DETERMINANTS OF PERFORMANCE OF AGROFORESTRY PROJECTS IN MBOONI DIVISION, MAKUENI COUNTY, KENYA

PETER KAMAU NDUATI

A Research Project Report submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi.

2015

DECLARATION

This research project report is my own academic work which has not been submitted to any other university for any award

Signature …… Date……

PETER KAMAU NDUATI

L50/71738/2014

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

Signature…… Date……

Dr. NAOMI MWANGI
Lecturer
University of Nairobi

DEDICATION

To my wife Lucy and our children Boniface, Mercy and Stella for being a rich source of inspiration and encouragement for me during the development and preparation of the entire project.

ACKNOWLEDGEMENT

I wish to extend my special thanks and acknowledgement to my supervisor, Dr. Naomi Mwangi for her prompt invaluable support and guidance which enabled me to prepare this research project successfully. I thank all my lecturers for their priceless support, motivation and inspiration. I thank the University of Nairobi for giving me a unique opportunity to acquire the knowledge which has made it possible for me to prepare this work. I also acknowledge the immense support of fellow Master of Arts in project planning and management students for the year 2014 through consultations and peer review sessions.

TABLE OF CONTENTS

DECLARATION ii
DEDICATION iii
ACKNOWLEDGEMENT iv
TABLE OF CONTENTS v
LIST OF TABLES ix
LIST OF FIGURES x
LIST OF ABBREVIATIONS AND ACRONYMS xi
ABSTRACT xii

CHAPTER ONE:INTRODUCTION 1
1.1 Background to the Study 1
1.2 Statement of the Problem 4
1.3 Purpose of the Study 5
1.4 Objectives of the Study 5
1.5 Research Questions 5
1.6 Significance of the Study 6
1.7 Delimitations of the Study 6
1.8 Limitations of the Study 6
1.9 Assumptions of the Study 7
1.10 Definition of Significant Terms 7
1.11 Organization of the Study 7

CHAPTER TWO:LITERATURE REVIEW 8
2.1 Introduction 8
2.2 Concept of performance of agroforestry projects 8
2.3 Land Tenure and performance of agroforestry projects 11
2.4 Size of the Land and Performance of agroforestry projects 14
2.5 Nature of land and performance of agroforestry projects 15
2.6 Extension Services and Performance of agroforestry projects 17
2.7 Theoretical Framework 19
2.8 Conceptual Framework 21

2.9 Summary and Research Gaps 22

CHAPTER THREE:RESEARCH METHODOLOGY 24

3.1 Introduction 24

3.2 Research Design 24

3.3 Target Population 24

3.4 Sample Size and Sampling Procedure. 25

3.5 Data Collection Instruments 25

3.6 Validity of Research Instruments 25

3.7 Reliability of Research Instruments 26

3.8 Data Collection Procedures 26

3.9 Data Analysis Techniques 27

3.10 Ethical Considerations 27

3.11 Operationalization of Variables 27

CHAPTER FOUR:DATA ANALYSIS, PRESENTATION, AND INTERPRETATION ... 29

4.1 Introduction 29

4.2 Questionnaire Response Rate 29

4.3 Demographic information 29

4.3.1 Distribution of Respondents by Gender 29

4.3.2 Distribution of Respondents by Age 30

4.3.3 Distribution of Respondents by Level of Education 31

4.4 Land Tenure and Agroforestry 31

4.4.1 Practice of Agroforestry 31

4.4.2 Proportion of Farmers who Practice of Agroforestry 32

4.4.3 Nature/status of ownership of Agroforestry land 32

4.4.4 Nature of Acquisition of Land Owned by Respondents 33

4.4.5 Ownership Dispute 34

4.5 Size of Land and Agroforestry 34

4.5.1 Land under Agroforestry 35

4.5.2 Pattern of Agroforestry 36

4.6 Nature of the Land and Agroforestry 37

4.6.1 Pattern of Tree Planting 37
4.7 Extension and Agroforestry 38
4.7.1 Frequency of Provision of Extension Services 39
4.7.2 Tree Species Planted by Respondents 41
4.7.3 Period taken by Trees to reach Maturity 42
4.7.4 Sale of Trees by Agroforestry Farmers 43
4.7.5 Agroforestry Farmers Cost and Income for the Last Three Years 43
4.8 Inferential Statistics 45
4.8.1 Regression Analysis 45
4.8.2 Analysis of Variance (ANOVA) 46
4.8.3 Regression coefficients 46

CHAPTER FIVE:SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS 49
5.1 Introduction 49
5.2 Summary of Findings 49
5.2.1 Land Tenure and Agroforestry 49
5.2.2 Size of Land and Agroforestry 49
5.2.3 Nature of the Land and Agroforestry 50
5.2.4 Extension and Agroforestry 50
5.3 Discussions of Findings 51
5.4 Conclusion of the Study 53
5.5 Recommendations 54
5.6 Suggested areas for Further Research 56
5.7 Contribution to the body of Knowledge 56

REFERENCES 58
APPENDICES:
Appendix I: Questionnaire for Agroforestry Farmers i
Appendix II: Questionnaire Forestry Officers v
Appendix III: Transmittal Letter ix

Appendix IV: Household Population for Mbooni West Sub County Population Distribution by Sex, Number of Households, Area, Density and Administrative Units..... x
Appendix V: Table for Determining Sample Size..... xv
Appendix VI: Introduction Letter..... xvi
Appendix VII: Authorization Letter..... xvii
Appendix VII: Research Permit..... xviii
Appendix IX: Eucalyptus Woodlots in Mbooni Division..... xviii
Appendix X: Map of Mbooni West..... xx

LIST OF TABLES

Table 1.1: Status of Land adjudication in Mbooni Division 4
Table 3.1: Operationalization of Variables 28
Table 4.1: Distribution of respondents 29
Table 4.2: Distribution of respondents by gender 30
Table 4.3: Distribution of Respondents by Age 30
Table 4.4: Distribution of Respondents by Level of Education 31
Table 4.5: Practice of Agroforestry 32
Table 4.6: Proportion of Farmers who Practice of Agroforestry 32
Table 4.7: Status of ownership of agroforestry land 33
Table 4.8: Nature of Acquisition of Land Owned by Respondents 33
Table 4.9: Ownership Dispute 34
Table 4.10: Respondents Land Holding 34
Table 4.11: Average Land Holding 35
Table 4.12: Land under Agroforestry 35
Table 4.13: Pattern of Agroforestry 36
Table 4.14: General Topography of Respondents Land 37
Table 4.15: Pattern of Tree Planting 37
Table 4.16: Provision of Extension Services by Officers from the Forestry Department 38
Table 4.17: How Forestry Department Provided Extension Services to Farmers 39
Table 4.18: Frequency of Provision of Extension Services 40
Table 4.19: Frequency of Provision of Extension Services 40
Table 4.20: Challenges Faced by Forestry Department in its Efforts to Provide Extension Services 41
Table 4.22: Period taken by Trees to reach Maturity 42
Table 4.23: Sale of Trees by Agroforestry Farmers 43
Table 4.24: Agroforestry Farmers Cost and Income for the Last Three Years 44
Table 4.25: Model Summary 45
Table 4.26: ANOVA of the Regression 46
Table 4.27: Coefficient of Determination 47

LIST OF FIGURES

Figure 1: Conceptual Framework 21

LIST OF ABBREVIATIONS AND ACRONYMS

CBO	Community based organization
ERI	Enabling Rural Innovation
ICRAF	International Council for Research in Agroforestry/World Agroforestry Centre
KEFRI	Kenya Forestry Research Institute
KFS	Kenya Forestry Service
NGO	Non-Governmental organization
UK	United Kingdom
UN	United Nations Organization

ABSTRACT

This study investigated the determinants of performance of agroforestry projects in Mbooni division in Mbooni West Sub-County in Makueni County with a view to generating information which may be used by policy makers at the county and national government level as well as other stakeholders who are keen on either building on the research findings or improving the performance of agroforestry projects in other parts of the country or the world in order to realize and even exceed the ten percent tree cover recommended by the UN in the best interest of the global environmental conservation endeavour. The objectives of the study were to establish the extent to which land tenure determines performance of agroforestry projects in Mbooni division, to assess the extent to which size of the land determines performance of agroforestry projects in Mbooni division, to determine the extent to which nature of land determines performance of Agroforestry projects in Mbooni division and to examine the degree to which extension services determine performance of agroforestry projects in Mbooni division. The study used descriptive survey design to conduct research. Multistage cluster sampling method was used .The data was collected using semi-structured questionnaires which were administered to 177 respondents and the data analyzed through descriptive and inferential statistics. The findings presented in percentages, frequencies and tables. Multiple regression analysis was done to establish the relationship between the independent variables of the study and the dependent variable. The study findings were that agroforestry is widely practiced by farmers in the study area. Majority of the farmers practiced agroforestry on their own land with no pending ownership dispute, topography of the land in Mbooni varies between gentle and steep slope and majority of the farmers were not provided with extension services. The study concluded that land tenure, size of land, nature of land and extension services determine performance to a large extent. It recommended that, farmers be encouraged to plant trees which take 3-5 years to reach maturity and stagger the tree planting time to maintain and even exceed the tree cover of 10% as recommended by UN, farmers who own land on a gentle slope should be sensitized on the need to plant trees among crops and use the steep part for tree planting in an effort to increase the tree cover, KEFRI should develop tree species which reach maturity within 3- 5 years and partner with CBOs to make the species available to farmers at affordable prices KFS partners with county government of Makueni, NGOs and any other stakeholders to build its human and material resource capacity to mount a robust extension service regime, , KFS to target farmers in the 20-29 age bracket for sensitization to increase their uptake of the practice , findings of the study be used to increase the national tree cover from 6.99 to 10 % and beyond and that KFS recruits female forestry officers to encourage and extend special support to women in an effort to achieve gender parity in the uptake of agroforestry. The study suggested that further research be done on the relationship between pure agriculture and performance of agroforestry projects especially on land with a hilly topography, the relationship between education and performance of agroforestry projects and a comparative study be done in other parts of the country between areas where establishment of existing private land rights has been done and those areas where it has not been done in order for a regional and national perspective on the determinants of performance of agroforestry projects be determined.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

According to Nyandemo and Kongere (2010), a Project is an endeavour in which human, material, and financial resources are organized to undertake a unique scope of work within the constraints of time with a view to achieving defined objectives. Kloppenburg (2012) views a project as a temporary endeavour to create unique product or service. Young (2007) considers a project as a temporary endeavour to achieve some specific objectives in a defined time. According to the above definitions, material and human resources are put together within the constraints of time and scope to create a product that did not exist. All the above definitions view a project as a temporary and unique undertaking.

On the other hand, agroforestry means the growing of trees on farms. Trees are grown together with crops on the same plot Lwakuba et.al(2003).Young (1989) views agroforestry as land use systems in which trees or shrubs are grown in association with agricultural crops pastures and /or livestock in a spatial arrangement. Schroth and Sinclair (2003) view it as a set of land use practices that involve the deliberate combination of woody perennials including trees and shrubs with agricultural crops and/ animals on the same land management unit. Rocheleau et.al (1988) defines agroforestry as all practices that involve a close association of trees or shrubs with crops, animals and/or pasture. An agroforestry project is therefore, a set of activities where tree and food crop growing with or without livestock keeping are practiced on the same piece of land to achieve defined objectives.

Each of the above definitions of agroforestry has an element of intensive farming where the farmer who is involved in the practice of agroforestry maximizes on the returns from the land at their disposal with or without use of sophisticated technology. At the same time land is not only utilized sustainably but also in the interest of environmental conservation especially in Africa where environmental degradation is rampant. The above definitions also have an element of inter-dependency between the different components of agroforestry .The trees are a source of

firewood, timber for domestic and commercial use in addition to being a source of fodder for livestock that provides the farmer with milk and meat for domestic as well as commercial use. Trees contribute to sustainable soil management by reducing soil erosion risks and at the same help farmers minimize the risks associated with crop failure by selling trees to compensate themselves should they suffer crop failure Fahrstrom, (2000). Trees hold the soil together by their roots thereby reducing soil erosion on steep slopes and also reduce the scale of wind-driven soil erosion. Reduction of soil erosion goes a long way in mitigating the impact of environmental degradation. The trees also enhance and supplement the global environmental conservation efforts in addition to contributing to the realization of the ten percent tree cover recommended by the United Nations organization. The quality of life can be improved for both the current and future generations if the current generations take care of their needs without making it difficult for the future generations to take care of their needs. This is the goal of sustainable development. Verchot et al (2005) note that one of the strengths of agroforestry systems is that they can significantly contribute to mitigation of climate change.

According to Temu and Ogweno (2008), current thinking is that forestry should include trees and forests wherever they occur. There is a new paradigm in forest management with the inclusion of trees outside forests. Kiyiapi (2008) concurs: Kenya is strongly committed to integrated natural resources management approaches out of the realization that more timber is already being harvested from farms than forests. This reinforces the practice of domestication and cultivation of trees and shrubs on farms. Agroforestry is increasingly becoming an attractive option for the future. It is in this context that agroforestry is seen as including the cultivation of trees on farmland.

The thinking that forestry should include all the trees whether they are within the forests or not is a welcome justification for agroforestry projects and by extension a study of the determinants of performance of those projects as key strategy by which the tree cover of ten percent of the total area of the country in question can not only be attained but also maintained. In Kenya, the Constitution of Kenya (2010) has emphasized the need for the country to work towards attaining and maintaining a 10% tree cover. According to the immediate former director of Kenya forestry service Mbugua (2014November 14) Daily Nation pp Xx there is reliable data which confirms

that as at 2010 Kenya's forest cover was 6.99% of Kenya's Land Area. Mugo (2015,June 5) Daily Nation pp 13, concurs: Statistics from the Kenya Forestry service in 2013 indicated the country's forest cover had risen from a low of 1.7 % in 2002 to 6.99 putting the country on the path towards attaining the United Nations recommended cover of 10%

Agroforestry is one of the key strategies, which Kenya can use to attain the envisaged 10% tree cover since it is an individual investment and a form of entrepreneurship where an investor combines the factors of production to maximize on the benefits and/or profit. Since the main motive for the investor is to maximize on the benefits, they tend and protect the trees and at the same time stagger the tree planting activities to ensure that at any one given time they have trees, which are ready for harvesting. This ensures that the 10 % tree cover is not only realized but also maintained.

The county of Makueni covers an area of 8,034.7square kilometres. Mbooni hills rise to 1900 metres above sea level. The total area under forest cover is 191 square kilometres according to Makueni Integrated Development plan, (2013).The tree cover for the entire county is, therefore, approximately 2.4 %.Mbooni West Sub-county has been deliberately chosen for the proposed study because agroforestry projects are done widely owing to fact that the hilly topography of the Sub-county makes it unsuitable for pure agriculture. The Sub-county was chosen because its hilly topography would contribute largely to the realization of the significance of the findings of the study to policy makers who are keen on increasing the tree cover for the county and the rest of the country. According to the information available from the department of land Adjudication and Settlement the land rights regime is secure since all the community land in Mbooni West has been adjudicated and preparation of title deeds for the Land owners is at an advanced stage in areas where land registration has not been done and confirmed through issuing of title deeds except for Ngai sub-location where land demarcation and survey are ongoing The adjudication status of land in Mbooni Division is tabulated in Table 1.1.

