maize bags to be produced per acre of cultivated land, (Tegemeo Institute, 2008).

## **1.2 Statement of the Problem**

Credit farm input has been used by private sector and the Government in subsidizing farmer activities with an aim to address the problem of poverty among resource poor farmers by assisting them with agricultural inputs, comprehensive training and capacity building that has seen these farmers derive a pathway out of the vicious cycle of poverty. A study done by Bunde et al. on impact of fertilizer input subsidy on maize production in Nandi North District reveals that, over 85% of the rural population derives their livelihood from Agriculture most of whom engage in Maize production. According to this study, there was tremendous growth in maize production between 1964 and 1997 fuelled by the introduction of hybrid maize, input subsidies and related technologies. According to this study, the maize farm input subsidy program which began its operation in 2007/2008 financial year to date, is an initiative to improve access and affordability of key inputs for small holder farmers and enable them participate in agriculture as a business enterprise. The maize subsidy program was conceptualized due to the observed decline in soil fertility in Kenya due to limited use of fertilizer especially in small scale farmers.

The study carried out by Bunde et al. showed that maize yields before implementation of farm input subsidy program were unsatisfactory. This study showed that, majority of the farmers 117(77.5%) produced between 1 and 10 bags of 90 kg of maize with a few of them 34(22.5%) producing between 11 and 20 bags of 90kg per acre. This indicates that most

farmers produced below the ideal quantity expected per acre. The results of the study after implementation of the maize subsidy program in Nandi North District indicate that there had been a reported increase in maize yield amongst the beneficiary farmers with a majority of them, 58(38.4%) producing between 21 and 30 bags of maize which is the ideal quantity per acre. However, maize yield by small scale farmers has continued to decrease in most parts of the country since 1997 from 1.85 metric tons per hectare to the current yield of 1.57 metric tons. Some of the reasons for the dwindling performance in maize production are associated with constraints along the maize chain value and key among the constraints are poor access to credit, inadequate use of recommended technologies, high cost of inputs, inefficient agricultural extension services, Daphen O.O et al, 2012. By looking at influence of credit farm input on improvement of small scale farmer output, this study seeks to determine how credit farm input relates to farm productivity and how this is a contributing factor to either decreased or increased farmer output with a special focus on seed, fertilizer, agro-chemicals as subsidies provided to farmers in Bungoma South and how provision of training also influence their output.

### **1.3 Purpose of the Study**

The main purpose of the study was to evaluate the influence of credit farm input on improvement of small scale farmers' output in Bungoma County in Kenya

### **1.4 Objectives of the Study**

The research study was guided by the following objectives:

1. To determine the extent to which provision of seeds on credit influences improvement of small scale farmers' output in Bungoma County.
2. To determine how fertilizer provision on credit influences improvement of small scale farmers' output in Bungoma County.

3. To investigate how provision of Agro-chemicals on credit to small scale farmers influence improvement of small scale farmers' output in Bungoma County.
4. To examine how training of small scale farmers in utilization of new farming methods by credit providers influences their output in Bungoma south.

### **1.5 Research Questions**

The research study sought to answer the following questions:

1. How does provision of seeds on credit influence improvement of small scale farmers' output in Bungoma County?
2. How does provision of fertilizer on credit influence improvement of small scale farmers' output in Bungoma County?
3. How does provision of Agro-chemicals on credit influence improvement of small scale farmers' output in Bungoma County?
4. How do farmer trainings on utilization of new farming methods by credit providers influence improvement of small scale farmers' output in Bungoma County?

### **1.6 Assumptions of the Study**

During the study, it was assumed that the selected sample of respondents would cooperate to give the information freely without fear or biasness and that the information will be true and be given honestly. It was also assumed that all the targeted respondents will be available and that small scale farmers sampled have access to farm input credit facilities and that there shall be credit providers who will still be providing input credit to the respondents.

### **1.7 Significance of the Study**

It was hoped that the study would generate findings, conclusions and recommendations that would assist various stakeholders in a number of ways by exploring the importance and effect of farmer input credit on general farm output. This information will assist credit providers in understanding the gaps that exist in organizations that provide farmers with input credit, consequently help them gauge their products to meet specific and relevant needs of the small holder farmers that have financial needs to be addressed. It was hoped that the study would highlight the current output trends in farm production of farmers who access credit input and highlight the major contributions of input credit on crop production. The study was to contribute to the existing field of knowledge and serve as reference for future studies on farmer credit input research topic or other related studies with the aim of building knowledge and creating a rich reservoir of knowledge for farm credit funding and farm production.

Finally, the study was also meant to highlight the challenges faced by microfinance organizations while offering credit input to farmers and assist them in understanding the nature and complexity involved in the same, in order to come up with counter measures to mitigate the challenges.

### **1.8 Limitation of the Study**

The researcher encountered a number of challenges including language barrier, farmers who formed part of the respondents in this study understand their local language better therefore the researcher experienced difficulty in communication and understanding, this was countered by having translators for respondents' better understanding of the questions. Secondly, small scale farmers spend majority of their time on the farm since most of them depend on agricultural activities for their daily needs and survival, the researcher had a challenge in having some of them spare their time in order to give their response to the questions to be administered.

## **1.9 Delimitation of the Study**

This study only covered small scale farmers in Bungoma County due to time limit the researcher only concentrated on this group of farmers. This particular area was chosen because farming is the main economic activity and the study being about farming, was suitable to be done here. The findings in this research were majorly findings on influence of input credit on improvement of farmer output in Bungoma County only and should be applied cautiously in other counties other than Bungoma.

## **1.10 Definition of Terms**

***Credit Farm Input:*** Refers to basic farming necessities or requirements like seed and fertilizer that are given to farmers on loan to increase their farm productivity.

***Fertilizer:*** Refers to one form on credit input given to small holder farmers that is applied to soils or to plant tissues to supply one or more plant nutrients essential for the growth of the plants and to boost farmers output.

***Agro-chemicals:*** Are chemicals provided on credit to small holder farmers to be used on farms to reduce pest and disease occurrence including preservatives used to store maize produce for future use by small scale farmers to reduce hunger during the dry season.

***Farmer Trainings:*** Refer to new techniques, methods and knowledge of farming that are imparted to farmers by staff who work with input credit firms.

***Productivity:*** Is a measure of the ratio of agricultural outputs to agricultural inputs provided by the credit firm to small scale farmers.

***Small scale farmers:*** Refers to poor cultivators who rely on input credit for provision of basic inputs and use the same to venture into farming. They own small farms supporting a single family.

***Farm Output:*** Is the end result or produce realized by small holder farmers after utilizing the inputs provided on credit while observing the recommended farming techniques by the credit firm.

***Improvement of output:*** Refers to the change in farm productivity realized by small scale farmers after utilizing new farming methods and inputs provided on credit.

### **1.11 Organization of the Study**

This research study was organized into five chapters. Chapter one described the background of the study, the problem statement describing the specific problem addressed in the study, purpose of the study, limitation and delimitation of the study, basic assumptions, and definition of significant terms and organization of the study. Chapter two highlighted the literature related to the study area and includes conceptual framework. Chapter three presented the research methodology that will be used in the study. It described the research design, target population, sample size, sampling technique, research instrument, their validity and reliability, data collection, analysis and presentation. Chapter Four described details on data analysis and presentation of findings and interpretation. Finally Chapter Five highlights a summary of the Findings, Discussions, Conclusions and Recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter covers both empirical and theoretical literature related to the research topic and the conceptual framework. It also summarizes the literature review done by scholars in the past as done from referenced books, journals, periodicals, magazines, newspapers, reports, documentaries and other publications. The review covers the influence of credit farm input on improving farm output.

#### **2.2 The Concept of Farm Input Credit Facilities offered to Farmers.**

Farm Input Credit refers to basic farming necessities or requirements like seed, fertilizer and Agro-chemicals, that are given to farmers on loan to increase their farm productivity. There are several firms that offer input credit to farmers for example One Acre Fund and Heifer International who have the interest of helping small scale farmers draw their path out of hunger and poverty. These firms first make an effort to sensitize farmers on how they can access farm input credit then farmers are given an opportunity to select the input type they desire and give collaterals depending on the value of their input loan. These inputs are to be repaid in cash within a specific time frame of approximately one year and firms advice borrowers to repay their loans before they make their harvests so that they can achieve financial sustainability.

In the current risky economic environment, credit should be managed as closely and as carefully as other production inputs. Like seeds and chemicals, agricultural credit options are

changing and expanding with new and innovative products, and can be complicated by legal concerns. Borrowers are offered more alternatives and need to develop procedures to evaluate those choices. These alternatives give borrowers the opportunity to better manage their financial affairs (Paul N. E. & Peter J.B, 2007)

Agricultural input credit loans are categorized as short-term, intermediate-term or long-term, depending on their maturity. Lenders often describe loans by the purpose or terms of the loan. For example short-term loans are often used for operating expenses. Loan maturity usually matches the length of the agricultural production cycle (e.g., 3 to 18 months), hence a short-term loan. Lenders need better and more thorough training in risk and portfolio management; understanding the heterogeneity of rural borrowers and the lending products will increase the amount of credit extended. On the farmers' side, innovative financial and insurance products will improve their ability to mitigate risk. Credit firms however need to deal with challenges of risks associated with farmer inability to repay their input credit loans (Skarstein, R. 2005). Perceptions of high risk in agriculture not only cause less working capital to be available to farmers, but less capital for the medium-to-long term investments necessary for intensification. There is a distinct need for knowledge sharing at the institutional-level of models that may work; i.e. insurance-indexing, risk management, seed and technology fairs, contract farming, etc. Ultimately, the institutional environment will determine commercial or subsistence orientation. Training for farmers is crucial for navigating and using the financial and technological options (improved seeds and fertilizer) available to them. The private sector has incentive to engage with small scale farmers, but only to a certain point along the continuum of commercialization. There is a need to build strategies to supply input and credit to farmers who remain closer to the subsistence end (Diagne A.Z. & Sharma, 2001).

Rural development in particular, farm productivity, can be influenced by several factors; one is access to credit. Access to credit may affect farm productivity because farmers facing binding capital constraints would tend to use lower levels of inputs in their production activities compared to those not constrained (Feder et al., 1989; Petrick, 2004). Improved access to credit may therefore facilitate optimal input use and have a major impact on productivity. Thus, access to credit allows farmers to satisfy their cash needs induced by the agricultural production cycle and consumption requirements.

Governments have in the past intervened heavily in the provision of credit to the agricultural sector. Credit often accompanied input packages offered by the marketing boards who in turn deducted the costs from the crop purchased after the harvest. Government and donor subsidies served to keep the cost of production and food prices low but encouraged levels of input use which were economically and environmentally unsustainable. With market liberalization, there has been a movement towards the reduction or abolition of subsidies with the transfer of distribution of agricultural inputs to the private sector (agribusinesses, fertilizer companies, agricultural traders and merchants). Studies carried out by Amani, (2004; 2005); Skarstein, (2005MAFC, (2006); Nyange and Wobst (2005); and R&AWG, (2005); and Poverty and Human Development Report of 2007 (R&AWG, 2007), shows that smallholder maize productivity in Tanzania is suffering due to the fact that, most smallholders do not practice high-yield farming methods such as chemical fertilizers, certified seeds, pesticides, herbicides or insecticides (agrochemicals), due to the high costs of agricultural inputs and services.

### **2.3 Provision of Seeds on Credit and Improvement of Small Scale Farmer Output.**

The average world grain yield in 1950 was 1.1 tons per hectare. In 2011, it was 3.3 tons per hectare, (USDA, 2013). The challenges for all policy makers and researchers are to

continually improve and maintain this yield per hectare because of the ever increasing population. The world population is currently rising rapidly. Virtually the same amount of arable global farmland is expected to support this increasing number of people. Efforts geared towards increasing yield per unit area will therefore help improve and increase food security. In his report to British parliament mentioned that the world population is predicted to rise from then 6 billion to over 9 billion by 2050, rising at a rate of 6 million a month. Africa's population alone, he projected, was to nearly double from then 1 billion to 2 billion and said that estimates suggest that to meet the most basic of needs for this increased global population, food production will need to double. The report also found that by 2050 there will be 6 people per cultivable hectare of land in Uganda and 14 in Ethiopia by this time. This study aims at finding ways of improving seed dressing of wheat seeds in the area of study and therefore improves yields from wheat farms (Omonona B.T & Awoyinka Y.A, 2008).

Farmers need seed because without viable seed the survival of their household is endangered. In fact, the ways that farmers obtain seed are as old as agriculture and most small-scale farmers in developing countries routinely save their seed from one harvest to the next. Nowadays, some 60-70 per cent of seed used by these farmers is still saved on farm. Most of the remaining seed is obtained off-farm, from local sources (Louwaars, 1994; Cromwell, 1996). In addition, not all farmers can afford to buy improved seed supplied by the organized seed industry. For many farmers, such seed is not available, even if they wanted it and could afford it. In actual fact, the majority of the world's farmers, and crops, are not planted from such seed but from home saved seed which are treated. The average world grain yield in 1950 was 1.1 tons.

