FACTORS INFLUENCING FARMERS' DECISIONS TO ADOPT AGRO-SILVICULTURE IN KENYA: A CASE OF KAPENGURIA DIVISION, WEST POKOT COUNTY.

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A research project submitted in partial fulfillment of the requirements for the award of Master of Arts degree in project planning and management.

University of Nairobi

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DECLARATION

This research project is my original work and has not been presented to any other university for credit.

Signed…….**.....** Date ……...……

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L50/62723/2013

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

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DEDICATION

I dedicate this research project to my mother Carorine Tuwei, dad Hannington Koskei, my son Easter and the entire family for moral support and encouragement, during the writing of this research project.

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I am heavily grateful to my supervisor Mr. Cheben who guided me through the process of writing this research project. Gratitude also goes to the School of Education and Distance Learning University of Nairobi for providing me with conducive environment for developing this research project. Much appreciation also goes to Hassan Abdala for his tireless support throughout the development of this research project. I also extend much appreciation to my class mates Samary Sabila, Benard Pyegon who gave me moral support during preparation of this project. Special thanks to my lecturers in the school of education and distance learning. They shaped me and gave me the right stuff that is compliant to the current economic and social challenges. Finally, I am thankful to God for the grace He generously gave me to undertake the study.

ABSTRACT

Agro-forestry is a collective name for all land-use systems and practices where woody perennial plants are deliberately grown on the same land management unit as agricultural crops and/or animals, either in spatial mixture or in temporal sequence, while agro-silviculture basically entails combination of crops and trees in the same land management unit. The study investigates the factors that influence farmers' decision to adopt agro-silviculture Kenya: a case of Kapenguria DivisionWest Pokot County. The guiding objectives of the study were; to determine the influence of land tenure on adoption of agro-silviculture in Kapenguria Division, establish how planting inputs (capital, fertilizer and seeds) influence adoption of agro-silviculture, to establish the influence of gender on adoption of agro-silviculture and finally to investigate the influence of knowledge of benefits of tree planting on adoption of agro-silviculture in Kenya a case of Kapenguria Division West Pokot County. The population of this study dwelt solely on farmers. To add up to a target population of 300 it involved four forest officers, 2 from KVDA and 2 agriculture officers. The study selected a sample size of 169 respondents from the targeted 300 by use of Krejcie and Morgan 1970 table. The study employed simple random sampling in selecting the farmers that participate in this study. Data collection entailed use of questionnaires, interviews and observation and analyzed using descriptive methods. The frequencies and percentages were used in interpreting the respondent's perception of issues raised in the questionnaires to answer the research questions in table format. The study findings indicated that land tenure, planting inputs, gender and knowledge of benefits influences adoption of silviculture. Most of the residents in study area owned enough piece of land on which they could practice agro-silviculture. The adoption of agro-silviculture was also dependent on the ability of the farmers to procure their planting inputs like fertilizers, seedlings and resistant species. The influence of gender was likely to play a role in the adoption of agro-silviculture. Knowledge of the benefits of agro-silviculture is a motivation towards it adoption. The study recommends that the government should deploy more extension officers to do regular agro-silviculture training to ensure proper land use; increase in capacity building to ensure that farmers access seedlings from government sectors (Kenya Forest Service) and subsidize fertilizers for farmers; national and county government should empower women to enable them increase agro-silviculture practices so as to partake of the benefits of the noble course and finally more campaigns should be held to increase farmers' knowledge on benefit of agro-silviculture.

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ABBREVIATIONS AND ACRONYMS

ASAL Arid and Semi-arid Lands areas

DANIDA Danish Development Agency

FAO Food and Agriculture Organization of the United Nations

FINNIDA Finnish Development Agency

GOK Government of Kenya

ICRAF International Centre for Research in Agroforestry

JICA Japan International Cooperation Agency

KEFRI Kenya Forestry Research Institute

KVDA Kerio Valley Development Authority

CHAPTER ONE

INTRODUCTION

1.1 Background information

FAO (1999) found out that worldwide, there are more trees on the farms than in state forests. The distribution of trees planted on farms differs significantly between continent to continent and country to country. It indicated that in Western Europe, tree planted on farms hold up to 54% of the total forestlands and 49% in North America. The distribution by size of individual owners in North America skewed towards large commercial forest owners and corporation while in Western Europe, the majority of the tree owners are smallholders. (Cheboiwa and Langat 2006).Stated that42% of the private forests in Germany are owned by farmers who hold less than 5 hectares of land while in Japan, smaller individuals and communities own 64% of forestland. Scandinavian countries are reputed to have one of the most developed private forests in the world for example, in Finland 60% of the forestland, are trees planted and owned by small holders under the umbrella of forest owners association, while in South Africa, farm forestry accounts for 1.2% of the total area of land (FAO, 1997)

Kenya's population has continued to increase rapidly, creating an additional one million people every year. This increase is exerting stress and pressure on existing natural resources including land. It is therefore, important to intensify production on the available scarce land in order to prepare agriculture to contribute effectively to the economy and sustain livelihoods. This has increased the use of appropriate technology, proper land use management and conservation of soil and water resources. Currently, agro-forestry is

receiving more attention from government and development organizations around the world. They have identified the potential for agroforestry in addressing several environmental and developmental problems (ICRAF, 2003).

The Kenyan concept of trees outside forests thus exists within a broad context of land tenure system comprising all tree resources and land lying outside gazetted or protected forests. Included are woodlands, pastoral systems, agroforestry, scattered trees, and hedges among others. Trees may occur naturally or they may have been planted, and there are no conceptual limits on density or area. (Kiyapi, 2002).The Forest Act No 7 of 2005 provides three types of forests namely: state forests, local authority forests and private forests. State forests are public forests which are protected by the state and they are designated in specific areas such as hilly terrains, catchment areas and other suitable sites. Local authority forests are trust lands vested under local authority to manage for the public, whereas farm private forests are those that are owned by individuals. But there are limited information onfactors that influence farmers' decision to adopt agro-silviculture in West Pokot County.

Kenya has been experiencing high population growth for the last four decades which grew at the rate of 3.8% from 1969 to 1979, 3.4 % between 1979 and 1989 and by 2.9% from 1989 to 1999 (GOK, 2001& 2009).It grew at the rate of 3% raising the population to approximately 40 million (GOK, 2009). The rural areas sustain over 80% of the population and the rest 20% are located in the urban and major trading centers spatially located in the country (Cheboiwa, 2006). The concentration of the population and agricultural activities (farming), keeping livestock in rural landscape, led to

deforestation and land degradation at the early stages, causing the scarcity of forest products and environmental values, but these scarcities has led to increased tree plantings in the farms thus directly compete with other land uses.

Forests and agro-forest systems provide various environmental services, including carbon sequestration and biodiversity conservation as well as provision of food and other wood products which can be marketed to earn income (Streck and Scholz, 2006). In order to attract farmers to participate in tree planting, there has to be efforts to show them benefits of these services and possibly offer payments. Otherwise land uses that include forests might not be attractive for private owners and especially poor small-scale farmers. This is certainly true in the tropics, where crops and pasture have been expanded at the expense of forests and food security is a priority among the smallholders (FAO, 2004). Profit-maximizing producers will enter into contracts to plant trees when the benefits for the contracts outweigh the opportunity cost. That is they will do this if the expected net return from their current operation is lower than the benefits to be achieved from the exercise (Antle et al.,2003). This is expected from a rational farmer.

Previous studies have shown that farmers who benefit most from adoption of tree planting enterprise have low opportunity cost of adoption and are the resource poor (Antle, 2005). There have been developments in involvement of smallholder farmers in carbon trading in an effort to make sure that low income communities participate in clean development mechanism. For instance under Kyoto protocol, industrialized countries with emissions targets can implement tree planting projects that reduce emissions in developing and transition countries (Streck and Scholz, 2006).. The government of Kenya has made numerous attempts to ensure food security and poverty alleviation efforts are

not compromised by the worsening climatic conditions. To improve environmental management, the government committed itself together with other stakeholders to create knowledge on environmental cost and benefits and involve communities in environmental conservation activities such as reforestation (G.o.K,2003).

The 1999 government moratorium on harvesting trees in state forest became a constraint in the industrialization of the forest sector and other sectors dependent on wood such as energy, and allied sectors (GOK 2001). The forest sector used to produce over 90% industrial round wood. Due the restriction of timber harvesting from the state forest, the timber dealers turned to trees on farms as alternatives sources of the industrial round wood, the demand of trees in the farms increased round wood prices, thus encourage farmers and other stakeholders to plant more trees on their farmers than before despite this ,the adoption rate is still low.

Several afforestation programmes under the context of social forestry has been taking place in the country since the creation of rural afforestation and extension service division in the then forest department, similarly there are several NGOs who have funded afforestation programmes in Kenya. Some of them are DANIDA, care-Kenya, world vision, JICA, FINNIDA to name a few.

1.2 Statement of the problem

The practice of planting useful trees and shrubs together with crops on the same piece of land for domestic use and sale has not been adopted by most farmers in Kapenguria division to a level that could make households self-reliant, yet this form of agro-forestry land use system has the potential of maximizing productivity and

sustainability of land as well as increasing resource base of farmers and their households. The situation is heightened by the fact that most farmers focus on large-scale crop production of maize and beans for commercial purpose.

In an ideal situation, there should be proper documentation, for instance, the factors that influence farmers' decision to adopt agro-silviculture. Research is therefore desirable to determine factors that have slowed down or influenced the decision of farmers of adopting the practice .Such a study is informative and may influence favourably investment status in the region, by farmers, investors and development partners.

1.3Purpose of this study

The study aimed at investigating the factors influencing farmers' decision to adopt agro-silviculture.

1.4 Objectives of the study

The study was based on the following objectives;

1. To determine the influence of land tenure in adoption of agro-silviculture.
2. To establish how planting inputs (capital, fertilizer and seeds) influence adoption of agro-silviculture
3. To establish the influence of gender on adoption of agro-silviculture
4. To investigate the influence of knowledge of benefits of tree planting on adoption of agro-silviculture

1.5 Research questions

The study answered the following questions**:**

1. What is the influence of land tenure in adoption of agro-silviculture?
2. How do planting input (capital, fertilizer and seeds) influence adoption of agro-silviculture?
3. How do gender influence farmers decision to adopt agro-silviculture?
4. To what extend do knowledge of benefit of tree planting influence adoption of agro-silviculture?

1.6 Significance of the research

This study attempts to address the factors influencing farmers' decision to adopt Agro-silviculture. Nonetheless it provides information for policy makers County Government and the key government departments to enhance the adoption of agro-silviculture in Kapenguria Division and other parts of Kenya. It is deemed that also influence further research on other parts of Kenya.

1.7 Limitation of the study

Samples used to generalize the whole Division which might not be the case, the study was limited to the following specific objectives and it will be generalization to scientific research or knowledge production.