Table 1.1: Status of Land adjudication in Mbooni Division

Name of Adjudication Section	Number of parcels	Adjudication Status
Uvuu	1862	Title deeds being issued to land owners
Mutitu	5213	Preparation of title Deeds ongoing
Nzeveni	3804	Title deeds ready For collection
Uthiuni	2668	Preparation of title deeds ongoing
Kaliani	2722	Preparation of title deeds ongoing
Kyuu	4,662	Title deeds ready for collection
Ngai	1943	Land Adjudication ongoing.1943 parcels done so far

Source: Department of Land Adjudication and Settlement in Makueni: September, 2015

1.2 Statement of the Problem

According to Okowa and Mwangi (1996), much of Kenya's tree resources exist outside of the gazette forests in the extensive woodlands and on land devoted to agriculture. Temu and Ogweno (2008) note that there is an emerging school of thought that views trees grown through agroforestry as part of the forest cover. This has placed agroforestry at the top of the national and international agenda on environmental conservation. The huge and unexploited potential of agroforestry as a sustainable land use practice which could help the Sub-county of Mbooni West county and other counties whose hilly topography makes them unsuitable for pure agriculture realize and even exceed the 10% tree cover which the country needs, has motivated this study. A study carried out by Makau (2013) to determine the avifaunal diversity of Mbooni hills, document the different habitats and investigate the threats to the forests there found out that there were a number of threats facing Mulooni, Katende, Utunene, Kivale and Mavindu forests which include cattle grazing, illegal logging, firewood collection, charcoal burning, fire, debarking of herbal plants with illegal logging being severe in Katende forest. Human settlements and cultivation, which pose the threat of human encroachment, extend right up to the forest edges.

The above –mentioned study shows that the department of forestry lacks the capacity to conserve and protect the gazette forests in Mbooni from the identified threats .The people who pose those threats are the same people who are involved in agroforestry activities on their land. Kaseva(2013) notes that due to the crucial role played by agroforestry in improving farm productivity, many small-scale farmers in Mbooni West have started practicing agroforestry as a means of improving their farm income and food security .Therefore, the future of forestry and forest conservation efforts can be guaranteed through capacity building for the people involved in agroforestry since it will increase the tree cover taking into consideration the fact that the people cannot pose a threat to their own investments in agroforestry.

1.3 Purpose of the Study

The study investigated the determinants of performance of agroforestry projects in Mbooni division in Mbooni west sub-county.

1.4 Objectives of the Study

1. To establish the extent to which land tenure determines performance of Agroforestry projects in Mbooni division.
2. To assess the extent to which size of land determines performance of agroforestry projects in Mbooni division.
3. To assess the extent to which nature of land determines performance of agroforestry projects in Mbooni division.
4. To examine the degree to which extension services determine performance of Agroforestry projects in Mbooni division.

1.5 Research Questions

1. To what extent does land tenure determine performance of Agroforestry Projects in Mbooni division?
2. To what extent does the size of land determine performance of Agroforestry Projects in Mbooni division?
3. To what extent does nature of land determine performance of Agroforestry Projects in Mbooni division?

4. To what degree do extension services determine performance of Agroforestry Projects in Mbooni division?

1.6 Significance of the Study

The findings of this research may be used by other researchers, the county, and national governments who have an interest in the growth and development of agroforestry as a sustainable land use practice. The county and national governments may use the findings to enact policies tailored at building the capacity of famers involved in agroforestry as an income generating activity which enhances the realization of the ten percent tree cover in areas whose hilly topography makes them unsuitable for pure agriculture in addition to being a source of revenue for the government through tree movement permit fees levied on farmers and other individuals moving tree products to market places. The farmers may benefit through better support enhanced by a partnership between them on the one hand and the county and national governments on the other hand. Other researchers could also build on the findings of the current research.

1.7 Delimitations of the Study

The study focused on the determinants of the performance of agroforestry projects in Mbooni division, Mbooni West Sub-County. The division was specifically chosen for this study because it is endowed with a huge potential for agroforestry. The nature of the land in Mbooni Division such as its hilly topography enabled the researcher tests the extent to which the independent variables determine the dependent variable, performance.

1.8 Limitations of the Study

The researcher faced logistical challenges due to the hilly topography of the research area. The researcher made good use of motor bikes to negotiate around the hilly terrain. The researcher also faced a communication barrier between him and most of the respondents because he is not fluent in the local Kamba language. The limitation was dealt with through training of local research assistants.

1.9 Assumptions of the Study

The researcher assumed that the sample size for the study was a fair representation of the population and that the respondents would answer questions in the questionnaire honestly.

1.10 Definition of Significant Terms

Agroforestry refers to an activity where tree and food crop growing as well as livestock keeping are practiced on the same piece of land.

Agroforestry project refers to a set of activities where tree and food crop growing as well as livestock keeping are practiced on the same piece of land to achieve defined objectives.

Extension services refer to education and learning activities organized for farmers on application of new and existing scientific knowledge in order to boost productivity.

Land Tenure refers to full land ownership without the risk of loss of rights.

Nature of land /Topography refers to the surface shape, height, and configuration of land and other physical features of an area.

Performance refers to the cost of a project and income from it.

Size of land refers to the amount of land owned by an individual in acreage.

1.11 Organization of the Study

The study is organized in to five Chapters: Chapter One deals with introduction, background to the study, statement of the problem, purpose, objectives, research questions, significance of the study, its delimitations and limitations and assumptions. Chapter two handles literature review as well as the summary and gaps. Chapter three deals with research methodology while chapter four handles data analysis, presentation, interpretation, and discussions. Chapter five is devoted to summary of findings, conclusions and recommendations.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The chapter is divided into five subtopics. It outlines the views of other authors and publications regarding the determinants of performance of agroforestry projects. The first sub-topic deals with the concept of performance of Agroforestry projects. The second sub-topic reviews the relationship between land tenure and agroforestry. The Third sub-topic reviews the relationship between size of the land and agroforestry while the fourth sub-topic deals with the relationship between nature of the land and the performance of agroforestry projects. The fifth sub-topic reviews the literature on relationship between extension services and agroforestry.

2.2 Concept of performance of agroforestry projects

Agroforestry is a global practice. Tyler and Miller (1996) note that in the United States of America farmers have been reducing soil losses through a combination of conservation tillage and government sponsored programmes which include agroforestry or alley cropping a form of intercropping where several crops are planted together in strips or alleys between trees and shrubs which can provide fruit or fuel wood. The trees provide shade which reduces water loss by evaporation. The trees and shrub trimmings can be used as mulch, green manure for crops and fodder for livestock. Shibu et al (2012) concur: The forms of agroforestry in the USA include trees and shrubs which are planted between agricultural land and water bodies such as rivers and lakes to reduce runoff, trees and shrubs planted as wind breaks, alley cropping which combines trees planted in a single or multiple rows with agricultural crops and trees planted in pastures to protect livestock from temperature extremes in addition to being a source of timber and poles. The US farm bill incentive programme provides cost sharing for farmers to practice agroforestry since its potential has not been exploited fully.

In the UK, Hamer (2012) notes that despite the fact farmers are enthusiastic about the practice of agroforestry; there are still a handful of farms deliberately practising it. The practical evidence suggests that agroforestry has something to offer to both commercial and smallholders alike. The challenge now is how to make skeptical farmers believe that planting trees is a good idea.

However, Bangor and Aberdeen universities have gone out of their way to promote agroforestry as an economic incentive for farmers who are not doing well as well as a land management tool for flood prevention.

In Australia, Nuberg et.al (2009) note that agroforestry represents a significant proportion of Australia's native forest. In 2005-2006, the value of Australian forestry exports was estimated at $2.1 billion dollars. The country's forest cover is approximately 21% of the total land area 13% of which is formally protected in nature conservation areas. However, much of the country's agroforestry takes the form of plantation forest estates. The National farm forestry indicates that over the last thirty years there has been a significant increase in small grower plantations located on farms. The country also recognizes the important role of agroforestry in mitigating climate change and rehabilitating degraded agricultural land.

According to Kapsoot (2014), India has designed a comprehensive policy to improve, generate income, and meet the ever-increasing demand for timber, food, fuel, fodder, fertilizer, and fibre for a growing population. The policy recognizes the potential of agroforestry as a land use system that integrates trees into farmlands and rural landscapes to enhance productivity, profitability, diversity, and ecosystem sustainability. The government of India's target is to increase the tree cover to 33% from the present level of less than 25%.It is estimated that approximately 64% of India's timber needs are met from trees grown on farms.

In Southern Africa, results of studies conducted in the region show that farmers appreciate agroforestry though they face challenges in its uptake including land constraints and property rights. For example adoption of agroforestry in Zambia is influenced by several factors including farmer perceptions, land tenure, property rights, technology and government policy framework Kalaba et al., (2010).A report commissioned by the UN Habitat in 2005 on Land tenure housing and gender notes that economic development of Southern Africa-Lesotho, Mozambique, Namibia and Zambia requires more individualized and more secure land rights. Colonization of the countries in the region led to skewed land allocations. However, Scroth and Sinclair (2003) note that farmers in Southern Africa practice agroforestry by planting legume trees along with

crops to regenerate their soils and substitute for mineral nitrogen fertilizers which are needed by plants but which are too expensive for them.

According to Asare (2004), agroforestry has been practiced in Ghana for many years. It has been enhanced for sustainable development through the National agroforestry policy of 1986, which initiated a national programme to support agroforestry through research, training, and extension. The NGO's like Ghana Rural Reconstruction Movement, Adventist Development and Relief Agency, CARE-Denmark and Conservative international have been influential in supporting government's efforts in empowering farmers to engage in sustainable agriculture through agroforestry.

In Uganda, Musukwe and Mbalule (2001) note that agroforestry is widely practiced. Increasing pressure on land resulting from a rapidly growing population has led to deforestation and other forms of environmental degradation. Consequently, agroforestry has been identified as a land use approach which ensures the sustainability of the production base According to Kaboggoza and Eilu (2008) the University of Makerere offers a Master of Science degree in agroforestry where the link between agriculture and forestry is strongly built with agroforestry entrepreneurship and environmental conservation for sustainable agriculture being emphasized.

The forestry and agroforestry issues in Kenya are handled by the Kenya Forestry service, which has offices in most of the counties and Sub-counties in the country. The Service runs a tree seed programme within its research arm, Kenya Forestry research Institute which does research in order to develop different agroforestry technologies as well as species of woody plants for all agro-ecological zones of the country. According to Murigi (2015 July 18) People weekend, pp 8 a good example of tree species which is a product of KEFRI's robust research activities is the twenty four high yielding, fast maturing and disease- resistant bamboo species which take three to five years to reach maturity. They can grow in arid and semi-arid areas and are good for environmental conservation, building, water purification and furniture making in addition to being a source of nutritious vegetables. Agroforestry extension services in Kenya are a devolved function as per the fourth schedule of the new constitution although they are still provided by the Kenya forestry service under the guidance and support of the county governments. The country

therefore has unique opportunity to exploit the potential of agroforestry through a partnership between the county governments and the national government.

2.3 Land Tenure and performance of agroforestry projects

Ogolla and Mugabe (1996) note that the term Land tenure is derived from a Latin word *tenere*, *which* means to hold. It defines the methods by which individuals hold, transfer, or transmit property rights in Land. On the other hand, FAO (2011) views land tenure as the relationship whether legally defined or not among people as individuals or groups with respect to land, tenure can therefore be viewed as the inalienable right to land granted by custom and/ or the law. The Constitution of Kenya (2010) classifies land tenure system in Kenya as customary, private, and public.

According to Ogolla and Mugabe (1996) theoretical debates on the interface between land tenure and land use have centered until recently on the virtues of private property rights and the inherent vices of communal ownership where private rights are seen as a tool for rational management of land and other natural resources. However, in seeking to maximize economic gains an individual with private rights may not pay attention to the long-term sustainability of the resource .The two scholars argue that communal property regimes where all the co-owners enjoy equal rights acts as a regulatory mechanism regarding the use of resources for the benefit of all. They feel that groups are better land managers than individuals. Although they recognize the importance of individualized land tenure, they argue for a secure communal land regime. In Kenya, the regime has been implemented in arid and semi-arid areas of the country through the land group representatives act cap 287.

Scoones and Wolmer (2002) concur with the above-mentioned views on Individualized tenure. The regime, it is held, encourages investment in the farm resulting in boosts in productivity and efficiency. More sustainable form of land use will be the end result .While there is little dispute that land tenure security is important for agricultural investment, land tenure arrangements are not necessarily only associated with privatization. A wealth of empirical research shows how security of land rights is enhanced under a range of complex hybrid tenure systems involving

mixes of communal and private arrangements. They seem to support hybrid of communal and private land tenure regimes.

On the other hand, Lwakuba et.al (2003) says that land tenure is a factor that influences the type of agroforestry which farmers practice. Title to land makes farmers feel secure or enjoy future security of tenure and grow trees .Customary ownership based on inheritance encourages growth of trees, which grow fast. They argue for individualized land tenure. Mithika (2011) says land tenure and development are closely related. Land tenure can promote better land use. His study on factors contributing to environmental degradation in Tigania North Division in Tigania east sub-County found out that insecure land tenure is linked to poor land use.

Smucker (2002) concurs with Mithika (2011) to some extent through their view that the objective of the individualization of tenure is to increase land rights security through the state-sponsored adjudication of land rights thereby creating incentives for improved land management and increased productivity. Like several other African countries, Kenya's land reform programme has focused on the individualization of land tenure as a means of creating incentives for increasing agricultural productivity. Yet, in the same paper, he notes that much recent research has found a weak or ambiguous relationship between land tenure status and investment in agricultural productivity. For example, research from Africa and elsewhere has not demonstrated a clear relationship between land titling and increased agricultural productivity. However, he appreciates that major components of land use and social change have been associated with the individualization of land tenure. Existence of overlapping land use rights may inhibit investments such as planting of trees and fencing. With greater security of tenure under freehold tenure, greater investments in labour and capital for agricultural production may result.

Gichuki et.al (2002) takes a definite position that the most limiting social constraint is land tenure. People need to be assured of their present and future ownership and use of the rights to land they occupy in order to develop it. Their views are that land tenure has a positive influence on investment in land. Schroth and Sinclair (2003) introduce a new line of thinking by noting that in post war Mozambique where land rights are unclear and ambiguous, land disputes are very common and costly. Agroforestry trees, in particular older cashew trees are, however,

considered as evidence of land ownership. In other words, agroforestry is used to justify and strengthen a farmer's claim of ownership to the land in question in a land ownership dispute. To the two authors land holding system whether secure or not has an influence on agroforestry. They further note that social customs and norms influence a number of the elements farmers need to integrate in their decisions on the soil fertility management and agroforestry practice. These customs and norms determine farmer's access to many natural resources as well as human labour through the prevailing land and tree tenure systems.

World Bank (2000) carried out study in Kenya, found out that land tenure increases the incentives to invest in the trees, and at the same time reduces incentives for resource mining. Some argue that securing land title increases smallholder access to credit, information, and extension services thereby facilitating clearance of land for agriculture. However, the merits of secure land rights for indigenous populations are more generally accepted .The position of world Bank is that land tenure is double edged sword which constrains and facilitate agroforestry projects in that it may be an incentive for farmers to either invest in agroforestry projects or clear the trees, bushes and shrubs on their land to pave way for pure agriculture.

Oduor (2011) carried out a study on the relationship between land tenure and irrigation found out that those landowners without title deeds set aside less acreage for irrigation compared with those with title deeds to their land .This study was carried out in an area where irrigation -fed agriculture is practiced. Since it requires a substantial financial investment, those landowners without title deeds to their land could find it difficult to get loans from financial institutions to invest in irrigation projects if they do not have any other source of funds such as individual savings. Therefore, they devote less acreage to irrigation projects than those with other sources of funds. ICRAF (2014) notes that in its endeavour to find out why farmers favor some tree species and not others it interviewed 400 farmers in Cote d'Ivore. Its findings were that farmers without secure land rights planted trees, which take a short time to mature such as fruit trees in sharp contrast to farmers with secure land rights who are far more willing to plant timber trees such as Iroko, which take many years to mature. ICRAF's conclusion, despite the fact that it does not indicate the population represented by the sample of 400 farmers, is that insecure land rights lead to short-term agroforestry practices while land tenure boosts sustainable agroforestry.

Lwakuba (2003) supports these views to some extent; customary ownership based on inheritance encourages growth of trees, which grow fast and can be harvested within a short time.

