ADOPTION OF SOCIAL FORESTRY PRACTICES IN UASIN GISHU DISTRICT, KENYA

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DECLARATION AND APPROVAL

Declaration

This research work is original and has not been presented in any university for a degree.

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Supervisors' Recommendation

This research thesis has been submitted with our approval as University Supervisors

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DEDICATION

To my wonderful family, for their outstanding patience, understanding and encouragement throughout the entire course of the study.

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ABSTRACT

Moiben is one of the six divisions of Uasin Gishu District in Rift Valley Province, Kenya. Like many other areas of the country, it is faced with many environmental and social problems such as soil erosion, declining land productivity, reduced tree-based products and rising poverty levels. In spite of the involvement of various development agencies like government ministries, non- governmental and church organizations in promoting tree planting in the area over the years, woody vegetation cover has been diminishing and environmental degradation increasing. Contrastingly, social forestry has been practiced elsewhere with great success in lowering poverty levels and environmental degradation. In all the cases of success, both inside and outside Kenya, public participation generally and the participation of women specifically is cited as a critical factor. The study investigated the current level of social forestry practices among the local communities in Moiben Division, the level of women participation and examined the effects of socio-economic and socio-cultural factors on adoption of social forestry practices. Research instruments applied included a structured questionnaire administered on a randomly selected sample of 200 households, key informant interviews and direct observations. Descriptive and analytical procedures, using Statistical Package for Social Sciences (SPSS) software, were utilized to analyze the data. Correlation and regression techniques were used. The results indicated that 47.5 percent of the households were practicing some form of social forestry. Although 65.0 percent of the respondents were women, only 17.0 percent and 10.0 percent of them could decide to plant and harvest trees, respectively. Women participation was constrained by lack of capital, inputs, time, technical know-how and cultural discouragement. Socio-economic factors found to influence adoption were occupation, education level and health status. Socio-cultural factors influencing adoption were public awareness, extension services and land tenure. It is recommended that these factors be addressed sufficiently in order to improve adoption of social forestry in the study area. Reasons advanced for not adopting social forestry were: trees interfere with mechanized farming, land is not big enough, trees attract pests, and lack of seeds/seedlings. Income, farm size and traditional beliefs had no significant influence on adoption.

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LIST OF ACRONYMS

A.S.L (a.s.l).....Above Sea Level

ASAL.....Arid and Semi arid Lands

CBOs.....Community-Based Organizations

DDP.....District Development Plan

EATEC.....East African Tanning and Extract Company

FAO.....Food and Agriculture Organization (of the United Nations)

FSR.....Farming Systems Research

HIV/AIDS.....Human Immuno-deficiency Virus/ Acquired Immune Deficiency Syndrome.

ICRAF.....International Centre for Research in Agroforestry [currently World Agroforestry Centre (WAC)]

KWAP.....Kenya Woodfuel and Agroforestry Project

KWDP.....Kenya Woodfuel Development Project

MENR.....Ministry of Environment and Natural Resources

MOA.....Ministry of Agriculture

NES.....National Environment Secretariat

NGOs.....Non Governmental Organizations

PRA.....Participatory Rural Appraisal

ROK.....Republic of Kenya

RRA.....Rapid Rural Appraisal

SE.....Social Economic

SPSS.....Statistical Package for the Social Sciences

UKAI.....Ukamba Agricultural Institute

UNEP.....United Nations Environment Programme

CHAPTER ONE: INTRODUCTION

1.1. Background to the Study Problem

The study was conducted in Moiben Division, Uasin Gishu District, Rift Valley Province of Kenya. The area was chosen for this kind of study because of the visibly low levels of social forestry adoption, as evidenced by scanty tree cover within the farmlands. The main aim of the study was to unravel factors affecting social forestry practices and, recommend ways of improving adoption of social forestry in the district of Uasin Gishu. The study was designed to firstly determine the level of social forestry or the extent to which the communities in the area had planted and managed trees on their farms and secondly determine the main socio-economic and socio-cultural factors that affect social forestry adoption, with a view to recommending remedial measures.

Once upon a time before Kenya was colonized, thick indigenous forests and thickets covered most highland areas of the country, including Uasin Gishu District. This was later to change when Kenya became a British colony. Incoming European settlers wanted to establish large agricultural and forest monocultures based on commercial production for export markets. This marked the beginning of a long term policy of the colonial administration in Kenya: - to open and clear as large tracts of indigenous vegetation as possible to pave way for large economic activities, including exotic forestry and large-scale agriculture. The intervening period quickly saw the emergence of extensive industrial forest plantations and large-scale agricultural farms. It is believed that this is the phenomenon that left large areas of the former white highlands devoid of tree cover (ROK, 2002). The African farmers who took over these farms after Kenya attained political independence in 1963 have not reversed the trend either. They continued the vegetation-clearing policy as their populations continued to swell. The result is the highly populated and subdivided country-sides that we see today. Farm sizes have been dwindling and gazetted forests have been disappearing at an alarming rate. Traditional sources of wood supplies are no more as a result. This is the story of Uasin Gishu District today (ROK, 2002).

Uasin Gishu District is regarded as one of the prominent food-producing districts in Kenya, although poverty incidence is still quite high. According to the current Uasin

Gishu District Development Plan (2002-2008), rural food poverty was estimated at 42.92 per cent of the district population in 1997 as compared to 37.04 per cent in 1994. Those most vulnerable to poverty in the area include persons with disabilities, the elderly, women in general, the landless, the youth, the unemployed, orphans and children in difficult circumstances (Republic of Kenya (ROK), 2002). In 2002, hard-core poverty levels were estimated at 20.72 per cent and 12.83 per cent in rural and urban areas respectively. The single major cause of poverty has been unemployment, due to closure or operational slow-down of major industries in Eldoret, such as Kenya Cooperative Creameries (KCC), East African Extract and Tanning Company (EATEC), Rivatex and Raymond Woolen Mills besides others. Since 2003, some of the factories have been trying to restart operations. Other causes of poverty include lack of markets for farm produce, high cost of farm inputs and poor or lack of food storage facilities. Poor quality seeds, limited access to credit and poor delivery services also contribute to poverty escalation. By 2004, the HIV/AIDS pandemic, with a prevalence of 12.1 per cent compared to the country's 14 per cent, was making a major socio-economic impact.

Due to high population growth rate, social facilities such as health, education, transport, and so on are grossly over-burdened. Environmental degradation is proceeding at an alarming rate. Productivity of the land is rapidly decreasing. Deforestation (devegetation) of the landscape has led to fuel shortage and massive soil erosion. Incidents of disease and human suffering have become widespread (ROK, 2002). A reliable and vital source of firewood, charcoal, posts and poles in the region since colonial times has been the Lonrho-owned East African Tanning and Extract Company (EATEC) with its extensive forest estates. However, since EATEC wound up around 1999, the forest estates have been surveyed, subdivided and sold out to private developers as residential or commercial property. As a result, the price of one bag of charcoal increased from Ksh 200 in 1998 to Ksh 700 in 2004. This, combined with already high cost of living, has been creating unprecedented levels of poverty and environmental degradation in the study area. Households have resorted to using farm residues and wastes such as straws, maize cobs and animal dung as sources of energy. Due to their role in the society, women particularly have been hit hard by this problem. The ever increasing human population and correspondingly decreasing size of land holding per

capita will only serve to worsen the situation. This calls for urgent and affordable social interventions capable of mitigating both poverty and environmental problems simultaneously.

Social forestry here refers to any type of tree growing practice by the communities, such as agroforestry, afforestation, reforestation, and others. Despite the potential of social forestry, tree-planting activities in the area are extremely low, as can been seen on a casual visit to the area. It is against this background that this study was found necessary- to try and find out why this is the prevailing situation and what could be done about it. Previous social forestry studies in the area have tended to concentrate on geophysical factors and biomass yields of sites and tree species. There has not been similar interest in establishing adoption levels and/or the factors that would influence farmer adoption of social forestry. Yet, it has been argued before that almost everywhere people know and appreciate the value of trees. Thus, establishing why growing of more trees has not been taking place spontaneously was a critical step in planning the development of social forestry programmes in the district.