Ethnic diversity was challenge hence a language barrier was solved by using research assistants who are fluent in English and local languages.

1.8 Delimitation of the study

The study was delimited to farmers in one Division out of three divisions in West Pokot Sub County. Moreover the researcher dwelt solely on those farmers who have taken interest on the program as a venture to gain socially and economically.

1.9 Assumptions of the study

Agro-silviculture adoption rate in Kapenguria Division is still low. The respondents are familiar with the Agro-silviculture. Respondents provided unbiased responses.

1.9 Definition of terms

These are the agro-forestry operational terms as used in this project for the purpose of the research to be undertaken

Agro-silviculture: denotes the combination of trees and crops such as cultivation of maize, cassava, hedgerow inter-cropping, multipurpose trees on crop land, plantation crop combinations, home gardens, trees in soil conservation and reclamation, shelterbelts, windbreaks, live hedges and fuel wood production.

Agro-forestry: is a collective name for all land-use systems and practices where woody perennial plants are deliberately grown on the same land management unit as agricultural crops and/or animals, either in spatial mixture or in temporal sequence

Land tenure: is the system of rights and institutions that govern access to and use of land and other resources.

Moratorium: The ban of tree harvesting in the state forest by the government

Rotation period: Period between planting of tree and harvesting (life span of tree)

Sampling: Defined as the process of selecting few small scale farmers who have planted trees to be the representative sample for the entire tree growers in the Division

Tree planting: is the process of establishing trees in the farms after raising them in the nursery and transplant them to the field

1.10 Organization of the study

This project report is organized into five chapters. Chapter one consists of the background of the study, statement of the problem , purpose of the study, research objectives, research questions, significance of the study, delimitations of the study, limitations of the study, and basic assumptions of the study. Chapter two covers literature review which is divided into various topics in accordance with the objectives. The theoretical and conceptual framework is provided at the end of the chapter linking the independent and the dependent variables of the study. Chapter three constitutes the research methodology which is divided into eleven subthemes: research design, study area, target population, sample size and sampling technique, research instruments, data collection procedure, validity of instruments, reliability of instruments, data analysis procedure and ethical considerations. Chapter four constitutes of data analysis, presentation, and interpretation. The sections are organized as per the objectives of the study. Finally chapter five constitutes of the discussion, conclusions drawn, recommendations and suggestions for further research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This section provided a literature review based on the objectives of the study. The literature provided an understanding of the key words in the study and helped to clarify the variables. It further provided the theoretical framework in which the study is anchored. The literature review started with the discussion of the concept of agroforestry and agro-silviculture, factors influencing adoption of agro-silviculture. The theoretical framework and conceptual framework explained the relationships among variables are presented.

2.2 Concept of Agro-forestry and agro-silviculture

Before discussing the concept of agro-silviculture, it was necessary to clarify the meanings of various concepts associated with agroforestry since more literature review is borrowed from agroforestry the mother of agro-silviculture.Agro-forestry is a collective name for all land-use systems and practices where woody perennial plants are deliberately grown on the same land management unit as agricultural crops and/or animals, either in spatial mixture or in temporal sequence (FAO 2005). Agroforestry has long been a recognized in sustainable development models throughout the world due to the benefits they bring not only to the economy and society but also to the ecosystem (Rocheleau et al 1989; Thanh et al 2005). A number of factors have contributed to a rising increase in agroforestry since the 1970s and these are deteriorating economic situation in many developing countries, increased deforestation and scarcity of land because of population pressures, interest in farming systems, intercropping and the environment (Nair 1993).

In Africa, sustainable use of agricultural land is becoming increasingly important for maintaining capacity for the food supply and livelihood of the agricultural sector. The increased food demand due to the rapidly planting population has increased the importance of improving productivity of land (T. Otsuki, 2010). Agroforestry is a long-established farming practice in many parts of the world. Broadly defined, agroforestry refers to a land-use system in which trees are grown simultaneously, sequentially, or in conjunction with annual crops or livestock.

The three major components of agro-forestry systems are: crops, trees and animals and depending upon these combinations the major forms are; Agro-silviculture, Silvo-pastoral and Agro-silvopastoral systems, (Nair, 1990). Nair (1993) note the term agro-silviculture is used to denote the combination of trees and crops such as cultivation of maize, cassava, or plantains between timber tree species or coconut or palm trees, hedgerow inter-cropping, multipurpose trees on crop land, plantation crop combinations, home gardens, trees in soil conservation and reclamation, shelterbelts, windbreaks, live hedges and fuel wood production.

There are different types of agroforestry practices that can be used, these includes improved fallow, taungya (systems consisting of planting annual agricultural crops along with the forestry species during the early years of establishment of the forestry plantation), home gardens, alley cropping, planting multipurpose trees and shrubs on farmland, boundary planting, farm woodlots, orchards or tree gardens, plantation/crop combinations, shelterbelts, windbreaks, conservation hedges, fodder banks, live fences, trees on pastures and apiculture with trees (Nair 1993; Siclair 1999).

The different types of agroforestry technologies have been found to address specific human and environmental needs. One of the important benefits is production of fodder to feed livestock. Farmers in other parts of the world have enjoyed increased incomes from livestock production, increased crop production, and reduced labour especially for herding cattle from adoption of agroforestry practices (FAO 2005). Improved soil fertility through production of leguminous and other agroforestry trees is another benefit. In Malawi and Zambia, planting shrubs in fallow for two years and rotating with maize has improved maize yields compared with planting continuous unfertilized maize (Franzel et al 2002). Timber and firewood as well as environmental services such as wind breaks, carbon sequestration and biodiversity among others are more benefits that can be obtained from agroforestry practices (FAO 2005). If this agroforestry system adoption will be enhanced, then it will boost the livelihood of inhabitants of Kapenguria Division, West Pokot County and Kenya at large.

Wikipedia (the free encyclopedia) (2008) defined agroforestry as "a collective name for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in a spatial mixture or in a temporal sequence. There are normally both ecological and economic interactions between woody and non-woody components in agro-forestry. As the links and interactions between climate change, biodiversity loss, land and water degradation – and their effect on ecosystems and human beings – are apparent, the potential of agroforestry systems to mitigate and adapt to climate change, address land degradation and enhance biodiversity conservation also clear. While protection of natural habitats remains the core of conservation strategies, agro-forestry

practices designed to improve land quality and productivity also offer opportunities to create habitats for wild species in agricultural lands. Furthermore, the multifunctional nature of agroforestry offers a range of opportunities sustaining ecosystem functions which includes the use of live fences(to protect farms), woodlots (to produce fuel wood), and nitrogen fixing trees (to improve soil fertility, soil organic matter and physical conditions) (Ajayi, 2007).

2.3 Land tenure and adoption of agro-silviculture

One of the critical factors that have been given consideration in determining the potential acceptability and viability of agroforestry is land fragmentation, land tenure systems and tree ownership. Land fragmentation at generational transfers has become a more important tendency in nearly all types of holdings. Rules of inheritance of land by all sons in a family and a larger family size inevitably imply a rapid fragmentation of family land. In areas already heavily populated with average land holdings of less than 2 hectares such as parts of western Kenya, the land fragmentation continues much below the limits of capacity to reproduce a family. In the study of Agroforestry adoption and risk perception by farmers in Senegal, (P. Mbote, 2005) established that land ownership was one of the two predominant factors (the other was labour) affecting the adoption of agroforestry practices.

Land tenure includes both formal and informal rights and obligation associated with particular categories of individuals and groups in relation to land and its products. These rights and obligation concern the acquisition, use, preservation and transfer of specific land or products of the land. Such rights may be disaggregated so that rights of

use, for example may include cultivating annual or perennial crops, trees, grazing or collecting fuelwood. Studies have shown that ownership of land title is found to increase total factor production (TFP) in all models. For instance (T. Otsuki, 2010) assert that having secure land title promotes a farmer's investment in land improvement.

Land size has a negative effect, possibly because a small-scale operation is more efficient in subsistence production, which does not rely heavily on machinery. This results from the intensification of production with decreases in land size.Commins, in their 1993 study of the factors affecting the availability of land for forestry conceptualized the determinants of land availability in terms of five different levels of analysis: Technological and economic factors restructuring agriculture, economic diversification of the rural economy, especially the availability of off-farm employment, public policies affecting returns from different agricultural enterprises and subjective responses of landowners to the foregoing factors Mercer and Hyde (1992) found out that as parcels of land increases, more land will be allocated to tree planting.

2.4 Planting inputs (Capital, fertilizers, seeds) and adoption of Agro-silviculture

There is consensus in literature that sustainable land management practices such as agroforestry practices are feasible and technically sound (Ajayi et al 2008; Sileshi et al 2008), but the level of uptake of the technologies by farmers has been very low particularly in low income regions of the world or attained only a modest success in other regions (Antle and Diagana 2003; Mercer 2004). Moreover, Ajayi et al 2008 reasoned that low levels of uptake of sustainable land management practices could be due to use of moral persuasion approach (farmer sensitization, farmer training and field

demonstrations) and wielding the stick approach (regulations, land use enforcements and instructions) without creating incentives for adoption of technologies.

Lack of planting materials (seed and seedlings) is another factor considered to constrain establishment of fallows (Peterson, 1999;Kwesiga et al., 2003).Sometimes seeds and seedlings have not been sufficient to meet the needs of the farmers, or the preferred species have not been available. Generally, lack of planting materials is a limitation to adoption of agroforestry (Kwesiga et al., 2003).

Smallholder tree production contributes substantially to rural livelihoods and national economies, yet these contributions are not adequately quantified or appreciated. With less than half a hectare of natural forest remaining per person in the tropics, trees on farms in many countries are more important for tree product supply than trees in forests. This is true for both household and commercial purposes. Yet, obsolete policy objectives often act as a barrier to greater investment in trees on farms by farmers and entrepreneurs as discussed byPuri and Nair (2004) in the Indian context and by Scherr (2004) in the general context. Even where forest extraction gives way to tree cultivation, small-scale farmers are not sufficiently prepared to diversify and add value to their tree production.

National planners are also ill-equipped to support agroforestry since few analyses have been carried out to identify the winners and losers in the cultivation and commercialization of tree products (as, for example, Shackleton et al. 2003). In many regions the enabling policies, species choice, tree husbandry skills, germplasm quality, and tree improvement lag far behind the overall demand for tree planting. Furthermore, the markets for tree products are often poorly organized and thus perform sub optimally (Russell and Franzel 2004). This causes spoilage of perishable tree products, lost income

for producers, and restricted choices for consumers. The rural poor are further disadvantaged by lack of market price transparency, and the absence of processing techniques to add value to tree products.

The art of planting and harvesting trees for home consumption has not been adopted in Busia Sub County to a sustainable level. The situation is aggravated by the fact that most farmers in Busia engage in small-scale farming and the majority in subsistence production. As a result, farm forestry is given little attention (Lwayo, 1999).The adoption of agro-forestry is affected by several factors such as: the biophysical characteristics of technology; individual and household characteristics of farmers; policies; and institutional context within which the technology is disseminated, (Muneer,2008).