According to development professionals, the lack of access to credit by poor rural households has negative consequences for agricultural productivity, income generation and

household welfare (Von- Pischke and Adam, 1980). The role of credit cannot be overemphasized. Without credit accessibility, it will be impossible to purchase the inputs needed for production let alone maximizing output from given resources or minimizing the resources required for producing a given level of output. Credit market literature distinguishes between access to credit and participation in credit markets. In their argument, (Diagne and Zeller, 2001) stated that, “a farm household has access to credit from a particular source if it is able and entitled to borrow from that source, whereas, it participates in the credit market if it actually borrows from that source of credit”.

In Chile for instance most studies have found, seed credit constraints to have a negative impact on farm investment (Carter and Olinto, 2003; Petrick, 2004), farm output (Feder et al., 1990; 4 Petrick, 2004) farm profit (Carter, 1989; Foltz, 2004; Fletschner et al., 2010) and farm productivity (Guirkingner and Boucher, 2008). These reports and publications concluded as follows in all categories of credit constraints, farmers have a demand for credit but they are limited in accessing credit by a limited capacity to provide collateral, high transaction costs of the credit contract or a high level of risk associated with the credit contract. In other words, all three types of credit constraints can lead to an imperfect or even inexistent credit market.

In Nigeria, the prevalence of seed credit constraints and their impact on production efficiency has led to low productions on the farms. Economics of agricultural production at the micro-level is to attain the objective of profit maximization through efficient farm allocation of resources over a period of time or by either maximizing output from given resources or minimizing the resources required for producing a given level of output (Carter, 1989) . Hussein (2008) examined the influence of seed credit constraint on production efficiency of farming Households in Southern Ethiopia, using a parametric approach to access farm households' specific technical efficiency. He calculated the technical efficiency of credit constrained respondents using Maximum Likelihood Estimator. The study found out that all

input variables except herbicide and land variables were found to be statistically significant. The results also showed that credit constrained farming households use lower levels of capital intensive inputs due to binding financial constraint. The results also revealed that the credit constrained farming Households had a lower mean productive efficiency.

The establishment of KSC in Kitale in 1956 was the initial mark of the formal seed system in Kenya. The company was established to produce pasture seed for the immigrant farmers (Sikinyi, 2010). Today, the formal system comprises a number of specialized organizations in the public and private sector involved directly or indirectly (regulatory agency) in breeding, multiplication, quality control, processing, storage, marketing, and distribution of seed. The formal seed system supplies strictly regulated certified seeds of improved varieties and accounts for 20% of the seeds sown in Kenya (Sikinyi, 2010). The informal seed system is still the major seed source in Kenya. It provides seeds without quality control and supplies 80% of the seeds for planting purposes in the country (Sikinyi, 2010). According to MOA, the informal seed sources include road-side nurseries, farm-saved seed, farmer-to-farmer exchange, local markets, NGOs and CBOs. Seed provided by relief agencies are sometimes obtained from non-registered seed dealers with unknown quality (Sikinyi, 2010).

A number of NGOs are establishing private companies to supply small scale farmers with certified seed. Gamba et al, 2003 found out in their study that 56% percent of small-scale farmers and corresponding 49% percent of large scale farmers obtained wheat seeds from other farmers. They also found that seeds from various harvest and from Kenya Farmer s' Association (KFA) were both 9% and the Kenya Seed Company (KSC) and KFA both constituted 5% for large scale farmers. Most small scale farmers, they observed, (50%) obtained seeds in the same village although about 35% travelled more than 10 Km to get the seed. About 59% of large scale farmers travelled more than 10 Km to get seed, while 28% obtained seed from the same village.

Skarstein (2005: 359), while referring to Tanzania; stresses that, if the agriculture sector is to be transformed, producer associations (in form of farmers' cooperatives) are needed first and foremost to give the smallholders bargaining power in the input, output and credit markets. Msuya (2007: 2865) and R&AWG (2005: 89) went a step further and showed integrated producer schemes are more suited than cooperatives in assisting smallholder farmers to address most of the constraints they face including low production and productivity due to inaccessibility to good quality seed.

#### **2.4 Provision of Fertilizer on Credit and improvement of Small Scale Farmers' Output**

Fertilizer is one of the land augmenting inputs that is likely to enhance land productivity. It is widely acknowledged in the world that the use of fertilizers leads to higher yields. Studies by Strasberg *et al* (1999), Odhiambo (1998), Owuor (1999), Evenson and Mwabu (1998), Ekborm (1998) have all demonstrated positive and significant statistical relationships between fertilizer use and productivity. Besides, there are numerous farm-demonstrations mainly by physical scientists that have shown the impact of fertilizer use on farm yields. The policy implication of these results is clear: increase fertilizer use to enhance productivity. The Malawi Government (2009) recognized low input use as one of the major factors contributing to low small scale farmers' agricultural productivity in Malawi. The report went further to state in parts. Over time, prices for major inputs such as fertilizers and seeds have increased substantially while incomes for smallholder farmers have remained persistently low. Credit options are very limited due to the high risk of agricultural production and a shortage of farmer organizations.

According to Serageldin (1996), credit for rural smallholders especially in agriculture is assuming increasing importance in many parts of the world in response to the needs of less privilege entrepreneurs with limited capital base in the sector. (Omonona et al. 2008), while supporting this argument said "there has been a general awareness of the significance of

credit as a tool for agricultural development”.Omonona et al., (2008) studied credit constrained condition and output supply of Country Women Association of Nigeria (COWAN) farmers in Oyo State, Nigeria. The findings of the study revealed that majority of the farmers (80 percent) were constrained and therefore this affected their productivity. A test of hypothesis on the difference in the value of the output of the farmers in this study showed that credit unconstrained farmers have their output supply higher than that of credit constrained farmers.

Input transfers or subsidized inputs are social protection or development policy. Some scholars and practitioners argue in favor of using input subsidies as a way of stimulating increased agricultural productivity growth, but others argue that input subsidies can be used as an instrument for achieving welfare goals (Morris et al., 2013). Morris et al. (2007), seeking good fertilizer use practice in Africa, called the latter “fertilizer aid,” suggesting that its proponents contend that fertilizer subsidies provide a less costly way to ensure food security at the household level than do alternative approaches (such as importing food commercially or distributing food aid). A UN Millennium Project Report proposed “fertilizer safety nets” or “fertilizer-for-work” programs targeted at the chronically food-insecure (UN Millennium Project, 2005). Morris et al. (2007) argued that the economic case for fertilizer aid rests on a number of assumptions and contended that well-functioning markets (for food and fertilizer) are one important condition. The prescriptions for structural adjustment that donors have imposed on Africa have led to the elimination of fertilizer subsidies. However, fertilizer subsidies are now attracting renewed attention in Africa. Some World Bank publications have acknowledged that economic reforms in the 1980s and 1990s resulted in significant reductions in overall levels of fertilizer use and increased food insecurity among many rural households (Morris et al., 2007).

Recently, there has been considerable debate about the desirability of using fertilizer subsidies to achieve not only economic growth targets but also welfare goals. Some economists have admitted the political appeal of fertilizer subsidies, and they have realistically recognized that some African countries implemented fertilizer subsidies for their political popularity (Morris et al., 2007). Many social protection programs recently introduced in sub-Saharan Africa are centered on the delivery of free or subsidized inputs to poor farmers. Both Zambia and Malawi have re-established national fertilizer subsidies, thus going against neo-liberal wisdom with respect to the benefits of free markets. In addition to national fertilizer subsidies (the Fertilizer Support Program), Zambia has an input package scheme (the Food Security Pack) specifically aimed at farmers who are too poor to purchase fertilizer, even at subsidized prices.

Irrigation Input subsidies for rain-fed agriculture require complementary circumstances to reduce vulnerability, particularly because the amount and pattern of rainfall must be favorable for crop growth and maturation. When events are not so favorable, input subsidies are an expensive way to fund crop failure (Ellis et al., 2009). As Morris et al. (2007) stated, the economic case for “fertilizer aid” rests on a number of key assumptions. Input subsidies have a checkered history as a means of raising rural incomes and lowering rural vulnerability. In the Asian Green Revolution, input subsidies were regarded as making a significant contribution to sustained yield growth, but experience in Africa was mixed. One explanation for the differences in performance may be the lack of irrigation development in African input subsidy schemes. Sustained yield growth has not materialized in Africa because increased use of improved seeds and fertilizer results in crop failure under the unstable and unpredictable conditions of rain-fed agriculture. In a region such as sub-Saharan Africa where droughts are prevalent, irrigation could be a key factor in enhancing food security.

Studies in Kenya have however shown that the use of fertilizer is still very low especially among smallholder farmers. According to a study by Argwings-Kodhek (1997), smallholder fertilizer use in Kenya has been stagnant during the 1990s in many places while it actually declined in others. Among reasons he gave was the high cost of fertilizer after liberalization. To exploit the full yield potential of maize hybrids, it is necessary to apply an optimal level of fertilizer (Evenson R.E & G. Mwabu, 1998). So, for example, most commercial maize hybrids are performing poorly on soils with low nitrogen levels because they have been developed in research stations with soils of optimum nitrogen conditions. Consequently, for achieving optimal grain yields, smallholders should apply fertilizer and use it efficiently, which means in recommended amounts. However, although fertilizer has become more available in Kenya in the course of the liberalization of the agricultural sector, the high cost of these chemicals often resulting from high transportation costs still constrains the adoption and the use of reasonable quantities of fertilizer in resource-poor farm households (As already mentioned, these households often lack cash and credit to purchase hybrid seeds and fertilizer.

As productivity gains from hybrid seeds can only be fully realized if fertilizer is applied and used efficiently, it is assumed that constraints to fertilizer use hamper the demand for hybrid seeds. Indeed, the adoption study of Ouma et al. Shows that farmers who are using more fertilizer are more likely to adopt improved maize varieties than those using less fertilizer. Furthermore, the study indicates that the amount of fertilizer used positively correlates with the intensity of use of improved maize varieties (Odhiambo, W. 1998).

### **2.5 Provision of Agro-chemicals on Credit and improvement of Small Scale Farmers' Output.**

The world pesticide amount used in both 2006 and 2007 was approximately 5.2 billion pounds (World Bank, 2007). Herbicides accounted for the largest portion of total use, followed by other pesticides, insecticides, and fungicides. Total world pesticide amount used increased in 2007. U.S. pesticide amount used in both 2006 and 2007 exceeded 1.1 billion

pounds, in proportions similar to those of world pesticide use, with herbicides and other pesticides representing a larger portion of total U.S. pesticide. U.S. pesticide amount used accounted for 22% of total world pesticide amount used, 25% of world herbicide amount used, 10% of world insecticide amount used, 14% of world fungicide amount used, and more than 25% of other pesticide amount used in both years. Pesticides are the only toxic substances released intentionally into our environment to kill living things. This includes substances that kill weeds (herbicides), insects (insecticides), fungus (fungicides), rodents (rodenticides), and others (UNEP & WHO, 2002).

The use of toxic pesticides to manage pest problems has become a common practice around the world. Pesticides are used almost everywhere -- not only in agricultural fields, but also in homes, parks, schools, buildings, forests, and roads. It is difficult to find somewhere where pesticides aren't used from the can of bug spray under the kitchen sink to the airplane crop dusting acres of farmland, our world is filled with pesticides. In addition, pesticides can be found in the air we breathe, the food we eat, and the water we drink.

Agrochemicals are the result of modern technology that depends on inorganic fertilizers and pesticides. Over use of these chemicals have severe effects on environment that may lead to an immediate and long term effects. Investigating farmers' awareness of agrochemicals residues and their behaviors regarding application is important in order to reduce human factors that negatively affect agricultural safety. Agrochemicals (pesticides and fertilizers) are looked upon as a vehicle for improved crop production technology though it is a costly input. Balance use, optimum doses, correct method and right time of application of agrochemicals ensures increased crop production.

The requirement of fertilizers and pesticides for crops differ according to soil and meteorology. The available soil analysis data indicated that the soil in Nepal is generally low to medium in total nitrogen content. Under such conditions supply of nitrogen (N) through external sources leads to increase in crop yield (Ehler, L.E & Bottrell D.G. 2000). Pesticides include chemically synthesized compounds, devices or organisms that are routinely utilized in agriculture to manage, destroy, attack or repel pests, pathogens and parasites. The fate, on application, of pesticides in the soil and the transport processes involved depend on the cumulative effects of the pesticide's characteristics (e.g., absorptivity, solubility, volatility and degradation rate), the soil's characteristics (e.g., texture and organic matter), the application methods used (e.g., aerial or ground) and the site conditions (e.g., topography, weather and irrigation) (Owuor, J. 1999).

Certain pesticides, which are more resistant to degradation by abiotic (physical, chemical and other factors) and biotic (living organisms i.e. the micro and macro organisms of the soil food web) agencies, leach into the lower strata of the soil, are absorbed by plant roots, accumulate in the food chain and are ultimately biomagnified in the food web (S. Kodamaya 2011). There have been several reports on the accumulation of pesticide residues in plant and animal tissues. The applied pesticide can be transported from the sprayed area to non-target areas away from the crop, which thus affects not only pest species, but potentially non-target endangered species also.