Although the study was carried out with minimal resources due to lack of financial sponsorship, great care and due diligence were continually exercised. The thesis is organized into six precise chapters. Chapter one introduces the study as a whole, providing a background to the study problem, stating the problem, objectives of the study, the research questions and justification for the study. Chapter two provides relevant literature written by other researchers about similar work elsewhere in addition to laying down the conceptual framework of the study. Chapter three is about the research methods and materials used in the study, including site attributes, location, research design, sampling and sample size, data collection instruments, definitions of terms/ variables used, problems encountered during data collection, operationalization of variables, processing and analysis of data. It is important to state from the onset that definition of terms/ variables was not necessarily according to contemporary meanings but according to the way they were used in the study to achieve the stated research objectives. Chapter Four offers results of the study. Although a lot of data was collected to avoid the risk of inadequate information, only relevant results have been summarized and presented. Tables and charts have been used in the presentation of results. Chapter

Five is about discussion of the results and findings. In the course of discussions, the results are sometimes compared to results of similar works authored by researchers elsewhere and for the sheer purpose of intellectual comment. It is in this chapter that the level of social forestry adoption and the major factors found to affect/ not affect social forestry adoption are discussed in detail. Chapter Six, being the final chapter, presents the conclusions and recommendations reached for follow up.

1.2. Statement of the Problem

Moiben Division is a rich agricultural zone that is well known for mechanized large-scale farming. Most of the maize and wheat consumed in Kenya is actually produced in this region; hence the common reference to it as "the bread basket of Kenya". As the farmers continue to pursue production of commercial food-crops, the farms continue to be devoid of trees and other vegetation. The farmlands remain dry and bare, especially during the periods between harvests and replanting. Lack of trees in farms has left the land sun-baked and exposed to degradation. Dust storms during dry seasons and heavily silted run-off storms during rainy seasons are common features in the area (ROK, 2002). These phenomena are also visibly evident during the hot (dry) and rainy seasons (Plates 1 and 2).

Over the years various development agencies, among them the Ministries and Departments of Agriculture, Livestock, Forestry; non-governmental and church organizations, have been providing free tree seedlings, technical and extension services to area residents, but there has not been much improvement in terms of increased tree cover. Farmers do not even seem motivated to take advantage of the favourable soils and climate to enjoy and maximize the benefits of social forestry. The visibly low and scanty tree cover in the study area effectively signifies low adoption of social forestry practices. This study is therefore devoted to establishing the likely root causes of this problem.

1.3. Objectives of the Study

Broad Objective

The aim of the research is to unravel factors affecting adoption of social forestry practices in Moiben Division, and recommend ways of improving the adoption.

Specific Objectives

1) To determine the level of adoption of social forestry practices in Moiben Division.
2) To identify the major socio-economic and socio-cultural factors that affect adoption of social forestry practices in the division.

1.4. Research Questions

The proposed research will attempt to answer the following questions:

1. What is the level of adoption of social forestry practices in the division?
2. What is the level of women participation in social forestry in the division?
3. What are the major economic and socio-cultural factors that affect adoption of social forestry practices?
4. How could such constraints to adoption of social forestry practices be overcome to improve public participation?

1.5. Justification

At least three hundred thousand tree seedlings have been available for planting in Moiben division every tree-planting season since 1983 (ROK, 2002). This translates to six million seedlings for the last twenty years in the division. However, there is no evidence of many trees having been planted. The seedlings would be sourced from nurseries operated by the Forest Department, Ministry of Agriculture, NGOs, Chiefs and Sub-Chiefs, Kerio Valley Development Authority, Kenya Power and Lighting Company, individual farmers and others. Yet, most farms are still devoid of tree cover. Hence the need for a study to unravel factors that contribute to this state of affairs, and suggest possible measures to improve the adoption of social forestry practices in the area.

The study not only quantified and explained the current social forestry adoption levels in the area but also identified key constraints to participation and recommended ways of mitigating them. The study provides useful entry points for intervention by environmentalists, social forestry promoters and poverty alleviation agencies. Social forestry not only has the requisite potential to mitigate both environmental and socio-economic problems simultaneously, but it is also a fairly simple, affordable and sustainable technology for the rural folk. There are studies, which provide evidence that social forestry has been adopted successfully elsewhere in the country and in the world to assuage similar problems.

CHAPTER TWO: LITERATURE REVIEW

2.1. Benefits of Social Forestry

The association of mankind and trees dates as far back, according to the theory of creation, as when God created man. This is good testimony that the human race has depended on trees for various purposes throughout history. Trees may play one or more of the following functions and thus contribute directly or indirectly to rural and urban sustainable development and quality of the environment (FAO, 1986):

- As a source of human food
- Provision of livestock fodder
- Provision of fuel wood - for both rural and urban population
- Provision of building material
- Provision of fibre
- Provision of medicine for both human beings and animals
- Source of other useful products such as latex, and
- May play service functions such as soil conservation, microclimate amelioration, soil-nitrogen fixation, and provision of shade, besides others. Trees also increase the stability of the farm system by adding to the diversity and seasonal spread of farm products (FAO, 1986).

Tiffen *et al.* (1994) examined what is now referred to as the "Miracle of Machakos", in which a transformation from hopelessness to a tripling of income and a reduction in the erosion problem was achieved. She states: "In Machakos, a spectacular transformation took place. In 1937, it was reported that its 250,000 people were rapidly drifting to a state of hopelessness and miserable poverty, and their land to perching desert of rocks, stones and sand. Forty years ago, this district was still called a disaster area; characterized by over population, soil erosion and poverty. In 1990 the population density had tripled, but so had the average farm incomes per capital, while soil erosion virtually had reduced. This was achieved through a massive large-scale investment in terracing for soil and water conservation, organic matter management, tree and fodder planting, crop experiments and so on" (Tiffen *et al.*, 1994). There is thus sufficient evidence to show that social forestry has substantial socio-economic and environmental benefits.

Although forestry has ordinarily been associated with timber production, it also has a role in contributing to nutrition of both mankind and livestock. The combination of perennial trees and shrubs with ephemeral food plants in one and the same area constitutes the concept of agroforestry. This is a form of social forestry, with a changed emphasis on artificial rather than natural forestry. Therefore timber production can still be enhanced through social forestry production systems. With dwindling renewable energy sources, social forestry may be expected to play an even greater role in the provision for the rural people and most of the urban poor. This will also help reduce pressure on the remaining protected government forests.

In India, social forestry has been used to establish sand dunes stabilization, shelterbelt plantations, silvi-pastoral and agri-silvicultural systems (Sharkanarayan et al., 1989). In Tanzania, the Chaga people have home gardens characterized by intensive integration of numerous multipurpose trees and shrubs with food crops and animals simultaneously on the same unit of land. The great diversity provides both subsistence and cash crops. It enables farmers to keep their management options open and provides insurance against drought, pests and economic risks (Fernandes *et al.*, 1989). Social forestry reduces soil erosion and adds cheap farm- produced fertility to the soil. This eases pressure on forests and other natural vegetation resources by enabling the land user to produce fodder, fuel wood, building material and food on the farm. Thus social forestry contributes in sustainable agricultural development (Lundgren and Raintree, 1988). Social forestry can also rapidly create surplus products for industry and trade, and also care for the environment so that future generations can continue to increase production and maximize the number of options on how to use the natural and environmental resources of soil, water, vegetation and animals.