2.5 Gender and adoption of agro-silviculture by farmers

Sixty to eighty percent of the farmers in the developing world are women. In 1990, women subsistence farmers accounted for 62% of total female employment in low-income countries (Mehra and Gammage1999). Rural women in developing countries grow and harvest most of the staple crops that feed their families. This is especially true in Africa. In sub-Saharan Africa, women account for 75% of household food production (UNDP 1999, as cited in Bread for the World Institute 2003). Food security throughout the developing world depends primarily on women. Yet they own only a small fraction of the world's farmland and receive less than 10% of agricultural extension delivery.

Opio (2001) found that lack of security of tenure was hampering female farmers from participating in the establishment of improved fallows with Sesbaniasesban in Katete District. Most of the studied emphasize on cultivated land size effects on adoption

than security of tenure. In the case of Zambia, most if not all smallholder farmers are situate in designated traditional lands, without formal written tenure but still believed to be a secure tenure. The synthesis by Ajayi et al. (2003) revealed that 3 studies had found farm size to have a positive association with farmers' decisions to plant and even continue with improved fallows although this finding is not associated with gender

Among various Kenyan communities, women do not traditionally own land or other immovable properties. At best, they have usufruct rights, which are hinged on the nature of the relationship obtaining between them and men either as husbands, fathers, brothers or such other male relatives. Such access can be denied, as it is dependent on the whims of such male benefactors. This situation does not only place women in a precarious position in terms of their survival and livelihoods, but stifles their effective role and contribution to national development.

Because women are in charge of household and staple crops, female farmers often fail to gain from export-oriented agriculture. Women may have trouble diversifying their crops because they have difficulty obtaining the credit and land needed to shift to nontraditional exports. These realities have major implications for agroforestry research. Much more needs to be done to understand the kinds of traditional and nontraditional agroforestry products that are accessible to women, and to get research attention focused on them. This also applies to value-added processing activities and marketing. Greater attention to how women are affected by land and tree tenure practices is leading to knowledge of the need to address these inequities.

For example, women in Cameroon are very keen on cultivating *Dacryodesedulis*as its marketing season coincides with the need to pay school fees and buy school uniforms (Schreckenberg et al. 2002).

Trees are a medium for long-term investment on the farm. Thus, the propensity to cultivate them is particularly sensitive to property rights (Place and Otsuka2002). Policy research in agroforestry must continue to strengthen our understanding of these linkages. We need to assist in identifying the means by which women's land rights can be made more secure to enhance the intensification of farming in general, and the acceleration of tree cultivation in particular (Place and Swallow 2002) Although Franzel et al. (2001) reported of high adoption, recent adoption studies indicate that both trailing and adoption of these technologies are low (Ajayi, Pers. Comm., March 2007). Ajayi estimates adoption of improved fallows in eastern Zambia at 20.6 percent and that of biomass transfer at 10.7 percent (Ajayi, Pers. Comm., March 2007).

Adesina *et al.* (2001) on econometric analysis of the determinants of adoption of alley farming by farmers in the forest zone of southwest Cameroon showed that gender played a role in decision making when it came to the adoption of new agro-forestry technologies. For instance, women worldwide have been at the centre-stage of economic production, including agricultural, livestock and business sectors. In Africa, where the mainstay of most economies is farming or agriculture and livestock production, women contribute to 80% of the workforce. In most parts of Africa, women are closely associated with production of food and raw materials for the industrial sector. Indeed, women are also more directly involved in small-scale crafts and localized industries, trade and general business.

However, women who comprise over half of the world's population, rarely own any reasonable forms of property; do not have adequate access to the same, and do not even make major decisions pertaining to allocation and use of such property. Among farming communities where the basic property is land, women's access to it is determined by men as a matter of patriarchy cultural tradition. According to a study carried out by Women and Law in East Africa in 1995 on Inheritance Laws and Practices in Kenya, women only own land to the extent that they perceive or believe this is the case especially within marriage or other cohabitation relationships Franzel et al. (2002) reported that factors of adoption of Agroforestry technologies in Zambia include financial profitability, farmers' perception, resources and skills, labour, risks, compatibility with farmer's values, ornamental value and marking boundaries. Tripp 1993 cited illiteracy, in-adequate credit facilities, non-availability of farm inputs and socio-cultural factors as contributing factors to low levels of adoption.

2.5 Knowledge of tree planting and its benefits and adoption of agro forestry on livelihoods

In Indonesia, commercial small-scale farm forestry on community-owned land has been practiced since the 1970s and is widely believed to be more successful than industrial plantation forestry carried out by concessionaires on a large-scale in State forest, particularly in terms of landscape and socio-economic benefits (Nawir*et al*., 2007).

Literature about African agriculture proved that application of tree-based renewable soil fertility replenishment technologies such as agroforestry in the traditional

agricultural sector is more profitable than the conventional farmers' practice of continuous crop production without external fertilization, however, its adoption is affected by several factors such as the biophysical characteristics of the technology itself, the individual and household characteristics of the farmers, policies and the institutional context within which the technology is disseminated (Ajayi et al.,2007; Kuntashula,et al.,2004; Mekuria and Waddington, 2004). Among the factors that were found to influence African farmers' tree- based renewable soil fertility replenishment technologies adoption decision are availability of information about the technology, the technology perceived relative advantage and usefulness, perceived complexity, compatibility with farmers' previous experience and knowledge, land size and tenure (Ajayi and Katanga, 2005; Flettet al.,2004; Place,1995).

Ng`oriareng (2005) on factors hindering afforestation approaches in West Pokot District noted that specific social factors related to local community were hindering afforestation programmes. Those factors noted were level of knowledge in tree planting, level of participation in tree planting. It is evident that after years of experimentation with a wide range of soil fertility replenishment practices, three types of simple, practical fertilizer tree systems have been developed that are now achieving widespread adoption. These are: (1) improved fallows using trees and shrubs such as sesbania*(Sesbania sesban)* or tephrosia (*Tephrosia vogelii*), (2) mixed intercropping with gliricidia (*Gliricida sepium*), and (3) biomass transfer with wild sunflower (*Tithonia diversifolia*) or gliricidia (Place et al. 2002). They provide 50 to 200 kg N ha−1 to the associated cereal crops. Yield increases are typically two-to-three times that with current farmers' practices.

These fertilizer tree systems have now reached over 100,000 households in the maize belt of eastern and southern Africa, and demand for tree seed and knowledge transfer is increasing exponentially (Kwesiga,pers. comm. 2002).

Thus, by enhancing agroforestry, the ancient practice of integrating trees on farms, the goals of agricultural development(increased crop and livestock productivity) can be more effectively aligned with biodiversity conservation, and this is considered one of the approaches that can be very useful and effective in making progress towards balancing environment and development needs (World Agroforestry Centre, 2007). This is because of its ability to contribute to food security by restoring soil fertility for food crops and production of fruits and nuts, reduce soil erosion and rainfall runoff, reduce deforestation and pressure on woodlands by providing fuel wood grown on farms, reduce emissions and enhance sinks of green house gases, provide more diverse streams of income and reduce poverty. Hence, as dynamic, ecologically-based natural resources management system, agro -forestry integrates trees on farms, diversities and sustains production for increased socioeconomic and environmental benefits and is cited as a potential win – win land use system which provides key rehabilitation and other ecosystem services while it also improves production and generates income for land users.

Given the immense agricultural and environmental potential of agroforestry, it is no wonder that it is being promoted for adoption among farmers in most developing countries especially in sub-Sahara Africa where productivity is low and more marginal lands are increasingly being brought under cultivation with increasing demand. Adoption of agroforestry can lead to an improved crop and livestock production because agro-

forestry practices are less costly, more affordable since inputs for fodder and soil amendments are readily available to small holder farmers (Parwada et al 2010).

Timber and firewood as well as environmental services such as wind breaks, carbon sequestration and biodiversity among others are more benefits that can be obtained from agroforestry practices (FAO 2005).One of the purposes of agroforestry tree domestication is enhancement of stability and productivity of agro-ecosystems by diversifying on-farm tree species composition (presence and abundance). Diversification and intensification of land use through domestication of agroforestry trees is one of the three pillars of the research of the World Agroforestry Centre (Kindt and Lengkeek, 1999; ICRAF, 2000)

Nguriareng C.(2005) notes that West Pokot District like other places in the tropics is faced with environment problems such as shortage of wood fuel, soil erosion, climate change and reduced tree based products and that all these could be solved through afforestation and Agro -forestry activities. Kwesiga and Beniest (1998) indicated that improved fallows of Sesbania sesban increase maize yield from 1 ton per ha per year to between 3.4 and 5.36 ton per haper year and in addition, the farmer got 5 - 10 ton of fuel wood per year. Sileshi et al (2009) conducted a meta- analysis using160 publications and found that agroforestry technologies at least doubles maize yields in Sub-Sahara Africa

The well being of the land is directly tied to the well being of its inhabitants. Only when rural people and poor farmers have a way to earn sustainable, stable livelihoods will the planet's biodiversity be safe. It is not futile to attempt to conserve tropical forests without addressing the needs of poor local people, nor is it desirable (ASB 2002). As much as 90 percent of the biodiversity resources in the tropics are located in human-

dominated or working landscapes. Agroforestry impinges on biodiversity in working landscapes in at least three ways. First, the intensification of agroforestry systems can reduce exploitation of nearby or even distant protected areas (Murniati et al. 2001; Garrity et al. 2003). Second, the expansion of agroforestry systems can increase biodiversity in working landscapes. And third, agroforestry development may increase the species and within-species diversity of trees in farming systems. A new paradigm is emerging that integrates protected areas into their broader landscapes of human use and biodiversity conservation, particularly in agricultural areas that now constitute the principal land use in most of the developing world (Cunningham et al. 2002).

The issue of how best to achieve a balance between production and biodiversity conservation is moving to the centre of much of ICRAF's work, particularly in Southeast Asia (van Noordwijk et al. 1997). It has become the basis for the concept of *ecoagriculture,* which refers to land-use systems managed for both agricultural production and wild biodiversity conservation (McNeely and Scherr 2003). Agroforestry is uniquely suited to provide eco-agriculture solutions (McNeely 2004). But much more must be done to understand and refine suitable options for widespread use. The global program on Alternatives to Slash-and-Burn has been on the forefront of identifying and applying such solutions in humid forest areas (Tomich et al. 1998).

Agroforestry will play a major role in the two key dimensions of climate change: mitigation of greenhousegas emissions and adaptation to changing environmental conditions. Despite some efforts to reduce the impacts of climate change, the process will not be halted. Farmers will need to adapt to more extreme drought and flooding events, as well as the elevation in temperatures that are predicted to occur in coming decades.