In Nepal, a total of 178 tons of pesticides were used in 2003, of which insecticides (58%) and fungicides (31%) made up the bulk consumed. The number of households using pesticides varies considerably across the country, with the Terai (plains) region having the highest users (25.04% of land holdings) and the Mountains region having the least at about 7.14% of land holdings. The Mid-hills region has an average of 8.38% of land holdings using

pesticides; however, certain pocket-areas in Mid-hills near urban markets, have considerably higher pesticide use holdings. Generally, pesticide usage in Nepal is against pests such as brown plant hopper, fruit flies and diseases like late blight of potato and tomato (Waller, B.E et al. 1998).

The bio magnification of pesticides in plant and animal tissues (particularly in lipid bodies) makes their use hazardous to health and may lead to several ailments. Over the decades, there has been a considerable increase in pesticide use and a simultaneous increase in the problem of bio magnification has been encountered in soil, in plant and animal products such as cereals, fruits and vegetables and in milk and milk products. In addition, there is the emerging problem of the development of pesticide-resistant pests, which may resist even higher concentrations of pesticides (Doss, C.R & Morris , M.L. 2001). The negative effects of applied pesticides in higher organisms include direct impacts such as fish kills, reproductive failure in birds and acute illnesses in humans. Human exposure to or ingestion of pesticides usually occurs as a result of the misapplication or careless disposal of unused pesticides and pesticide containers. Moreover, as the top consumers, humans are exposed to high levels of pesticides on ingesting contaminated plant and animal products.

Although pesticides are important, their effects on non-target organisms are of great concern because this poses a risk to the entire ecological system. In general, the effects of pesticides on microorganisms will vary depending on the chemical dosage, the properties of the soil and various environmental factors. Because the application or extensive use of pesticides has led to a rapid decline in the quality of the organic matter in soil it also affects the diversity of the microbial flora and fauna (Michael C.R. 2009). Several soil microbial enzymes are hampered or affected by the application of pesticides to the soil. Nitrogen mineralization processes, such as ammonification and nitrification, are also affected by the

application of pesticides, with the former being inhibited less because it is carried out by a vast diversity of micro-flora.

In Kenya, the Government has not established a parastatal enterprise with monopoly powers. Private firms imported pesticides through the agricultural and industrial supply company. In 1987, pesticide imports were liberalised and continued to be distributed to farmers either freely or at a heavily subsidised price by the primary societies (Misanga, 1998). Private sector involvement in distribution grew after subsidies were removed and prices de-controlled. Initially, there were problems of counterfeit products. Pesticide imports have declined by roughly 40 percent since the late 1980's. The proportion of farmers using pesticides is highest in Kilimanjaro probably related to coffee production and Iringa where pesticides are used in maize storage (Ferreira, 1994).

## **2.6 Provision of Training by credit providers to small scale farmers and influence on productivity**

Agricultural education, extension, and advisory services are a critical means of addressing rural poverty, because such institutions have a mandate to transfer technology, support learning, assist farmers in problem solving, and enable farmers to become more actively embedded in the agricultural knowledge and information system (Christoplos and Kidd 2000, 11). Extension is responsible to almost one billion small-scale farmers worldwide. It is thus urgent to seek the best ways to support such farmers in terms of information, technology, advice, and empowerment. Finding an extension approach is a special challenge in the African context, as poverty is growing and productivity is declining on the continent. Twenty-four African countries have listed extension as one of the top agricultural priorities for a poverty reduction strategy (InterAcademy Council 2004).

One very popular extension and education program worldwide is the farmer field school (FFS) approach, now in place in at least 78 countries (Braun et al. 2006). Started in Indonesia in 1989, FFSs have expanded through many parts of Sub-Saharan Africa. Kenya alone is the site of more than 1,000 such schools with 30,000 farmer graduates (FAO/KARI/ILRI 2003). Many donors, governments, and nongovernmental organizations (NGOs) enthusiastically promote FFSs in Sub-Saharan Africa today. As a result of their popularity, there is some discussion as to whether the FFS approach should be scaled up and out and incorporated into mainstream extension practices (Anandajayasekeram, Davis, and Worknen).

Increasing agricultural productivity is a major challenge in Sub-Saharan Africa (SSA), where 62% of the population (excluding South Africa) depends on agriculture for their livelihoods (Staatz & Dembele, 2007). Since 1960s, agricultural production in SSA has failed to keep up pace with population growth (Benin, 2006). Improving the productivity, profitability, and sustainability of smallholders farming is therefore the main pathway to get out of poverty (World Development Report [WDR], 2008). It is widely argued that, achieving agricultural productivity growth will not be possible without developing and disseminating improved agricultural technologies that can increase productivity to smallholder agriculture (Asfaw, Shiferaw, Simtowe, & Lipper, 2012). Like in many other SSA countries, agriculture is the most important sector for sustaining growth and reducing poverty in Ethiopia. It accounts for 85% of employment, 50% of exports, and 43% of gross domestic product (GDP) (FAO, 2010). However, lack of adequate farm management practices, low level of modern inputs usage, the depletion of soil organic matter and soil erosion, highly rain fed dependent agriculture system are major obstacles to sustain the agricultural production in the country (Grepperud, 1996; Pender & Gebremedhin, 2007).

In cognizant of these problems, the government of Ethiopia launched a strategy which is known as the Agricultural Development Led Industrialization (ADLI) in 1993 that sets out

agriculture as a primary stimulus to generate increased output, employment and income for the people, and as the spring board for the development of the other sectors of the economy (Kassa & Abebaw, 2004; Gebremedhin, Jalata, & Hoekstra, 2009). One of the major components of ADLI is the national extension package program known as Participatory Demonstration and Training Extension System (PADETES). The objective of PADETES are to achieve sustainable development in rural areas through increasing farm productivity (yield), reducing poverty, increasing the level of food security, increasing the volume and variety of industrial raw materials (primary products), and producing for the export market (Kassa, 2003; Ethiopian Economics Association [EEA], 2006).

The PADETES program has been focusing on supply-driven intensification which consists of enhanced supply and promotion of improved seeds, fertilizers, on-farm demonstrations of improved farm practices and technologies and close follow up of farmers' plots (Kassa & Abebaw, 2004; EEA, 2006; Kassa, 2008). Hence, wider dissemination of improved farm technologies, management practices and know-how to the smallholder farmers have been the major activities of the extension program (Kassa, 2003; Gebremedhin et al., 2009; Asfaw et al., 2012).

However, the performance of the agriculture sector has been very dismal in spite of implementing the national extension package program-PADETES. The impacts of the implemented technologies have been mixed, with increased use of fertilizer but poor productivity growth (World Bank, 2006). The country is still vulnerable to recurrent food shortfalls and national food insecurity (Abate et al., 2011). For instance, between 1998 and 2012 the average number of Ethiopians in need of food assistance fluctuated between 3 million and 14 million.

According to Anderson and Feder (2003) productivity improvements are only possible when there is a gap between actual and potential productivity. They suggest two types of 'gaps' that contribute to the productivity differential, the technology gap and the management gap. Extension can contribute to the reduction of the productivity differential by increasing the speed of technology transfer and by increasing farmers' knowledge and assisting them in improving farm management practices (Feder, Murgai, & Quizon, 2004). The design of agricultural extension programs in developing countries has been the subject of heated debate. Guided by these debates, extension services have undergone several transformations in the past few decades (Byerlee, 1994).

The main transformation, until recently, was a shift from the transfer-of-technology approach to the Training-and-Visit, or T&V, system. Under T&V, the extension system was reoriented from a desk-bound bureaucracy with multiple economic and social objectives to a field-based cadre of agents who focused mainly on technology diffusion (Picciotto and Anderson, 1997). T&V extension agents would meet with a small group of "contact" farmers who were expected to disseminate information to the members of their respective communities and convey farmer's opinions back to the agents, thus creating a feedback mechanism absent in the prior system (Birkhaeuser, et al, 1991). For nearly three decades, international aid donors, such as the World Bank, promoted T&V as the most cost-efficient extension system. T&V did, however, have its critics.

With continued budgetary crises of less developed countries, some argued that it was too expensive and impossible to implement over extensive regions. Highly dispersed farmers could never establish frequent contact with extension agents. And their needs varied widely and could not be addressed with a single, inflexible technology package (Picciotto and Anderson, 1997; Feder, Willett, and Zijp, 2001).

In recent years, a number of development agencies have promoted farmer field schools (FFS) as a potentially more effective approach to extend knowledge to farmers. FFS programs were first introduced in East Asia, in the late eighties, as a way of diffusing knowledge-intensive integrated pest management (IPM) practices for rice. FFS have since been adapted to work with other crops and diseases, and have spread rapidly across Asia, Africa, and Latin America (Nelson et al., 2001).

The FFS approach represents a paradigm shift in agricultural extension: the training program utilizes participatory methods “to help farmers develop their analytical skills, critical thinking, and creativity, and help them learn to make better decisions” (Kenmore, 2002). Extension agents, who are viewed as facilitators rather than instructors, conduct learning activities in the field on relevant agricultural practices. Through interactive learning and field-experimentation, FFS programs teach farmers how to experiment and problem-solve independently, with the expectation that they will thus require fewer extension services and will be able to adapt the technologies to their own specific environmental and cultural needs (Vasquez-Caicedo et al., 2000). Participants are encouraged to share their knowledge with other farmers, and are sometimes trained to teach the courses themselves, thus reducing the need for external support.

Cocoa production is one of the cornerstones of Ghana's economy. However, cocoa yields per hectare of land in the country are among the lowest in the world. Low use of fertilizer has been identified as one of the likely causes of such low yields. A scheme in Ghana that combines training with fertilizers, insecticides and pesticides on credit to groups of Ghanaian cocoa farmers has shown remarkable success in increasing production and incomes for farmers: average farm production increased by 20% as a result of the programme and the increase in production was worth nearly three times the value of the loan (Feder Muigai & Quizon 2004). The same programme also led to an increase in productivity for

other non-participating farmers in the same villages. There were also more opportunities for day laborers to find employment. These surprising secondary effects of the programme show that the programme benefits both the participating farmers but also the wider community (Russell and Young, 1983; Battese and Coelli, 1988).

The T &V system was introduced in Kenya in 1982 as a supplement to the old system which had been implemented before Independence in 1963. The new system spread rapidly and by 1985 it covered some 30 districts, despite having been started on a pilot basis in only two districts. An important and 3 salient feature of T &V extension system is a regular pattern of visits by frontline extension workers to contact-farmers (see e.g., Benor et al. 1984). A fortunate aspect of the T &V system in Kenya, with respect to visitation by extension workers, is that in many areas, farmers in Kenya have organized themselves in groups to facilitate such ventures as the marketing of agricultural output, mutual help assistance and acquisition of agricultural credit. Extension workers seek out these existing groups as their contacts.

The original design of T & V whereby extension workers were to reach out for individual farmers proved hard to implement. Extension workers focus on imparting key messages to farmers on each visit, with the complexity of these messages being increased in subsequent visits. Initial messages aim at improving basic production techniques, with attention being focused on land preparation, the timeliness of operations, crop spacing, plant population sizes, the use of better seed varieties and on weeding. After the simple messages, attention shifts to more complex messages such as those relating to fertilizer use and pest control measures (Caswell, M. et al, 2001).

## **2.7 Summary of Literature Review**

Doss and Morris in their study on factors influencing improved maize technology adoption in Ghana, and Over field and Fleming studying coffee production in Papua New Guinea showed significant effects of access to funds including credit to increase the probability of adoption. For instance, the reports revealed that most small scale farmers in the countries were unable to afford basic production technologies such as fertilizers and other agrochemicals resulting in low crop yields due to poverty and limited access to trainings.

A number of studies that sought to establish the effect of education on adoption in most cases relate it to years of formal schooling. Generally, education is thought to create a favourable mental attitude for the acceptance of new practices, especially information-intensive and management-intensive practices. According to Rogers, Ehler and Bottrell, technology complexity has a negative effect on adoption and this could only be dealt with through education. This was highlighted further by Russell and Young, Battese and Coelli, who in their research studies found positive correlations between the degree of technical inefficiency and education levels of farmers, age of farmers, land size, proportion of hired labour used, per capita net income and negative correlations between the degree of technical inefficiency and farming experience and off farm employment.

In Kenya, there has been low adoption of new technologies due to several constraints, key among them being: weak research-extension-farmer linkages, low funding, inadequate field staffing levels and inadequate promotion and marketing of new varieties and complementary technologies by the private sector. In Malawi it was clear that when the government of Malawi introduced Starter Pack Scheme (SPS) in 1998, which provided free seeds and fertilizers to small holder farmers, the country registered positive growth in per capita GDP.

The literature material reviewed highlighted an in-depth importance of credit input provision to farmers especially small scale and poor rural farmers who can't access financial services from formal credit institutions. There is also evidence from reviewed literature materials that lack of access to credit constrained most small holder farmers' productivity and also led to low production. From Hussein's report credit constrained farmers use lower levels of capital intensive inputs due to lack of finances and lack of credit access also affects adoption of new farming technologies. The importance of credit to farming households has been highlighted by all materials reviewed, however, there exists a gap in that, none of these materials presents a clear scientific evidence as to how credit provision by providers has improved productivity of small scale farmers. This study therefore aims to bridge this knowledge gap by assessing the influence of credit farm input on improvement of small scale farmers' output in Bungoma County in Kenya.