2.4 Size of the Land and Performance of agroforestry projects

Size of land refers to the amount of land held by an individual in acreage. Most of the landowners in Mbooni division have small parcels of land. The average land holding in the division is two acres. The farmer is faced by the challenge of producing food for domestic use and creating stable source of income to take care of financial needs for the family yet the size of the family land is barely two acres. In the event that there is a crop failure or a poor harvest, the farmer's family could suffer badly. The farmer therefore invests in agroforestry to cushion the family against the effects of a poor harvest. Fahrstrom (2000) notes that trees help farmers minimize the risks associated with crop failure by selling trees to compensate themselves should they suffer crop failure.

The situation where the farmer finds himself/herself with a parcel whose size decreases with time emanates from population increase over the years. According to Lwakuba et al., (2003) population growth has led to subdivision of land with family land holdings decreasing in size. Consequently, pressure on land has increased and old sustainable systems of agriculture can no longer be practised. Therefore, agroforestry becomes a viable practice. Kinwe (1993) notes that the small scale farmers face serious land resource with their plots being small and the soils rapidly deteriorating .However the situation may be moderated through integration of agroforestry trees into their farming practices. Muturi (1992) supports these views: Limited land resources and a high rate of population growth in Kenya necessitate the development of intensive yet sustainable land use systems. Soil conservation and agroforestry are becoming integral features in smallholder farming. Appropriate agroforestry applies management practices that are compatible with the problems and needs of the local population. According to Muturi (1992), the Kenyan farmer whose land resource is limited integrates trees into his field and practices other agroforestry measures such as boundary planting, live fences, home gardening, small woodlots and trees in grazing areas. In other words, the farmer practices the form of agroforestry that is directly proportional to the size of land available.

Scroth and Sinclair (2003) are of the view that there is a relationship between the size of land and the practice of agroforestry. They indicate that the decisions on the soil fertility management and agroforestry practice are made within the context of the whole farm and the totality of the resources available to the farmer, which includes the entire land holding and the different fields comprising it. The two scholars view the farmer as a rational individual whose land use decisions are based on size of the land available as well other human and material resources. Glover et.al (2013) note that when farm sizes decrease farmers may become more interested in high yielding systems such as alley cropping. Alley cropping is a form of agroforestry where crops are grown between rows of trees.

Verchot (2008) also concurs with Glover et al., Scroth and Sinclair's views; Agroforestry may provide a means for diversifying production systems and increasing the resilience of smallholder farming systems. It is reasonable to expect that on poor soils, the long-term prospects of systems based on annual food crops are bleak and a transition into tree-based farming offers a better prospect. Verchot (2008) not only concurs with Scroth and Sinclair (2003) but also makes out a case for agroforestry as a form of sustainable land use and a survival strategy for the small holder farming systems. A study carried out by Mithika (2011) found out that there was a significant relationship between farm size and soil conservation practices. Farmers with farm size of more than two acres were more likely to conserve the environment. The land owner with two or more acres may feel that he/she could suffer a higher loss for not managing his agroforestry project than a farmer with one acre of land or less. The findings of a study carried out by Abagale et al., (2003) on the potential of agroforestry in the forest fringe communities of the Asunafo district in Ghana were that that 47.5% of the respondents indicated that they were unwilling to practice agroforestry because of the small size of their land.

2.5 Nature of land and performance of agroforestry projects

According to Kaseva (2013) Mbooni West district is mountainous with an average altitude of 1900 meters above sea level .This implies that the land in most parts of the area may be unsuitable for pure agriculture .Agroforestry may therefore be a better and a sustainable option. Young (1989) is of the view that the introduction of agroforestry practices may provide a solution to the dilemma implied by the existence of a high erosion hazard under conventional

arable farming on sloping land. The farmers who own land whose general nature is hilly have to choose between engaging in pure agriculture where the risk of soil erosion is high and abandoning any productive land use activities on that land. Agroforestry not only provides them with a better way out of such a dilemma but also leads to sustained productive land use. Young (1989) also notes that sloping lands are among the areas regarded as having high potential for agroforestry as illustrated by the areas where ICRAF has participated in projects-Rwanda, Nepal, Ethiopia, and Malawi among others.

Verma et.al (2007) concurs with Young (1989): Tree planting patterns vary with landforms. In Himachal Pradesh in northern India, trees are grown in areas where intensive agriculture is not feasible due to undulating topography. Glover et.al (2013) take the position that people live within a physical environment. Physical factors such as soil type, vegetation, climate, and topography all influence agroforestry. Nuberg et al (2009) take the position that agroforestry has revived the economy of the south-West slopes of New South Wales, in Australia, through employment creation. This has significant implications in areas where farm returns have declined over long periods yet the capacity to increase employment exists especially through processing of wood products.

Young (1989) further notes that agroforestry has the potential to permit arable cropping on sloping land coupled with adequate soil conservation leading to sustained productive use. It has made it possible for cultivation to be extended to land with slopes of 25 degrees and above. According to Mithika (2011) when farmland begins to grow scarce, people farm begin to farm on marginal lands including slopes and areas of thin soil thereby encouraging soil erosion. Land tenure strategies should be linked with appropriate land management practices such as agro-ecological zoning to improve sustainable use of natural resources and ensure that land is put into a use that is suitable for its landform and climatic characteristics.

Schroth and Sinclair (2003) also concur with Mithika's views: Projected human population growth will aggravate the situation on chemical and physical soil degradation especially where population pressure obliges farmers to cultivate fragile soils. However, the two authors note that ecological parameters such as climate, soils topography, among others influence farmer decision

regarding a given soil fertility management and agroforestry practice. Agroforestry increases farm productivity. Field and farm boundaries can be used for tree planting in areas with poor soils, rocky site, and steep slopes. Musukwe and Mbalule (2001) note that alley cropping which entails growing food crops between hedgerows of planted shrubs and trees is suitable in highland areas with steep slopes where hedgerows can be established to check water and soil run off. It also provides green manure.

Gichuki et al., (2000) take the position that areas with rocky sites and steep slopes can be used for tree planting. Muturi (1992) builds on those views through his position that agroforestry has the potential for increasing productivity, profitability and diversity of production from the farmer's land. It offers the possibility of household access to building materials, medicine and fodder for livestock. It can also lead to sustained productivity of the natural resource base by enhancing the general improvement of the environment. Lwakuba et al., (2003) take the position that tree planting along the contours on sloping land is a soil conservation measure.

2.6 Extension Services and Performance of agroforestry projects

According to World Bank (2000) extension services have an important role in both production efficiency and technological change in that through them knowledge and advice on the best practices suitable to the local circumstances are imparted to the farmers to improve their skills and at the same time, they are a mechanism for dissemination of information on the latest technological development. ICRAF (2014) concurs: Close interaction during project implementation between research, development, and extension organizations has been particularly fruitful and beneficial to all those involved. Verchot et al., (2005) too have similar views that agroforestry can very likely contribute to an increase in the capacity of the tropical farming systems to withstand and recover from changes in climate such as increased intensity and frequency of extreme weather conditions. However, government and international support in terms of research, education, and extension will be required to help farmers in developing countries cope with the additional stresses created by climate change and increased climate variability.

World Bank (2000) takes the position that the objective of Kenya's extension was to increase productivity through competent well-informed village extension workers who visit farmers regularly with relevant technological messages. Kenya's extension services system is neither financially sustainable nor cost-effective. The government's allocations for extension as for other public expenditures continue to decline leaving the system heavily dependent on donor funding. The approach of high intensity contact with a limited number of farmers has been costly and unwarranted. Farmers selected for interaction should be more representative of the local population of famers. Exploiting low-cost modern mass media, demonstrations, and partnership with the civil society as well as the private sector would have a greater impact. Verchot (2008) notes Government support in extension will be required to help smallholder farmers make a transition to tree-based production systems particularly when the switch entails a few years of reduced production and reduced income security. There is need for a national strategy to harmonize and facilitate efficient coordination of agroforestry as opposed to provision of extension services separately by agriculture and forestry governed by separate laws.

Most projects rely have relied to some extent on individual extension in which extension workers visit farmers on their farms. One of its major advantages is that it facilitates dialogue in that extension worker can often learn from the farmers as well as pass on some advice. According to Oduor (2011), the participatory approach model where the researchers and extension agents work closely with the farmer recognizes the fact that the farmers have a wealth of knowledge gained through problem solving experience. Scoones and Thompson(2009) note that getting agricultural science and technology, research, extension and education working better for poor farmers, herders and resource managers is vital to improving productivity and managing resources sustainably. Extension should be both upstream and downstream. The farmer first approach should be institutionalized. However, Kerkhof (1990) has a concern that only a small proportion of the farming population can be reached. There is also a tendency to focus on the more progressive farmers at the expense of the poor farmers who are mostly in need of help. A participatory poverty assessment study done by world bank in Kenya in 1994 found out that access to information especially among the poor is lacking .Extension services were found to be sporadic irregular and generally targeted the rich or large land owners with most extension officers disseminating information through baraza's.

ICRAF (2014) notes that farmers who receive information from cooperatives and extension agencies about the benefit of intercropping or agroforestry are more likely to practice it on their farms than those who have not benefitted from similar contacts. ICRAF researchers carried out a study found out that as increasing numbers of farmers in an area intercrop their cocoa with a specific tree, the likelihood of other farmers doing the same increases .Extension agencies could take advantage of this trend by focusing on the promotion of intercropping to a core promotion thereby allowing additional farmers to learn from and be influenced by these early adopters. Close interaction during project implementation between research, development and extension organizations has been particularly fruitful and beneficial to all stakeholders.

Glover et al., (2013) take the position that with a change in production system comes also a need for change in knowledge, management skills, and extension services. For farmers, introduction of a new species means that they have to learn how to take care of it. They concur with Oduor (2011) that in other cases effective integration of local knowledge and perspectives into agroforestry are necessary for such projects. Dudley et al., (2006) says that education and training are needed in many cases to help communities value and manage forest resources. The importance of education and training is a constant factor in all the work on forest quality. Such education can work in two directions because experts often have much to learn from local communities. Education opportunities may include bringing different groups together or informal teaching alongside more traditional approaches to extension and training. They feel that informal or formal training sessions for groups would be a good model for dissemination of agroforestry services.

2.7 Theoretical Framework

The theoretical framework for this study was the systems theory. A theory is a set of systematically interrelated concepts and propositions that are advanced to explain or predict a phenomenon. Mugenda and Mugenda (2003) define a theory as a set of concepts or and the interrelations that are assumed to be among them. Lesniewski (2006) defines a system as a collection of objects joined in a constitutive relationship of interactions that forms a whole .The systems theory was proposed by Ludwig Von Bertalanffy in 1928 who emphasized that systems are open to and interact with their environments. Heylighen and Josyln (1992) note that, the

theory focuses on the arrangements of and relationships between the parts, which connect them into the whole. The developments of the systems theory are diverse. Its applications include engineering, computing, ecology, management, and family physiotherapy.

According to Heylighen and Josyln (1992), Systems analysis has been developed to aid a decision maker identify, reconstructing, optimizing, and controlling a system while taking into consideration multiple objectives, constraints and resources. It aims at specifying possible courses of action, together with their risks, costs and benefits Izac (2003) concurs with these views: A basic rule is that systems theory is that systems at a certain level **x** are constrained and controlled by systems at another level **y** and in turn they constrain the systems at level **w**. Social scientists who have analyzed farmers decision making in the tropics have shown that farmers think in a systematic fashion. Decisions regarding agroforestry are made within the context of the whole farm and the totality of the resources available .The farmers operating at the farming system level have to take the environment at the village level as a constraint in their decision to practice agroforestry. Consequently, farmers integrate a wide range of ecological, social and economic parameters belonging to levels higher than the farming systems in their decision to adopt soil fertility and agroforestry practices.

The systems theory was appropriate for this study because the hilly topography of the land is a constraint for the farmer who is determined to improve the quality of life has no option but to take up agroforestry as the most appropriate and sustainable land use practice. At the same time, the size of the land is limited for those farmers whose access to land is through inheritance. The government policy to provide extension services to the farmers or not has an influence on productivity in agroforestry since it determines the appropriateness of the technology made available to the farmers as a product of research and development. At the same time the government has to develop polices to enable it realize the minimum 10% tree cover recommended by the UN since it is part of a global system which imposes that minimum limitation.

2.8 Conceptual Framework

The following conceptual framework guided the study. It had independent variables and a dependent variable, a moderating variable and an intervening variable. Figure one shows how the independent variables determined the dependent variable.

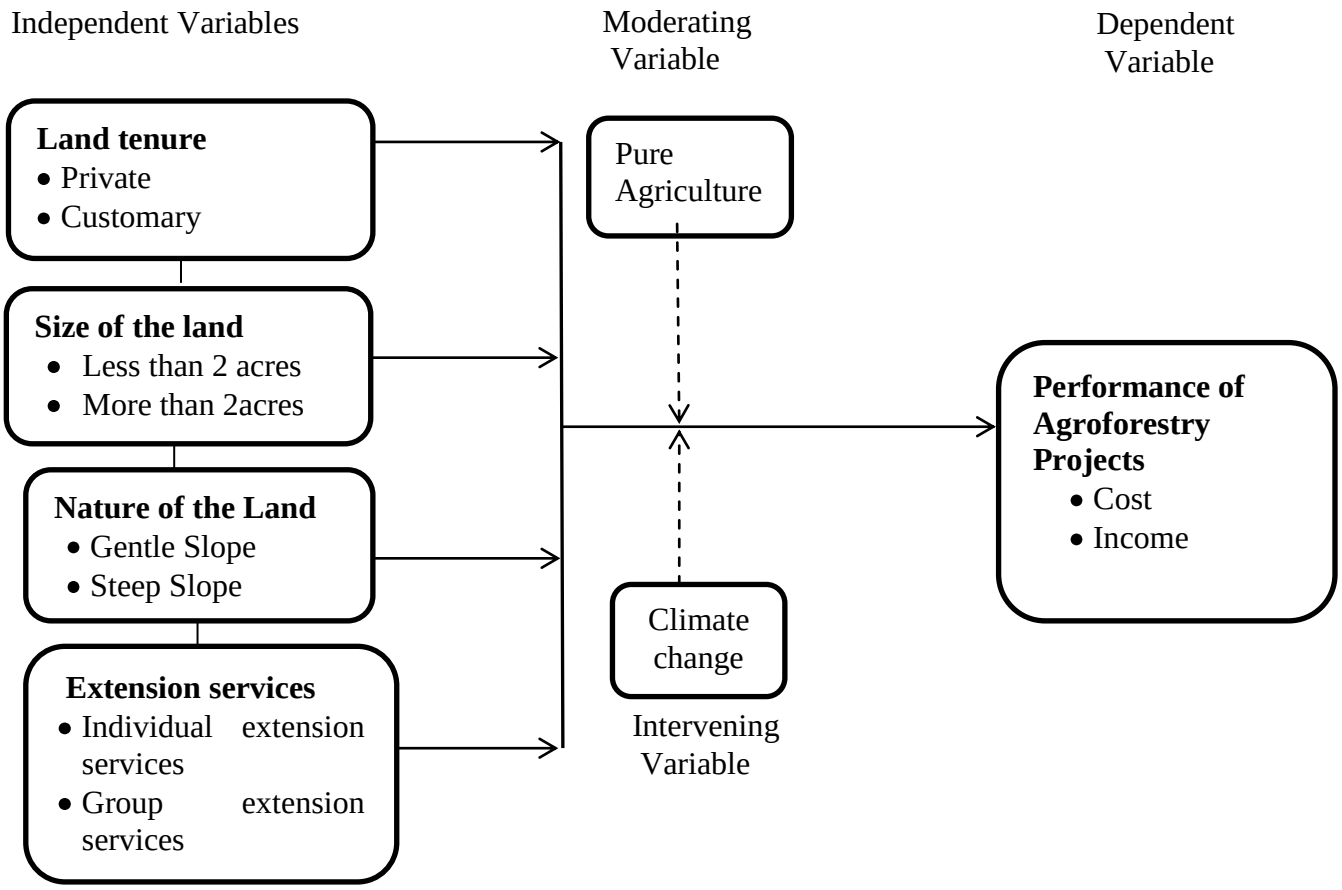


Figure 1: Conceptual Framework

2.9 Summary and Research Gaps

The literature review revealed several gaps; on land, tenure and agroforestry there were conflicting views. One school of thought argued for individualized land tenure while the other argued for a communal land tenure regime. Scoones and Wolrmer felt that a hybrid tenure system is better. Smucker noted that research has not demonstrated a clear relationship between titling and agricultural productivity. World Bank (2000) viewed land tenure as a double-edged sword, which is an incentive for investment in agroforestry and at the same time an anti-agroforestry tool that could encourage cutting down of trees as part of land preparation activities to pave way for pure agriculture. Scroth and Sinclair's position that tree planting can be used to justify land ownership claims appeared to suggest that agroforestry contributes to the realization of land tenure

There were conflicting views on size of the land and performance: Mithika (2011) noted that those with less than two acres are less inclined to practice tree planting to conserve the environment Abagale et.al (2003) concurred with those the views that most land owners with small parcels of land are reluctant to practice agroforestry although they did not indicate what size of land was considered to be small. Muturi (1992), Vercot (2008) and Fahrstron (2000) viewed agroforestry as a viable and realistic and sustainable option for the owners of small parcels of land whose sizes continues to decrease with the passage of time despite the fact that they, too, did not indicate what size of land they considered small. Therefore, the literature review on size of land and performance of agroforestry projects revealed a gap.