People differ in their vulnerability to such climate changes. The poorest rural populations in the regions with least responsibility for causing climate change are nevertheless likely to be most negatively affected. Agroforestry needs to play a role in increasing the resilience of smallholder farmers to climate change and other stresses. However, research on its prospective role in adaptation is only now getting under way.

Agroforestry was recognized by the Intergovernmental Panel on Climate Change as having a high potential for sequestering carbon as part of climate change mitigation strategies (Watson et al. 2000). Methods are now needed to determine the sequestration potential of specific agroforestry systems in particular agro-climatic conditions. Carbon offsets through tree farming will be a secondary product of smallholder agroforestry systems. Key question is how smallholders can benefit from carbon sequestration projects (Montagnini and Nair 2004). Methods are being developed to pursue carbon projects that will improve livelihoods and provide positive incentives to smallholder Agro foresters.

Smallholder growers grow subsistence and cash crops in their rain fed, complex and resource deprived fields often combining the cultivation of the crops with scattered multipurpose trees and realizing a wide range of benefits (Radovich, 2009). Moringa oleiferais one such multipurpose tree of global interest and is grown in combination with agricultural and horticultural crops by smallholder growers and this give growers a wide range of benefits(Palada andChang, 2003; Radovich, 2009). It is a suitable tree for traditional agroforestry in the home because of its versatility (Odeeet al., 2001; Palada and Chang, 2003; Nduwayezu et al., 2007).Short Rotation Forestry (SRF) is a rapidly planting practice in Kenya .Many rural farmers are embracing the practice for its

considerably quick and high returns (Senelwa et al.2008) especially from the sale of fuel wood, poles and small sized timber.

As much as 90 percent of the biodiversity resources in the tropics are located in human-dominated or working landscapes. Agro-forestry impinges on biodiversity in working land-scapes in at least three ways. First, the intensification of Agro-forestry systems can reduce exploitation of nearby or even distant protected areas (Murniati et al. 2001; Garrity et al. 2003). Second, the expansion of agroforestry systems can increase biodiversity in working landscapes. And third, agroforestry development may increase the species and within-species diversity of trees in farming systems.

A recent study by Ajayi (2007) indicated that farmers in South Africa mentioned that agroforestry as a soil fertility improving technology has several advantages over minerals fertilizers. These includes: (1) It is cheaper and does not require direct cash expenses associated with mineral fertilizers; (2) its fertility effects last for more than one season; (3) it serves multiple purposes (fodder for livestock and fuel wood) in addition to improving soil fertility; (4) it improves biophysical functions (e.g., suppression of noxious weeds and softening of soils which facilitates easier weeding operation) and (5) provide opportunity for obtaining cash income from sale of tree products. On the other hand, farmers mentioned some disadvantages such as incidence of bush fires, pests' problems, too much labor, long wait period, high mortality of tree seedlings, livestock browsing and it requires large land.

FAO (1999) explained in detail the role of trees in the farms its influence in the mineral content in the soil, soil structure and texture, role in preventing both water and wind erosion, increasing water percolation fixing nitrogen into the soil among other roles.

These entire functions prove that trees in Institutions are important, Trees may increase system productivity by reducing nutrients loses through leaching and reduce soil erosion (Soumare.1994). Suggested that trees might capture nutrients which would have been lost in their absence, and improve efficiency out of nutrient availability. These statements emphasize the important of trees in the farms.

Research conducted by Boatang (2008) found that a greater proportion of households (97%) had improved food security after adopting agroforestry. This was partly due to the fact that most farmers used money accruing from the sales of tree crops/products in purchasing food items to supplement food in the household.It is the use trees and/or tree planting specifically to pursue social objectives, usually betterment of the poor, through delivery of the benefits (of trees and/or tree planting) to the local people; Nair 1993). Forests and agro-forest systems provide various environmental services, including carbon sequestration and biodiversity conservation as well as provision of food and other wood products which can be marketed to earn income (Streck and Scholz, 2006).

Trees are one of the most important resources to the livelihood of small-scale farmers. They are used for their multiple products including implements for the farm and household use; construction of houses, storage and curing structures; fuelwood;food stuffs such as fruits, nuts and leaves; and medicine to name but a few of the tree products. For example, fuel wood is the major source of primary energy for heating and cooking in Kenya. Biomass energy accounts for more than 90% of the total primary energy (NRI, 1996; EAD, 2002).Trees are also important as a source of income for rural households.

Several studies indicate that as a livelihood strategy, most rural communities turn to tree products for subsistence and income. Trees have been reported to increase household income by between 25% to over 100% (Salam et al., 2000;Campbell, 2002; Mithoefer et al., 2004).

In order to attract farmers to participate in tree planting, there has to be efforts to show them benefits of these services and possibly offer payments. Otherwise land uses that include forests might not be attractive for private owners and especially poor small-scale farmers. This is certainly true in the tropics, where crops and pasture have been expanded at the expense of forests and food security is a priority among the smallholders (FAO, 2004). Profit-maximizing producers will enter into contracts to plant trees when the benefits for the contracts outweigh the opportunity cost. That is they will do this if the expected net return from their current operation is lower than the benefits to be achieved from the exercise (Antle et al., 2003). This is expected from a rational farmer. Previous studies have shown that farmers who benefit most from adoption of tree planting enterprise have low opportunity cost of adoption and are the resource poor (Antle, 2005).

Summer (2004) found out that tree planting, whether as part of an agricultural system (Agroforestry), tree plantations, or as the enrichment of secondary growth areas, is found in many places to offer substantial environmental and economic benefits for rural people. Most tree planting research has focused on timber and fuel-wood species, but there is planting interest in the production of Non Timber Forest Products (NTFPs) as well as in environmental services such as carbon sequestration, erosion control and soil productivity enhancement, (Vasseur, 2002).Focuses on the factors that motivate small

farmers to plant trees, considerably less has been written about the factors that influence farmers decision to adopt tree planting (Browder &Pedlowski, 2000).

2.6Theoretical framework

This study utilized Diffusion of Innovations theory (Rogers 1995).

2.6.1Diffusion innovation theory, history and orientation

Diffusion research goes one step further than two-step flow theory. The original diffusion research was done as early as 1903 by the French sociologist Gabriel Tarde who plotted the original S-shaped diffusion curve. Tardes' 1903 S-shaped curve is of current importance because "most innovations have an S-shaped rate of adoption" (Rogers, 1995).

Diffusion research centers on the conditions which increase or decrease the likelihood that a new idea, product, or practice were adopted by members of a given culture. Diffusion of innovation theory predicts that media as well as interpersonal contacts provide information and influence opinion and judgment. Studying how innovation occurs, E.M. Rogers (1995) argued that it consists of four stages: invention, diffusion (or communication) through the social system, time and consequences. The information flows through networks. The nature of networks and the roles opinion leaders play in them determine the likelihood that the innovation will be adopted.

Innovation diffusion research has attempted to explain the variables that influence how and why users adopt a new information medium, such as the Internet. Opinion leaders exert influence on audience behavior via their personal contact, but additional

intermediaries called change agents and gatekeepers are also included in the process of diffusion. Five adopter categories are: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. These categories follow a standard deviation-curve, very little innovators adopt the innovation in the beginning (2,5%), early adopters making up for 13,5% a short time later, the early majority 34%, the late majority 34%and after some time finally the laggards make up for 16%. *Statements*: Diffusion is the "process by which an innovation is communicated through certain channels over a period of time among the members of a social system". An innovation is "an idea, practice, or object that is perceived to be new by an individual or other unit of adoption". "Communication is a process in which participants create and share information with one another to reach a mutual understanding" (Rogers, 1995).