According to a World Agroforestry Centre's report, agroforestry technologies and policies had a life changing impact on well over 100,000 farmers worldwide, "and the need now is to scale up research and development effects aimed at dramatically increasing knowledge about, and the use of agroforestry practices throughout the tropics" (World Agroforestry Centre, 2003). The Centre is launching a global campaign "to improve the lives of tens of millions of people while enhancing the global environment and resilience". The motto aptly chosen to drive this is: Agroforestry- billions of trees on

millions of small-scale farms is a sustainable solution. The Centre further avers that this is simply the beginning in this "greening of the tropics" campaign!

Important conservation and production benefits have been reported at sites where social forestry practices like alley cropping have been introduced on trial basis (Rocheleau *et al.*, 1988; Obonyo, 1996). Forestry and food production are interrelated in that trees and forests influence both their immediate surroundings as well as the stability of the larger environment. As a result, trees have an important link with food security both at macro and micro levels. Subsequently they help to provide stable environmental conditions on which sustainable food production depends. Trees improve the microclimate, reduce damage by wind, provide protection against soil erosion and restore soil productivity (FAO, 1989). A study carried out in Muguga, Kenya shows that yields of arable crops can be improved without using costly chemical fertilizers, but by use of the hedgerow cropping and alley farming systems for effective management of soil fertility (Nyamai, 1996).

The socio-economic role of social forestry at a broad level may address the following additional land use objectives: (i) maintain productivity of land in situations of scarce capital when presence of trees helps substitute purchased inputs of fertilizers and herbicides/insecticides; (ii) make productive use of land when labour is scarce - trees, as low input and low management crops, constitute the most effective use of these resources; (iii) increase usable biomass output per unit of land area in situations of limited land and capital, as tree/crop/livestock combinations permit better use of available labour per unit of land; (iv) increase income-generating opportunities from on-farm resources as size of land holding and/or site productivity fall below the level at which the household basic needs can be met, and (v) reduce the risk through diversification of outputs and build-up of tree stocks, which can be sold to meet periodic or unforeseen needs of capital (Torres, 1983).

Trees may also be a direct source of food such as fruits, nuts, seeds and cereal substitutes. For example, in Baringo District (Kenya), seeds of *Boscia coriacea* are boiled for many hours and eaten as cereal substitute during drought periods.

Trees and shrubs too are important in livestock production and can help ensure a year round supply of milk, blood and meat products for local inhabitants. This is an

important contribution to national food security. The range of woody species used for fodder is extremely wide and the importance of fodder or browse depends on the type of livestock (Skerman, 1977; Felker and Bandurski, 1979). Comparisons of different types of fodder in the interior savanna of Ghana, for example, showed that browse typically has two to three times as much protein as grasses, the exact values varying between seasons (Torres, 1983). Animals eating only dry grass would suffer from malnutrition both because of the shortage of energy and protein, and the lack of vitamin A and essential minerals, especially phosphorous- all abundant in browse (Le Houerou, 1986). Protein content is important in that it is the main limiting factor to live-weight gains of livestock (Pratchet, 1977).

In the analysis of individual tree-grass relationships, it was found that there was greater yield of grass (*Cenchrus ciliaris*, *Panicum maximum*) under the microhabitat conditions of trees (*Eucalyptus populea*) than in the inter-tree areas (Christie, 1975). It was also found that sites under canopies were associated with a higher water infiltration rate and water holding capacity; more exchangeable magnesium, calcium, potassium and organic carbon in the soil; while average light intensity and mean surface temperatures were low (Goldson, 1973). Under tropical conditions, trees on pastureland also provide shade to the animals, while at the same time reducing the speed of winds that may adversely affect pasture growth.

However, some browse plants contain biochemically active materials, such as cyanogenic glycosides, tannins and goitrogenic and allergenic substances, which may affect metabolism of livestock. For example, the seedpods of *Acacia nilotica*, relished by cattle, may be harmful if consumed in large amounts (Pratt and Gwynne, 1977). It is therefore necessary that farmers be properly advised on the tree species and amounts of fodder to avail to their animals.

2.2. Factors That Influence Adoption of Social Forestry by Farmers.

Adoption of social forestry by communities appears to be determined by several factors. Economic value of trees appears to be the key factor in farmers' adoption (Scherr, 1995). Alongside the economic factor is also the type of trees available for planting. Farmers appear to accept multipurpose trees more than single purpose trees and fast growing trees that can yield early benefits (e.g. fruits) rather than trees that have long

maturity periods (Sharma, 1995). The main consideration is the amount of time it takes to realize a return even for the most minimal investment. Another factor that determines farmer's adoption is the availability of labour (Aboud, 1997).

Studies also show that initial adopters of agroforestry practices tend to be individuals or groups that can afford to take a risk. For example, in Kenya, tree nurseries have proved to be appropriate for small informal women groups because the group as a whole can share the risk involved in the activity. This group approach also takes care of labour requirements (FAO, 1989).

There are other reasons for adoption or non-adoption of social forestry. Farmers in Nyeri, Kenya, gave reasons for not planting trees with crops as; trees shade crops and reduce yields, and that farm units are small (Chitere, 1985). On the other hand reasons given by farmers in favour of interplanting trees with crops included the fact that trees had no effect on crops, provide manure and fruits, etc. In lower Muranga District, people in a marginal coffee zone and a recently settled area said they planted fruit trees with vegetables in home gardens to supplement the family diet and to generate extra income. They planted timber trees along the edges or fields to serve as windbreaks, to mark property boundaries and to provide extra sources of cash. Thus farmers in Muranga appeared more educated in terms of social forestry than those in Nyeri.

In Eastern and Central parts of Kenya, *Grevillea* is the most common tree species interplanted with maize, beans, sweet potatoes, Irish potatoes, coffee and tea. *Grevillea* is popular, even in other parts of the country, because of its light crown and narrow deep roots (Chavangi and Zimmerman, 1987). The species also tolerates occasional drought, produces timber, firewood, poles and mulch. On the other hand, *Sesbania* is like an indigenous agroforestry tree in Western Kenya. *Sesbania sesbans* is interplanted with maize, beans, sorghum and other crops in Western Kenya. The species has a light crown and minimal effect on agricultural crops, is fast growing and produces firewood in about a year. It fixes nitrogen, seeds are easily obtainable and can be directly sown, and leaves are good fodder. Although new technologies offer opportunities to increase production and income, the introduction of such new technologies has often been met with sceptism and partial success (Feder *et al.*, 1982).

Farmers will be wary of a system that is radically different from that which they know and are familiar and comfortable with (Pannel, 1999). To move past this, Pannel suggests that several specific conditions must be met. First, the farmer must be aware that the innovation exists and is relevant. This would trigger the farmer to seek more information before deciding whether or not to adopt it. Second, farmers are risk averse and will therefore not get into large-scale adoption of a new innovation. Rather, they generally employ small-scale trials, adjusting towards full adoption or non-adoption as they gain confidence in their perceptions about the new innovation. This trial phase is important, perhaps finally determining adoption or non-adoption. If small-scale trials are not possible or enlightening for some reason, the chances of widespread adoption are greatly diminished. Third, the innovations being promoted must be perceived to promote the interests of the farmer. These interests may be to do with risk, leisure, environmental protection and, most importantly, economic profits. Adoption of unfamiliar species and systems, for example, can present significant risks beyond those associated with crops (Scherr, 1995).

Socio-economic and cultural factors have also been cited as being key in the adoption of agricultural technologies. The reasons why farmers adopt farm practices quickly at one time than another is influenced by the situations in which they find themselves (Lionberger, 1960). Although these situational factors are many and varied, not all have been studied adequately. These include income, farm size, culture, the complexity of the technologies involved and even the attitudes and perceptions of the households. Most factors that influence the rates of adoption and diffusion of agroforestry are non-technical and revolve around social-economic and cultural issues (Noordin, 1996).