Regarding nature of land and agroforestry Scroth and Sinclair (2003). Gichuki et.al, (2000) Lwakuba et.al (2003) agreed that it determines performance of agroforestry projects. However, Scroth and Sinclair (2003) and Mithika (2011) introduced a new aspect where scarcity of land leads to farming in areas that are not ideal including slopes. The research on the determinants of agroforestry in Mbooni division was about agroforestry in an area where much of the available land is on a steep slope. Therefore there were conflicting views on nature and performance.

The literature review on extension services and performance did not show the way forward on the model of extension services that is good for agroforestry. It did not indicate whether the

group or individual approach to extension is the best model. At the same time, it was low on the magnitude of extension services. Oduor (2011) views that extension services regime should be two-way traffic where both the extension agent and the farmer learn from each other were supported by Dudley et.al (2006), Scoones and Thompson (2009), Verchot (2008) and ICRAF (2014). However, ICRAF noted that if some farmers in an area, who are referred to as early adopters, take up extension services, there is a likelihood that their skills will trickle down to the rest of the farming community in the area. Kerkhof (1990) viewed this model as problematic since it focuses on a few successful landowners in the misplaced hope that they will pass on their skills to others yet this does not always happen. The literature review revealed a gap on the nature and magnitude of extension services.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This Chapter is divided into ten sub-topics. The first sub-topic presents the research design, which will be used to conduct the study, the second sub-topic deals with the target population while the third one handles sample size and the sampling procedure. The fifth sub-topic deals with data collection instruments and how data will be analyzed and summary. The sixth sub-topic deals with validity of research instruments while the seventh one is devoted to reliability of research instruments with the eighth sub-topic handling data collection procedures. The ninth and the tenth subtopics handle ethical considerations and operationalization of variables respectively.

3.2 Research Design

A descriptive survey research design was used to investigate the determinants of performance of agroforestry projects in Mbooni Division. Descriptive survey design enables the researcher to summarize and organize data in an effective and meaningful way. It involves describing and interpreting events, conditions and situations (Ogayo, 2012). Karlinger (1973) concurs; Descriptive research involves measurement, classification, analysis, comparison, and interpretation of data. It helps in describing the characteristics of variables under investigation appropriately. The researcher considered the design appropriate since it would facilitate collection of descriptive data from the sampled population by asking respondents about their opinions on the determinants of performance of agroforestry projects in Mbooni Division.

3.3 Target Population

Mugenda and Mugenda (2003) define population as the entire group of individuals, events, or objects having a common observable characteristic or the aggregate that conforms to a given specification. The study targeted 9704 the households practicing agroforestry in Mbooni division (Kenya National Bureau of Statistics 2010).

3.4 Sample Size and Sampling Procedure.

The study used multistage cluster sampling method. According to Ryman (2008).It is used when dealing with a sample that is to be drawn from a widely dispersed population such as a national population, or a large region or even a large city Mugenda and Mugenda (2003) concur: Multistage cluster sampling is used when it is not possible to obtain a sampling frame because the population is either very large or scattered over a large geographical area. The researcher used the method to generate the required sample at three stages since it was not possible to generate a sampling frame taking into consideration the fact that the total number of households in Mbooni division was 9704 and spread over a large geographical area of 103.9Square Kilometres, according to the Kenya National Bureau of Statistics population and Housing census report (2010).The division has four locations. These are; Nzeveni, Kyuu, Kithungo and Mbooni. Random sampling was used to select Kithungo and Kyuu locations in the first stage. In the second stage, random sampling was used to select Kithungo location. In the third stage, random sampling was used to select Uvuu Sub location because of its hilly topography and questionnaires were administered to household heads/representatives through random sampling where respondents were selected at random from three parts of each of the five villages in Uvuu which include Mataa, Nzueni, Ngaa, Uvuu and Mavuni. According to Israel (1992) the appropriate sample size at a precision level of 93% for a population of 9704, is 200. At the confidence level of 95%, a sample size of 385 would have been too high taking into consideration the logistical constraints. Questionnaires were administered to those 200 respondents including five officers from the department of forestry in Makueni.

3.5 Data Collection Instruments

The researcher adopted researcher-administered questionnaire as the key data collection instrument. The questionnaire was designed to capture all the data, which would be considered relevant to the study.

3.6 Validity of Research Instruments

Mugenda and Mugenda (2003) view validity as accuracy and meaningfulness of inferences, which are based on the research results. In other words, it is the degree to which the results obtained from the analysis of the data actually represent the phenomenon under study. The

questionnaire comprised of carefully constructed and unambiguous questions with different sections where each section addressed each objective of the study. Pre-testing of the questionnaire was done on ten percent of the non-sampled population to assess its accuracy, clarity, and suitability. The questionnaire was also presented to the project supervisor for ascertainment of its validity.

3.7 Reliability of Research Instruments

According to Mugenda and Mugenda (2003) reliability is a measure of the degree to which a research instrument yields consistent data after repeated trials Bryman (2008) notes that reliability is concerned with the question of whether the results of a study are repeatable. This study used the internal consistency technique where a score obtained in one item will be correlated with scores obtained from other items in the instrument. Cronbach's coefficient Alpha was then computed to determine how items correlated among themselves. Cronbach's alpha is used to measure internal consistency of the data collected through the questionnaires (Cronbach, 1951). Cronbach's alpha (α) ≥ 0.9 indicate excellent internal consistency $0.7 \leq \alpha < 0.9$ good internal consistency $0.6 \leq \alpha < 0.7$ acceptable excellent internal consistency $0.5 \leq \alpha < 0.6$ poor excellent internal consistency and $\alpha < 0.5$ unacceptable excellent internal consistency. The reliability findings were: 0.733 for land tenure and agroforestry, 0.796 for size of land, 0.721 for nature of land and agroforestry and 0.708 for extension services and agroforestry. Therefore the instrument was considered reliable since all the values for the Cronbach coefficient alpha were above 0.6

3.8 Data Collection Procedures

A letter was obtained from the University of Nairobi and the basis of which a research permit was sought from the council for research science and technology. 20 household heads from the non-sampled population would be interviewed in a pilot study, the data collected was analyzed, and results interpreted for correctness of the instruments. Appropriate modifications were done. Two research assistants visited the sampled households and explained the purpose of the research to the respondents, assured them of the confidentiality with which the information they would provide would be handled, obtained the consent to interview them and administered the questionnaires to 195 household heads within the households and/or on their farms. The

researcher administered the questionnaires to the five officers from the forestry department, in order to realize the 200 respondents.

3.9 Data Analysis Techniques

The researcher used descriptive and inferential statistics data analysis techniques. The raw data from the field was sorted as per the objectives of the study, coded, analyzed, and presented in form of tables, frequencies, and percentages. Regression analysis was done to establish relationships between the independent and dependent variables.

3.10 Ethical Considerations

The researcher collected data, which would contribute to the realization of the purpose of the study only. Above all a full disclosure of the purpose of the study was made to the respondents and their identities protected by a requirement of non-disclosure of identity on the introduction letter.

3.11 Operationalization of Variables

Each objective of the study had an independent and dependent variable. Table 3.1 summarizes the key variables, which guided the study and how each variable was measured in order to realize the research objectives.

Table 3.1: Operationalization of Variables

Objective	Variable	Indicator	Measurement	Data Analysis
To establish the extent to which land tenure determines performance of agroforestry projects	Independent variable**:** land tenure	Adjudication status	Nominal	• Descriptive statistics • Inferential statistics
To assess the extent to which the size of land determines performance of agroforestry projects	Independent Variable**:** Size of land	Approximate acreage	Ordinal	• Descriptive Statistics • Inferential statistics
To assess the extent to which nature of land determines performance of agroforestry projects	Independent Variable**:** Extension services	Gentleness of slope Steepness of slope	Nominal Nominal	• Descriptive Statistics • Inferential Statistics
To examine the degree to which extension services determine performance of agroforestry projects	Independent Variable**:** Nature of land	Frequency of extension contacts Magnitude of extension services	Ordinal Ordinal	• Descriptive Statistics • Inferential Statistics
	Dependent Variable**:** performance of agroforestry projects	Cost Income	Ordinal Ordinal	• Descriptive Statistics • Inferential statistics

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.1 Introduction

This chapter presents the findings of the study, which have been analyzed, interpreted, in line with the objectives.

4.2 Questionnaire Response Rate

Out of the 200 questionnaires administered, 177 questionnaires were responded to by the respondents. This constituted 88.5% response rate. According to Mugenda and Mugenda (2003), a questionnaire return rate of 50% is adequate for analysis and reporting. A questionnaire return rate of over 70% is very good for analysis. Therefore 88.5% is adequate for analysis.
Distribution of the respondents is captured in Table 4.1.

Table 4.1: Distribution of respondents

Distribution	Frequency	Percent (%)
Agro forestry farmers	173	97.7
Forestry officers	4	2.3
Total	**177**	**100.0**

The study established that 97.7% of the respondents were agroforestry farmers while 2.3% were forestry officers.

4.3 Demographic information

This section presents the findings on the general information on the respondents. The general information sought was in terms of respondents gender, age and academic level.

4.3.1 Distribution of Respondents by Gender

The respondents were requested to indicate their gender in order for the researcher to understand their gender composition. Accordingly, the findings are presented in Table 4.2

Table 4.2: Distribution of respondents by gender

	Frequency	Percent (%)
Male	98	55.4
Female	79	44.6
Total	**177**	**100.0**

According to this study, 55.4% of the respondents were males while 44.6% were females. This implies that gender distribution amongst the respondents was in favour of males. However, the findings indicate that agroforestry is not a preserve of men. The practice involves a lot of physical activities such as pruning and cutting down of trees. This could be the reason why more men are involved in the practice than women. There is need to extend special support to women to increase their uptake of agroforestry.

4.3.2 Distribution of Respondents by Age

The study sought to establish the age bracket of the respondents and the findings are as tabulated in Table 4.3.

Table 4.3: Distribution of Respondents by Age

Age Bracket	Frequency	Percent (%)
20 - 29	20	11.3
30-39	49	27.7
40 -49	42	23.7
50 – 59	52	29.4
60 and above	14	7.9
Total	**177**	**100.0**

The findings in Table 4.3 show that 52 (29.4%) respondents were within the age bracket of 50-59 years, 49 (27.7%) were aged between 30-39 years, 42(23.7%) were aged between 40-49 years, 20(11.3%) were aged between 20-29 years while the remaining 14(7.9%) were above 60 years. This implies that involvement in agroforestry increases with age where majority of agroforestry farmers were aged between 50 and 59 years. Most of the farmers in this age bracket are deeply

attached to nature. Those who are 60 years and above do not have much energy and the enthusiasm to practice agroforestry.

4.3.3 Distribution of Respondents by Level of Education

The respondents were asked to indicate their level of education in order for the researcher to establish the relationship between education and performance of agroforestry projects. The results are indicated in Table 4.4

Table 4.4: Distribution of Respondents by Level of Education

Level of education	Frequency	Percent (%)
No formal education	38	21.5
Primary level	87	49.2
Secondary level	43	24.3
College level	8	4.5
University level	1	0.6
Total	**177**	**100.0**

According to the findings in Table 4.4, 87 (49.6%) respondents had primary level education while 43 (24.3%) had secondary level education.38 (21.5%) respondents had no formal education with 8 (4.5%) having achieved college level of education. Only 1(0.6%) respondent had university level of education. This implies that most of the respondents are literate hence they were able to understand and respond to the questions presented. However the level of literacy is still low in the area yet the uptake of agroforestry is very high.

4.4 Land Tenure and Agroforestry

The first objective of this study was to establish the extent to which land tenure determines performance of Agroforestry projects in Mbooni division. Respondents were therefore asked a series of questions in relation to this.

4.4.1 Practice of Agroforestry

The farmers were asked if they practice agroforestry and the findings are presented in Table 4.5.

Table 4.5: Practice of Agroforestry

	Frequency	Percent (%)
Yes	143	82.7
No	30	17.3
Total	**173**	**100.0**

The findings in Table 4.5 show that 143 (82.7%) respondents indicated that they practice agroforestry while 17.3% of the respondents said they did not. This implies that agroforestry is widely practiced by farmers in the study area.

4.4.2 Proportion of Farmers who Practice of Agroforestry

The forestry officers were also asked to state the percentage of the farmers who practice agroforestry in Mbooni division. Table 4.6 illustrates the findings.

Table 4.6: Proportion of Farmers who Practice of Agroforestry

	Frequency	Percent (%)
Over 50%	1	25.0
75%	3	75.0%
Total	**4**	**100.0**

According to Table 4.6, 3 (75%) forestry officers indicated that 75% of the farmers practice agroforestry in the study area division while 1 (25%) of the forestry officers said that over 50% of the farmers practice agroforestry in the area. The officers therefore confirmed the views of the farmers that the uptake of the practice is very high in the division.

4.4.3 Nature/status of ownership of Agroforestry land

The researcher asked the respondents a series of questions with a view to establishing the extent to which land tenure determines performance of agroforestry projects in the study area. The respondents were asked to state if they practice agroforestry on their own or family land. Their responses are in Table 4.7.

Table 4.7: Status of ownership of agroforestry land

	Frequency	Percent (%)
Own	102	71.1
Family land	41	28.9
Total	**143**	**100.0**

The findings indicate that 102 (71.1%) respondents practice agroforestry on their own land while 28.9% practice it on family land. Therefore, majority of the farmers practice agroforestry on their own land. This could be the reason why the uptake of agroforestry is very high in this area.

4.4.4 Nature of Acquisition of Land Owned by Respondents

The respondents who stated that they own the land on which they practice agroforestry were asked how they had acquired that land. Table 4.8 presents a summary of the findings.

Table 4.8: Nature of Acquisition of Land Owned by Respondents

	Frequency	Percent (%)
Inherited	95	66.5
Bought	48	33.5
Total	**143**	**100.0**

The findings presented in Table 4.8 show that 95 (66.5%) of the respondents had acquired the land on which they practice agroforestry through inheritance and 48 (33.5%) had bought the land on which they do the practice. This implies that inheritance was the main form of land acquisition by the farmers who practice agroforestry in Mbooni division. However, 33.5% of the farmers had bought land from the original owners. This implies that sale of land in the study area is very common due to poverty. Rampant sale of land creates a situation where land is subdivided into small portions. Majority of those who buy will always buy the land whose topography is gentle slope since they have a choice. Majority of those own land on a steep slope are the original owners. There is need to improve the performance of agroforestry projects to reverse this trend of widespread sale of land to avoid further subdivision of land into uneconomic

units and at the same time ensure that those who own land on a steep slope use it in productive and sustainable manner.