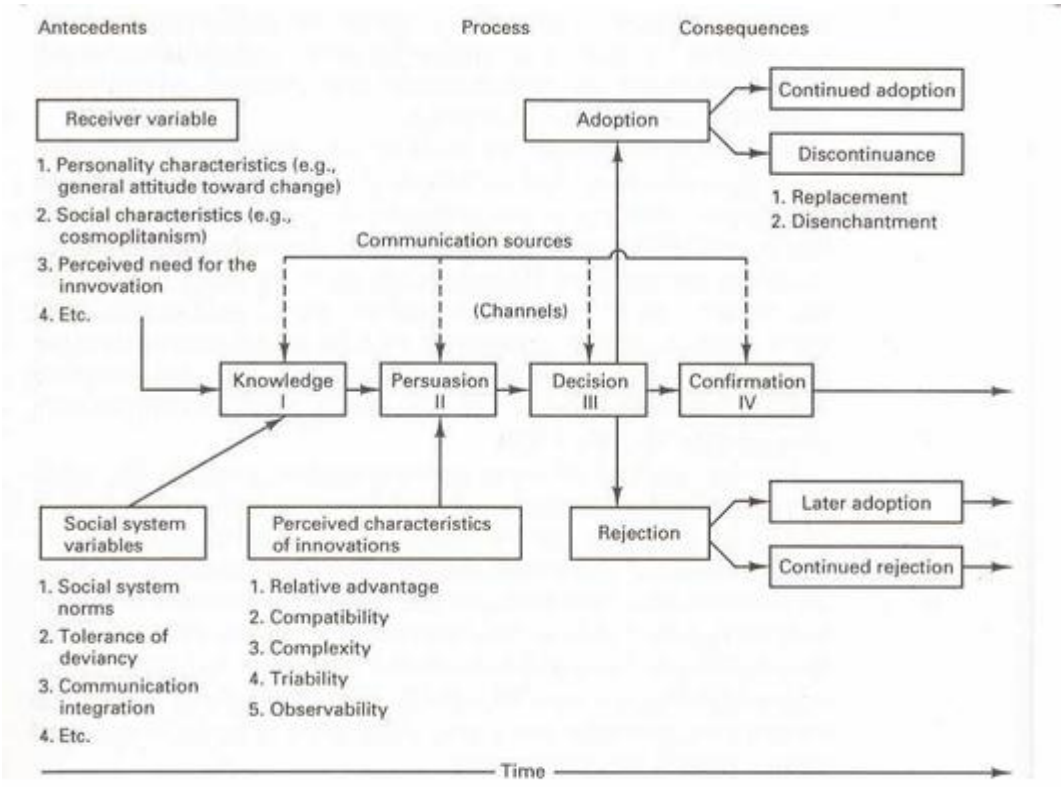


Figure 1:Diffusion of innovation model

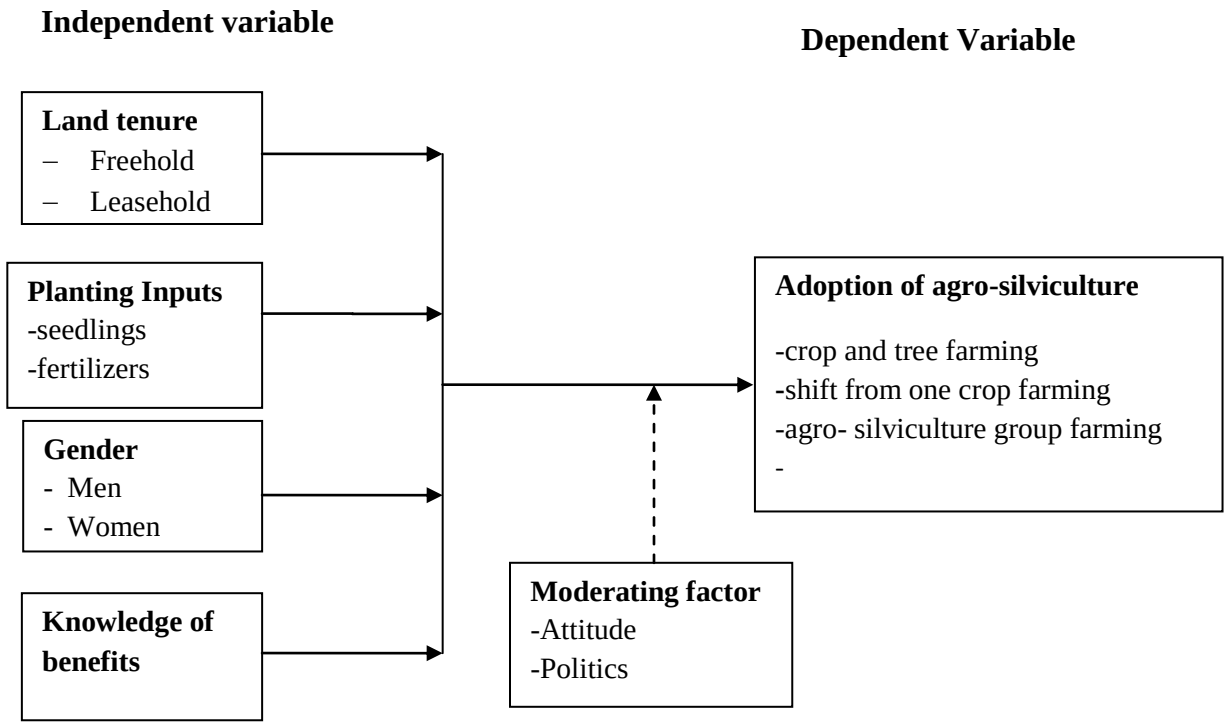
Source: Rogers (1995)

Diffusion research has focused on five elements: (1) the characteristics of an innovation which may influence its adoption; (2) the decision-making process that occurs when individuals consider adopting a new idea, product or practice; (3) the characteristics of individuals that make them likely to adopt an innovation; (4) the consequences for individuals and society of adopting an innovation; and (5) communication channels used in the adoption process.

2.7 Conceptual framework

This study was based on simple conceptual framework that is illustrated in figure 2.1 below .The conceptual framework of the study indicated agro-silviculture largely depends on various factors in the model.

Figure 2.1: Conceptual framework



Source: Reviewed literature 2014

It was conceptualized in this study "Agro-silviculture depends on land tenure, capital, gender, knowledge of benefits and culture based on farmers practicing agro-silviculture.

2.8 Summary of literature review

The previous related study generally showed that an Agro Silviculture practice has not been adequately adopted in Africa in extension Kenya. Despite the fact that the adoption of Agro- Silviculture is crucial in food production and conservation of the environment, there is no documented that shows the influence of socio-economic factors on the adoption of the practice hence the need to undertake the study in West Pokot County.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter focused on how the study was carried out. It explained the research design, study population, sample size, data collection techniques and instruments and ethical consideration.

3.2 Research Design

According to Katundu (1998), research design is a basic plan that guides data collection. It also guides the analysis phases in a research project. It is a framework that specifies the information, which is to be collected, the data sources, and data collection procedures. In this study, the descriptive design was adopted to explore the factors influence farmers decision to adopt Ago-silviculture. Descriptive designs are used in preliminary and exploratory to allow researchers to gather information, summarize, present and interpret for the purpose of clarification (Orodho 2004). In addition, Gay (2007) further noted that descriptive research has the advantage of answering questions concerning the current status of the subject of study after collecting data.

3.3 Target Population

According to Mugenda & Mugenda, (2003) research population is a large collection of individuals or objects that are the focus of a scientific query. Research is done ultimately for the benefit of the population. The study was conducted in three locations in Kapenguria Division. The locations included Talau, Siyoi and Kaibos. In this study, 300 farmers were targeted as well as four officers from Forest Department, two

from KVDA and two from agriculture office. The target population was distributed as shown in table 3.1 below.

Table 3.1Target population

Target respondents	Number
Talau	100
Kaibos	80
Siyoi	120
Agriculture officers	4
Forest officers	2
KVDA officers	2
TOTAL	**308**

Source: West Pokot Sub County forest /Agriculture officers (2014)

3.3 Sample size and sampling procedure.

Sample is a sub set of the population, also referred to a subset of a population. It comprises some members selected from it. Sampling procedure is the process of selecting sufficient number of elements from the population.

3.3.1 Sample Size

Sampling is a part of statistical practice that involves the selection of individual observations. Due to the large population sizes, every individual in the population cannot be tested because it is extremely time-consuming and expensive. They are intended to yield some knowledge about a population of concern, especially for the purposes of statistical inference (Neuman, 2003). The main factor considered in determining the

sample size is the need to keep it manageable (Newman, 2003). In this study sample size was determined using table given by (Krejcie& Morgan 1970).Thus sample size of 300 farmers target population was 169.

Table 3.2 Sample size

Target respondents	N	Calculation	Sample size (n)
Talau	100	(100/300)*169	56
Kaibos	80	(80/300)*169	45
Siyoi	120	(120/300)*169	68
TOTAL	**300**		**169**

Source: Research Data (2014)

3.3.2 Sampling procedure

The researcher first stratified the study area into three strata as per location. The farmers in these locations were selected through simple random sampling so as to give each farmer an equal chance to participate in the study. The four officers from Forest Department, two from KVDA and two from agriculture office were selected by purposive sampling because of the vast information they were to contribute to the study.

3.4Research instruments

Data for this study was collected through Questionnaires and interviews

1.4.1 Questionnaires:

A questionnaire is a research instrument. It consists of questions and prompts for gathering information from respondents. The questionnaires will be used to gather information from small scale farmers who practice agro-silviculture.

The main data collection instruments that were used in this study include the questionnaire. This was used for the purpose of collecting primary quantitative data. Additionally, the questionnaires were used for the following reasons: its potentials in reaching out to a large number of respondents within a short time, able to give the respondents adequate time to respond to the items, offers a sense of security (confidentiality) to the respondent and it is objective method since no bias resulting from the personal characteristics (as in an interview) (Owens, 2002).The questionnaire was divided into the main areas of investigation except the first part which captures the demographic characteristics of the respondents. Other sections were organized according to the major research objectives.

3.4.2 Interview schedules:

An interview according is an administration of a questionnaire or an interview schedule (Orodho 2005) Interview schedules were administered on to agro-silviculture farmers. The study structured interview schedules (Kane 1995), states that interviews can be modified to fit the needs of the situation. Interview schedules involved Forest extension officers and Agriculture extension officers who were interviewed and their responses written. Interviews can convey empathy, build trust and collect rich data and provide understanding of respondent's own views points. Structured interview was used because it is ideal in getting detailed information.

3.4.3 Observation

An observation schedule was used by the researcher to collect data to corroborate the information obtained from the other instruments. Agro-silviculture practices in the area such as hedgerow inter-cropping, multipurpose trees on crop land, plantation crop

combinations, home gardens, trees in soil conservation and reclamation, shelterbelts, windbreaks, live hedges and fuel wood production was observed.

3.5 Pilot study of the instruments

According to Orodho (2004) validity in the sense raised is the degree to which the empirical measure of the concept, accurately measure the concept. To validate the questionnaire, a pilot survey to the selected separate respondent was carried out, but a similar sample to the one in the study. A panel of three judges competent is the Agro-silviculture programme from the West Pokot Sub County Forest Office was requested to assess the relevance of the content used in questionnaire development. Their recommendations were incorporated in the final questionnaire. Descriptive survey was used to analyze the data.

3.6 Validity of instruments

Validity refers to the degree to which the research instrument measures what it purports to measure (Mugenda and Mugenda2003).According to Orodho (2004) validity in the sense raised is the degree to which the empirical measure of the concept, accurately measure the concept. To validate the questionnaire, pilot survey was carried out to the selected separate respondent, but a similar sample to the one in the study. A panel of three judges competent is the Agro-forestry programme from the County Ecosystem Conservator was requested to assess the relevance of the content used in questionnaire development. Their recommendations were incorporated in the final questionnaire. Questionnaires were administered twice to selected separate, but similar responded to the sample in the study using the test re test of the coefficient stability method.

3.7 Instrument reliability

The reliability of research instrument conserves the extent to which the tool yields the same results on repeated trials hence, the tendency towards consistency found in repeated measurements in what is referred to as the reliability of the of the research instrument.

Research instruments were selected or carefully developed to fit the research design. It also fitted the plan of data analysis so that the data collected could facilitate the answering of research questions (Yin, 2004). The study involved the use of test re-test method to determine the reliability of the research instruments. Questionnaires were administered to two farmers involved in Agro-silviculture to test the reliability of the research instruments. The questionnaires were administered to the same sample on two different occasions within a span of two weeks. The crouchback's Alpha was employed to measure the internal consistency of the research instruments. The formula adopted a correlation coefficient that described the strength of the relationship between responses at two times of administration was calculated. Correlations achieved here were expected to be above 0.7 to signify a high reliability (Coolican, 2000).

3.8 Data Collection Procedure

After establishing the validity and reliability of the instruments, the researcher got written permission from the University of Nairobi to the ministry that enabled her collect data from institutions under study. After obtaining permission to carry out the research, the researcher visited those farms to familiarize herself with respondents. Eventually the researcher administered the questionnaire to the said persons and management.

3.9 Data analysis techniques

After assembling and organizing completed instruments, descriptive statistics was used to analyze data. Quantitative data was analyzed using the descriptive statistical tools of average or mean, percentages and frequencies. This data was presented in terms of tables and graphs. In analyzing general and demographic information percentages of the respondents who provided data was computed. Qualitative data on the other hand was organized and summarized into themes opinions, reports and patterns relevant to the study. Mugenda and Mugenda (1999) say that in order to save time and to increase the accuracy of result, a computer should be used .Hence the services of a data analyst shall be sought in order to use the statistical package for social science (SPSS) to analyze the data.

3.10 Ethical consideration

The information researched or obtained from the study was held confidential and respondent privacy was upheld. Firstly, the consent of every respondent was sought. At the beginning of every interview, the purpose of research was clearly stated. The respondents were given a chance to ask any questions before consenting to be interviewed. Moreover, participation was voluntary and issues concerning confidentiality of discussions and recordings were discussed with the participants and adhered.