2.2.1. The Influence of Socio-Economic Factors on Social Forestry Adoption.

Socio-economic factors here are aspects that relate more to social and economic conditions in the communities and less to the cultural and biophysical environment. They include income, occupation, education level, the health status of the farmer, and farm size, besides others. Research has shown that these factors variously influence the adoption of social forestry among farmers. For example, in Western Kenya income, occupation and education level were found to influence tree planting (Ongayo, 1994).

Land size was a factor in the adoption of tree planting in Central Kenya (Chitere, 1985). Farm size, tree species and crop being grown in the farm and local tree planting practices were found to be important factors in agroforestry adoption in Western Kenya (Kimwe, 1994). In most studies the relationship between income and adoption was a direct one. In Nigeria, for instance, adopters were older, wealthier farmers who own more than average amounts of land (FAO, 1989).

Among the studied socio-economic factors influencing adoption of social forestry and agricultural innovations, education level has been quite controversial. Lionberger (1960) argues that the relationship between a farmer's level of education and farm practice is indirect except where persons learn new practices in school. Where this is not the case, education may merely create a favorable mental atmosphere for the acceptance of new practices. More interestingly, Misiko (1976) sees education of farmers as "prompting them to prefer better and well paying jobs at the expense of their farms" although they may easily help relatives who remain behind on the farms in purchasing new technologies and inputs. Education enhances ones ability to receive, decode and understand information and that it affects adoption behaviour (Ragland and Lal, 1993).

2.2.2. The Influence of Socio-Cultural Factors on Social Forestry Adoption

The words 'social' or 'cultural' may be used to refer to the norms, rules and attitudes that govern the meaning of certain activities for individuals and groups. They may also govern the organization of activities and behavior of individuals in the course of participation in such groups (Ongugo, 1992). Therefore, activities that are designed around existing cultural and social structures, taking into consideration local customs, beliefs, values and even taboos, are socio-cultural. Socio-cultural factors for the purpose of this study included traditional beliefs, land tenure, public awareness, and availability of extension services. Research has shown that farmer adoption of tree planting practices also varies with the social-cultural practices of the community. A number of social forestry technologies have been identified by researchers and agroforesters, which have developed traditionally or scientifically and can be adopted and utilized by farmers (Foley and Barnard, 1984). The most common forms include; dispersed trees on cropland; contour vegetation strips; alley cropping; trees in home gardens and improved fallows. The majority of indigenous agroforestry systems are either rotational, as in

shifting cultivation, or trees and crops grown in intimate mixtures, with the trees distributed over more or less the whole of the land area (Young, 1989). Young argues that conservation by means of an enforced policy frequently does not work. Conservation is likely to be most effective where it is conducted with the active cooperation of farmers, in their perceived interests, and integrates other measures of agricultural improvements.

In an agroforestry project in the Philippines, it was noted that part-owners of land used their own area on the site for contour hedges, indicating their acceptance of agroforestry but a reluctance to establish trees on land they did not own or own fully. Further more, the extent of agroforestry and the involvement of the local farmers are directly related to the flexibility or otherwise of the land tenure system (Adayoju, 1984). This shows that land tenure and policy is crucial in the adoption of social forestry (Binswanger, 1980). Land tenure refers to the possession or holding of the rights associated with each parcel of land. Most farmers in Kenya find it unacceptable and unattractive to invest in tree panting on land, which has not legally been confirmed as belonging to them (Tengnas, 1994). For example, it was found that low participation in agroforestry in Ainabkoi Division of Uasin Gishu District was due to lack of title deeds (Busienei, 1991). Closely related to land tenure is also the issue of tree tenure. Farmers who do not own the land tend to feel they cannot possibly own the trees, hence no need of planting them. Women in Vihiga District called for the sorting out of the issue of tree ownership before being persuaded to plant trees (Ipara, 1992). Secure tree and land tenure and a relative freedom to harvest trees and sell products were found to be an incentive for farmers to adopt tree planting in Kitui (Makindi, 2002). It has also been found a pertinent issue in Kenya that farmers should be required to seek authorization from government agencies before they can cut down trees in their own farms.

The presence of certain traditional beliefs has also been found to be a factor in the adoption of social forestry practices. In some communities in Kenya, women cannot plant trees because doing so establishes an act of ownership over the land (Gichuki and Njoroge, 1989). In other communities trees belong to men regardless of who plants them. There are distinct men and women tree species in Western Kenya (Kerkhof, 1992). Women cannot be allowed to plant certain species - "she will become barren". Among

the communities that hold these beliefs and taboos, traditional land tenure and ownership rights are based on the male patrilineage (Ipara, 1992). Certain tree species are associated with certain beliefs and bad omen and therefore should not be propagated at all by community members- however beneficial they may be in other ways. It has also been found that tree-planting decisions in many communities are the domain of the male head of the household. However, a study in North Maragoli, Vihiga District actually found that female-headed households had more land under trees than male-headed households. The same was the case with female-managed households. Women in Vihiga appeared more concerned with preservation and conservation of the environment than men. This was explained by the role of women in the society, which meant they would be affected most in case of scarcity of forest resources (Mutoro, 1997). In another study on community participation in wildlife conservation around Ol Donyo Sabuk National Park in Machakos District, Kenya, it was also found that women were more crucial stakeholders in environmental management and conservation than men (Lelo, 1994).

Different studies have also shown that availability of extension services has significant influence on social forestry adoption. For example, two different studies in Vihiga and Kitui districts respectively demonstrated that availability or non-availability of extension services affected the practice of social forestry activities in the two districts in Kenya (Mutoro, 1997; Makindi, 2002).

2.2.3. Constraints to Social Forestry Adoption

There is abundant evidence that, almost everywhere, people appreciate the value and usefulness of trees, and know how to grow them. The assumption that major educational efforts are needed just to convince people that trees are beneficial is rarely justified. If farmers are not growing trees it does not mean that they are unaware of the problems of disappearing wood resources or are unconcerned about their own future. It is far more likely that there are good local reasons why they are not able to grow them, or have other more urgent priorities. Establishing why growing of more trees is not taking place spontaneously is one of the most important steps in planning agroforestry programmes (Foley and Barnard, 1984).

Although most research on social forestry has tended to concentrate on the production of biomass in social forestry systems and factors that affect it, there is

evidence that there are a number of constraints that may hinder the successful adoption of such technologies by farmers. For example, in Kitui District, adoption was found to be affected by lack of water; lack of inputs and time, in addition to debilitating diseases and pests (Makindi, 2002). Elsewhere studies have shown that lack of income, capital, labour and land is a serious constraint. In the drier parts of the country constraints may include suitability of soils and/or tree species, termite and livestock attacks, and inadequate moisture. It is also documented that social-cultural aspects of certain communities are serious constraints to adoption of tree planting practices. Chavangi (1992) documented that the following would happen if a woman in Western Kenya planted trees: she would become barren; her husband would die; the seedlings would die; it is a challenge to her husband, and; the tree should not be used for house construction. Thus gender issues, though rolled out as traditional practices, might clearly be an important factor in tree planting practices among certain communities.

2.2.4. Women Participation in Social Forestry

Women make up a considerable majority of the rural communities involved in active agricultural production. Therefore they are people who should be primarily concerned with resource conservation, as resource depletion would impoverish them and create work for them (Mutoro, 1997). It is noted that, in most of the cases where social forestry adoption has been successful, women participation has been excellent. Whereas changing people's perception about the environment has been quite difficult it may require a virtual revolution to change attitudes towards women in many communities (Dankelman and Davidson, 1988). The centrality of the role of women in natural resource management and conservation in the developing world is hardly acknowledged. It has been relatively easy for international agencies, NGOs and even governments to gloss over the importance of women and ignore their potential usefulness in sustainable development.