4.4.5 Ownership Dispute

The respondents were asked to indicate if their land had any pending ownership dispute in order for the researcher to establish the extent to which land tenure determines performance. The findings are as shown in Table 4.9.

Table 4.9: Ownership Dispute

Pending dispute	Frequency	Percent (%)
Yes	12	8.7
No	131	91.3
Total	**143**	**100.0**

According to the findings in Table 4.9, 131 (91.3%) respondents indicated that they owned land that was not affected by any pending ownership dispute while 12 (8.7%) respondents only had land which was affected by ownership disputes. This could be attributed to the success of the land adjudication dispute resolution regime in the area. Therefore, land tenure determines performance of agroforestry projects in Mbooni division to a large extent. This finding was confirmed by 4(100%) Forestry officers interviewed.

4.5 Size of Land and Agroforestry

The second objective of this study was to assess the extent to which size of land determines performance of agroforestry projects in Mbooni division. The respondents were asked how much land they owned in acres. The findings are indicated in Table 4.10.

Table 4.10: Respondents Land Holding

	Frequency	Percent (%)
Less than two acres	69	48.6
Two acres and above	74	51.4
Total	**143**	**100.0**

According to the findings, 74(51.4%) respondents revealed that they owned two acres of land and above while 69 (48.6%) own less than two acres of land.

The Forestry officers were requested to state the average land holding in Mbooni Division. Table 4.11 illustrates the findings.

Table 4.11: Average Land Holding

	Frequency	Percent (%)
Less than two acres	3	75.0
Two acres	1	25.0
Total	**4**	**100.0**

According to the study findings 3 (75%) officers were of the opinion that average land holding in Mbooni Division is less than two acres while only1(25%) officer was of the opinion that average land holding in Mbooni Division is two acres. Therefore farmers mainly hold less than two acres of land. This could have been caused by rampant sale of land as indicated in Table 4.8 where subdivision of the land to create new portions of land for the buyers results in a decrease in the size of the family land.

4.5.1 Land under Agroforestry

The study sought to determine the scope of agroforestry practiced by most of the farmers. The respondents were asked to state how much land they had put under agroforestry. Table 4.12 illustrates the findings.

Table 4.12: Land under Agroforestry

	Frequency	Percent (%)
25 % and below	93	65.3
25 – 50 %	25	17.3
50 % and above	25	17.3
Total	**143**	**100.0**

The findings presented in Table 4.12 indicate that 93 (65.3%) respondents had put 25% of their land and below under agroforestry. 25 (17.3%) respondents had put 25-50% of their land under the practice while a similar number had put 50% of their land and above under agroforestry. Therefore, majority of the respondents had put a quarter or less of their land under agroforestry. The findings indicate that majority of the farmers were willing to set aside a quarter of their land for the practice if they were well sensitized on its benefits. The findings also indicate that as the size of land under agroforestry increases, the scope of agroforestry increases but, the number of farmers decreases since the size of land is small for majority of the farmers.

4.5.2 Pattern of Agroforestry

The respondents were requested to indicate where they had planted trees on the land. Table 4.13 shows the findings.

Table 4.13: Pattern of Agroforestry

	Frequency	Percent (%)
Wind break	6	4
Live fence	3	2
Woodlots/block planting	80	56
Scattered on the cropland	23	16
Along the land boundaries	31	22
Total	**143**	**100.0**

According to the findings, 80 (56%) respondents practised woodlots or block planting while 38 (22%) planted trees along the boundaries. 23 (16%) farmers had trees scattered on the cropland while 6 (4%) had planted trees as wind breaks with 3 (2%) planting trees as live fence. Therefore, majority of the farmers practised woodlots form of agroforestry where part of their land was set aside for trees only. The 4 (100%) forestry officers on whom questionnaires were administered confirmed that most of the farmers practiced this form of agroforestry. There is need to sensitize the farmers to plant trees on crop land to increase the tree cover in addition to enjoying the benefits that come with trees grown together with crops such as mulch.

4.6 Nature of the Land and Agroforestry

The third objective of this study was to assess the extent to which nature of land determines performance of agroforestry projects in Mbooni division. The respondents were asked to indicate the general topography of their land. The findings are indicated in Table 4.14.

Table 4.14: General Topography of Respondents Land

	Frequency	Percent (%)
Steep slope	56	39.3
Gentle slope	87	60.7
Total	**143**	**100.0**

The findings indicate that the general topography of land for 87 (60.7%) respondents is a gentle slope while 39.3% of the respondents practiced agroforestry on land whose general topography is steep. The nature of the land in Mbooni can therefore be said to be varying between gentle and steep hilly topography. However approximately 40% of the land in the study area has a hilly topography and therefore unsuitable for pure agriculture. Therefore the potential of agroforestry is huge in the area. The forestry officers were also asked to indicate what the general topography of most of the land in Mbooni Division is, and 3(75%) confirmed that it is mainly hilly and on a steep slope with 1(25%) officer indicating that some areas are on a gentle slope.

4.6.1 Pattern of Tree Planting

The researcher sought to find out the part of the slope where trees are planted. The respondents were requested to indicate the part of the slope where they had planted most of the trees. The results are in Table 4.15.

Table 4.15: Pattern of Tree Planting

	Frequency	Percent (%)
On the gentle slope	86	60.1
On the steep slope	57	39.9
Total	**143**	**100.0**

The findings indicate that 86 (60.1%) farmers had planted most of the trees on the gentle slope while 57 (39.9%) of the farmers had planted most of the trees on the steep slope. 50.0% of the forestry officers stated that agroforestry farmers plant most of the trees on the steep slope with the other 50% saying that agroforestry farmers plant most of the trees on the gentle slope. The findings indicate that both the gentle and the steep slopes of the study area were being used for agroforestry. The findings also indicate that one farmer whose land was on gentle slope planted trees on the small part of the land on a steep slope. This implies that a robust extension service regime would make those farmers whose land was on a gentle slope with a small part being on a steep slope use the steep slope for agroforestry. The fact that the small part of land on a steep slope has not been set aside for agroforestry for majority of the farmers who own land whose general topography is gentle can be attributed to the influence of pure agriculture where terraces are done on the steep slope and used for growing of crops.

4.7 Extension and Agroforestry

The last objective of this study was to examine the degree to which extension services determine performance of Agroforestry projects in Mbooni division. The respondents were requested to state the ways in which officers from the forest department provided extension services to them. The findings are presented in Table 4.16.

Table 4.16: Provision of Extension Services by Officers from the Forestry Department

	Frequency	**Percent (%)**
Seminars/workshops	10	6
Forestry Extension officers barazas	1	0.5
Visits to farms	0	0
Chief's barazas	36	21
None	96	71
Total	**143**	**100.0**

According to the findings, 96 (71%) respondents said officers from the forest department did not provide extension services to them, while 36 (21%) indicated that they got extension services through chief's baraza's, 6% indicated that they got them through seminars/workshops. This

implies that majority of the farmers do not get the extension services while most of those who had access to those services got them through chief's baraza. Therefore the chief's baraza was the most common way of providing extension services in the study area.

The forestry officers were asked if their department provides extension services to the farmers in Mbooni Division, to which they all responded in the affirmative. They were probed on the ways in which their department provides extension services to the farmers. A summary of the findings is in Table 4.17.

Table 4.17: How Forestry Department Provided Extension Services to Farmers

	Frequency	**Percent (%)**
Extension officers barazas	1	25.0
Chief's barazas	3	75.0
Total	**4**	**100.0**

The findings in Table 4.17 show that 3 (75%) forestry officers indicated that the department provided extension services to the farmers in Mbooni Division through chief's barazas with the other1(25%) officer indicating that the department provided extension services to the farmers in Mbooni Division through extension officers' barazas. The officer with a different view indicated the officers determination to provide extension services through barazas where they would be in control of the programme.

4.7.1 Frequency of Provision of Extension Services

The respondents who had confirmed that they had gotten extension services were probed on how often the extension services are provided to them. Their responses are in Table 4.18.

Table 4.18: Frequency of Provision of Extension Services

	Frequency	Percent (%)
Monthly	6	12.8
Quarterly	18	38.2
Mid-year	15	32.0
Annually	8	17.0
Total	**47**	**100.0**

The findings in Table 4.18 indicate that 18 (38.2%) farmers accessed extension services on a quarterly basis, followed by 15 (32.0%) who got the services mid-year while 8 (17.0) got the services on an annual basis. Only 6 (12.8%) farmers got the services monthly. Therefore, majority of the farmers got the extension services on a quarterly basis. The 6 farmers who got the services monthly may be part of those who either attended seminars/workshops or made a deliberate effort to consult the officers in their offices. The low turnout in the barazas could be attributed to poor publicity. There is need to facilitate the forestry department to give adequate publicity to the barazas through local radio stations such as Musyi FM.

The officers were also asked to state how often their department provides extension services to the farmers. Their responses are shown in Table 4.19.

Table 4.19: Frequency of Provision of Extension Services

	Frequency	Percent (%)
Quarterly	3	75
Throughout the year	1	25
Total	**4**	**100**

According to the findings in Table 4.19, 3 (75%) officers said their department provided extension services to the farmers on a quarterly basis and the other 25% said their department provided extension services to the farmers throughout the year. The officer who stated that they

offer extension services throughout the year was referring to the farmers who consult the officers in the office as they obtain other services such as permits to cut down and move trees.

The officers were also asked if the county government supported them in provision of extension services. They all confirmed that they got the support to a moderate extent. The forest officers were further asked to indicate the challenges which their department faces in its efforts to provide extension services to the farmers. The findings are as shown in Table 4.20

Table 4.20: Challenges Faced by Forestry Department in its Efforts to Provide Extension Services

	Frequency	Percent
Financial challenges	2	50
Logistical challenge	1	25
Human Resource challenges	1	25
Total	**4**	**100**

According to the findings in Table 4.20, 2 (50%) officers indicated that financial challenges constitute the biggest constraint to their work while1 (25%) indicated that logistical challenges were the biggest impediment to the department activities with the remaining officer (25%) indicating that they faced human resource challenges. Therefore, the forestry department faces financial, human resource and logistical challenges in its efforts to offer better extension services to agroforestry farmers in Mbooni division. However, financial challenges were considered to be the greatest constraint to the department's activities in relation to provision of extension services.

4.7.2 Tree Species Planted by Respondents

The researcher investigated the tree species planted by agroforestry farmers as well as the tree species the forestry department provides the farmers with. The results are indicated in Table 4.21.

Table 4.21: Tree Species Planted by Respondents

	Frequency	Percent (%)
Eucalyptus	83	58
Cypress	20	16
Grevillea	37	26
Total	**143**	**100**

The findings in Table 4.21 show that 83 (58%) agroforestry farmers had planted the eucalyptus tree species, while 37 (26%) farmers had planted the grevillea tree species with 20 (16%) farmers planting the cypress tree species .The forestry officers also indicated that the forestry department provides the farmers with the local tree species including; eucalyptus, cypress and grevillea.

4.7.3 Period taken by Trees to reach Maturity

The respondents were requested to state how long it takes the trees to reach maturity for harvesting. The findings are in Table 4.22.

Table 4.22: Period taken by Trees to reach Maturity

	Frequency	Percent (%)
3 - 5 years	50	34.7
5- 7 years	68	48.0
Above 7 years	25	17.3
Total	**143**	**100.0**

According to Table 4.22, 68 (48.0%) respondents said it took the trees 5-7 years to reach maturity while 50 (34.7%) respondents said the trees take 3-5 years to reach maturity for harvesting purposes with 25 (17.3%) respondents indicating that trees take above 7 years to reach full growth for harvesting. All the forestry officers indicated that the trees take over 7 years to reach maturity. They further explained that it takes the cypress tree 30 years to reach maturity while it takes eucalyptus ten years to grow to maturity with the grevillea taking 15 years.

Therefore, the findings in Table 4.22 show that majority of the farmers harvest the trees before they reach maturity since they need to either use them domestically or sell them to supplement their income. Since majority harvest their trees 3-7 years after planting, there is need for the forestry department to supply the famers with tree species which reach maturity in at least five years in order for the famers to harvest them at the right time.

4.7.4 Sale of Trees by Agroforestry Farmers

The researcher asked the respondents if they sell the trees from their land with a view to establishing the outcome of the projects. The findings are presented in Table 4.23.

Table 4.23: Sale of Trees by Agroforestry Farmers

	Frequency	Percent (%)
No	54	37.6
Yes	89	62.4
Total	**143**	**100.0**

The findings in Table 4.23 show, 89 (62.4%) farmers said sell the trees from their land while 54 (37.6%) agroforestry farmers do not. Majority of the farmers sell the trees which they grow. Most of those who do not sell are still tending them before they grow to a level where they can be harvested. Therefore, agroforestry is a viable economic activity which should be encouraged and supported in order for its full potential to be realized.

4.7.5 Agroforestry Farmers Cost and Income for the Last Three Years

The researcher asked the respondents to indicate their cost and income trend for the last three years from the tree project with a view to establishing the performance of agroforestry projects. The cost and income for three years 2012, 2013 and 2014 for the agroforestry projects for the respondents is indicated in Table 4.24.

Table 4.24: Agroforestry Farmers Cost and Income for the Last Three Years

Cost	2012		2013		2014	
	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
0-1000	90	69.4%	104	77.5%	109	80.3%
1001-2000	4	2.3%	9	5.2%	14	8.1%
2001-3000	0	0.0%	5	2.9%	5	2.9%
3001-4000	0	0.0%	0	0.0%	0	0.0%
4001-5000	0	0.0%	5	2.9%	5	2.9%
5001-6000	0	0.0%	5	2.9%		0.0%
6001-7000	5	2.9%	5	2.9%	0	0.0%
7001-8000	0	0.0%	5	2.9%	0	0.0%
Above 8000	44	25.4%	5	2.9%	10	5.8%
Total	**143**	**100.0**	**143**	**100.0**	**143**	**100.0**
Income	**2012**		**2013**		**2014**	
	Frequency	**Percent (%)**	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**
0-1000	138	97.1%	138	97.1%	93	71.1%
2001-3000	5	2.9%	0	0.0%	0	0.0%
3001-4000	0	0.0%	0	0.0%	0	0.0%
4001-5000	0	0.0%	0	0.0%	0	0.0%
5001-6000	0	0.0%	5	2.9%	5	2.9%
6001-7000	0	0.0%	0	0.0%	0	0.0%
7001-8000	0	0.0%	0	0.0%	0	0.0%
Above 8000	0	0.0%	0	0.0%	45	26.0%
Total	**143**	**100.0**	**143**	**100.0**	**143**	**100.0**

The findings in Table 4.24 show that 69.4%, 77.5% and 80.3% of the respondents indicated they incurred a cost of Kshs.0-1,000 in 2012, 2013 and 2014 respectively from the trees project. On the other hand, the respondents indicated they had gotten an income of Kshs.0-1,000 in 2012, 2013 and 2014 respectively from the trees project. This implies that majority of the respondents

did break even from the tree project. The 45(26%) farmers who earned an income of more than Ksh.8,000 got it in the year 2014. This implies that the practice of agroforestry is growing in the study area.

4.8 Inferential Statistics

The study further applied multiple regressions to determine the predictive power of determinants of performance of agroforestry projects in Mbooni division.

4.8.1 Regression Analysis

The Regression Analysis was carried out to calculate the regression coefficient and regression equation using the independent variables, which were determinants of performance in this study and the dependent variables which was performance of agroforestry projects. The researcher applied the statistical package for social sciences (SPSS V 20.0) to code, enter and compute the measurements of the multiple regressions for the study.

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (performance of agroforestry projects in Mbooni division) that is explained by all the four independent variables (land tenure, size of land, nature of the land and extension services). The results of the regression analysis are show in Table 4.25:

Table 4.25: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.885	0.783	0.619	0.6273

a Predictors: (Constant),

b Dependent Variable: performance of agroforestry projects in Mbooni division.