3.11 Operational definitions of variables

Objectives	Independent variable	Indicators	Measure	Measurement scale	Research design	Data collection	Type of analysis
To determine the influence of land tenure in adoption of agro-silviculture	Land tenure	Ownership of land ,whether communally owned, individually	Acre	Ordinal nominal	Descriptive research design	Questionnaire ,interviews and observation	Descriptive
To find out how planting inputs (capital, fertilizer and seeds) influence adoption of agro-silviculture	Planting inputs	Labour availability, Use of fertilizer ,manure, seedlings availability	No. of trees on the farm, tree nursery owned.	Ordinal nominal	Descriptive research design	Questionnaire ,interviews and observation	Descriptive
To establish the influence of gender on adoption of agro-silviculture	Gender	Women involvement in planting, planning, harvesting.	Number of times they are involved in weeding thinning	Ordinal nominal	Descriptive research design	Questionnaire ,interviews and observation	Descriptive
To investigate the influence of knowledge of benefits of tree planting on adoption of agro-silviculture	Knowledge of tree planting ,and its benefit	Involvement in tree planting groups ,contact with extension officers	No. of Self-help groups ,no. of times in contact with extension officers	Ordinal nominal	Descriptive research design	Questionnaire ,interviews and observation	Descriptive

CHAPTER FOUR
PRESENTATION, DISCUSSION AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presents an analysis and interpretation of the results from the data collected from the field. The study was out to establish the factors that influence farmer's decision to adopt agro-silviculture in Kenya, taking a case of Kapenguria Division, West Pokot County. The response was good because out of the 169 respondents to whom the questionnaires were administered 164 were returned well filled representing 97% response. Data was cleaned, coded and entered into Statistical Package for Social Sciences (SPSS) which aided in analysis of the data. The analysis of the data was guided by the study objectives which include;

1. To determine the influence of land tenure in adoption of agro-silviculture.
2. To establish how planting inputs (capital, fertilizer and seeds) influence adoption of agro-silviculture
3. To establish the influence of gender on adoption of agro-silviculture
4. To investigate the influence of knowledge of benefits of tree planting on adoption of agro-silviculture

4.1General Characteristics of respondents

The researcher sought to establish the characteristics of the respondents who participated in the study. This was meant to assist in drawing explanation to the kind of results that the study will present.

Table 4.1 showing the characteristics of Respondents

Characteristics		Frequency	Percent (%)
Gender	Male	109	66.5
	Female	55	33.5
	Total	**164**	**100.0**
Age	Less than 20	7	4.3
	21-30 years	27	16.5
	31-40years	40	24.4
	41-50 years	52	31.7
	Above 50 years	38	23.2
	Total	**164**	**100.0**
Occupation	Herder	2	1.2
	Farmer	123	75.0
	Businessman	6	3.7
	Professional	33	20.1
	Total	**164**	**100.0**
Education Level	Primary	82	50.0
	Secondary	51	31.1
	college	26	15.9
	University	5	3.0
	Total	**164**	**100.0**
Marital Status	Married	148	90.2
	Divorced	5	3.0
	Single	11	6.7
	Total	**164**	**100.0**

Source: Research Data (2014)

From table 4.1 the results show that there were more male respondents accounting for about 66% than female who were represented by about 34% of the respondents. Majority of the respondents in this study were aged between 31-50 years of age which accounted for about 55%. The respondents aged between 21-30 years accounted for 16% while those with more than 50 years accounted for 23%. This implies that most of the

respondents were either middle aged or old age. These ages are mostly associated with farming activities hence had some experience to answer to the questions in this study. The results indicate that 75% of the respondents practiced farming while 20% were engaged in professional activities. Business persons and herders were represented by 3% and 1% of the respondents respectively. It was also evident from the results that more than 80% of the respondents had not attained education beyond secondary education. About 18% of the respondents had attained college and university education. Almost all accounting for 90% of the respondents were married while only a few were divorced or single as accounted for by 3% and 6% respectively.

4.2: Land Tenure and Adoption of Agro-Silviculture

The first objective aimed at establishing land tenure as a factor that affects adoption of agro-silviculture. The responses were as presented below.

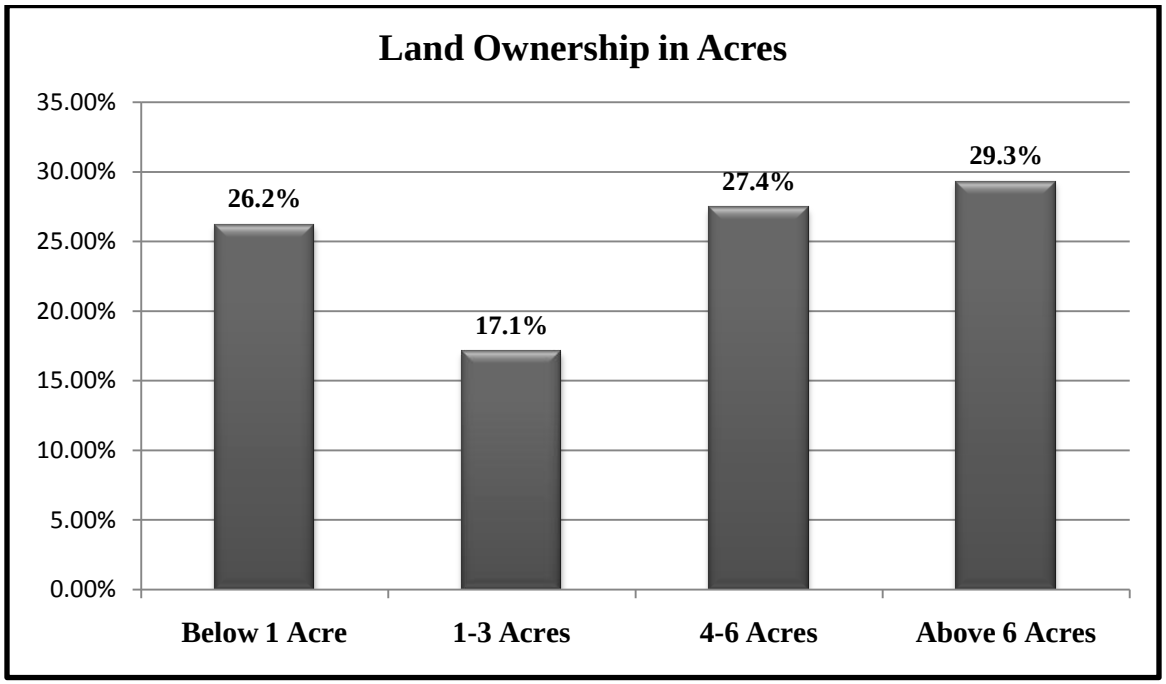
Table 4.2 Land ownership

		Frequency	Percent
Do you own farming land?	Yes	160	97.6
	No	4	2.4
	Total	**164**	**100.0**

Source: Research Data (2014)

The researcher sought to know whether the respondents owned land which they could do farming on. The results show that almost all of the respondents accounting for about 97% accepted that they owned a piece of farming land. Nevertheless, about 2% did not own farming land. This implies that land ownership issues were not likely to be key in choice of whether to adopt or not to adopt agro-silviculture.

Figure 4.1 Farming Land sizes



Source: Research Data (2014)

In figure 4.1 it was evident that almost 29% of respondents owned land above 6 acres while 27% owned land between 4 and 6 acres. Likewise, there were 26% of the respondents who owned land below 1 acre while only 17% had between 1 and 3 acres. This could be interpreted to imply that most of the respondents had substantially enough land for practicing agriculture. This was likely to be a motivation towards adoption of agro-silviculture.

Table 4.3 Land ownership Rights

		Frequency	Percent
How are the land rights?	Private	149	90.9
	Communal	15	9.1
	Total	**164**	**100.0**

Source: Research Data (2014)

The researcher sought to know about land rights, it was clear as shown in table 4.3 that 90% of the respondents had their privately owned land but only 9% stayed on

communal land. This was an indicator that they had exclusive rights over their land use as long as it was within the government regulations. This was also an indicator that agro-silviculture could be adopted by individuals without hindrances over land rights.

Table 4.4 Planting of trees

		Frequency	Percent
Have you planted trees?	Yes	127	77.4
	No	37	22.6
	Total	**164**	**100.0**

Source: Research Data (2014)

After majority of the farmers noting that they privately owned farming land, in table 4.4 there is a clear indication that majority of them accounting for 77% have planted trees while only 22 had not planted trees in their farms.

Table 4.5 Land ownership in the family

		Frequency	Percent
Who owns land in the family?	Father	159	97.0
	Mother	5	3.0
	Total	**164**	**100.0**

Source: Research Data (2014)

Adoption of agro-silviculture is likely to be affected by the decision maker. The study envisaged the one such member in the family who is perceived to be the owner of the land. The study results indicate that father figure in the house owns the land. This implies that adoption of agro-silviculture is likely to be influenced by the fathers in the households hence any efforts should be directed towards the same.

Table 4.6 Managers of Trees in Communal Land

		Frequency	Percent
Who manages trees in communal land?	Elders	108	65.9
	Others	56	34.1
	Total	**164**	**100.0**

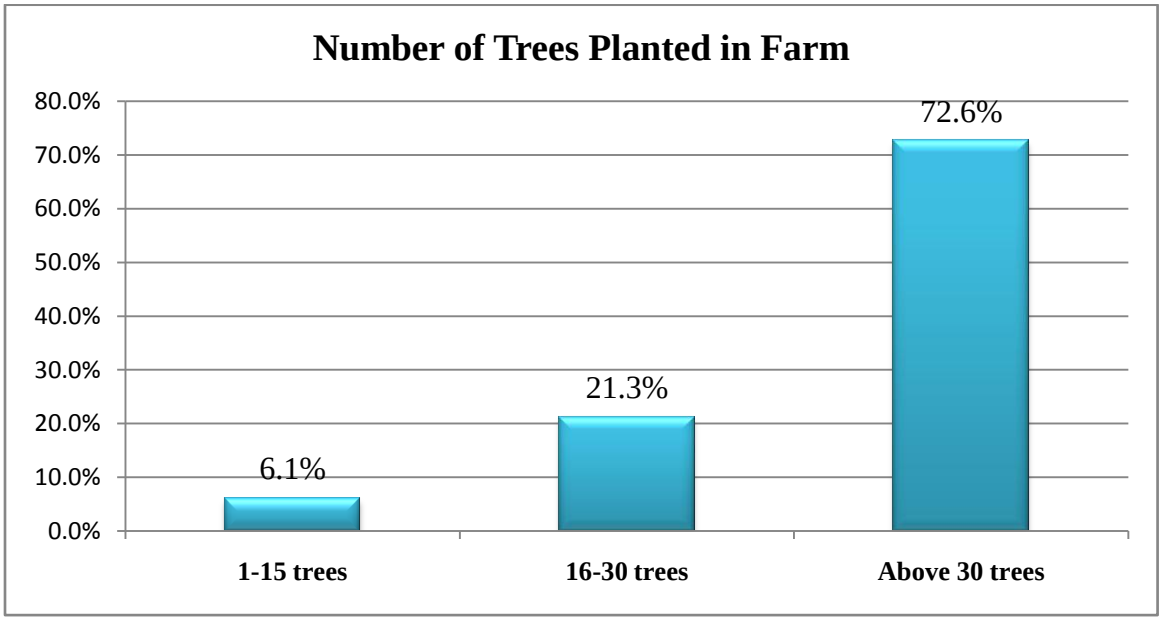
Source: Research Data (2014)

Communities adopt different activities in response to what has been demonstrated and is deemed successful. The study results show that majority of the respondents accounting for 65% agree that elders manage the trees in communal land. Any other people who manage these trees constitute only 34%. This implies that the elders of a society have a great role to play in adoption of agro-silviculture. Their decision on the land use of the communal land could see the adoption of or simply none at all

4.3: Planting Inputs and Adoption of Agro-Silviculture

The second objective aimed at establishing planting inputs as a factor that determines adoption of agro-silviculture. The responses were as presented below.