## **2.8 Theoretical Framework**

The Risk and Uncertainty Theory by Frank Knight (1921), states that the consequences of each alternative are not known in advance but depend on the realization of events out of the control of the consumer. Both Huirne et al. (2000) and Hardaker et al. (2004) distinguish two major types of risks in agriculture. First, business risk includes production, market, institutional and personal risks. Production risk is due to unpredictable weather and performance of crops. Market risk is related to uncertainty about the price of outputs and sometimes also inputs, at the time production decisions are taken. Institutional risk is due to government actions and rules such as laws governing farm activities like the use of pesticides, tax provisions and payments. Personal risks are due to uncertain life events such as death, divorce, or illness.

Second, financial risks result from different methods of financing the farm business. The use of borrowed funds means that interest charges have to be met before equity is rewarded which may create risk due to leverage. Additionally there is financial risk when interest rates rise or loans are unavailable. Musser and Patrick (2001) follow Baquet et al. (1997) and define five major sources of risk in agriculture. Production risk concerns variations in crop yields due to weather conditions, diseases and pests. Marketing risk is related to the variations in commodity prices and quantities that can be marketed. Financial risk relates to the ability to pay bills when due, to have money to continue farming and to avoid bankruptcy. Legal and environmental risk concerns the possibility of lawsuits initiated by other businesses or individuals and changes in government regulation related to environment and farming practices. Finally, human resources risk concerning the possibility that family or employees will not be able to provide labour.

Small holder farmers who face financial risk like bankruptcy are likely to encounter a hard time while repaying for their credit input loans therefore this will affect their net farm income negatively because they will either default or be forced to sell their produce in order to repay their loans. This will affect consequent seasons of production. Small holder farmers who encounter majority of the mentioned risks will continue experiencing dwindling productivity in their farms in turn making them unable to access input credit or any subsidies that are basic requirement for farm production.

## **2.9 Conceptual Framework**

In conceptual framework, the variables were divided into independent, dependent and moderating. The independent variables (credit farm input) which consist of provision of certified maize and beans seeds, fertilizers, agrochemicals on credit as well as training of

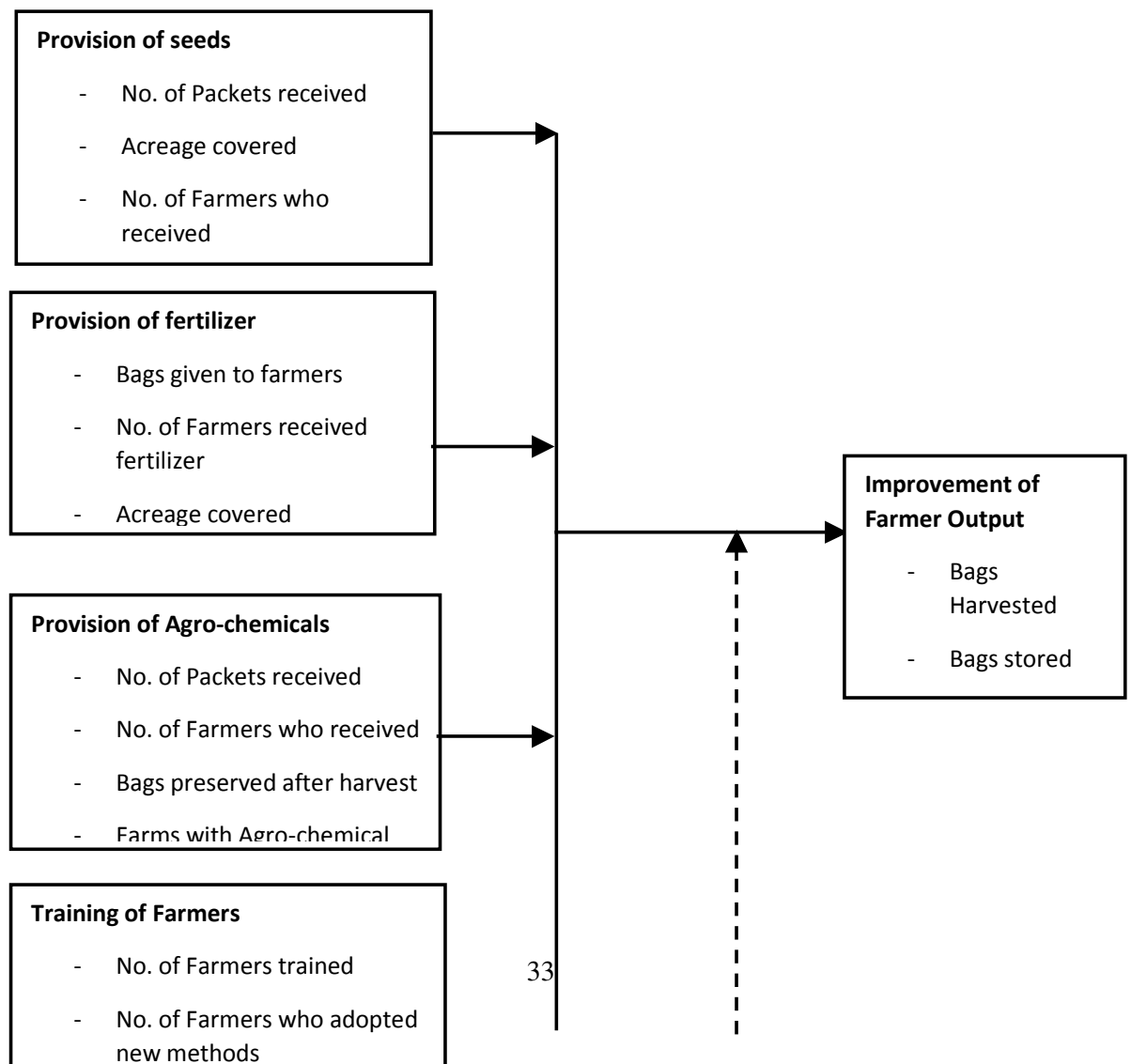
small scale farmers in Bungoma south by credit providers, are supposed to assist the small scale farmer in improving farm output (dependent variable).

The moderating variable (Government policy) plays part to both independent variables (credit farm input) and the dependent variable (small scale farmer output). The Government may create and implement policies that regulate provision of input subsidies which may affect farmers' access and cost of the credit inputs. Credit firms may be bound by such policies and will have to abide by all the stipulated rules.

**Conceptual framework about influence of credit farm input on improvement of small scale farmer output.**

**Independent Variables;**

**Dependent Variable;**



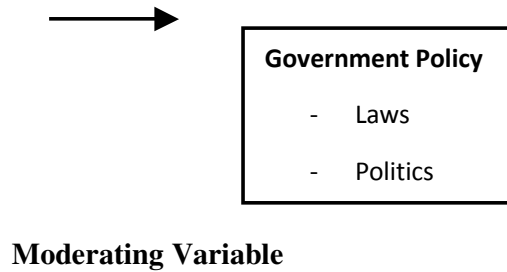


Figure 2.1: Conceptual Framework

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

Methodology is a systematic plan to study a scientific problem. This chapter of the study defined the study type, study population, sampling procedures, sample size calculation, data collection methods and a statistical analysis plan. In other words it is the framework that has been created to seek answers to research questions.

#### **3.2 Research Design**

A descriptive survey research design was used to obtain data that was used to describe the existing phenomena. It was the suitable method for collecting situational data for the purpose of describing a population which was too large to observe directly. The descriptive survey enabled collection of data without manipulation of the research variables. This design optimizes on the strengths of both qualitative and quantitative research methodology. This survey method also allowed collection of data from a large sample population and generated findings that were a representative of the whole population at a lower cost.

### **3.3 Target Population**

The target population was 2,505 individuals, this included 2,500 small scale farmers who grow maize and beans in Bungoma County in Kenya and 5 senior staff from two input credit firms in the area of study. This population was considered for the study because they met all the criteria required for this study.

### **3.4 Sample size and Sampling procedure**

This section presented sampling procedure and sample size.

#### **3.4.2 Sample Size**

The sample size used for the study was 105 respondents, comprising 100 Small Scale Farmers and 5 senior staff from input credit firms.

#### **3.4.1 Sampling Procedure**

This study adopted systematic and purposive sampling methods. Systematic sampling was used to determine the sample size of small scale farmers while purposive sampling was used to select 5 senior staff from credit firms. In systematic sampling, a list of every member of the population was created. From the list, the researcher selected the first item randomly. The sample element (25) from the first  $k$  elements on the population list was selected. Thereafter, every 25<sup>th</sup> element on the list was systematically selected. That is; the starting first element of the population selected was 25, this value 25 was picked to be the constant difference between two consecutive numbers in the progression.

Therefore;  $n^{\text{th}}$  element = 25

Constant element = 25

Total population size = 2500

Sample size = total population size/ Constant element between two consecutive numbers

Sample size =  $2500/25$

Sample size = 105, comprising 100 Small Scale Farmers and 5 senior staff.

The process of obtaining the systematic sample is much like an arithmetic progression. The researcher selected an integer that was less than the total number of individuals in the population (for this study the number was less than 2500). This integer corresponded to the first subject. The researcher then picked another integer which served as the constant difference between any two consecutive numbers in the progression. The integer was typically selected so that the researcher obtains the correct sample size. Systematic sampling has an advantage over simple random sampling in that it gives the assurance that the population will be evenly sampled. There exists a chance in simple random sampling that allows a clustered selection of subjects. This is systematically eliminated in systematic sampling.

Purposive sampling was used to select 5 senior staff from two credit firms that offer credit facilities in the study area. This is a suitable method because this group of people have the desirable traits and attributes that the researcher requires.

### **3.5 Research Instruments**

The study employed the use of questionnaires and interview schedule. Questionnaires have been defined as research instruments consisting of a series of questions and other prompts for the purpose of gathering information from respondents. It was a convenient tool since a large number of farmers will be involved, questionnaires are confidential and the researcher covered a wide area while using them to gather information within a short time from the farmers. The questionnaires were administered to 100 small scale farmers and captured both qualitative and quantitative type of data. The questionnaires also used both open and closed ended type of questions.

The interview schedule is a guide used by the interviewer when conducting a structured interview, (Michael S. Lewis & Alan Bryman, 2004). The interview schedule was

administered to 5 senior staff in input credit firms. It was the most suitable instrument in this case because it allowed detailed information to be obtained, had a high response rate and clarification and responses could be followed up using this instrument.

### **3.5.1 Pilot Testing**

Pilot testing was used to determine the reliability and validity of the instrument. Pre-testing of the instrument was done to ten respondents who were small scale farmers in Matisi sub-location. The pilot study was done to determine any ambiguities in the items of the questionnaire and redesigned.

### **3.5.2 Validity of the Research Instrument**

According to Mugenda and Mugenda (1999), validity of research is concerned with the extent to which an instrument measures the data that was intended or supposed to be measured. Validity of the instrument was tested by consulting the supervisors and validating further the questionnaire which was pre-tested through a pilot study then findings modified to free the instrument from any ambiguity.

### **3.5.3 Reliability of the Instrument**

Reliability of measuring instruments refers to the instrument's ability to yield consistent results each time it is applied. It can also be seen as a measure of the degree to which a research instrument yields consistent data after repeated trials, (Mugenda and Mugenda, 2003). Reliability can be quantified by taking several measurements on the same subjects. The reliability of an instrument is usually expressed as a coefficient. The reliability coefficient varies between values of 0.0 and 1, 1 indicates perfect reliability which practically cannot be achieved. A rating of 0.0 indicates no reliability. Reliability of the instrument was established by using the split half method, questionnaires were administered to ten small scale farmers not used as respondents in the study. Cronbach-Alpha coefficient was used to calculate the

reliability coefficient. A reliability coefficient of 0.7 and above is accepted as a good measure of reliability.

### **3.6 Data Collection Method**

The researcher requested for a letter from the University to apply for a research permit from NUCOSTI, then sought for a second permit from the Ministry of Agriculture and informed the employee of Ministry of Agriculture about the visit to collect data. The researcher also informed the Local administration then through the research assistants, administered the questionnaire to all the farmers sampled and at the same time guided each farmer to fill the questionnaire. Data collection involved 100 small scale farmers in Bungoma County and 5 senior staff working with input credit firms as respondents. Data was collected using questionnaire administration and interview methods. Questionnaire with specific questions addressing the objective items was administered to each individual small scale farmer selected to enter into survey, to help get their honest and accurate self-evaluation.

There was no group work from the side of the respondents when answering the questions as illustrated from the questionnaire, each farmer selected as respondent was advised to respond to questions independently, so as to get accurate and independent answers from the respondents. Before getting the actual respondents to answer the questions, a contact was made with them so as to enable them get prepared.

### **3.7 Data Analysis Technique**

Descriptive data was analyzed by the use of SPSS package and percentage frequencies. Statistical tally system was used to generate frequency counts from the responses so as to prepare frequency distributions. The results were presented in frequency distribution tables then discussions made. Pearson Correlation was used to analyze responses on items and seek whether there was any relationship between the dependent and independent variables.