The results of multiple regression analysis obtained multiple correlation coefficient (R) of 0.885 indicating multiple correlation between the independent variables (land tenure, size of land, nature of the land and extension services) and performance of agroforestry projects in Mbooni division. Adjusted R2 value of 0.783 indicates the independent variables of the study - land tenure, size of land, nature of the land and extension services are able to explain performance of agroforestry projects in Mbooni division by 78.3 percent.

4.8.2 Analysis of Variance (ANOVA)

The analysis of variance is shown in Table 4.26.

Table 4.26: ANOVA of the Regression

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	12.534	96	8.267	1.552	.0031
	Residual	29.307	168	5.327		
	Total	**41.841**	**264**			

Source: Research Findings

Predictors: (Constant), land tenure, size of land, nature of the land and extension services Dependent Variable: performance of agroforestry projects in Mbooni division.

The strength of variation of the predictor values influence the performance of agroforestry projects in Mbooni division variable at 0.0031 significant levels. This shows that the overall model was significant.

4.8.3 Regression coefficients

The regression coefficients in both the standardized and unstandardized form are indicated in Table 4.27.

Table 4.27: Coefficient of Determination

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.301	0.2235		5.821	0.011
	size of land	0.801	0.1032	0.761	7.762	.009
	nature of the land	0.763	0.2178	0.691	3.503	.028
	land tenure	0.794	0.1937	0.683	4.099	.019
	extension services	0.661	0.2158	0.549	3.063	0.016

Multiple regression analysis was conducted to determine the relationship between performance of agroforestry projects in Mbooni division and the four independent variables. P-values were used to test for the significance of each predictor variable (determinants of performance) in the model. The determinants of performance were significant when the significance value was less than 0.05 (significance level). The regression equation is as follows:

($\mathbf{Y} = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$) becomes:

($Y = 1.301 + 0.801X_1 + 0.763X_2 + 0.794X_3 + 0.661X4 + \varepsilon$)

Regarding the relationship between size of land and performance of agroforestry projects in Mbooni division the t value and significance levels were 7.762 and 0.009 against the significance level of 0.05 respectively, which indicates that the independent variable of size of land explained a highly significant proportion of the variation in the dependent variable .In regard to the relationship between nature of the land and performance of agroforestry projects, the t value and significance levels were 3.503 and 0.028 against the significance level of 0.05 respectively, which indicates that the independent variable of nature of the land explained a highly significant proportion of the variation in the dependent variable performance of agroforestry projects in Mbooni division.

With regard to the relationship between land tenure and performance of agroforestry projects in Mbooni division the t value and significance levels were 4.099 and 0.019 against the significance level of 0.05 respectively, which indicates that the independent variable of land tenure too explained a highly significant proportion of the variation in the dependent variable. Regarding the relationship between extension services and performance of agroforestry projects in Mbooni division the t value and significance levels were 3.063 and 0.016 against the significance level of 0.05 respectively. This indicates that the independent variable of extension services also explained a highly significant proportion of the variation in the dependent variable.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of findings, discussions, conclusions and recommendations of the study in line with the objectives.

5.2 Summary of Findings

The study findings are summarized below.

5.2.1 Land Tenure and Agroforestry

From the findings, majority (82.7%) of the respondents practice agroforestry. Majority (75.0%) of the forestry officers confirmed that 75% of the farmers practice agroforestry in Mbooni division. The study findings also indicated that majority (71.1%) of the respondents practice agroforestry on their own land while 28.9% practice it on family land. From the findings, majority (66.5%) of the respondents had acquired the land on which they practice agroforestry through inheritance and 33.5% had bought the land on which they practice agroforestry. The study further established that for majority (91.3%) of the respondents the land on which they practice agroforestry was not affected by any pending ownership dispute. 8.7% of the respondents practiced agroforestry on land that was affected by an ownership dispute. The study further revealed that land registration and issuance of title deeds would improve the scope of agroforestry projects in Mbooni division.

5.2.2 Size of Land and Agroforestry

According to the findings, majority (51.4%) of the respondents revealed that they owned two acres and above of land while 48.6% own less than two acres. The study established that, majority (65.3%) of the respondents had put 25% of their land and below under agroforestry while 17.3% had put 25-50% of their land under the practice with a similar number setting aside 50% of their land and above for the same practice. It was also clear that, 22% of the respondents had planted trees along the boundaries, 16% had trees scattered on the cropland, with the

majority (56%) having woodlots .These were the most common forms of agroforestry with woodlots being the main form of agroforestry.

5.2.3 Nature of the Land and Agroforestry

The general topography for the majority (60.7%) of the respondents land was found to be a gentle slope while 39.3% of the respondents owned land on a steep slope. Majority (60.1%) of the farmers were found to have planted most of the trees on the gentle slope while 39.9% of the farmers had planted most of the trees on the steep slope.

5.2.4 Extension and Agroforestry

According to the findings, 71% of the respondents said officers from the forest department do not provide extension services to them while 21% of the respondents said officers from the forest department provide extension services to them through chief's baraza's. 6% of the farmers said they had attended seminars/workshops. Therefore, majority of the farmers had no access to extension service. Most of those who had access to the extension services got them through chief's barazas.

The study found out that majority (38.2%) got extension services on a quarterly basis while 32% of the respondents accessed extension services at the beginning and in the middle of the year. 12.8% of the respondents got the services monthly with the remaining 8% getting the services once per year. The study further established that the county government supports the forestry officers in provision of extension services to a moderate extent. According to the study findings, the forestry department faces financial, human resource and logistical challenges in its efforts to provide extension services to the farmers.

The study revealed that majority (58%) of the agroforestry farmers planted the eucalyptus tree species, while 26% of the farmers planted the grevillea tree species with 16% of them planting the cypress tree species. The forestry department provides the farmers with the local tree species including; eucalyptus, cypress and grevillea through their groups. Most of the trees take 3-5, years, 5-7 years and above 7 years to reach maturity for harvesting.

Majority (62.4%) of the agroforestry farmers sell trees from their land while 37.6% of the agroforestry farmers did not sell the trees from their land. Majority (69.4%, 77.5% and 80.3%) of the farmers incurred a cost of Kshs.0-1,000 in 2012, 2013 and 2014 respectively from the trees project. On the other hand, the respondents indicated they had earned an income of Kshs.0-1,000 in 2012, 2013 and 2014 respectively from the trees project.

5.3 Discussions of Findings

The findings of the study are discussed in this section as per the objectives. The findings indicate that there is a significant relationship between land tenure and performance of agroforestry in Mbooni division. They confirm the views of Lwakuba et.al (2003) that land tenure makes farmers feel secure and grow trees. They confirm the views of Mithika (2011) that land tenure and development are closely related. Land tenure can promote better land use. The findings also bridge the gap brought out in the literature review where Ogolla and Mugabe (1996) had supported communal land ownership regime, Scoones and Wolmer (2002) had argued for a hybrid of communal and private land ownership regime with Lwakuba et.al (2003), Gichuki et.al (2002) and Mithika (2011) supporting an individualized land tenure. Smucker (2002) had argued for and against land tenure while World Bank (2002) had viewed land tenure as double-edged sword which constrains and facilitates agroforestry. The study in Mbooni division is unique in that it was done in an area on a hilly topography where agroforestry is a viable and a sustainable survival strategy for the farmers.

Regarding size of land and agroforestry, majority of the land owners practice agroforestry on approximately 25% of their land. Since agroforestry is an economic activity from which majority of the farmers earn a decent income and make a living, they are ready to set aside approximately 25% of their land for the practice. The findings support the views of Muturi (1992) that limited land resources and a high rate of population growth in Kenya necessitate the development of a sustainable land use system .Agroforestry is becoming a an integral feature of small land holder farming .The findings have also bridged the gap brought out in the literature review; Abagale et.al (2003) had noted that farmers with small parcels of land were reluctant to practice agroforestry while Mithika (2011) had noted that those with less than two acres of land are less inclined to practice tree planting to conserve the environment with Muturi (1992), Verchot

(2008) and Fahrstron (2000) viewing agroforestry as viable and sustainable practice for the owners of small parcels of land whose sizes would decrease with time. This study has shown that the level of commitment to agroforestry among farmers with two acres of land or less is as high as that of those with more than two acres of land. However the scope of agroforestry increases with an increase in the size of land. Therefore size of land determines performance to a large extent. The farmers who are practicing agroforestry on the gentle slope could also use the steep slope for agroforestry if encouraged through extension services taking into consideration the findings in in table 4.13 that 122 (71%) did not have access to extension services.

In regard to nature of land and performance, the findings indicate that nature of land determines performance of agroforestry to a large extent. They support the views of Young (1989) that agroforestry has the potential to permit arable farming on sloping land leading to sustained productive land use. The findings support the views of Gichuki et.al (2003) that areas with steep slopes can be used for tree planting taking into consideration the approximately 40% of the land in Mbooni division has a steep hilly topography. They also take care of the gap identified in the literature review where Verma et.al (2007), Glover et.al, (2013) Gichuki et.al (2000) and Lwakuba et.al (2003) had agreed that nature of the land determines performance of agroforestry in contrast to the views of Mithika (2011) and Scroth and Sinclair (2003) that scarcity of land leads to farming in areas that are not suitable for agriculture. The findings of the study in Mbooni division indicate that agroforestry is a sustainable land use practice which can be done in areas that are fragile and unsuitable for pure agriculture. However, the message of environmental conservation through agroforestry should include the economic and social benefits that come with agroforestry in order for it to be embraced widely.

The findings indicate that most farmers had no access to extension services. However, majority of those who had access to the services got them through the chief's barazas. Therefore, the most effective way of providing extension services was the chief's barazas. The findings confirm the findings of World Bank study (1994) that access to information especially among the poor is lacking .Five out of the 6 farmers who earned above Kshs. 100,000 from agroforestry projects had access to extension services through workshops since they can afford to pay for that service. The findings also confirm the views of ICRAF (2014) that farmers who receive extension

services practice the knowledge that they get on their land. The findings also support the views of World Bank (2000) that most extension officers in Kenya disseminate extension services through barazas. They also bridge the gap revealed in the literature review where Oduor (2011), Dudley et.al (2006), Scoones and Thompson (2009) had agreed on the need for a two- way traffic extension service regime with ICRAF (2014) arguing for the progressive farmer approach in which the fruits of agroforestry trickle down from the early adopters of agroforestry technology to the rest of the agroforestry community in contrast to Kerkhof (1990) who views this model as problematic since the early adopters of agroforestry-related technology do not always share it with the other farmers. The findings indicate that the group approach to provision of extension services through the chief's baraza is the most effective strategy.

The findings also indicate that majority of the respondents (38.2%) prefer quarterly extension contacts while 32% prefer two barazas in a year with the mid-year one being a review session. 8 (17%) respondents would like to attend one baraza in a year. Therefore most respondents would like to attend a minimum of one and a maximum of 4 barazas in a year. The findings bridge the gap revealed in the literature review where Oduor (2011), Dudley et.al (2006), Scoones and Thompson (2009), ICRAF (2014) and Kerkhof (1990) had agreed on the need for a two- way traffic extension service model but none of them had come up with a suggestion on the magnitude of extension services needed by the beneficiaries of those services.

5.4 Conclusion of the Study

The study concluded that the independent variables studied are determinants of performance of agroforestry projects in Mbooni division as follows:

Land tenure is, to a large extent, a determinant of performance of agroforestry projects in Mbooni division. When people enjoy the right to the land they live and work on the productivity in their land use practices is enhanced in their own interest and in the interest of their dependents, neighbours and other fellow citizens since a lot of time which could have been spent on dispute resolution is devoted to other useful activities on the farm. Good neighbourliness, peaceful coexistence and security are also enhanced where land ownership disputes are few or non-existent.

The size of land is, to a large extent a determinant of agroforestry projects in Mbooni division. When the size of land is two acres or less the land owner makes good use of that land in order to maximize on the returns from the little space available the same way an individual with more than two acres of land makes maximum use of the available land .However the scope of agroforestry increases with increase in size of land. 48.6% of the land owners in Mbooni division are those with less than 2 acres of land. Any stakeholder interested in boosting the practice of agroforestry cannot ignore them.

The nature/topography of land too is a determinant of performance of agroforestry to a large extent. The land whose topography is hilly is not very suitable for pure agriculture since such a practice could lead to severe environmental degradation if not managed well. Approximately 40% of the respondents own land whose topography is hilly. A robust sensitization campaign could lead to a significant increase in the number of farmers practicing agroforestry on such land especially those who have a small part of their land on a hilly topography with the rest of the land being on a gentle slope.

Extension services are a determinant of performance of agroforestry officers to some extent based on the research findings. Provision of extension services could go a long way in improving performance since 71% of the farmers involved in agroforestry in Mbooni do not have access to those services yet the farmers whose agroforestry projects are doing well have at one time or another used those services. Chief's barazas addressed by forestry officers are the best way of providing such services since they bring together all the local residents in an open forum that is not very expensive to constitute in monetary terms.

5.5 Recommendations

This study has made recommendations which are tailored to make agroforestry remain a sustainable land use practice. They should be implemented by different stakeholders in the field of agroforestry such the national and county governments, the private sector, the farmers and the non-governmental organizations working together.

1. Farmers should be encouraged to plant trees species which take 3- 5 to reach maturity and stagger the tree planting time and activities in order to maintain a tree cover of 10% and above and at the same time maximize on the returns form investment in agroforestry since the size of land is limited to two acres per land owner or less for majority of the land owners.
2. Farmers who have land whose general topography is gentle should be sensitized about the need to plant trees among crops and also use the steep part of it, if it is there, for growing of trees in order to enhance the tree cover in the area. Those farmers with land whose general topography is hilly should set aside the steepest part of it for agroforestry and practice woodlots since it is the best form of agroforestry for such areas.
3. KEFRI should develop tree species which take 3-5 years to reach maturity since most of the farmers prefer planting trees which reach maturity within that period and partner with the CBOs to make the species available to the farmers at affordable prices. This will go a long way in reversing the current trend where rampant sale of land results in subdivision of land into uneconomic units. It will also reduce the price of timber for the benefit of domestic and commercial construction industry in addition to minimizing cases of illegal logging and other forms of degradation of forest resources in the gazette forests.
4. Kenya Forestry services to partner with the county government of Makueni, NGOs and any other stakeholders available to build its human and financial resource capacity to provide a robust extension service regime including mounting the widest publicity campaigns possible for chief's barazas addressed by its officers since the barazas are the most convenient ways of providing extension services to agroforestry farmers. The publicity campaigns could be done through the local FM radio stations e.g. Musyi FM which is popular with farmers in the region.
5. The farmers in the 20-30 age brackets should be targeted for sensitization on the environmental importance and economic viability of agroforestry with a view to enhancing their uptake of the practice since majority of the farmers involved in agroforestry are aged between 59 and 59 years and their exit from the practice though natural attrition could cripple that practice.
6. KFS should use the findings of this research to increase the current national tree cover to 10% by waging more agroforestry campaigns in the areas with a hilly topography

without ignoring the areas without such topography. The message of agroforestry should include its economic benefits in order for it to be embraced widely.

7. KFS should recruit female forestry officers to encourage and extend special support to women in an effort to achieve gender parity in the uptake of agroforestry.

5.6 Suggested areas for Further Research

The researcher in this study proposes the following areas for further research:

1. Research should be done on the relationship between pure agriculture and performance of agroforestry projects.
2. Further research be done on the relationship between education and performance of agroforestry projects
3. A comparative study should be done on determinants of agroforestry in other parts of the country between areas where establishment of existing private land rights has been done and those areas where it has not been done with a view to getting a regional or national perspective on the determinants of agroforestry.

5.7 Contribution to the body of Knowledge

This study has made the following contribution to the body of knowledge as per the research questions.

The first research question was: To what extent does land tenure determine performance of agroforestry projects in Mbooni division? The study revealed that individualized land tenure determines to a large extent the performance of agroforestry projects.