Figure 4.2 Number of Trees Planted In a Farm



Source: Research Data (2014)

In figure 4.2 it was evident that majority of the respondents accounting for about 72% planted more than 30 trees. Those who planted between 16 and30 trees accounted for 21% while 1 tree to 15 trees was represented by only 6% of the respondents. This implies that majority of the respondents were already practicing agro-silviculture. They plant trees alongside their crops as shown in the results.

Table 4.7 Planting of crops

		Frequency	Percent
Do you grow crops?	Yes	159	97.0
	No	5	3.0
	Total	**164**	**100.0**

Source: Research Data (2014)

Majority of the respondents accounting for 97% agreed that they plant crops in their land. This is almost the same number that agreed to be planting trees in their land. This can be inferred to mean that the residents practice agro-silviculture.

Table 4.8 Source of tree Seedlings

		Frequency	Percent
Source of tree Seedlings	Own nursery	17	10.4
	Purchased	145	88.4
	Government (KFS) nursery	2	1.2
	Total	**164**	**100.0**

Source: Research Data (2014)

One of the major inputs in the agro-silviculture is seedling. The source of seedlings could determine the viability and survival of the trees in the farms. The results indicate that most of the respondents (88%) purchased seedlings from the market or vendors. It was also notable that some respondents accounting for 10% get them from their own prepared seedlings. Very few seem to get their seedlings from government nursery.

Table 4.9 Affordability of tree seedlings

		Frequency	Percent
Are tree seedlings affordable?	Affordable	107	65.2
	Not Affordable	57	34.8
	Total	**164**	**100.0**

Source: Research Data (2014)

It was evident that 65% of the respondents found the seedlings affordable while 34% alluded that the seedlings were not affordable. Affordability of the seedlings is likely to affect the adoption of agro-silviculture. When the seedlings are not affordable to many it is likely that the there will be slow adoption or even unsustainable practices that wont spur much achievement.

Table 4.10: Choosing a tree species

		Frequency	Percent
Do you face difficulties in choosing species?	Yes	73	44.5
	No	91	55.5
	Total	**164**	**100.0**

Source: Research Data (2014)

Table 4.10 shows that about 44% of the respondents agree that they face difficulty while choosing which species to plant but 55% seem to be comfortable with the choices available. The easier it is to make such choices the more the chances of adoption of agro-silviculture.

Table 4.11: Ability to purchase fertilizer

		Frequency	Percent
Are you able to purchase fertilizer?	Yes	104	63.4
	No	60	36.6
	Total	**164**	**100.0**

Source: Research Data (2014)

The results in table 4.11 show that 63% of the respondents are bale to purchase the fertilizer to their farms. Nevertheless, 36% of the same respondents admitted that they were not able to purchase fertilizer. The 36% need to get some training because without the abilities to make a choice of such a core component in farming, it was unlikely that their agro-silviculture projects may flourish.

4.4: Gender and Adoption of Agro-Silviculture

The third objective aimed at assessing gender issue as a factor that determines adoption of agro-silviculture. The responses were analysed and presented as follows.

Table 4.12: Tree planting Decision maker

		Frequency	Percent
Who makes decision on tree planting?	Mother	13	7.9
	Father	151	92.1
	Total	**164**	**100.0**

Source: Research Data (2014)

From the results in table 4.12, it was evident that the father in a household was the tree planting decision maker as accounted for by 92% of the respondents. Only about 7% of the respondents alluded that the mother in a household makes a decision.

Table 4.13: Involvement of women

Question	**YES**	**NO**
Do you involve women in tree planting?	89.6%(147)	10.4%(17)
Are women involved in planning?	23.8%(39)	76.2%(125)
Are women involved in weeding?	60.4%(99)	39.6%(65)
Are women involved in pruning?	18.3%(30)	81.7(134)
Are women involved in thinning?	15.2%(25)	84.4%(139)
Are women involved in tree harvesting?	21.3%(35)	78.7%(129)
Are women involved in fuel wood harvesting?	92.7%(152)	7.3%(12)

Source: Research Data (2014)

In table 4.13 the study sought to establish the involvement of women in agro-silviculture. The results indicate that even though women are not the decision makers, they participate in tree planting as represented by 89% of the respondents. The results

further show only 23% of the respondents believe that women are involved in planning of tree planting while 76% are of a contrary opinion. Women are somehow involved in weeding which was supported by 60% of the respondents while only 39% posit that women are not involved in the weeding activities.

There is a general impression that the women are not involved in pruning; about 81% contends that women were not involved in the pruning process. The same trend is also recorded on the thinning activities where about 84% of the respondents believe that women are not involved. This could be due to the culture where women are not allowed to climb on trees and yet thinning and pruning requires a person to climb up the trees. Majority of the respondents accounting for about 78% agreed that women were not involved in tree harvesting activities. Nevertheless, 92% of the same respondents believe that women are involved in wood fuel harvesting probably because they are the ones who manage the cooking in homes and fuel is part of the important things needed.

4.5: Knowledge of benefits and Adoption of Agro-Silviculture

The fourth objective aimed at assessing the knowledge of benefits as a factor that determines adoption of Agro-silviculture. The response results were as shown below.

Table 4.14: Knowledge on the benefits

		Frequency	Percent
Are you aware of benefits of planting both trees and crops on same land?	Yes	157	95.7
	No	7	4.3
	Total	**164**	**100.0**

Source: Research Data (2014)

The results in table 4.14 show that 95% of the respondents seem to be aware of the benefits of planting both trees and crops in the same land. It is likely to be inferred that people who know the benefits can easily be able to adopt agro-silviculture. This implies that the benefits accrued to agro-silviculture are very evident amongst the respondents and that could be the reason why they have seemingly adopted.

Table 4.15: Frequency of meeting extension officers

		Frequency	Percent
How many times have you met with the extension officers	Once	50	30.5
	Twice	38	23.2
	Several times	76	46.3
	Total	**164**	**100.0**

Source: Research Data (2014)

Extension officers are very important in the training and educating communities on the benefits of the best farming practices. The more the farmers interact with them the more likely it is for them to gain skills. The results show that 46% of the respondents have met them several times while 30% seem to have met the officers only once. Those who have met the officer twice accounted for 23% of the respondents. This implies that adoption of agro-silviculture is likely as indicated by almost 70% of the respondents having met the extension officers more than once.

Table 4.16: Membership in planting group

		Frequency	Percent
Are you in a tree planting group?	Yes	18	11.0
	No	146	89.0
	Total	**164**	**100.0**

Source: Research Data (2014)

The results in table 4.16 indicate that most of the respondents who accounted for 89% were not in any planting group. Only 11% were in planting groups. This implies that success of the farmers was due to individual efforts and probably informal consultations among themselves.

Table 4.17: Membership in Community Based Organization

		Frequency	Percent
Are you a member of a Community Based Organization?	Yes	24	14.6
	No	140	85.4
	Total	**164**	**100.0**

Source: Research Data (2014)

In table 4.17 it was evident that most of the respondents who accounted for 85% were not members of any community based organization. Only 14% were in CBOs. This implies that the farmers' knowledge and decisions were probably influenced informally or through extension officers.

Table 4.18: Membership in Community Forest Association

		Frequency	Percent
Are you a member of a Community Forest Association?	Yes	8	4.9
	No	156	95.1
	Total	**164**	**100.0**

Source: Research Data (2014)

The results in table 4.18 show that 95% of the respondents were not members of community forest association while only 5% had membership with such a group.

Table 4.19: Ownership of a tree nursery

		Frequency	Percent
Do you own a tree nursery?	Yes	10	6.1
	No	154	93.9
	Total	**164**	**100.0**

Source: Research Data (2014)

The results in table 4.19 indicate that most of the respondents accounting for about 94% do not own tree nurseries while only 6% own tree nurseries. This implies that the respondents do not have the necessary skills to prepare tree nurseries or it could be more convenient to purchase seedlings rather than preparing a tree nursery.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter focuses on the summary of the study findings, conclusions and recommendations. Suggestions for further research are also enumerated. The study set out to investigate on factors influencing farmers' decisions to adopt agro-Silviculture in Kenya, a case of Kapenguria Division, West Pokot County.

5.2 Summary of Findings.

The study envisaged to establish the background information of the respondents. The results revealed that majority of the respondents were males. The modal age bracket was between 31-50 years, most were either middle aged or old age. These ages are mostly associated with farming activities hence had some experience to answer to the questions in this study. The results indicate that most of the respondents practiced farming while a few engaged in professional activities, Business and herders. It was also evident that most of the respondents had not attained education beyond secondary education. Almost all of the respondents were married.

5.2.1 Land Tenure and Adoption of Agro-Silviculture

The first objective aimed at establishing land tenure as a factor that affects adoption of agro-silviculture. Almost all of the respondents accepted that they owned a piece of farming land. This implies that land ownership issues were not likely to be key in choice of whether to adopt or not to adopt agro-silviculture. It was evident that many of respondents owned land above 4 acres. This results agree that with what Ajayi et al.

(2003) revealed that 3 studies had found that farm size to have a positive association with farmers' decisions to plant and even continue with improved fallows although this finding is not associated with gender. This could be interpreted to imply that most of the respondents had substantially enough land for practicing agriculture. This was likely to be a motivation towards adoption of agro-silviculture.

The researcher sought to know about land rights, it was clear majority of the respondents owned land privately. This was an indicator that they had exclusive rights over their land use as long as it was within the government regulations. This was also an indicator that agro-silviculture could be adopted by individuals without hindrances over land rights. After majority of the farmers noting that they privately owned farming land, there is a clear indication that majority of them had planted trees in their farms. These findings agree with studies which have shown that ownership of land title is increases total factor production (TFP) in all models. For instance (T. Otsuki, 2010) assert that having secure land title promotes a farmer's investment in land improvement.