According to the Uasin Gishu 2002-2008 District Development Plan (DDP), the concept of gender equality and development has not been fully understood by the local communities. Equality has been viewed to mean sharing of domestic chores between husband and wife. It has also been seen as undermining the African traditional society's cultural norms where the conduct and specific roles of men and women were clearly

defined. In national development, equality functionally means equality of rights, responsibilities and opportunities for participation of men and women. The attainment of such equality implies equality of access to resources and effective participation in decision-making at various levels. The DDP further asserts: "during the plan period (2002-2008) efforts will be made to bring together government officers, leaders, NGOs and other stakeholders to improve the status of women and support their role in development so as to achieve gender equality". Under the plan, the government targets 30 per cent of the farm families to have sufficient firewood on farm through tree planting programmes (ROK, 2002). However, the plan does not suggest ways of tackling constraints that have previously limited successful adoption of similar efforts.

Women in Kenya perform a large share of farm work and therefore they must be taken into consideration in every rural development planning efforts. Rural development projects may continue to fail unless and until full public participation is enlisted (Lelo *et al.,* 2000). Nyerere (1988) observed that less than half of the population (men) couldn't develop the nation alone; women must participate. It is also acknowledged that, in the rural areas, women spend more time at home and in the neighborhood than men do, but very few participate in the designing of their environments.

2.3. Theoretical Framework of the Study

A number of models have been used to come up with conceptual framework in social forestry research projects. The Kenya/Japan Social Forestry Training Project (SFTP) in Kitui District developed a model called the Social Forestry Extension Model (SOFEM). This model is based on forestry extension as the main objective (Makindi 2002). Another example is the Innovation Decision Model. This model describes agroforestry decision-making as a mental process which households follow beginning from the knowledge of agroforestry and finally coming to a decision to a adopt or reject tree planting technologies. It assumes that a tree-planting technology is ecologically and economically adoptable and compatible with agricultural practices. The innovation decision is assumed to be influenced by socio-economic and socio-cultural characteristics at the household level at all stages. Extension workers are assumed to have created the necessary awareness to the community members. Several researchers have also used this

model as a framework for studying the adoption of agroforestry innovations (Rogers, 1983; Raintree, 1983; Evans, 1988; Alavalapati *et al.*, 1995).

As cited in the literature, a wide variety of factors have been found to influence the adoption of social forestry. Evaluation reports by field agricultural and forestry extension officers in the study area suggest that the factors in the following conceptual model are understood to be responsible for the level of social forestry adoption in the study area.

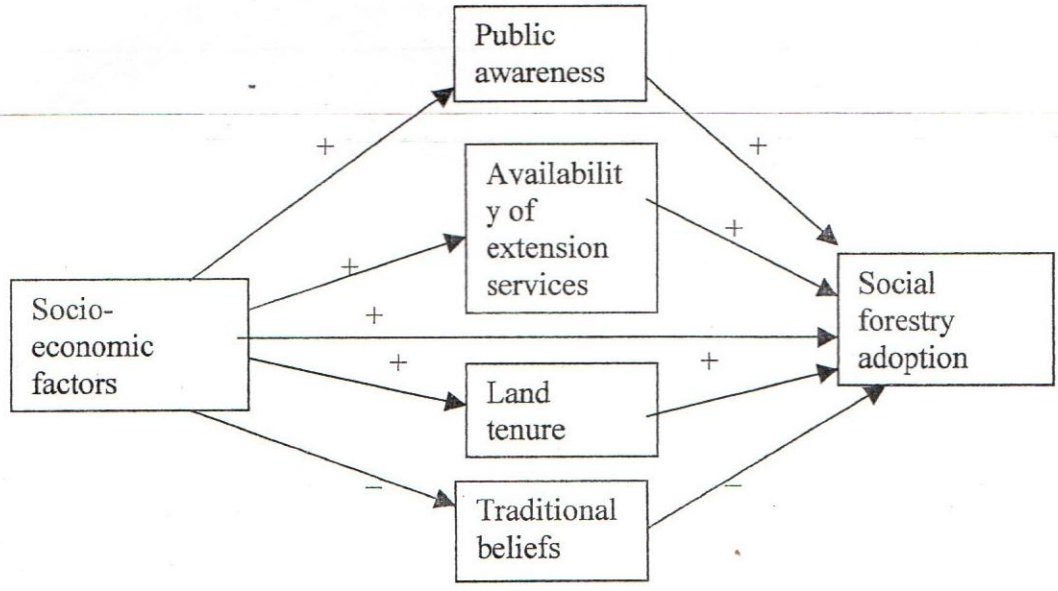


Figure 1: Theoretical Framework of the Study

The social-economic factors under consideration include income, occupation, farm size, education level and health status while the socio-cultural ones include public awareness, availability of social forestry extension services, land tenure and traditional beliefs. The arrow sign denotes relationship between variables. The positive sign (+) denotes a positive relationship while the negative sign (-) denotes a negative (inverse) relationship between the variables. Data was also collected on additional aspects like age, marital status and family size and added to the regression process to determine their effects on social forestry adoption. The study area is a high potential agricultural zone

considered quite suitable for tree farming and, therefore, biogeophysical aspects were not measured or thought to influence adoption of social forestry.

CHAPTER THREE: MATERIALS AND METHODS

This chapter discusses, in appropriate subsections, the study site characteristics; data gathering instruments, research design, sampling techniques, data processing and analysis. Challenges encountered during data collection have also been highlighted here. The chapter also gives definitions of the terms/ variables used and how each was measured (operationalized) and/ or applied. For the purpose of this study (which was to attain the stated objectives) definitions of variables do not necessarily conform to their usual or contemporary meanings but to the way the terms have been used in the research.

3.1. The Study Site

3.1.1. Location

Uasin Gishu is one of the 18 districts in the Rift Valley Province. It extends 34° 50' and 35° 37' east and 0° 03' and 0° 55' north. It borders with Trans Nzoia District to the north, Marakwet and Keiyo Districts to the east, Koibatek District to the southeast, Kericho District to the south, Nandi District to the west and Lugari District to the northwest. Administratively, the district is divided into six divisions namely Kapseret, Ainabkoi, Kesses, Soy, Turbo and Moiben. Moiben is the largest division with an area of 778.2 km^2. It has ten locations and twenty-six sub locations. Located politically within Eldoret North Constituency of Uasin Gishu, the division has its headquarters at Moiben Township, about 42 km north of Eldoret Municipality (figures 1, 2, and 3).

3.1.2. Climate

Rainfall in Uasin Gishu is fairly reliable and evenly distributed with two distinct peaks in May and August and a drier spell from November to February. The division has a mean annual rainfall of 1100 mm. Areas neighbouring Marakwet district receive up to 1500mm of rainfall. The average temperature in the district is about 18°C during the wet season with a maximum of 26°C during the hot dry season and a minimum of 8.4°C in the coolest season. February is the hottest month while June is the coolest. It is always almost sunny in the morning and cloudy in the afternoons during the rainy months (Republic of Kenya (ROK, 2002).