### 3.8 Ethical Consideration

The researcher upheld morals while conducting research in such a way that aims of research were promoted. The researcher, while conducting research observed human rights and respected respondents' opinion, was fair, objective and honest while collecting data, upheld integrity and above all ensured confidentiality of information given by respondents. The researcher also complied with the law throughout the period of research.

### 3.9 Operational Definition of Variables

OBJECTIVES	VARIABLES	INDICATOR	MEASUREMENT	STATISTIC TEST
To determine the extent to which provision of seeds on credit influence improvement of small scale farmers' output.	Independent	Packets distributed Acreage covered Farmers who received	Interval	Correlation Frequency tables
	Dependent	Bags stored	Interval	
To determine how fertilizer provision on credit influence improvement of small scale farmers' output.	Independent	Bags Received Bags harvested per acre	Interval	Correlation Frequency tables
	Dependent	Bags harvested Bags stored	Interval	
To investigate how provision of Agro-chemicals on credit to	Independent	Packets distributed Farmers received Bags preserved	Interval	Correlation Frequency tables

small holder farmers has an influence on improvement of small scale farmers' output.

Dependent      Bags sold      Interval

To examine how training of small scale farmers in utilization of new farming methods by credit providers influence their output

Farmers trained  
 Independent      Farmers who adopted new methods      Interval  
 Dependent      Farmers using credit facilities      Interval

Correlation  
 Frequency tables

## CHAPTER FOUR

### DATA ANALYSIS, PRESENTATION AND INTERPRETATION

#### 4.1 Introduction

This chapter consists of data analysis, presentation, interpretation and discussion. The chapter is organized according to the objectives of the study. The analyzed data is presented using frequency distribution tables preceded by interpretation and explanations of findings on the influence of credit farm input on improvement of small scale farmers' output in Bungoma County in Kenya.

#### 4.2 Questionnaire Return Rate

The study targeted farmers from Bungoma County and senior staff from input credit firms. This section consists of the questionnaire and interview response rates.

**Table 4.1: Questionnaire Return Rate**

This table shows findings on questionnaire return rate.

Target Category	Sample size	Number Responded	Return Rate (%)
Small scale Farmers	100	100	100.00
Senior Staff	5	5	100.00

<b>Total</b>	<b>105</b>	<b>105</b>	<b>100.00</b>
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Table 4.1 shows that the questionnaire returns and interview responses were received from the entire sample of 105 respondents (comprising 100 Small Scale Farmers and 5 senior staff from input credit organizations) .This was (100.00) 100 per cent participation rate. The questionnaire return rate was high due to a positive response from respondents who were willing to dedicate their time to talk about farming which was their passionate activity. The researcher also trained research assistants on the ethical approach to be used while collecting data and this turned out successful.

### **4.3 Socio-demographic Characteristics of Study Participants**

The study sought to find to determine demographic characteristics of farmer respondents based on age, academic qualifications marital status and gender.

#### **4.3.1 Gender of respondents**

In question one, the respondents were asked to indicate their gender from either the Male or Female choice given on the questionnaire.

**Table 4.2: Gender characteristics of respondents**

<b>Gender</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Male	45	45.00
Female	55	55.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

**Source: Primary data**

The responses showed that majority 55 (55.0%) were female against 45 (45.0%) of male representation among the 100 selected farmers. Female’s domination among the farmers over

and above men's representation shows that more women than men are the ones concerned with farming in their families. From the reviewed literature there was no past research evidence that had linked gender of the participants with any influence of credit farm input on improvement of small scale farmers' output . Therefore, although women were the majority among the sampled farmers, gender was an insignificant variable in as far as the influence of credit farm input on improvement of small scale farmers' output in Bungoma County in Kenya was concerned in this study. From my studies in entrepreneurship, women have been viewed to shy away from credit due to associated risks, however from these findings, women actually participate in input credit facilities and are able to benefit from the same. The societal norms around the area of study favored men due to perception that men own the means of production, even though women may provide farm labour in most cases. In this study however, women have shown almost equal participation in farming activities when compared to their male counterparts.

#### **4.3.2 Marital status of respondents**

The study sought to find out whether marital status of Respondents in households affected decision making on issues around credit farm input in any way and whether respondents in all categories participate equally in farming activities. Respondents were asked to give their marital status. They gave the following;

**Table 4.3 Distribution of Respondents by Marital status**

<b>Marital status</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Married	80	80.00
Single	06	06.00
Divorced	01	01.00
Widowed	13	13.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

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Table 4.3 illustrates that 80 (80%) of the respondents are married, 13(13%) are widowed, 06 (6%) are single and 1(1%) divorced. This shows that a large percentage of respondents are married therefore are supported by their spouses in farming. The married group of farmers have an upper hand in making consultative decision making on whether to engage in input credit activities and the risk can be shared between parties. This is also significant when it comes to attendance of meetings in that one party is able to represent another which has well contributed to efficient communication on farm activities. However, there is no evidence from past research on how marital status influences farm output.

#### **4.3.3 No of dependents of the respondents**

The item sought to look at how many dependents the respondents had and whether this would influence farm activities in any way. Small holder farmers who have many dependents, from general understanding tend to encounter constraints in acquisition of quality and enough farm inputs required to do farming due to scarcity of resources among this group of people.

**Table 4.4: No of dependents of the respondents**

<b>No of dependents</b>	<b>Frequency</b>	<b>Percentage (%)</b>
0 -4	12	12.00
5-9	68	68.00
10-14	17	17.00
15-19	03	03.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

Table 4.4 shows that 68(68%) of the respondents have dependents between five and nine, 17 (17%) have dependents between ten and fourteen, 12 (12%) have dependents between zero and four, and 3(03%) have dependents between fifteen and nineteen. According to this study,

majority of respondents can do both commercial and subsistence farming and part of the reasons being that they have a manageable number of dependents. It also implies that they can save part of their unconsumed produce for commercial purposes. These dependents also provide readily available farm labour meaning that farmers do not necessarily have to look for cash to pay for labour cost that could be incurred during farming. A very small number of respondents have more than 15 dependents, probably due to the current low life expectancy.

#### 4.3.4 Age of respondents

The study obtained age groups of the respondents for purposes of understanding their age and possibly the experience they possess in farming. Farmers who have practiced farming for several years have good understanding on the various techniques used in production. Here is how respondents were distributed by age group;

**Table 4.5: Distribution of Respondents by Age Groups**

<b>Age group (Years)</b>	<b>Frequency</b>	<b>Percentage</b>
16 -25	03	03.00
26 -35	29	29.00
36-45	28	28.00
Above 45	40	40.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

The findings showed that 40(40%) of the respondents were of age above 45, 29 (29%) of age 16-25, 28(28%) between 36-45 and lastly 3(3%) between 16-25. Majority of the respondents are of age and have experience in farming and can work without close supervision and also understand any guidelines that could be given. Very few respondents were aged between 16 and 25 meaning those at age 16 could not make proper independent decisions and that could affect their involvement in credit activities negatively.

#### 4.3.5 Level of Education of respondents

Farmer respondents were asked to indicate their highest level of education they attained. The guidelines on the levels of education in the question were given as follows: No schooling; primary; secondary; college; diploma and university. The findings were tabulated as shown.

**Table 4.6: Distribution of Respondents by Highest Level of Education**

<b>Qualification</b>	<b>Frequency</b>	<b>Percentage (%)</b>
None	04	04.00
Primary	29	29.00
Secondary	50	50.00
College	15	15.00
University	00	00.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

Table 4.6 above shows that majority, 50(50.00 %) of the respondents had attended school up to secondary level 29(29.00%) had up to primary education, 15(15.00%) had college education, there were only 04(04%) without any form of schooling and none attained university education. The number of years in formal education for the farmers ranged from null = 0 for no schooling, 8 for primary level of education, 12 for secondary level of education, 15 for diploma level of education and 16 for those who had attained degree level of education. Therefore the average number of years of schooling among the farmers was:

:  $(\text{none} = 4 \times 0) + (\text{primary education} = 29 \times 8) + (\text{Secondary education} = 50 \times 12) + (\text{diploma level} = 15 \times 15) + (\text{university} = 0 \times 16) / 100 = (224 + 600 + 225) / 100 = 10.01$  years. Therefore, on

average the results showed that farmers had only 10.49 years of formal schooling. Thus most of these respondents had attained only attained 10.49 years of secondary school education.

However, there was no past research evidence that had linked the participants mean number of years in formal education with improvement of small scale farmers’ output. Formal years of schooling were insignificant in influencing improvement of small scale farmers’ output although this could be a contributing factor to farmers’ ability to understand and comprehend new farming techniques disseminated to them.

#### 4.3.6 Reasons why farmers practiced farming

This item sought to find out the major reason why respondents engaged in farming, whether they consumed all their output or sold any that could boost their involvement in farm input credit activities. First, they were asked why they practice farming.

**Table 4.7: Reasons why farmers practiced farming**

<b>Reason</b>	<b>Frequency</b>	<b>Percentage</b>
Subsistence	26	26.00
Commercial	4	04.00
Both	70	70.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

From table 4.7 above, 70(70.00 %) of the respondents said they do farming for both subsistence and commercial purposes, 26(26%) of the respondents do subsistence farming while 4(04%) do farming for commercial purpose. This shows that most respondents get enough produce that enables them to sell some and consume the rest. Respondents benefit from input credit and are able to sell part of their produce, meaning that they depend on

income from farm activities. Very few respondents do farming only for commercial purpose, meaning they sell all their produce and none is diverted to household consumption. This findings agree with a study done by Ralph et al in 2005 highlights that the main economic activity in Bungoma County is subsistence agriculture with maize, sunflower, sugarcane, coffee, tobacco, potatoes and beans being the main crops.

#### **4.4 Provision of seeds on credit and improvement of small scale farmers’ output**

Farmers were to respond to questions related to provision of seeds on credit and how that could affect the output. The items asked on this sought to find out why farmers engaged in farming, the number of packets of seeds farmers received, acreage covered and the number of farmers who received the seeds on credit. Findings on each of the items are as follows;

##### **4.4.1 Frequency of provision of farm input credit facilities to farmers**

The study also sought to find out the frequency of provision of farm input credit facilities to farmers to find out how frequent credit firms provided farmers with credit facilities. Their responses were tabulated as shown;

**Table 4.8: Frequency of provision of farm input credit facilities to farmers**

<b>Frequency of Provision</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Every 6 months	04	04.00
Annually	70	70.00
Never	26	26.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

Table 4.7 above shows that 70(70.00%) of the respondents received farm input credit facilities annually, 26(26.00%) never receive and 04(04%) receive after every six months.

This is evident from the survey done with senior staff respondents from Equity bank who offer particular services for one year after which farmers are required to apply for new funding at the start of another year. It was also noted that farmers utilized services of credit organizations throughout the year they enrolled with them. Respondents were to state the organizations that give the farm input credit facilities. The organizations that they mentioned include One Acre Fund, Equity Bank, Pioneer, NALEP, ICS and Ministry Of Agriculture. Indeed some of these organizations were visited during the study and senior staff respondents from One Acre Fund and Equity bank participated in the survey that showed the organization’s participation in giving farmers credit.

#### **4.4.2 Access of information about Credit farm input**

The study sought to find out how respondents accessed information on credit farm inputs and whether all had an equal chance to acquaint themselves with the same. When asked how they accessed information about credit farm input, the respondents gave the following information:

**Table 4.9: Access of information about Credit farm input**

<b>Access of information</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Fellow farmers	44	44.00
Media	09	09.00
Chief’s Baraza	15	15.00
Trainers	32	32.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

The table indicates that 44(44.00%) of the respondents get information about credit farm input from fellow farmers, 32(32%) get it from trainers, 15(15%) from chief’s barazas and 9(9%) from the media. Since most farmers get information from their fellows, this is an indicator that farmers mostly learn about new farming techniques from other farmers and this

could also contribute to their high adoption rate. The survey study also indicated that some of these channels are used by input credit firms when communicating and identifying farmers who engaged in input credit activities. For example, respondents from the credit organizations identified potential clients through marketing their products at farmer group levels and signing contracts with them and also from Chief's Barazas village elders and group leaders. They also get reference from their existing clients meaning farmers do actually communicate to their fellows about credit facilities. Sometimes the credit organizations did baseline surveys, site scouting and also confirm past credit repayment progress from farmers in order to retain them. Respondents from Equity bank identify farmer legibility for credit farm inputs through field days, Ministry of Agriculture and from fellow farmers.

#### 4.4.3 Provision of Seeds on Credit

This item sought to determine whether respondents were provided with seeds on credit by input credit firms and their responses tabulated.

**Table 4.10 Provision of Seeds on Credit**

<b>Provision of seeds</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Yes	80	80.00
No	20	20.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

Table 4.10 above shows 80(80%) of the respondents agreed that they received seeds on credit while 20(20%) indicated that they are never given seeds on credit. Those who received seeds on credit had received between 2- 5 packets (2kg) of seeds and had land ranging between half to five acres and their output was moderate and high. Most farmers come from humble backgrounds where they cannot afford buying inputs like seeds on their own. According to development professionals, the lack of access to credit by poor rural households

has negative consequences for agricultural productivity, income generation and household welfare as cited by Von- Pischke and Adam (1980).