Decision makers in a family are likely to influence adoption of agro-silviculture. The study results indicate that father figure in the house owns the land. This implies that adoption of agro-silviculture was greatly to be influenced by the father figures in the households hence any efforts should be directed towards the same. Communities adopt different activities in response to what has been demonstrated and is deemed successful. The uses of communal land are likely to be replicated in the private land. The study results show that majority of the respondents agree that elders manage the trees in communal land. This implies that the elders of a society have a great role to play in adoption of agro-silviculture.

5.2.2 Planting Inputs and Adoption of Agro-Silviculture

The second objective aimed at establishing planting inputs as a factor that determines adoption of agro-silviculture. Majority of the respondents planted more than 30 trees. Majority of the respondents were already practicing agro-silviculture. They plant trees alongside their crops as shown in the results. It was further indicated that majority of the respondents agreed that they plant crops in their land. This is almost the same number that agreed to be planting trees in their land.

One of the major inputs in the agro-silviculture is seedling. The source of seedlings could determine the viability and survival of the trees in the farms. The results indicate that most of the respondents purchased seedlings from the market or vendors. Very few seem to get their seedlings from government nursery. It was evident that most respondents found the seedlings affordable. Affordability of the seedlings is likely to affect the adoption of agro-silviculture. As Kwesiga et al., (2003) argue that lack of planting materials (seed and seedlings) is a factor considered to constrain establishment of fallows.

The results show that some of the respondents agree that they face difficulty while choosing which species to plant but other seemed to be comfortable with the choices available. The easier it is to make such choices the more the chances of adoption of agro-silviculture. The results further indicate that most of the respondents are able to purchase the fertilizer to their farms. The respondents needed some training because without the abilities to make a choice of such a core component in farming, it was unlikely that their agro-silviculture projects may flourish.

5.2.3 Gender and Adoption of Agro-Silviculture

The third objective aimed at assessing gender issue as a factor that determines adoption of agro-silviculture. It was evident that the father in a household was the tree planting decision maker while very few of the respondents alluded that the mother in a household makes a decision. The study also sought to establish the involvement of women in agro-silviculture. The results indicated that even though women are not the decision makers, they participate in tree planting. The results further show the women are involved in planting. Women are somehow involved in weeding.

There is a general agreement that the women are not involved in pruning. The same trend is also recorded on the thinning activities. This could be due to the culture where women are not allowed to climb on trees and yet thinning and pruning requires a person to climb up the trees. Majority of the respondents indicated that women were not involved in tree harvesting activities. Nevertheless, a general agreement was that women are involved in wood fuel harvesting probably because they are the ones who manage the cooking in homes and fuel is part of the important things needed.

5.2.4 Knowledge of benefits and Adoption of Agro-Silviculture

The fourth objective aimed at assessing the knowledge of benefits as a factor that determines adoption of Agro-silviculture. The results show that most of the respondents are aware of the benefits of planting both trees and crops in the same land. It is likely to be inferred that people who know the benefits can easily be able to adopt agro-silviculture. This can be inferred to mean that the benefits accrued to agro-silviculture are very evident amongst the respondents and that could be the reason why they have seemingly adopted.

Agricultural extension officers are very important in the training and educating communities on the benefits of the best farming practices. This agrees with Ajayi(2007) findings. The more the farmers interact with them the more likely it is for them to gain skills. The results show that most of the respondents have met them several times. This implies that adoption of agro-silviculture is likely as indicated by almost all of the respondents having met the extension officers more than once. This implies that success of the farmers was due to individual efforts and probably informal consultations among themselves.

It was evident that most of the respondents were not members of any community based organization. This implies that the farmers' knowledge and decisions were probably influenced informally or through extension officers. The same trend was witnessed in community membership. The results also indicated that most of the respondents do not own tree nurseries. This implies that the respondents do not have the necessary skills to prepare tree nurseries or it could be more convenient to purchase seedlings rather than preparing a tree nursery.

5.3 Conclusion of the Study

In conclusion the study established that land tenure, planting inputs, gender and knowledge of benefits influences adoption of silviculture. Most of the residents in study area owned enough piece of land on which they could practice agro-silviculture. The adoption of agro-silviculture was also dependent on the ability of the farmers to procure their planting inputs like fertilizers, seedlings and resistant species. The influence of gender was likely to play a role in the adoption of agro-silviculture. The fathers in the household dominate the list of those who make decisions in the family hence there is

need to ensure they have a clear understanding of what agro-silviculture. Knowledge of the benefits of agro-silviculture is a motivation towards it adoption.

5.4 Recommendations

The study makes the following recommendations based on the findings;

1. The study recommends that the government should deploy more extension officers to do regular agro-silviculture training to ensure proper land use.
2. The study recommends increase in capacity building to ensure that farmers access seedlings from government sectors (Kenya Forest Service) and subsidize fertilizers for farmers.
3. The national and county government should empower women to enable them increase agro-silviculture practices so as to partake of the benefits of the noble course.
4. More campaigns should be held to increase farmers' knowledge on benefit of agro-silviculture.

5.5 Suggestion for Further Research

This study recommends that further research should be done to assess the effect of agro-silviculture on socio-cultural development.

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APPENDICES

APPENDIX 1: LETTER OF TRANSMITTAL OF DATA

University of Nairobi

P.O. Box 30197 - 0100

Nairobi

TO WHOM IT MAY CONCERN

Dear Respondent.

My name is Juliet Tuwei; I am a student at University of Nairobi pursuing a Masters of Arts degree. I am requesting you to furnish me with the following information .The research is about finding factors that influence farmers decision to adopt agro-silviculture in Kenya a case of Kapenguria Division West PokotCounty.The information obtained in the research will be used for the intended purpose and will be held in strict confidence.

Kindly answer all questions in the questionnaire accurately.

Your assistance will be highly appreciated.

Thank you.

Yours Faithfully,

Juliet Tuwei

0707402698

APPENDIXII: QUESTIONNAIRE

Juliet Tuwei is a student at University of Nairobi (UoN) carrying out a research study on **'FACTORS INFLUENCING FARMERS' DECISION TO ADOPT AGRO – SILVICULTURE IN KENYA : A CASE OF KAPENGURIA DIVISION WEST POKOT COUNTY".** The information requested in this questionnaire is meant for academic purposes only and confidentiality will be upheld. Kindly assist in answering the following questions:

Date: _____
Location: _____
S/Location: _____
Code No: _____

SECTION A: DEMOGRAPHIC INFORMATION

(Please tick where appropriate)

1. Indicate your gender Male [ ]Female [ ]

2. What is your age bracket? <20 [ ] 20-30 [ ]

30-40 [ ] 40-50 [ ]

>50 [ ]

3. Give your highest level of education?

Primary [ ] Secondary [ ] College [ ]

University[ ]

4. Marital Status of the respondents

Married[ ] Divorced [ ] Single[ ]

5. What is your current occupation?

Herder [ ] Farmer[ ]

Business person [ ] Professional[ ]

SECTION B: Land tenure influence on adoption of Agro-silviculture

1. Do you have a farming land? Yes [ ] No[ ] If yes indicate acres ……

   If yes ,what is the land right?

   Private [ ] Communal [ ] Trust land [ ]

2. Have you planted trees in your farm? Yes [ ] No[ ]

   If yes ,what is the size you have allocated for tree planting?.....

3. Who owns land in the family ? Father [ ] Mother [ ] Daughter /son [ ]

4. Who manage trees in communal land? Elders [ ] Committee[ ]others specify[ ]

SECTION C: Planting inputs (Capital, fertilizer, seeds) and adoption of agro-silviculture

1. If you plant trees ,how many trees have you planted in your farm?

Planted 1- 15 [ ] 16 -30 [ ] other specify

List tree species planted ----------

---

2. Do you grow crops in your farm? YES [ ] No[ ]

If yes list them----------

3. Where do you source tree seedlings?

   a. Own nursery[ ]
   b. Purchased [ ]
   c. Donation [ ]
   d. Government nursery (KFS) [ ]

e. Other specify----------

5. If purchased is it affordable [ ] or not affordable [ ]

6. Do you face difficulties in choosing tree species?

YES [ ] No[ ]

If yes ,whom do you consult?

Agriculture officer [ ]

Kenya Forest Officers [ ]

KVDA officers [ ]

Others specify……..

7.Are you able to purchase fertilizers for use in your farm?

YES [ ] No [ ]

If no what do you use in planting crops/trees?

……

SECTION D: Gender and adoption of Agroforestry by farmers

1) Who makes decision when it comes to tree planting?

a. Mother [ ]

b. Father [ ]

c. Daughter/son [ ]

2. Do you involve women in tree planting ? YES [ ] No[ ]

If yes, to what extend Fully [ ] Partially [ ] None [ ]

3 . Are women involved in the following?

a. Planning Yes [ ] No [ ]
b. Planting Yes [ ] No [ ]

c. weeding Yes [ ] No [ ]
d. Pruning Yes [ ] No [ ]
e. Thinning Yes [ ] No[ ]
f. Harvesting Yes [ ] No[ ]
g. Fuel wood harvesting Yes [ ] No[ ]

4. Among the above which are women involved most?

a[ ] b [ ] c [ ] d [ ] e [ ] f [ ] g [ ]

5 Do you agree with the following ?

Women involvement in tree planting is low? Yes [ ] No [ ]

SECTION D: Knowledge of tree planting and its benefits and adoption of agro-silviculture

1. Are you aware of benefits of combining trees and agricultural crop on the same land management system?
Yes [ ] No [ ]
If yes name the benefits……
……
.
2. How many times have met with extension officers

Once [ ] Twice [ ] Several times[ ]

3. Are you in any tree planting group?

Yes [ ] No [ ]

If yes name the group……

4. Are you in any of the following?

Community Based Organization Yes [ ] No [ ]

Community Forest Association Yes [ ] No [ ]

Others specify.....

5 .Do you own a tree nursery ?Yes [ ] No [ ]

If yes is it for commercial or own planting?.....

APPENDIX III: INTERVIEW GUIDE FOR AGRICULTURE/FOREST EXTENSION OFFICERS

The purpose of this guide is to gather information on factors that influence farmers' decision to adopt agro-silviculture in Kapenguria division. The information given will be confidential and will be used for the purpose of research only.

General Questions:

1. What are the main crops grown in the area?
2. What are the main tree species grown in this area?
3. What are the main factors that influence farmers' decision to adopt Agro-silviculture?
4. What can you generally say about land tenure influence on adoption of agro-silviculture?
5. What is your view about gender influence on adoption of agro-silviculture?
6. How has knowledge of benefit of tree planting influencedadoption of agro-silviculture?
7. How often do you meet with farmers?

Thank you for your invaluable responses

APPENDIX V: SAMPLE SIZE DETERMINING TABLE

Table for Determining Sample Size from a Given Populationtable given by (Krejcie& Morgan 1970).

N	S	**N**	S	**N**	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370