The second research question was: To what extent does size of land determine performance of agroforestry projects in Mbooni division? The study found out that size of land determines, to a very large extent, performance of agroforestry projects and that farmers are willing to set aside approximately 25% of their land for agroforestry way beyond the 10% recommended by the UN. The study revealed that most farmers prefer woodlots to intercropping trees with food crops.

The third research question was: To what extent does nature of land determine performance of agroforestry? The study found out that nature of land determines to a large extent performance of agroforestry projects. However, the influence of pure agriculture where terraces are done on the steep slope and used for growing of crops only especially on the land with a small part of a steep slope on a general gentle slope, is strong.

The Fourth research question was: To what degree do extension services determine performance of agroforestry projects in Mbooni division? The study found that extension services determine to some extent performance of agroforestry. However the study revealed that although provision of extension service covers 27% of the potential beneficiaries only, a chief's baraza addressed between 2 and 4 times a year by forestry extension officers is the most effective way of providing extension services to the farmers.

REFERENCES

Abagale F, Addo J, Adisenu D,Mensah A Nyarko A Agyei B,….. Minu P. Nature of Land and Agroforestry. Retrieved from http://www.tropenbos.org/file

Asare R.(2004). Agroforestry initiatives in Ghana: A look at research and development: http://worldagroforestry.org/treesand markets//inaforesta/documents/ AgroforestryintitiativeinGhana.pdf. Retrieved on 16thJune 21, 2015

Bryman A.(2008).*Social Research Methods*(3rd ed.).New York: Oxford University Press.

Dudley N. Schlaepfer R., Jackson W., Jeanrenaud P., Stolton S.(2006). *Forest quality: Assessing Forests at Landscape Scale*, London: Earthscan Publishers.

FAO 2011:http://www.fao.org/docrep/013/i2050e/2050e.htm.

GichukiF., Mungai D., Gachene C., Donald B.(Eds.). (2000) .*Land and Water Management In Kenya: Towards a Sustainable Land Use* Soil and Water conservation Branch Nairobi: Ministry of Agriculture and Department of Agricultural Engineering, University of Nairobi

Government of Kenya(2010): Article61&69:*Constitution of Kenya*, Nairobi: Government Printers, .

Hamer E. D.(2012)Agroforestry comes of age but will farmers embrace it? Retrieved fromhttp:/www.treecologist.org/investigations/food and –farming/126734/ agroforestry – comes-of –age- bu- will- uk- farmers –embrace – it.html .on 13th June 2015.

Heylighen F. And Josly C (1992). The Systems Theory. Retrieved from http://pespmcl.vub.ac.be/systheor.html. on 23rd June 2015

ICRAF (2013): Annual report the world agroforestry centre. Retrieved from http://world agroforestry.org/ar2013 on30th June 2015.

Israel G. A.(1992).Determining sample size. Retrieved from: http://edis.ifas.ufl.edu/pdffiles/PD/PD00600.pdf.

Izac NM A(2003):.Economic Aspects of Soil Fertility Management and Agroforestry. In: Scroth and Sinclair (Eds.),*Trees, Crops and Soil Fertility: Concepts and Research Methods.* Wallinford, Oxon, U.K. :CABI publishers.

Juma C. and Ojwang J B (Eds.). (1996): *In Land We Trust: Environment, private Property and Constitutional change*. Nairobi: Initiatives Publishers.

Kaboggoza J. and Eilu G. (2008): Changes in Forestry Training Over The last Three Decades at Makerere University, Kampala Uganda. In *New Perspectives In Forestry Education:* Temu A.,Chamshema S., Kung'u J., Kaboggoza J., Chikimani B.,Kiwi B.(Eds.), (2008) African Network For Agriculture, Agroforestry Resources Education.

Kalaba K.F. et al. Contribution of agroforestry to biodiversity and livelihood improvement in rural communities of southern African Region http://www.geo.mtu.edu/-asmayer /rural-sustain/biodiversity/kalaba - et al-2010 pdf. Retrieved on 19th June, 2015

Kapsoot D. M. (2014)Agroforestry in India: New National Policy sets the bar high: www.theguardian.com/global-development-professionals-nmetwork-/2014//feb/17/india-national-policy-agroforestry-tree-coverage. Retrieved on 13th June 2015

Karlinger(1973): In Mwendwa T.A(2012): Factors affecting afforestation programmes in Chiulu Division, Kitui County, Kenya MPPM Project, University of Nairobi.

Kaseva D M(2013): An analysis of optimal Agroforestry enterprise mix under production risk in Mbooni West District, Kenya; Msc. Thesis in Agricultural and applied economics, University of Nairobi.

Kerkhof P. (1990). *Agroforestry in Africa -A survey of Project Experience* London: Panos Publications Limited.

Kiyiapi J (2008):Views from Various Organizations In:*New Perspectives In Forestry Education.* Temu A.,Chamshema S., Kung'u J., Kaboggoza J., Chikimani B., Kiwi B. (Eds.), African Network For Agriculture, Agroforestry and Natural Resources Education.

Kinwe S. (1993).*The Utilization of Agroforestry Trees: The experience of KWDP/KWAP*-Kenya Wood fuel and Agroforestry Programme, Nairobi: ETC Kenya Consultants B.V.i

Kiunzi R. (1994). V*egetation; Loss In Rural Settlements: Causes and Remedies with Examples From Tanzania* .Tanzania: Dar-es salaam University Press.

Lwakuba A. Kaudia ,A Okorio J,Esegu J Akileng J (2003):*Agroforestry Handbook for The Montane Zone of Uganda*. Regional Land Management Unit Nairobi, Kenya.

Lesniewski P(2006) Hierarchy Theory:www.uni.-kiel.de/ecology/users/…./2006-06-28-HierarcyTheory.Retrieved on 23rd June 2015.

Kloppenborg JT.(2012).*Contemporary project management: organize, plan, perform (*2nd ed.).London: South-Western Cengage Learning.

Makau R(2013).Avifaunal Survey of Mbooni Hill top Forests, Eastern Kenya. A technical Report to African Bird Club. Retrieved from http://www.africanbird.org/sites/default/files/2013-Mbooni-Hills-pdf. on 30th June, 2015.

Makueni County Integrated Development Plan (2013) Retrieved from :http://www.kenyampya.com/userfiles/ Makueni%/2520 CIDP%250% sept20139 (i).pdf. on 30th June 2015.

Mbugua D (2014, November 14) Forest Resource Assessment *Daily Nation* pp Xx

Mithika T.A. (2011). Investigation of The Factors Contributing to Environmental Degradation in Tigania North Division, Tigania East District, MPPM project, University of Nairobi.

Mugenda O. and Mugenda A. (2003). *Research Methods: Quantitative and Qualitative Approaches* .Nairobi: ACTS Press.

Mugo E (2015, June 5).It is our duty to conserve the environment. *Daily Nation*, pp 13.

Murigi M. (2015, July18: Bamboo New green Gold for Rural Farmers, *People Weekend*, pp8.

Musukwe and Mbalule (2001): *Agroforestry In: Agriculture in Uganda* Volume 111: Forestry Kampala: Mukiibi Fountain Publishers Ltd Kampala.

Muturi S.(Ed.). (1992): *Curriculum For In –Service Training in Agroforestry and Related Subjects in Kenya*. Nairobi. English Press, Nairobi.

Nyandemo S. and Kongere T (2010):*Project Management: From Design Implementation.* Nairobi: Richmond Designers and Printers.

NubergI, Brenda G, Reid R (2009): Agroforestry for natural resource management .Retrieved from http://www.publishcsiro.au./samples/ Agroforestry-NRM.pdf.

Ogolla B.D. and Mugabe J.(1996). Land Tenure and forest resource Management .In *In land we Trust.* Nairobi: Initiatives Publishers.

Ogayo J (2012) Factors Influencing Implementation of Humanitarian Assistance Programmes in Emergency Contexts: A case of Dadaab Refugee Camp in N E Kenya: MPPM Project University of Nairobi.

Okowa P. & Mwangi A. (1996). Land Tenure and Forest Resource Management. In *In land We trust.* Nairobi: Initiatives Publishers.

Rocheleau, Weber F., Juma A.,(1988).*Agroforestry in Dryland Africa*. Nairobi: ICRAF

Scoones I. and Womer W. (Eds.).(2002). *Pathways Of Change In Africa :Crops, Livestock& Livelihoods in Mali, Ethiopia and Zimbabwe*. Oxford, UK: James Currey publishers.

Scoones I. and Thompson J. (2009): *Farmer First Revisited: Innovation For Agricultural Research and Development.* Bourton on Dunsmore ,Rugby, Warwickshire, U.K : Practi Action Publishing.

Scroth G. and Sinclair F. L. (Eds.). (2003): *Trees, Crops and Soil Fertility: Concepts and Research Methods* Wallinford, Oxon ,U.K:CABI publishers.

Shibu J, Gold M.A ,Garret H.E(2012) .The Future of Temperate Agroforestry in the United States. The Centre for Agroforestry University of Missouri; Retrieved from: http://greenlandsbluewaters.net/Future%2520Temperate %2520AF%20 in %20 the%20 US %20 -%20 2012 pdf.

Smucker T. (2002) : Land Tenure and Changes in Land –Use and Land Management in Semi-Arid Tharaka. LUCID Working Paper Series No 11, Michigan State University.

Temu A. Chamshema S Kung'u J Kaboggoza J Chikimani BKiwia A (Eds.).(2008):*New Perspectives In Forestry Education*. African Network for Agriculture, Agroforestry and Natural Resources Education.

Tyler G. and Mille J. (1996).*Sustaining The Earth: An Integrated Approach*,(2nd ed.).New York: Wadsworth Publishing Co.

Verchot L. (2005):Opportunities for linking adaptation and mitigation in agroforestry systems in: Robledo A (Ed.).*Tropical forests and adaptation to climate change*. Published by centre for international forestry research, Situ Gede, Sindang, Barang, BoBarat,16680, Indonesia.

Verchot L.(2008): A look over the Horizon at Climate Change Issues relative to Agroforestry: Opportunities for relevant Forestry research towards 2030 in*:* Temu A Chamshema S Kung'u J Kaboggoza J Chikimani BKiwia A (Eds.). *New Perspectives in Forestry Education.* African Network for Agriculture, Agroforestry and Natural Resources Education.

Verma K, Bhardwaj D & Chaud K. (2007): Agroforestry in Himachal Pradesh. Retrieved from http://books.google.com/books?isbn=8189422626.

Walonick S D:(1993)General Systems Theory. http://www.statpac/.org/walonck/systems-theory.htm.Retrieved on 23th June 2015

World Bank a (2000): *Agricultural extension, The Kenyan Experience: An impact Evaluation*. Operations and Evaluation Department, World Bank, Washington, USA.

World Bank b (2000): *The World Bank Forest Strategy: Striking the Right Balance*, Operations and evaluation Department, World Bank, Washington, USA

Young A. (1989): *Agroforestry for Soil Conservation* Wallingford, Oxon, U.K: CAB International

Young T(2007).*The Handbook of Project Management. A practical guide to effective policies, Techniques and Processes* (*Revised* 2nd ed.).London: Kogan Publishers.

APPENDICES

Appendix I: Questionnaire for Agroforestry Farmers

Part A: Bio-Data

Please tick (√) as appropriate

1. Indicate your gender

Male [ ] female [ ]

2. What is your age bracket?

(i) Under 20 [ ]

(ii) 20 - 29 [ ]

(iii) 30-39 [ ]

(iii) 40 -49 [ ]

(iv) 50 – 59 [ ]

(v) 60 and above [ ]

3. Please indicate your academic level

(i) No formal education [ ]

(ii) Primary level [ ]

(iii) Secondary level [ ]

(iv) College level [ ]

(v) University level [ ]

(vi) Any other ; Specify _____

Part B

Section 1: Land tenure and Agroforestry

4 Do you practice agroforestry? Yes [ ] No [ ]

5 Do you practice it on your own or family land?

(i) Own [ ] (ii) family land [ ]

6 If your answer to (6) above is (i) how did you acquire your land

Inherited [ ] bought [ ]

7. Is your land affected by any pending ownership dispute? Yes [ ] No [ ]

Part 2 : Size of Land and Agroforestry

8 How much land do you own in acres? [ ]

(i) Less than two acres [ ]

(ii) Two acres and above [ ]

9 How much land have you put under agroforestry?

(i) 25 % and below [ ]

(ii) 25 – 50 % [ ]

(iii)50 % and above [ ]

10Where have you planted trees on the land?

(i) Scattered on the cropland [ ]

(ii) Along the land boundaries [ ]

(iii) Live fence [ ]

(iv) Wind break [ ]

(v) Woodlots/block planting [ ]

Part 3: Nature of the Land and Agroforestry

11 Indicate the general topography of your land

Steep slope [ ] gently slope [ ]

12 Where have you planted most of your trees?

(i) On the gentle slope [ ]

(ii) On the steep slope [ ]

Part 4 Extension and Agroforestry

13 In which of the following ways do officers from the forest department provide extension services to you

(i) Chief's barazas [ ]

(ii) Visits to farms [ ]

(iii) Seminars/workshops [ ]

(iv) Demonstration sites [ ]

(v) Forestry Extension officers barazas [ ]

(vi) None [ ]

14 If your answer to 18 above is (i) – (iv) how often are the extension services provided to you

(i) Monthly [ ]

(ii) Quarterly [ ]

(iii) Mid-year [ ]

(iv) Annually [ ]

15 Where do you obtain tree planting materials?

(i) From family tree nursery [ ]

(ii) From the forest department for free [ ]

(iii) From Non-governmental Organizations for free [ ]

(iv) Buying from Community-based organizations [ ]

(v) Buying from forestry department [ ]

(vi) Collection from thickets [ ]

16 Which tree species do you plant?

(i) Eucalyptus [ ]

(ii) Cypress [ ]

(iii)Others _____

17 Who does planting, pruning, thinning and harvesting of trees on your land?

(i) Self [ ] (ii) Labourer [ ]

18 How long does it take the trees to mature for harvesting?

(i) 3 - 5 years [ ]

(ii) 5- 7 years [ ]

(iii) Above 7 years [ ]

19 Do you sell the trees from your land?

Yes [ ] No [ ]

20 Kindly indicate the trend of your cost and income from your trees project for the last 3 years

Year	**2012**	**2013**	**2014**
Cost			
Income			

Thank you very much for your support and cooperation

Appendix II: Questionnaire Forestry Officers

Part A: Bio-Data

Please tick (√) as appropriate

1. Indicate your gender

   Male [ ] female [ ]

2. What is your age bracket?

   (i) 20 - 29 [ ]

   (ii) 30-39 [ ]

   (iii) 40 -49 [ ]

   (iv) 50 – 59 [ ]

3. Please indicate your academic level

   (i) Primary level [ ]

   (ii) Secondary level [ ]

   (iii) College level [ ]

   (iv) University level [ ]

   (v) Post-graduate [ ]

4. Have you attended any training on agroforestry?

   Yes [ ] No [ ]

Part B

Section 1 – Land tenure and Agroforestry

5 What is the percentage of the farmers who practice agroforestry in Mbooni division?

   (i) 25%

   (ii) 50%

   (iii) 75%

   (iv) Over 75%

6 Would land registration and issuance of title deeds improve the scope of agroforestry projects in Mbooni division?

Yes [ ] No [ ]

Part 2: Size of Land and Agroforestry

7 What is the average land holding in Mbooni Division?

(i) Less than two acres [ ]

(ii) Two acres [ ]

(iii) More than two acres [ ]

8 Which is the most common form of agroforestry in Mbooni division?

(i) Trees Scattered on the cropland [ ]

(ii) Trees around the land boundaries [ ]

(iii)Trees being a Live fence [ ]

(iv)Woodlots/block planting [ ]

Part 3: Nature of the Land and Agroforestry

9 What is the topography of most of the land in Mbooni Division?

(i) Steep slope [ ]

(ii) Gentle slope [ ]

10 On which part of the land do agroforestry farmers plant most of the trees?

(i) On the steep slope [ ]

(ii) On the gentle slope [ ]

Part 4: Extension and Agroforestry

11Does your departments provide extension services to farmers to the farmers in Mbooni Division?