3.1.3. Soil and Land- use Patterns

The district is a highland plateau, and altitudes fall gently from 2700 m a.s.l at Timboroa in the East to about 1500 m a.s.l. at Kipkaren in the West. Moiben lies in the

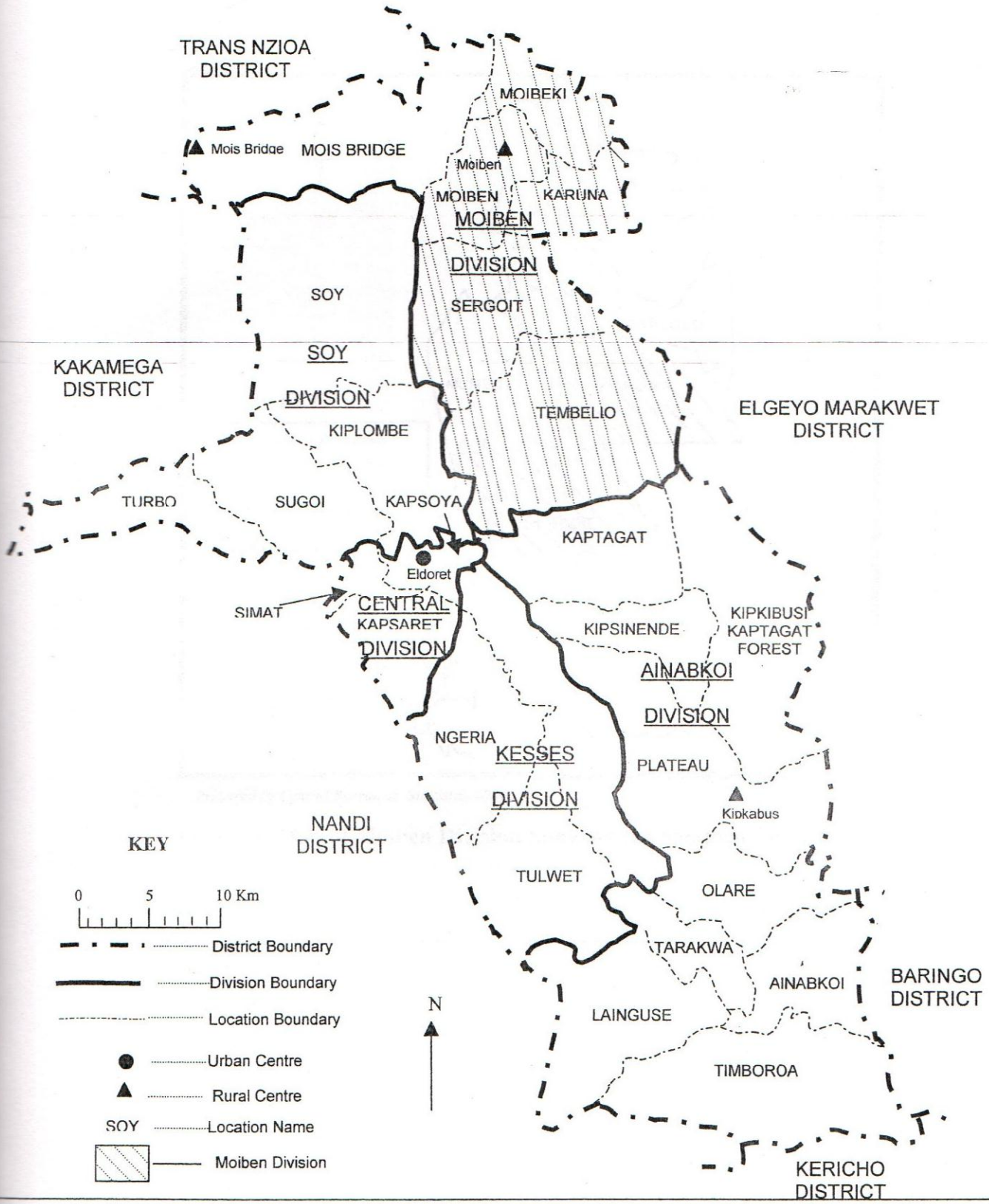
middle and is a medium to high potential agricultural zone with good soils. Brown loam soils occur in high altitude areas. They derive from both volcanic and basement complex rocks. The division is part of the former white Highlands with both large scale and small-scale farming. Crops grown are mainly wheat and maize. Pyrethrum is also grown near the Keiyo District border areas.

The above characteristics and conditions of the location suggest that the study site is agriculturally productive and, indeed, ideal for the development of social forestry. They suggest good soils and climatic conditions. It would then, therefore, seem logical that social forestry has not flourished in the area most probably due to socio-economic/ cultural factors rather than biogeophysical ones. Hence the nature of this particular investigation.

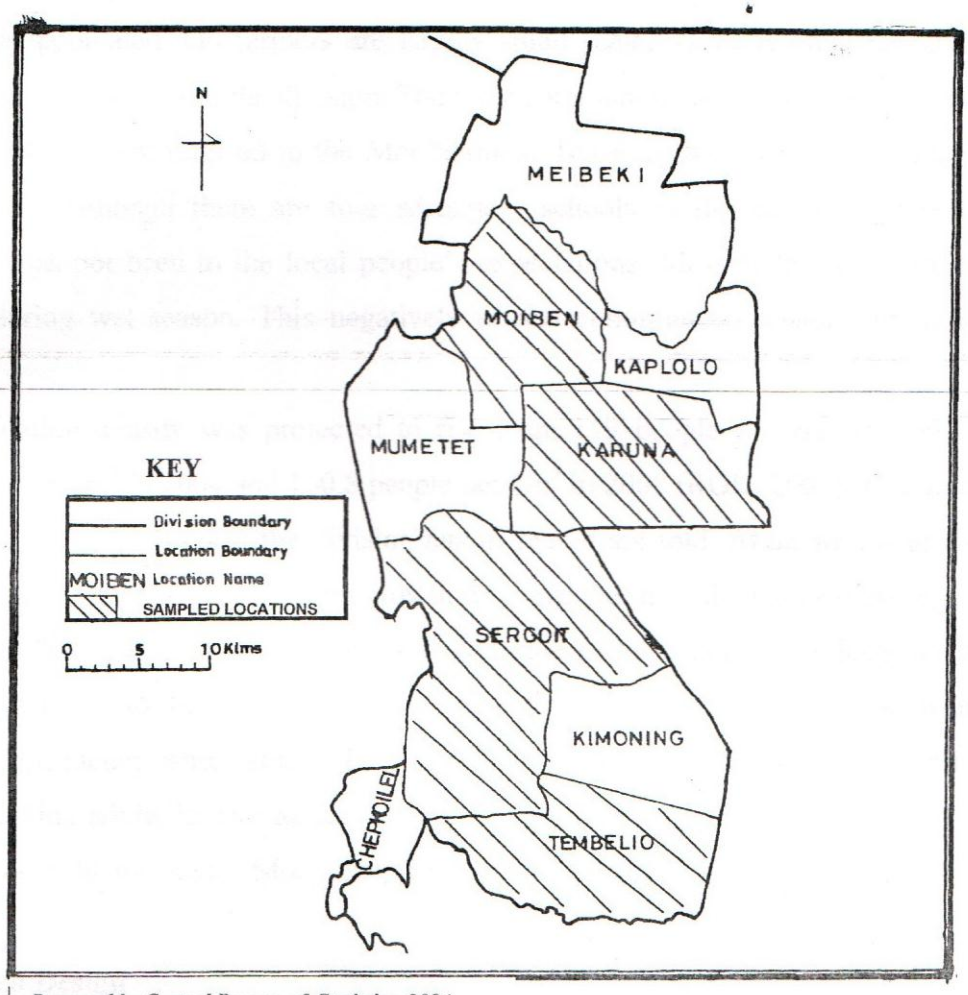


Central Bureau of Statistics, 2004

Figure 2: Map of Kenya Showing the Position of Uasin Gishu District (Shaded Area)



ure 3: Map of Uasin Gishu District Showing the Position of Moiben Division *Prepared by CBS, 2004*



Prepared by Central Bureau of Statistics, 2004

Figure 4: Map of Moiben Division Showing the Sampled Locations

3.1.4. Human Population and Services

The division currently has a population of 120,000 inhabitants (ROK, 2002). The Eastern and Northern parts including Kaplolo, Koitolo and Moiben sub-locations are more densely populated and farmers are largely small scale. There is only one health centre and six dispensaries in the division. The most common disease is Malaria and most serious health cases are referred to the Moi National Teaching and Referral Hospital in Eldoret Town. Although there are four secondary schools in the division, academic performance has not been to the local people's expectations. Most of the roads are not motorable during wet season. This negatively affects communication and agricultural activities.