The role of credit cannot be overemphasized. Without credit accessibility, it will be impossible to purchase the inputs needed for production let alone maximizing output from given resources or minimizing the resources required for producing a given level of output. In their study, Gamba et al reveal that 56% of small scale farmers and corresponding 49% of large scale farmers obtained wheat seeds from other farmers. Most farmers, they observed, obtained seeds from the same village although about 35% travelled more than 10 km to get the seed. This seems to agree with this study’s findings that some percentage of farmers do not have access to certified seed at their doorstep.

#### **4.4.4 Amount of land used, Number of packets of seed received and the output of bags of maize**

The study sought to establish the number of packets of seed respondents receive as related to the size of land they have and the output thereafter. Majority said they receive maize seeds. The following table gives a summary of the findings;

**Table 4.11: Amount of land used, Number of packets of seed received and the output of bags of maize**

<b>Acres</b>	<b>No. of 2 kg packets</b>	<b>Output (90 kg bag of maize)</b>	<b>Frequency</b>	<b>Percentage (%)</b>
0.5	2-2.5	5-10	21	27.27
0.75	2.5-3	7-13	06	7.79
1.0	2.5-3.5	12-19	21	27.27
1.5	2.5-7.5	8-28	08	10.39
2.0	2.5-5	9-14	06	7.79
2.5	5 -7.5	15-17	03	3.90
3.0	3-5	7.5-14	06	7.79
4.0	2.5-13	5-30	04	5.19
5.0	5.0	16-19	02	2.60

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<b>Total</b>	<b>77</b>	<b>100.00</b>
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For ideal production, one acre of land should be planted with two packets of 2kg seed. Ideal production means farmer's output is 20-30 bags. From the study, respondents with 0.5 acres, 21(27.27%) were given more than enough seed and produced maximum. Those with 1.0 acres, 21(27.27%) were also given the ideal amount of seed but could not produce to the maximum, although they were slightly below the ideal output. Some respondents were given less seed for their size of land .For instance 2.5 packets given to those with 4.0 acres. This automatically affected the yield. There could be constraints as to why respondents were not producing maximum for example low number of packets they received and non-use of all the packets given. Feder et al., (1990) and Petrick, (2004) agrees with these as they found out that seed credit constraints could have a negative impact on farm investment and farm productivity (Guirkinger and Boucher, 2008).

These reports and publications concluded as follows in all categories of credit constraints, farmers have a demand for credit but they are limited in accessing credit by a limited capacity to provide collateral, high transaction costs of the credit contract or a high level of risk associated with the credit contract. And these credit constraints can lead to an imperfect or even inexistent credit market. In their study, Cromwell (1996) and Louwaars (1994) in their study found that farmers need seed because without it, the survival of their household is endangered. They say farmers obtain seed using old ways including saving from one harvest to the next, off-farm buying from local sources, not all farmers can afford to buy certified seed and the few who could afford found it unavailable. These findings show that provision of seeds on credit influence farmers' output.

Similar studies done in Chile reveal that seed credit constraints have a negative impact on farm investment (Carter and Olinto, 2003; Petrick 2004). Farmers have demand for credit but

have limited access due to inability to provide collateral, high transaction cost of the credit contract or high level of risk associated with the credit contract. All these three types of credit constraints can lead to an imperfect or even inexistent credit market.

#### 4.4.5 Frequency of receiving credit farm inputs

The study sought to find out how often farmers received input credit. When asked, they said the following:

**Table 4.12: Frequency of receiving credit farm inputs**

<b>Frequency of receiving Credit inputs</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Twice yearly	06	06.00
Yearly	68	68.00
After 2 years	00	00.00
Never	26	26.00
<b>Total</b>	<b>100</b>	<b>100.0</b>

Table 4.12 showed that 68(68%) of the respondents received credit farm inputs yearly, 26 (26%) don't receive at all, 06% receive twice yearly and none receive after 2 years. A large percentage received credit farm inputs yearly because they are used to maize planting which is done yearly and also due to the credit firms that have organized their schedules to issue these facilities once a year. A small percentage of respondents, 26 (26%), did not receive the credit farm inputs and this could be a fraction who fear credit.

In his study, Skarstein found that Agricultural input credit loans are categorized as short term, intermediate-term and long-term depending on their maturity. Loan maturity usually matches the length of the agricultural production cycle of between 3-18 months, hence a short term loan. This study therefore shows that majority of respondents have access and took short term input credit loans. Von- Pischke and Adam (1980) argue that without credit accessibility, it will be impossible to purchase the inputs needed for production let alone maximizing output

from given resources or minimizing the resources required for producing a given level of output.

#### **4.5 Fertilizer Provision on Credit and improvement of small scale farmers' output.**

Questions in this section sought to find out if there was any influence of provision of fertilizer on credit on the farmers' output. The aim was to find out the quantity and numbers of bags of fertilizer farmers were given in relation to the size of land owned and the corresponding output. The study also sought to establish the number of farmers who received fertilizer and the respondents asked to comment about the range of cost of fertilizer provided by input credit firms.

##### **4.5.1 Number of bags of fertilizer, amount of land used, the output of bags of maize and the range of cost of fertilizer provided by input credit firms**

A summary of the number of bags of fertilizer provided, size of land that the fertilizer was used, the output of bags of maize and the range of cost of fertilizer provided by input credit firms as given by respondents is given below:

**Table 4.13: Number of bags of fertilizer, amount of land used, the output of bags of maize and the range of cost of fertilizer provided by input credit firms**

<b>No. of bags</b>	<b>Acres</b>	<b>Output (90 kg Bag of maize)</b>	<b>Total cost</b>	<b>Frequency</b>	<b>Percentage (%)</b>
1(of 25 kg)	0.5- 1	8-10	Low	63	63.00
1(of 50 kg)	1.5- 2	10-18 (and 2 of beans)	High	6	06.00
1.5-2(of 50 kg)	2.5 -above	12-18	Moderate	5	05.00
No fertilizer given	0.5 1.0 1.5	6-10 10-15 12-15	Moderate Moderate Moderate	26	26.00

	2.0	8-20	High
	3.0	15	High
<b>Total</b>		<b>100</b>	<b>100.0</b>

The table showed that 63(63%) of the respondents have land of between 0.5-1 acres and receive each 1 bag of 25kg fertilizer and produce 8-10 bags of maize of 90 kg. The range of cost of fertilizer provided in terms of production was rated as low meaning that they were able to get back what they spent in the farming and also get profit. The ideal quantity of fertilizer required for an acre of land is 1 bag of 50 kg. 6(6%) had land of 1.5-2 acres and got output of 10-18 bags. This range of cost of fertilizer provided in terms of production was rated as high. 5(5%) of the respondents had land of more than 2.5 acres and get output of 12-18 bags. This range of cost of fertilizer provided in terms of production was rated as moderate.

In the study, 26(26%) of the respondents did not receive fertilizer on credit. Among this group, those with 0.5 acres produced 6-10 bags, those with 1 acre of land produced 10-15 bags, those with 1.5 acres produced 12-15 bags all of which the range of cost of fertilizer provided in terms of production was rated to be moderate. Of this category those who had 2 acres produced 8-20 bags and those with 3 acres produced 15 bags and the range of cost of fertilizer used in terms of production was rated to be high. For this category, farm input credit has no influence on farmer output. Similar studies in Tanzania show that smallholder maize productivity in is suffering due to the fact that most smallholders do not practice high-yield farming methods such as use of chemical fertilizers, certified seeds pesticides, herbicides or insecticides due to the high cost of agricultural inputs and services. Studies in Kenya show that the use of fertilizer is still very low especially among small holder farmers, Argwings-kodhek (1997). Among reasons he gave was the high cost of fertilizer after liberalization.

On average, majority of respondents have little amount of land and hence are given only one bag of fertilizer and the rate on range of cost of fertilizer in terms of production is rated as low and produced maximum. This seems to agree with findings that show that the use of fertilizers leads to higher yields. For instance Studies of Strasberg *et al* (1999), Odhiambo (1998), Owuor (1999), Evenson and Mwabu (1998), Ekborm (1998) that demonstrated positive and significant statistical relationships between fertilizer use and productivity. But it is imperative that those with large pieces of land produce less bags of maize and they rate the cost of fertilizer in terms of production as moderate and high. This means they do not get the maximum produce coinciding with their large sizes of land due to less fertilizer given to them.

Even on credit, farmers are still receiving a limited number of bags of fertilizer and this could be the reason why respondents' with larger sizes of land have an output that is lower than the ideal (20-30 bags per acre). Thus to exploit the full yield potential of maize hybrids, it is necessary to apply an optimal level of fertilizer (Evenson R.E & G. Mwabu, 1998). From the surveys done, credit firms have policies that govern provision of credit, for instance, all clients need to be in groups, they should provide collateral in relation to the credit and clients are expected to follow the cash compliance policies stipulated. The method of loan repayment used was cash or M-Pesa from contract signing time and within an agreed deadline. Collateral provision could be the reason why farmers with larger land sizes can't access enough fertilizer thereby hampering their output.

#### **4.6 Agro-chemicals provision and improvement of small scale farmers' output.**

This section sought to analyze if provision of agrochemicals on credit to smallholder farmers influenced farmers' output. Items asked sought to find out whether farmers received any agro-chemicals, type of agrochemical received and number of bags stored using the same, their output and lastly respondents were asked to rank the benefits of farm input credit.

#### 4.6.1 Agrochemicals on credit offered by organizations

Respondents were asked to state if they received agrochemicals from any credit firm. The responses were tabulated;

**Table 4.14: Agrochemicals on credit offered by organizations**

Agrochemicals offered on credit	Frequency	Percentage (%)
Yes	62	62.00
No	36	36.00
Don't know	02	02.00
<b>Total</b>	<b>100</b>	<b>100.00</b>

This table shows that 62(62%) of the respondents received agrochemicals from an organization, 36(36%) did not receive any agrochemical and 2(2%) were not sure if they received. Those who received the agrochemical received only pesticide for storage/preservation of maize and beans. This findings agree with a study done in Nepal where insecticides and fungicides made the bulk consumed. The number of households using the pesticides varied considerably across the country. Generally, pesticide usage in Nepal is against pests such as brown plant hopper, fruit flies and diseases like blight of potato, (Waller, et al 1998).

#### 4.6.2 Number of bags of maize and beans stored by the pesticide

The number of bags of maize and beans stored by the given pesticide as indicated by respondents were tabulated in the table below:

**Table 4.15: Number of bags of maize stored by the pesticide**

<b>No. of bags of Maize Stored</b>	<b>Frequency</b>	<b>Percentage (%)</b>
0-4	8	12.90
5-9	33	53.23
Above 10	21	33.87
<b>Total</b>	<b>62</b>	<b>100.00</b>

Table 4.15 illustrates that, 33(53.23%) of the respondents stored maize at the range of between five to nine bags (of 90 kg), 21 (33.87%) stored above ten and 8 (12.90%) stored between zero and four. Majority of the respondents only managed to store between 5-9 bags of maize since they had small sizes of land therefore could not produce many bags for storage of extra, although their yield was ideal with respect to their land size.

This item also sought to determine the number of bags of beans stored after produce;

**Table 4.16: Number of bags of beans stored by the pesticide**

<b>No. of bags of beans</b>	<b>Frequency</b>	<b>Percentage (%)</b>
0-4	45	72.58
5-9	00	00.00
Above 10	17	27.42
<b>Total</b>	<b>62</b>	<b>100.00</b>

Table 4.16 above reveals that, 45(72.58%) of the respondents stored beans between zero to four bags, 17(27.42%) stored above ten and none between five and nine. Generally, the study indicates that majority of the respondents stored less bags of beans due to less produce. Several respondents also planted pure maize stands and did not plant enough beans that led to less produce for beans. Pesticides are used to preserve maize and beans .According to (Ehler, L.E & Bottrell D.G. 2000), pesticides include chemically synthesized compounds, devices or organisms that are routinely utilized in agriculture to manage, destroy, attack or repel pests,

pathogens and parasites. The use of toxic pesticides to manage pest problems has become a common practice around the world. Pesticides are used almost everywhere, not only in agricultural fields but also in homes, parks, schools, buildings, forests and roads. Ehler & Bottrell, 2000, in their study found out that it is difficult to find somewhere pesticides aren't used.