Yes [ ] No [ ]

12 In which of the following ways does your department provide extension services to the farmers?

(i) Chief's barazas [ ]

(ii) Visits to farms [ ]

(iii) Seminars/workshops for farmers [ ]

(iv) Demonstration sites [ ]

(v) Extension officers barazas [ ]

(vi) All of the above [ ]

13 In your opinion which of the above extension models is most effective?

(vii) Chief's barazas [ ]

(viii) Visits to farms [ ]

(ix) Seminars/workshops for groups of farmer s [ ]

(x) Demonstration sites [ ]

(xi) Extension officers barazas [ ]

14 How often does your department provide extension services to the farmers?

(i) Monthly [ ]

(ii) Quarterly [ ]

(iii) Mid-year [ ]

(iv) Annually [ ]

15 Does your department provide the farmers with tree planting materials?

Yes [ ] No [ ]

16 If your answer to the above question is **yes** on what terms do you provide the tree planting materials?

(i) For free

(ii) For a subsidized price

(iii) For a market price

(iv) For free on research basis

17 Which tree species do you provide the farmers with?

_____

_____

18 How long do the trees take to mature for harvesting?

(i) 3 - 5 years [ ]

(ii) 5- 7 years [ ]

(iii) Above 7 years [ ]

19 Does the county government support you in provision of extension services?

(i) To a very great extent [ ]

(ii) To a great extent [ ]

(iii) To a moderate extent [ ]

(iv) To some extent [ ]

(v) To no extent [ ]

20 What challenges does your department face in its efforts to provide extension services to the farmers?

(i) Financial challenges [ ]

(ii) Logistical challenge [ ]

(iii) Human Resource challenges [ ]

(iv) All of the above [ ]

(v) None of the above [ ]

(vi) Others;Specify_____

_____

21 What can be done to improve the performance of agroforestry projects in Mbooni division?

_____

_____

Thank you very much for your support and cooperation

Appendix III: Transmittal Letter

Dear Sir/Madam, Date: 30th September, 2015

REF: REQUEST FOR CONSENT TO CARRY OUT RESEARCH ON AGROFORESTRY IN MBOONI DIVISION, MBOONI WEST SUBCOUNTY.

My name is PETER KAMAU NDUATI. I'm a student at the University of Nairobi's department of extra-mural studies pursuing a master of arts in project planning and management degree course.

I have identified you as a source of the data required to make the above-mentioned study successful.

The information which you will provide will be used for the study purposes only. It will be handled with very high confidentiality.

Thanking you in advance.

Yours faithfully,

P .K. NDUATI

Appendix IV: Household Population for Mbooni West Sub County Population Distribution by Sex, Number of Households, Area, Density and Administrative Units

	Male	Female	Total	Households	Area in Sq Km.	Density
KIUMONI	828	858	1,686	299	17.4	97
KANTHUNI	4,179	4,646	8,825	1,633	113.1	78
KANTHUNI	1,407	1,646	3,053	557	43.3	70
IVINGANZIA	1,353	1,517	2,870	553	34.9	82
YEKANGA	1,419	1,483	2,902	523	34.9	83
KITISE	9,573	10,256	19,829	3,709	292.0	68
MBUVO	4,641	5,046	9,687	1,772	118.1	82
KIANGINI	2,249	2,426	4,675	857	58.7	80
KITULUNI	2,392	2,620	5,012	915	59.4	84
KITISE	4,932	5,210	10,142	1,937	173.9	58
KITISE	3,363	3,540	6,903	1,338	111.0	62
MWANIA	1,569	1,670	3,239	599	62.9	52
MBOONI	**84,788**	**93,044**	**177,832**	**37,302**	**894.6**	**199**
KALAWA	12,953	14,221	27,174	5,525	330.1	82
KALAWA	4,164	4,487	8,651	1,883	94.8	91
KALAWA	755	844	1,599	351	21.9	73
KIMEENI	920	1,036	1,956	382	29.6	66
MALUNDA	1,278	1,324	2,602	583	27.4	95
MBUKONI	1,211	1,283	2,494	567	16.0	156
KATHULUMBI	2,962	3,258	6,220	1,251	91.4	68
KATHULUMBI	896	981	1,877	386	30.9	61
MUTEMBUKU	940	975	1,915	385	21.4	89
SYOTUVALI	1,126	1,302	2,428	480	39.1	62
ATHI	2,288	2,582	4,870	932	67.9	72
MIANGENI	729	850	1,579	319	21.0	75
KAVUMBU	625	695	1,320	249	18.7	71
KINZE	934	1,037	1,971	364	28.2	70
KATANGINI	3,539	3,894	7,433	1,459	75.9	98
THWAKE	935	1,013	1,948	391	20.3	96
NDAUNI	989	1,113	2,102	412	15.8	133
ITITU	866	941	1,807	347	18.6	97
KATHONGO	749	827	1,576	309	21.1	75
KISAU	25,400	27,949	53,349	11,460	297.1	180
WAIA	7,906	8,384	16,290	3,456	121.5	134
KAKO	1,509	1,696	3,205	651	29.6	108
SAKAI	1,770	1,854	3,624	772	22.6	160
USALALA	2,600	2,655	5,255	1,162	34.7	151
NDULUKU	2.027	2,179	4,206	871	34.6	122
KISAU	7,873	8,779	16,652	3,475	92.2	181

MUTHWANI	2,169	2,427	4,596	979	26.5	173
NGONI	2,140	2,172	4,312	878	20.8	208
MUKIMWANI	1,973	2,470	4,443	911	21.5	207
MANGANI	1,591	1,710	3,301	707	23.4	141
KITETA	9,621	10,786	20,407	4,529	83.3	245
KAKUSWI	2,197	2,416	4,613	1,070	20.1	230
KIAMBWA	2,756	**3**,159	5,915	1,393	19.2	308
NDITUNI	1,693	1,866	3,559	733	13.8	258
NGILUNI	2,975	**3**,345	6,320	1,333	30.3	209
TULIMANI '	16,913	18,437	35,350	7,568	125.8	281
TULIMANI	3,620	3,782	7,402	1,544	36.7	202
HANI	3,620	3,782	7,402	1,544	36.7	202
KALAWANI	7,525	8,068	15,593	3,363	51.7	302
KALAWANI	4,631	4,761	9,392	2,036	36.9	255
MAVINDU	2,894	3,307	6,201	1,327	14.8	418
ITETANI	2,453	2,689	5,142	1,123	20.7	248
ITETANI	2,453	2,689	5,142	1,123	20.7	248
YANDUE	3,315	3,898	7,213	1,538	16.7	433
YANDUE	1,768	2,054	3,822	807	7.8	493
MBANYA	1,547	1,844	3,391	731	8.9	380
MBOONI	29,522	32,437	61,959	12,749	141.7	437
MBOONI	16,113	17,661	33,774	7,262	64.0	528
MUTITU	4,828	5,144	9,972	2,189	20**.4**	488
KYUU	4,481	4,896	9,377	2,004	17.4	540
UTHIUNI	2,163	2,330	4,493	994	9.5	472
NZEVENI	4,641	5,291	9,932	2,075	16.7	596
KITHUNGO "	5,870	6,431	12,301	2,442	39.9	308
KALIAN I	2,399	2,650	5,049	994	21.1	240
UVUU	842	895	1,737	371	1.7	1029
NGAI	2,629	2,886	5,515	1,077	17.2	322

Population Distribution by Sex, Number of Households, Area, Density and Administrative Units

	Male	**Female**	**Total**	**Households**	**Area in Sq Km.**	**Density**
KITUNDU	4,254	4,722	8,976	1,754	22.0	408
MATAA	1,046	1,087	2,133	414	5 I	394
K1TUNDU	3.208	3,635	6.843	1.340	15.3	**41?**
UTANGWA	3.285	3,623	6,908	1,291	15.3	439
KAVUM8U	1,060	1.230	2,290	446	7.3	293
UTANGWA	2,225	2,393	4.618	845	7.9	532
K1BWEZI	**123,069**	**125,635**	**248,704**	**52,979**	**3,985.3**	62
MTITO ANDEI	38 862	39,345	78,207	16,412	941.0	63
MTITO ANDEI	6,138	6,004	12,142	3,077	212.5	57
MTITO ANDEI	6,138	6,004	12,142	3,077	212.5	57
KAMBU	5,820	6,105	11,925	2.358	100.8	118
KITENGEI	2 105	2,155	4.260	838	63.0	68
KAMBU	3,715	3,950	7.665	1,520	37.8	203
NGWATA	5.547	5,663	11,210	2,312	201.9	56
MUKAANGE	5.547	5,663	11,210	2,312	201.9	56
NTHONGONI	9.855	9,695	19,550	3,854	168.9	116
MANG'ELETE	9,855	9,695	19,550	3,854	168.9	116
NZAMBANI	6,402	6,691	13,093	2,741	126.0	104
MUTHINGIIN:	6,402	6,691	13,093	2,741	126.0	104
KATHEKAN1	5,100	5,187	10,287	2.070	131.0	7?
KATHEKANI	5,100	5,187	10,287	2,070	131.0	79
MAKINDU	34.406	35,896	70,302	15,425	848.2	83
MAKINDU	11,653	12,275	23,926	5,797	169.8	141
KAI	1,424	1,429	2,853	730	29.9	95
KIU .	3,044	2,913	5,957	1,307	27.9	213
MANYATTA	4,227	4,811	9,038	2,593	11.3	798

KISINGO	1,736	1,856	3,592	696	32.3	111
KAMBOO	1,222	1,266	2,488	471	68.3	36
NGUUMO	13,697	14,511	28,208	5,774	210.6	134
NDOVOINI	2,108	2,171	4,279	936	32.5	132
SYUMILS	2,856	3,203	6,059	1,110	71.2	85
MUUNI	4,931	5,160	10,091	2,199	64.7	156
KAUNGUNI	3 80?	3.977	7 779	1,529	42.2	184
KIBOKO	5.526	5,283	10,809	2,434	3	31
KYALE	1,876	1,957	3,833	717	100.2	3B.
KAASUVI	1,830	1,644	3,474	983	168.4	21
MULIU	1820	1,682	3;502	734	77.7	45
TWAANDU	3.530	3,827	7,357	1,420	121.6	61
NGAKAA	1,094	1,263	2,357	456	23.7	100
MITENDEU	.1,161	1,299	2,480	496	53.0	47
. KALII	1,255	1,265	2,520	468	44.9	56
MACHINERY	16,048	16,025	32,073	6,749	261.4	123
KINYAMBU	5,001	4,945	9,346	2.364	134.5	74
KINYAMBU	5,001	4,945	9,946	2,364	134.5	74
UT1THI	11,047	11,080	22,127	4,385	126.9	174
UTITHI	4,925	5,056	9,981	1,944	55.6	179
THANGE	6,122	6,024	12,146	2,441	71.2	171
KIBWEZI	33,086	34,180	67,266	13,893	683.7	98
KIKUMBULYU	22,869	23,337	46,206	9,697	403.8	114
MIKUYUNI	4,629	4,841	9,470	2,585	21.9	433
MBUI NZAU	1,536	1,548	3,084	540	21.9	141
KALUNGU	2 299	2,370	4,669	936	22.9	204
NGANDANI	4,400	4,269	8,669	1,827	52.6	165
KATHYAKA	4,267	4,438	8,705	1,719	104.6	83
NDETANI	1,432	1,336	2,768	486	18.0	154
NGULU	4,306	4,535	8,841	1,604	162.0	55

MASONGALENI	10,217	10,843	21,060	4.196	279.9	75
MASIMBANI	3,256	3,330	6,586	1,310	70.7	93
ULIUNZI	3,309	3,433	6,742	1.315	146.7	46
KYANGULI	806	944	1,750	336	22.3	78
MASONGALENI	2,846	3,136	5,982	1,235	40.1	149
TSAVO W. N. P.	591	178	769	429	475.3	2
TSAVO W. N. P.	591	178	769	429	475.3	2
TSAVO W.N.P	591	178	769	429	475.3	2
CHYULU G. R.	76	11	87	71	775 8	0
CHYULU G. R.	76	11	87	71	775.8	0
CHYULU G R.	76	11	87	71	775.8	0
NZAUI	**100,410**	**104,265**	**204,675**	**44,193**	**1,418.6**	**144**

Appendix V: Table for Determining Sample Size

Sample size for ± 3%, ± 5 %, ± 7% and ±10% Precision Levels where Confidence level is 95% and P = 5

Size of population	**Sample Size (n) for Precision 9(e) of :**			
	± 3%	± 5%	± 7%	± 10%
500	a	222	145	83
600	a	240	152	86
700	a	255	158	88
800	a	267	163	89
900	a	277	166	90
1,000	a	286	169	91
2,000	714	333	185	95
3,000	811	353	191	97
4,000	817	364	194	98
5,000	909	370	196	98
6,000	938	375	197	98
7,000	959	378	198	99
8,000	976	381	199	99
9,000	**989**	**383**	**200**	**99**
10,000	**1,000**	**385**	**200**	**99**
15,000	1,034	390	201	99
20,000	1,053	392	204	100
25,000	1,064	394	204	100
50,000	1,087	397	204	100
100,000	1,099	393	204	100
>100,000	1,111	400	204	100
a = Assumption of normal population is poor(Yamane,1967).The entire population should be sampled				

Source :http://edis.ifas.ufl.edu/pdffiles /PDP/PD oo600.pdf.

Appendix VI: Introduction Letter

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

Your Ref:

Our Ref:

Telephone: 318262 Ext. 120

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
N A I R O B I

30th September 2015

REF: UON/CEES//NEMC/22/346

TO WHOM IT MAY CONCERN

RE: PETER KAMAU NDUATI -L50/71738/2014

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

He is proceeding for research entitled **"determinants of performance of agro forestry projects in Mbooni Division, Mbooni West Sub-County, Makueni County**.

Any assistance given to him will be appreciated.

UNIVERSITY OF NAIROBI CEES
P.O. Box 30197
30 SEP 2015
NAIROBI
NAIROBI EXTRA MURAL CENTRE

CAREN AWILLY
CENTRE ORGANIZER
NAIROBI EXTRA MURAL CENTRE

Appendix VII: Authorization Letter

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:
27th October, 2015

NACOSTI/P/15/11557/8289

Peter Kamau Nduati
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Determinants of performance of Agro-Forestry project in Mbooni Division, Mbooni West Sub-Couty, Makueni County,"*** I am pleased to inform you that you have been authorized to undertake research in **Makueni County** for a period ending **25th October, 2016.**

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

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

SAID HUSSEIN
FOR: DIRECTOR GENERAL/CEO

Copy to:

The County Commissioner
Makueni County.

The County Director of Education
Makueni County.

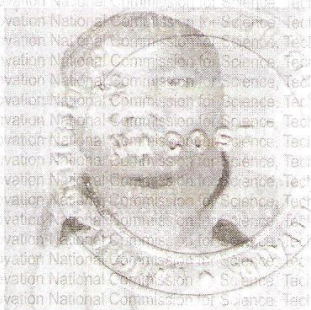
Appendix VII: Research Permit

THIS IS TO CERTIFY THAT:
MR. PETER KAMAU NDUATI
of UNIVERSITY OF NAIROBI, 1265-217
LIMURU,has been permitted to conduct
research in *Makueni County*

on the topic: *DETERMINANTS OF PERFORMANCE OF AGRO-FORESTRY PROJECT IN MBOONI DIVISION, MBOONI WEST SUB-COUTY, MAKUENI COUNTY*

for the period ending:
25th October,2016

Permit No : NACOSTI/P/15/11557/8289
Date Of Issue : 27th October,2015
Fee Recieved :Ksh 1000



.....
Applicant's Signature

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

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 6953

CONDITIONS: see back page

Appendix IX: Eucalyptus Woodlots in Mbooni Division

Appendix X: Map of Mbooni West