Population density was projected to rise from 119 people per km^2 in 1999 to 140.6 people per km^2 in 2004 and 160.8 people per km^2 in 2008 (ROK, 2002). Within the last 37 years, the population of the division has increased six fold. At an annual growth rate of 3.35 per cent (%) the population growth rate is higher than the national average of 2.8 per cent. This growth rate has, and will continue to have negative effects on the provision of services to the people. The high population of young people is a factor that determines dependency ratio, estimated at 100:89. At the household level, large families with few working adults impact negatively on savings and investments, and on the well being of household members. More than 55 per cent are aged below 20 years (ROK, 2002).

3.2. Research Design

The research was conducted through a sociological inquiry in four randomly selected administrative locations of Moiben Division, namely Moiben, Karuna, Sergoit and Tembelio (see Table 3.1). The sampling units were the households while the respondents were the household heads.

3.3. Sample Size

Although it would have been most ideal, usually, to collect data on the entire population for maximum accuracy, sampling was undertaken. Due to constraints of time and available resources, the number of households sampled was limited to 200. Under these unfortunate circumstances, it was also reliably learned that this sample size was technically capable of producing fairly reliable results on analysis with the intended SPSS

computer programme. Indeed, examples abound where researchers have used a sample size of 200 in many similar studies before, with acceptably good results.

3.4. Data Collection Instruments

Several data collection instruments were used either singly or in combination to obtain all the necessary primary and secondary data required for the study.

3.4.1. The Questionnaire

A structured questionnaire with both fact- and opinion-questions, including open- and closed-ended ones, was administered to the respondents (appendix 1). The questionnaire was divided into sections, each seeking specific kinds of data according to the objectives and research questions of the study. For example, the questionnaire sought information on the respondent's sex, age, location, marital status, education level, occupation and income. Also recorded was family size, land tenure, levels of social forestry (public) awareness, availability of social forestry extension services, traditional beliefs, health status, number of trees/seedlings and constraints that hinder adoption of social forestry. Although the questionnaire was administered in English, the questions were presented to the respondents in Kalenjin (with the help of an interpreter) or Kiswahili. Majority of the respondents had no difficulty communicating in the latter. This helped a great deal in ensuring personal conduct with the interviewees and in elaborating questions and answers.

3.4.2. Informal Interviews

This method was used in addition to the questionnaire to interview key informants. Key informants are reliably knowledgeable and authoritative sources of information. Information from discussions with them was used to supplement the data. Key informants interviewed included the Divisional Forestry Extension Officer and his frontline extension staff in the four locations, the Divisional Agricultural Extension Officer, Chiefs and Assistant Chiefs, women leaders, area elected representatives (Councillors), school heads, representatives of NGOs and church organizations, and other opinion leaders.

3.4.3. Observations

This method of data collection was used to enrich and supplement data collected via the questionnaire and key informant interviews. Observations were made of the various

types of social forestry practiced and the tree species planted. This method was also used to counter-check and confirm information from respondents and key informants. Direct observation is a reliable ground-truthing method. It was also used to assess the level of additional family resources around the household.

3.4.4. Secondary Data

This was obtained from office reports, development plans, research theses, pamphlets and other materials found in public offices, libraries and documentation centres.

3.5. Sampling Procedures

3.5.1. Non-probability Sampling

This is a sampling procedure where certain respondents are clearly preferred over others due to various reasons e.g. knowledge, experience, availability and/ or relevance to the study. Non-probability sampling or purposive sampling (as it is sometimes referred to) was used in the selection of key informants for interview. The procedure has advantage in that it is easy to administer, less costly and less time-consuming.

3.5.2. Probability Sampling

Probability (or random) sampling is a sampling procedure where all the elements in the population have an equal chance of being selected (in a random fashion). Clustered random sampling technique (Herman *et al.*, 1976) was used to select four administrative locations for the study. Taking each of the ten locations of the Division as clusters, four clusters (locations) were selected. Within each of these four locations further sampling (systematic sampling) was done to obtain fifty respondents per location for interview. This meant a total of 200 respondents from the four locations and for the whole study. Systematic sampling using the land registration files list kept at the local Chief's office was used. A random number was picked to choose the first household to be interviewed, and thereafter every fifth household in the list was selected for interview, for example 5, 10, 15, 20, etc. A sampling method where a list exists for every one in a population is termed systematic selection procedure (Weisburg, 1989). Finally, a total of 200 respondents with different characteristics such as income, farm size, marital status, health status, education level and income, besides others, were interviewed (Table 3.1).

Table 3.1. Study Sample Composition

Division	Locations	Number of respondents
Moiben	Moiben	50
	Karuna	50
	Sergoit	50
	Tembelio	50
Total		n = 200

The data presented in Table 3.1 shows the number of respondents interviewed in each location. Out of the 200 respondents, 70 (35%) turned out to be male while 130 (65%) were female. This ratio was not predetermined, but purely by chance. Men, who traditionally would be head of most households, were unavailable for the interview in many cases. Where the real household head could not be available for some reason, the second in-charge- the wife, was interviewed.

3.6. Problems Encountered During Data Collection

Several challenges were encountered during data collection. For example, respondents were originally uneasy to talk to the researchers- suspecting them to be government officers spying on their resources so as to advise the government to increase taxes on them. Such fears were assuaged by proper introduction of the researchers, often by use of more familiar government officials in the area, like the Chiefs or Assistant Chiefs. Some elderly respondents did not like the idea of counting family members, children, cows or chicken. They believed it might visit bad omen on the family. Assurance was given to them that the information was useful and going to be used only to determine how effectively farmers were utilizing their land. In several cases respondents demanded tangible incentives like tree seedlings, which were unavailable. This problem was minimized by researchers explaining the objectives as being to merely find out how far farmers had gone in practicing social forestry, the constraints involved, and that recommendations would later be made to relevant authorities who would then see how best to assist farmers. This could assist them to adopt social forestry for cheaper provisions of domestic requirements and for commercial purposes to help them uplift their living standards. The fact that the main aim of the study was to look into their problems, e.g. shortage of firewood, and thereafter make recommendations on how such problems could be solved through social forestry also greatly helped reduce suspicions.

Sensitive questions were asked last after gaining their confidence. Absenteeism was also a problem. If the household head was completely unavailable, the second in-charge was interviewed. Where both were absent simultaneously, a repeat visit would be arranged. Where it was not possible to interview a scheduled household (for whatever reason), a neighbouring household was selected and interviewed. These unforeseen circumstances became a major cause of frustration and delay. Use of an interpreter greatly eased the problem of language barrier and minimized errors in data collection.

3.7. Definitions and Operationalization of Variables

This section deals with the meanings of variables as they were used in the study and, how such variables were derived or measured/ or applied for the purpose of achieving the stated study objectives. The following variables were used in the conceptual model and have been defined and operationalized (measured and applied) as follows;

Socio-Economic Factors: Conventionally, these are aspects that relate more to social and economic conditions in the communities and less to the cultural and biophysical environment. For the purpose of this study, these refer to the status of a household in terms of the following indicators:

i) **Income**- the total amount of money earned by the household in a year in Kenya shillings. Scores were made on a scale of 1-5.

ii) **Occupation** - the type of job (on scale 1-5) the respondent did for a living. This variable is later coded as Occup, as in Table 4.26 under Results in Chapter Four, for computer entries and analysis.

iii) **Farm Size** (coded as Farmsi)- refers to the size of the farm in terms of acreage and was measured on a scale of 1- 5.

iv) **Education Level** (coded as Educle)- the level of education a respondent attained (in terms of class), on a scale of 1-5.

v) **Health Status** (coded as Healths)- the ability or inability, due to illness, to perform social forestry work manually by the respondent. (1) Affected (2) Not affected. This variable was included for study due to the constant mention of HIV/AIDS by community leaders and key informants during reconnaissance phase of the research. It was

persistently pointed out that, the area being not far from the fast-growing metropolis of Eldoret, the scourge was common and had indeed affected all facets of life in the region, possibly including social forestry. Hence the investigation.