#### 4.6.3 Duration of storing the bags of maize and beans

The study sought to find out whether respondents used agro-chemicals provided well and whether they benefited from this input given. When asked the duration to which these bags were stored, the respondents gave the following responses:

**Table 4.17: Duration of storing the bags of maize and beans**

<b>Duration of storing the bags</b>	<b>Frequency</b>	<b>Percentage (%)</b>
1-6 months	33	53.23
6-12 months	29	46.77
Above 1 year	00	00.00
<b>Total</b>	<b>62</b>	<b>100.00</b>

Table 4.17 shows that, 33(53.23%) of respondents stored maize and beans for the period between one to six months, 29(46.77%) stored them for the period between six to twelve months. None stored above one year. Respondents with small sizes of land do not get enough to store for long periods that is why they store up to one year. From the study respondents with large size of land don't produce the ideal output; seemingly this could be the reason why they could not store the produce beyond one year. In their research study to analyze trends in Western region agricultural productivity, Betty K. et al found out that majority of the farmers could not produce up to the expected ideal output of 20-30 bags per acre therefore could not store much for future use. Their findings agree with this study where small scale farmers cannot store much due to less produce experienced due to inadequate quantity of inputs used.

#### 4.6.4 Number of packets of pesticide received by respondents

The study sought to find out how many packets on average were provided to respondents for use. When asked the number of packets received, only forty six responded to it as follows:

**Table 4.18: Number of packets of pesticide received by respondents**

<b>Packets of Pesticide received (of 200g)</b>	<b>Frequency</b>	<b>Percentage (%)</b>
0-4	41	89.13
5-9	05	10.87
<b>Total</b>	<b>46</b>	<b>100.00</b>

Table 4.18 above illustrates that, 41(89.13%) of the respondents received between 0-4 packets of the pesticide and 05(10.87%) received between 5-9 packets; each packet weighed 200 g. Majority of the respondents have small pieces of land and that could be the reason why they also received a small number of packets of pesticides (0-4 packets). Respondents did not store their yields beyond one year so few packets of pesticide were required. It is evident that other people elsewhere also use pesticides, for instance according to Ferreira (1994), the proportion of farmers using pesticides is highest in Kilimanjaro probably related to coffee production and Iringa where pesticides are used in maize storage. When asked if the respondents used the pesticide on the farm, 44(62.86%) agreed that they used it on the farm while 26(37.14%) did not use it on the farm. This means a few respondents produced less that could not be stored for long and they never applied the storage pesticide given and also others with large land sizes end up using less packets of pesticides especially if they sell their produce within a short time, since they do farming for both subsistence and commercial purposes.

#### 4.6.5 Output of Number of bags of maize

The study also sought to establish the output in terms of maize and beans for respondents who received agrochemicals and whether the agro-chemicals had any contribution to this output;

**Table 4.19: Output of Number of bags of maize**

No. of bags of Maize	Frequency	Percentage (%)
0-4	14	19.22
5-9	24	33.80
10-14	26	36.62
15-19	07	9.86
<b>Total</b>	<b>71</b>	<b>100.00</b>

Table 4.19 above showed that 26(36.62%) of the respondents had an output of maize at the range of ten to fourteen bags (of 90 kg), 24(33.80%) had between five to nine bags, 14(19.22%) had between zero to four bags and 07(9.86%) had between 15-19 bags. For this output, agrochemicals specifically the storage pesticide given on credit did not have any influence on the yields since this is a type of chemical was used after harvest.

#### 4.6.6 Output of Number of bags of beans

The study also aimed to find out whether agro-chemicals provided had any influence on the output for beans, here are the findings;

**Table 4.20: Output of Number of bags of beans**

Output of Number of bags of beans	Frequency	Percentage (%)
0-4	15	75.00
5-9	05	05.00
<b>Total</b>	<b>20</b>	<b>100.00</b>

Table 4.20 reveals that, 15(75%) of the respondents had an output of beans of between zero to four bags and 05(5%) between five to nine bags. Farmers were only given storage pesticides, agrochemicals in form of fungicides, insecticides and herbicides were not provided to farmers, therefore did not have any influence on farm output.

The Risk and Uncertainty Theory by Frank Knight (1921), states that the consequences of each alternative are not known in advance but depend on the realization of events out of the control of the consumer. Both Huirne et al. (2000) and Hardaker et al. (2004) distinguish two major types of risks in agriculture. First, business risk includes production, market, institutional and personal risks. Production risk is due to unpredictable weather and performance of crops that could be varied due to attack from pests and diseases. As farmers cultivate they encounter unforeseen challenges like pests and disease occurrence.

In this study, input credit firms have not provided farmers pesticides to be used during cultivation to combat pests and diseases which form production risks. The farmer in this case does not know the outcome of the attack as to whether he will be able to break even, however from the survey study done, there is a product on crop insurance that covers this eventuality but this is only done after the farmer has realized the attack and some losses.

#### **4.6.7 The benefits of farm input credit**

Lastly the respondents were asked to rank the benefits of farm input credit to ascertain whether they experienced any after receiving and using credit farm input. Here is how they did it;

**Table 4.21: The benefits of farm input credit**

<b>Benefits of farm input credit</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Very Low	4	5.13
Low	7	9.00
Moderate	36	46.15
High	21	26.92

Very High	10	12.82
<b>Total</b>	<b>78</b>	<b>100.00</b>

Table 4.21 above reveals that, 36(46.15%) of the respondents ranked the benefits of farm input credit as moderate showing that, at least the respondents used the fertilizers and pesticides well and benefited to some extent. 21(26.92%) of respondents ranked as high, 10(12.82%) as very high. This group of respondents experienced farm input credit use and its benefits and observed the planting techniques to the later besides having access to optimum levels of inputs recommended to get maximum produce. This corresponds to the survey study findings where respondents from input credit firms highlighted several benefits accrued to farmers who used input credit facilities, including increased crop production, additional income from non-agricultural products and improved lifestyle. Farmers also get knowledge and skills they did not have before, are able to apply and disseminate to others. This knowledge facilitates them to consolidate their produce and sell together thereby eliminating middle men hence better prices after getting affordable inputs.

However, 7(9.00%) of the respondents rated benefits of credit farm inputs as low and finally 4(5.13%) as very low. This group could represent the respondents who had larger pieces of land and accessed less level of inputs than are recommended to get maximum produce per unit of land. Respondents who were not willing to undergo trainings could also be in this group meaning they could not see benefits since they did not use recommended planting techniques.

#### **4.7 Training of small scale farmers and improvement of small scale farmer output**

The study in this objective sought to establish if training of small scale farmers in utilization of new farming methods by credit providers influenced their output. Items in this

section sought to find out whether respondents received training from any organization, how often they use the trainings and whether they were willing to continue receiving the trainings.

#### 4.7.1 Respondents received training

First, the respondents were asked if they received training from any organization that offered farm input credit to farmers and their responses tabulated.

**Table 4.22 Respondents received training**

<b>Got Training</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Yes	80	80.00
No	11	11.00
Don't Know	0	00.00
<b>Total</b>	<b>91</b>	<b>91.00</b>

From table 4.22, 80(80%) of respondents did get training, 11(11%) did not get any training. Those who got training said they were trained by One Acre Fund, Kilimo Salama, Government extension officers, NALEP, Innovations Poverty Authority (IPA), Western Seed Company and Pioneer Company. This corresponds to the survey study where respondents said they trained farmers in utilization of credit farm inputs on weekly basis throughout the season. Application of the land technique by farmers is monitored through extension staff, by doing a survey, through field visits, group leaders and post disbursement visits. Agricultural education, extension and advisory services are a critical means of addressing rural poverty, because such institutions have a mandate to transfer technology, support learning, assist farmers in problem solving, and enable farmers to become more actively embedded in the agricultural knowledge and information system (Christoplos and Kidd 2000, 11).

These findings also agree to the research findings done by Davis et al that donors, governments and nongovernmental organizations enthusiastically promote Farmer field schools in Sub-Saharan Africa today. As a result of their popularity, there is some discussion as to whether this approach should be scaled up and out and incorporate into mainstream extension practices. It is widely argued that achieving agricultural productivity growth will not be possible without developing and disseminating improved agricultural technologies that can increase productivity to small holder agriculture, Asfaw et al, 2012.

#### 4.7.2 Frequency of usage of training on new farming methods

The study sought to determine whether respondents used the training on new farming methods to get expected produce. When asked the frequency they make use of the trainings given on new farming methods, respondents gave the following responses:

**Table 4.23: Frequency of usage of training on new farming methods**

<b>Frequency of usage of Training</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Frequent	72	72.00
Less Frequent	15	15.00
None	13	13.00
<b>Total</b>	<b>78</b>	<b>100.00</b>

Table 4.23 above shows that, 72(72%) of the respondents frequently use the training on new methods of farming, 15(15%) use them less frequently and 13(13%) don't use them. Frequent training ensures that farmers internalize new farming methods and put them in practice to ensure increased productivity. The PADETES program has been focusing on supply-driven intensification which consists of enhanced supply and promotion of improved seeds, fertilizers, on-farm demonstrations of improved farm practices and technologies and close follow up of farmers' plots (Kassa & Abebaw, 2004; EEA, 2006; Kassa, 2008). Hence, wider dissemination of improved farm technologies, management practices and know-how to

the smallholder farmers have been the major activities of the extension program (Kassa, 2003; Gebremedhin et al., 2009; Asfaw et al., 2012).

The training and visit system was introduced in Kenya in 1982 as a supplement to the old system which had been implemented before independence in 1963. An important and salient feature of training and visit extension system is a regular pattern of visits by frontline extension workers to contact farmers, Benor et al 1984. This agree with findings in the study survey done since the input credit farms have a group of staff who do post disbursement visits and on farm trainings to help farmers practice the trainings given. The staff focuses on imparting key messages to farmers on each visit with the complexity of these messages being increased in subsequent visits. After the simple messages, attention shifts to more complex messages such as those relating to fertilizer use and pest control measures.

#### **4.7.3 Willingness to continue receiving training**

The study sought to find out whether respondents were willing to continue receiving training, responses tabulated.

**Table 4.24 Willingness to continue receiving training**

<b>Willingness to continue training</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Yes	72	72.00
No	14	14.00
Not Sure	14	14.00
<b>Total</b>	<b>78</b>	<b>100.00</b>

Table 4.24 shows that, 72(72%) of respondents were willing to continue receiving training, 14(14%) were not and 14(14%) were not sure. The willing group must have benefited from the trainings that is why they wished to continue receiving training in new farming methods. Vasquez-Caicedo et al., (2000) agrees with these that through interactive learning and field-experimentation, Farmer Field School programs teach farmers how to experiment and

problem-solve independently, with the expectation that they will thus require fewer extension services and will be able to adapt the technologies to their own specific environmental and cultural needs. In addition, participants are encouraged to share their knowledge with other farmers, and are sometimes trained to teach the courses themselves, thus reducing the need for external support.

The 14 respondents who were not willing to continue with the training had the following reasons; they thought training was time consuming, they were not sure of whether the new training techniques would give a higher yield yet use of the technique was involving and labour intensive. From the study, training respondents had an influence on the farmers' output.

#### **4.8 Rating of influence of credit input on improvement of small scale farmer output**

The study sought to rate the overall influence of credit input on improvement of small scale farmer output in terms of provision of seeds, fertilizer, agrochemicals and training. (Rating scale: 5- Strongly disagree, 4-Disagree, 3-Neutral, 2-Agree, 1- Strongly agree). Their responses were used to establish whether there was any relationship between the independent and dependent variables and results were as shown;

**Table 4.25; Rating of Credit farm input and small scale farmer output**

		<b>Correlations</b>				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Small scale farmer output	Pearson Correlation	1	.191	.130	.381	-.907
	Sig. (2-tailed)		.809	.870	.619	.093
	N	4	4	4	4	4
Provision Of Seeds	Pearson Correlation	.191	1	.577	-.677	-.586
	Sig. (2-tailed)	.809		.423	.323	.414
	N	4	4	4	4	4
Provision Of Fertilizer	Pearson Correlation	.130	.577	1	-.167	-.354
	Sig. (2-tailed)	.870	.423		.833	.646
	N	4	4	4	4	4
Provision Of Trainings	Pearson Correlation	.381	.677	-.167	1	-.605
	Sig. (2-tailed)	.619	.323	.833		.395
	N	4	4	4	4	4
Provision Of Agro- chemicals	Pearson Correlation	-.907	-.586	-.354	-.605	1
	Sig. (2-tailed)	.093	.414	.646	.395	
	N	4	4	4	4	4

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

Table 4.25 shows that there was a statistically significant positive relationship between credit farm inputs and small scale farm output at ( $p>0.05$ ). This means that there is a relationship between input credit and improvement of small scale farmer output. There was a positive relationship between provision of seed and influence on farmer output at ( $p>0.577$ ). Respondents perceived provision of this input to have an influence on their productivity in line with their realized harvest. There was also a relationship between fertilizer provision and small scale farmer output at ( $p>0.577$ ). Most respondents agreed that fertilizer provision had an influence on their produce and given the optimal levels required, they would produce higher than they would when not using fertilizer at all. The findings also reveal that there was a strong positive relationship between provision of training and small scale farmer output at ( $p>0.677$ ), meaning that most respondents agree that training in new techniques has an influence on their output. As seen in this study, farmers who received training when asked whether they would like to continue receiving trainings, they gave a positive response indicating that they benefit from the training to increase farm productivity.

However from the shown correlation results, provision of agrochemicals had no relationship with small scale farmer output at ( $p> - 0.907$ ). Most respondents did not use agro-chemicals on their farms during planting, seemingly they cannot testify the benefits of this input, since all who received it used for storage purposes after harvesting. There could be other aspects that influenced this result for example access to agrochemicals like fungicides and insecticides that can be used during planting.

In this study, most farmers had small sizes of land and realized a higher output especially when provided with inputs at the recommended levels and training. There could be other variables that influenced the results for example, the input credit level provided to the

farmers and whether all farmers in the study who were given training used the skills as expected without any alterations.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

The main purpose of the study was to evaluate the influence of credit farm input on improvement of small scale farmers' output in Bungoma County in Kenya. The chapter focuses on the summary of the findings, related discussions and recommendations.

#### 5.2 Summary of Findings

##### 5.2.1 Influence of seed provision on credit and improvement of small scale farmers' output.

From the study, 70.00 % of the respondents do farming for both subsistence and commercial. 26% of the respondents do it for subsistence while 04% do farming for commercial purpose. 70.00% of the respondents received farm input credit facilities annually, 26.00% never receive and 04% receive after every six months. The organizations that give the farm input credit facilities include One Acre Farm, Kilimo Salama, Pioneer, One Acre Fund, NALEP, ICS and Ministry Of Agriculture. 44% of the respondents get information about credit farm input from fellow farmers, 32% get it from trainers, 15% from chief's barazas and 9% from the media. It was also noted that 80% received seeds on credit. From the study, respondents with 0.5 acres (27.27%) were given more than enough seed and produced maximum. Those with 1.0 acres (27.27%) were also given the ideal amount of seed but their produce was slightly below maximum expected. These findings shows that provision of seeds on credit influence farmers' output.

##### 5.2.2 Influence of fertilizer on credit and improvement of small scale farmers' output.

The study showed that 63% of the respondents have land of between 0.5-1 acres and receive each 1 bag of 25kg fertilizer and produce 8-10 bags of maize of 90 kg. The range of cost of fertilizer provided in terms of production was rated as low meaning that they were able to get back what they spent in farming and also get profit. 6% had land of 1.5-2 acres and got output of 10-12 bags. This range of cost of fertilizer provided in terms of production was rated as high. 5% of the respondents had land of 1.5-2 acres and get output of 12-18 bags. This range of cost of fertilizer provided in terms of production was rated as moderate. On average, majority of respondents have little amount of land and hence are given only one bag of fertilizer and the rate on range of cost of fertilizer in terms of production is rated as low. This seems to agree with findings that show that the use of fertilizers leads to higher yields.

### **5.2.3 Influence of provision of Agro-chemicals on credit and improvement of small scale farmers' output.**

Most respondents, (62%), received agrochemicals from an organization, 36% did not receive any agrochemical. The agrochemical they received was pesticide mainly for storage of maize and beans. 53.23% of the respondents stored maize at the range of between five to nine bags (of 90 kg), 33.87% stored above ten and 12.90% stored between zero and four. 72.58% of the respondents stored beans between zero to four bags, 27.42% stored above ten, 53.23% stored maize and beans for the period between one to six months, 46.77% stored them for the period between six to twelve months. From the above data, 89.13% of the respondents received between 0-4 packets of the pesticide and 10.87% received between 5-9 packets; all of 200g and 44(62.86%) agreed that they used it on the farm. The findings showed that 46.15% of the respondents ranked the benefits of farm input credit as moderate showing that at least the respondents used the fertilizers and pesticides well, however, use of agrochemicals did not have any influence on farmer output.

#### **5.2.4 Influence of training of small scale farmers in utilization of new farming methods and improvement of farmers' output.**

The study also showed most respondents (80%) got training, 11(11%) did not get any training. Those who got training said they were trained by One acre farm, Kilimo Salama, Government extension officers, NALEP, IPA, MOA, OAF, western seed and Pioneer. Findings showed that 72% of the respondents frequently use trainings on new methods of farming, 15% use them less frequently and 13% don't use them. Frequent training ensures that farmers internalize new farming methods and put them in practice to ensure increased productivity.

The respondents for the interview were senior staff at input credit organizations from One acre Fund and Equity bank. One Acre Fund offers fertilizer both for planting and topdressing; seeds of varied food/commercial crops like maize, sorghum and tree seeds; non agriculture products like lights, energy saving stoves; storage facilities and farm input loans. Equity bank on the other hand offers farm input loans, asset financing, school fees loan, purchase of livestock/poultry and Kilimo Biashara loan that is given at low interest rate. Apart from seeds, other credit facilities given to farmers include insurance cover for crops, life insurance, funeral insurance, pesticides and training.

Respondents identify farmers to be given credit farm input through marketing their products at farmer group levels and sign contracts with them. They also identify the farmers from Chief's Barazas, village elders and group leaders. They also get reference from existing farmers. Sometimes the respondents do baseline surveys and site scouting and also confirm past credit repayment progress from the farmers. Respondents from Equity bank identify farmer legible for credit farm input through groups, field days, Ministry of agriculture and from referrals from fellow farmers.

The method of repayment used by farmers was by cash or M-pesa from contract signing to an agreed deadline. They could also pay cash after sale of produce. There are policies in these organizations that govern provision of credit .For instance all clients need to be in groups, collateral in relation to credit and the cash compliance policy.

It was also established that farmers were trained in utilization of credit farm inputs on weekly basis throughout the season. Application of the land technique by farmers is monitored through extension staff, by doing a survey and through field visits, group leaders and post disbursement visits. It was noted in the study that farmers utilized services of credit organizations throughout the season they enrolled with them. Sometimes it depended on the situation if it called for the particular service. For Equity bank, the services are for one year then the farmers can be able to apply for new funding.

The findings of the study was that there are benefits accrued to farmers who apply these methods for instance increased crop production, additional income from non-agricultural products and improved lifestyle. Moreover, farmers get knowledge and skills they did not have before and are able to apply and even disseminate to others. The knowledge will facilitate them to consolidate their produce and sell together thereby removing middle men hence better prices after getting cheap inputs.

### **5.3 Conclusions**

The study ought to find out whether provision of input credit had any influence on small scale farmer output. In the first objective, 80(80%) of the respondents agreed that they received seeds on credit, majority owned 0.5 acres of land and produced maximum. This showed that provision of seeds on credit influences farmers' output.

In the second objective, on average, majority of respondents 63(63%) have little amount of land (0.5-1) acre and hence are given one bag of 25 kg fertilizer which enabled them to get the ideal yield and range of cost of fertilizer provided by credit firms in terms of production was rated as low. This implies that that use of fertilizers leads to higher yields thus provision of fertilizer on credit influence output of farmers. The use of seed and fertilizer give moderate production.

In the third objective, 62(62%) of the respondents received agro-chemicals used for storage purposes only and used the same to store produce between 6 and 12 months, therefore the study shows that agro-chemical provision on credit did not have an influence on farmer output since it was used after harvesting.

In the fourth objective, 80(80%) of respondents received training in new farming methods and utilized the same frequently during farming and realized the benefits. Through interactive learning and field experimentation, programs are taught to farmers on how to experiment and problem-solve independently, with the expectation that they will thus require fewer extension services and will be able to adapt the technologies to their own specific environmental and cultural needs. Therefore provision of training influences output of small scale farmers.

#### **5.4 Recommendation**

The following are the recommendations that were obtained from the study:

1. More fertilizers should be given to farmers commensurate to the number of acres planted in order to get the ideal output of between 20-30 bags of maize or beans per acre.
2. For ideal production, the seed should also be offered to farmers at the recommended quantity that is two packets of 2kg for one acre of land planted.
3. Input credit firms should critically assess any risks associated with pest and disease attack so that farmers are able to plan ahead for such unforeseen challenges and provide agrochemicals used on farm before harvest, on need basis.
4. The government of Kenya should liaise with NGOs like One acre fund to offer farmers facilities and requirements for farming on credit or even as grants since most farmers are the rural poor.
5. The organizations that offer input credit should also work hand in hand and share on challenges that can enable them assist farmers benefit from their services and complement each other.
6. Farmers should be sensitized on training and its importance for the few who see no need for such training as this was found to have an influence on their productivity.

## **5.5 Areas for Further Research**

- 1.** This study was limited to Bungoma County due to the researcher's minimal time available to conduct research. The researcher therefore suggests that, longitudinal studies can be done in other areas other than Bungoma County to study the concept of influence of credit farm input on farmer output in-depth.
- 2.** The researcher used and relied on literature available mostly on the desktop therefore suggests that other researchers can widely look at other literature available in the same area.

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## APPENDICES

### Appendix i: Questionnaire for Small Scale Farmers

This Questionnaire is about the influence of Credit Farm Input on improvement of small scale farmers' output. Your response will be highly confidential and only for academic purposes. Please tick in the brackets provided to indicate your choice and in case there are no choices, please answer appropriately. Do not indicate your name on this questionnaire.

#### INSTRUCTIONS

Fill in the space provided and tick where appropriate.

#### SECTION A: DEMOGRAPHIC INFORMATION

##### Personal details of respondents;

- a) What is your gender? Male ( ) Female ( )
- b) Marital status; Married ( ) Single ( )  
Divorced ( ) Widowed ( )
- c) How many dependents do you have? .....
- d) What is your age in years?  
16-25 ( ) 36-45 ( )  
26-35 ( ) over 45 ( )
- e) What is your Educational level?  
None ( ) Secondary ( )  
O-level ( ) College ( )  
Primary ( ) University ( )
- f) Why do you practice farming?

Subsistence ( )

Commercial ( )

Both ( )

**SECTION B: Provision of Seeds on Credit and Improvement of Small Scale Farmer**

**Output**

1. a) How often are you provided with farm input credit facilities?

Every 6 months ( )

Annually ( )

Never ( )

b) If Yes, which organization offers the services?

.....  
.....

c) How do you access information about credit farm input?

Through Fellow farmers ( )

Media ( )

Through chief's Baraza ( )

Through trainers ( )

d) Are you provided with seeds on credit?

Yes ( )

No ( )

e) How many packets of seeds do you receive? .....

f) How many acres of land do you own?

.....

g) What was your output last year? .....

h) How often do you receive credit farm inputs?

Twice a year ( )

Yearly ( )

Every 2 Years ( )

**SECTION C: Provision of Fertilizer on Credit and Improvement of Small Scale Farmer Output**

1.How many bags of fertilizer are you provided with on credit basis annually?

.....

2.Using the same bags of fertilizer, how many acres of land did you plant?

.....

3.What was your output in terms of maize and beans harvested last year?

.....

4.How would you range the total cost of fertilizer provided by input credit firms in terms of production?

Very Low ( )

Low ( )

Moderate ( )

High ( )

Very high ( )

**SECTION D: Provision of Agro-chemicals on Credit and Improvement of Small Scale Farmer Output**

1.a) Did you receive any Agro-chemicals on credit offered by any organization?

Yes ( )

No ( )

I don't know ( )

b) If yes, what was the type and purpose of the agro-chemical received?

Type: Fungicide ( ) Pesticide ( )

Herbicide ( ) Insecticide ( ) Other ( )

Purpose.....

c) If it was for storage purpose, how many bags of maize and beans did you store after harvest last season? Maize..... Beans .....

d) For how long did you store the bags?

1-6 months ( ) 6-12 months ( ) Over 1 Year ( )

c) How many packets of agro-chemical did you receive? .....

d) Did you use it on your farm? Yes ( ) No ( )

2.What was your output in terms of maize and beans?

3.How would you rank the benefits of farm input credit?

Very Low ( )

Low ( )

Moderate ( )

High ( )

Very high ( )

**SECTION E: Provision of Training to small scale farmers in utilization of new farming methods**

1.a) Have you received training from any organization that offers farm input credit to farmers? Yes ( ) No ( ) Don't know ( )

b) If yes, which organization was this? .....

2.How often do you make use of the trainings given on new farming methods?

Frequently ( )

Less frequently ( )

None ( )

3.a) Are you willing to continue receiving training from the input credit organization?

Yes ( )                  No ( )                  Not Sure ( )                  Don't Know ( )

b) If No, Please state reason.....

.....

**Influence of Credit Farm Input on Improvement of Small Scale farmer Output In Bungoma County.**

1.To what extend do you agree that credit farm input has an influence on your output?

**Measurement Scale**

	<b>Strongly agree</b>	<b>Agree</b>	<b>Neutral</b>	<b>Disagree</b>	<b>Strongly disagree</b>
Provision of seeds					
Provision of fertilizer					
Provision of agro chemicals					
Training of farmers					

*Thank You For Your Time.*

**Appendix ii: Interview For Senior staff at input credit organization**

1.What is the name of your organization?

.....

2.What credit facilities do you offer to farmers?

.....  
.....  
.....

3.How do you identify farmers to be given credit farm input?

.....  
.....

4.Apart from provision of seeds, what other credit facilities do you offer to farmers?

.....  
.....  
.....  
.....  
.....

5.What is the method of payment used by farmers?

.....

6.Are there any policies within your organization that govern provision of credit facilities?

.....  
.....

7.How often do you train farmers in utilization of credit farm input?

.....

8.How do you monitor application of the land technique by farmers?

.....

9.What are the benefits accrued to farmers who apply these methods?

.....  
.....  
.....

10. Roughly, how long do farmers utilize your services?

.....  
.....