Socio-Cultural Factors: The words 'social' or 'cultural' may be used to refer to the norms, rules and attitudes that govern the meaning and certain activities of individuals and groups. There have been arguments that socio-cultural factors are indeed also socio-economic. For the purpose of this study, socio-cultural factors refer to the status of a household in terms the of following indicators:

i) **Extension Services** (coded as Aextser)- refers to activities, education programmes, materials, visits; provided to assist farmers understand, appreciate and adopt social forestry. It was measured by (a) the number of visits by extension agents to the farmer in a given period and, (b) the number of visits to extension agent/office by the farmer for consultation.

Extension services have been treated as a socio-cultural factor for the purpose of this study. It has also been argued that socio-cultural factors are also economic factors. In addition, the impact of extension services in development may vary from one community to another, making it typically a socio-cultural issue.

ii) **Public Awareness** (later coded as Paware)- refers to the knowledge of the farmer in terms of his or her own social forestry needs and supplies. It was measured by (a) knowledge of tree species and their uses, (b) where to procure wood products in case of need, and (c) informal meetings or "barazas" on environment attended.

iii) **Land Tenure** (later coded as Laten)- ownership of land, as vouched for by the possession of a land title deed by the respondent. (1) No title (2) Has title.

iv) **Traditional Beliefs** (later coded as Tradbel) – the extent to which a household is traditionally oriented. For example, belief in traditional norms, taboos, etc. It was measured in terms of belief that (a) certain

species should not be used/planted, (b) women should not plant or own trees.

The study sought to define the terms 'socio-economic' and 'socio-cultural' differently notwithstanding the argument that the two coincide in meaning because there was need to differentiate between the two sets of factors for purposes of the investigation and, more importantly, to determine if the said factors (individually or collectively; whether socio-economic or socio-cultural) had any influence on the adoption of social forestry by local communities. This was the overriding drive of the study. Thus public awareness, social forestry extension and land tenure were considered as socio-cultural aspects. After all, impacts of extension services and the levels of public awareness and even the land tenure systems have been known in Kenya to vary from one community to another, and very much depending on the traditions and customs of the communities themselves. In such a context, the three factors would be considered in the realm of socio-cultural aspects of those communities.

Social Forestry Adoption (later coded in Table 4.26 as Sfadopt): In conventional terms, this refers to the knowledge and acceptance of social forestry; the practice of establishing, managing and utilizing trees and tree products individually, communally or as families. This variable was measured (operationalised) by the following:

i) Number of trees planted in the farm.

ii) Number of hours it takes to procure firewood.

iii) Number of years in social forestry practice.

iv) Source of household wood requirements.

The variable (social forestry adoption) was derived (by indexing) from the above four parameters and was not a yes or no (1 or 0) variable.

3.8. Data Processing and Analysis

After collection, data from the field was checked for completeness, clarity and consistency in answering of interview questions. Then the questionnaires were numbered, answers coded and indexed. A codebook was then developed, comprising of specifications like variable name (e.g. location), description of the variable, the variable

type (e.g. string, numeric, categorical, dummy, etc) and the measurement scale (e.g. ordinal, nominal, etc). The data was then analyzed using the Statistical Package for the Social Sciences (SPSS) computer programme. Further manual computation using a scientific calculator was performed to combine various tables generated from SPSS printout and extracting frequency tables.

Descriptive analysis to determine the frequency distribution and measures of central tendency was done. Correlation analysis was then undertaken to determine relationships between the variables in the conceptual model. The advantage with correlation analysis is that it shows both the strengths and directions of those relationships. Social forestry adoption was the dependent variable while socio-economic and socio-cultural factors were the independent variables. Social forestry adoption was not a yes/ no variable. Although not originally proposed, regression analysis was also undertaken- to determine and rank the effects of each independent variable on the dependent variable (Harvey and MacDonald, 1993; Elazar, 1982). The multiple regression model used was of the form;

$Y = bo + B_1X_1 + B_2X_2 + B_3X_3 + \ldots\ldots\ldots + B_nX_n + E$

Where, Y = the dependent variable (social forestry adoption)

bo = a constant

$B_1, B_2 \ldots B_n$ = regression coefficients 1, 2, up to the n^{th} term

$X_1, X_2 \ldots X_n$ = the independent variables (e.g income, occupation, etc), up to the n^{th} term (or n^{th} independent variable)

E = an error element

The model was used because it has certain advantages. First, it can be applied stepwise. Second, it eliminates the bias of extraneous variables by including them as regressors. Third, the inclusion of additional variables reduces the residual variance (r^2), thereby improving confidence intervals and tests. Fourth, the model also measures the contribution of each independent variable thereby enabling the selection of good predictors of the dependent variable. The square of the correlation coefficient R^2 was used to show the percentage of the total variations of the dependent variable that are explained by the addition of the independent variables in the model.

If the dependant variable (social forestry adoption) had been a yes/ no (1, 0) variable then it would have been logical to regress it in a logit/ probit model.

CHAPTER FOUR: RESULTS

This chapter presents the findings of the research study (after data collection and analyses) while the next chapter (Chapter Five) presents the discussions of the findings.

4.1. General Information About Respondents

4.1.1. Age Distribution of Respondents

As indicated in Table 4.1 and Figure 5 below, majority (39.0%) of the respondents were aged between 21-40 years; followed by those aged 41-60 years (32.5%). The proportion of respondents below 20 years was 6.0%, and equal to that above 80 years.

Table 4.1. Age Distribution in Years

Ages (Years)	Frequency	Percentage
Below 20	12	6.0
21 – 40	78	39.0
41 – 60	65	32.5
61 – 80	33	16.5
81 – 100	12	6.0
Total	n = 200	100

The same information can be presented in a bar chart as in Figure 5 below:

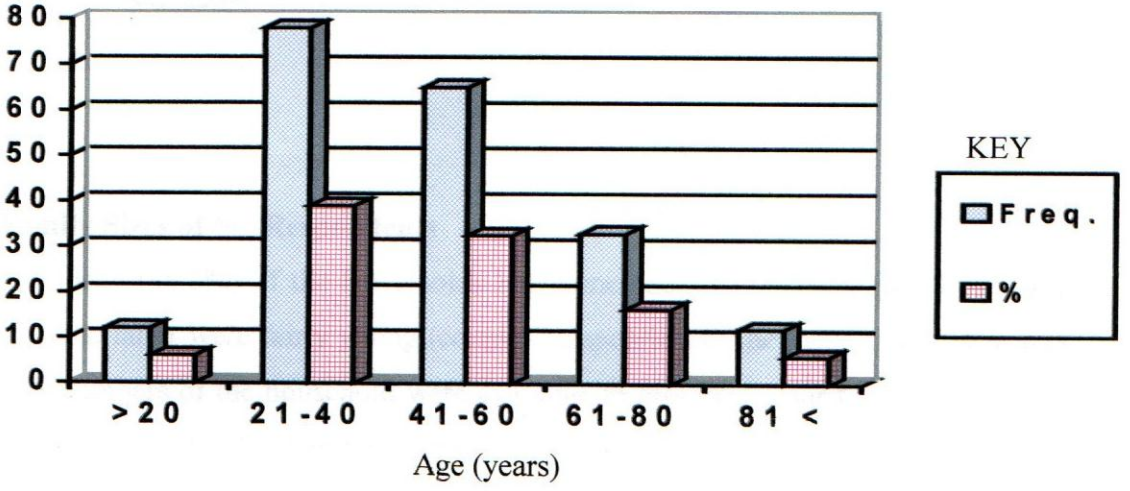


Figure 5: Age Distribution in Years

4.1.2. Marital Status of the Respondents

The majority of respondents (79.0%) were of married status (mode = 158) while 18.5% were either widowed or widowered. Only 2.5% were single.

Table 4.2. Marital Status

Marital Status	Frequency	Percentage
Married	158	79.0
Widowed/widowered	37	18.5
Single	5	2.5
Divorced	0	0
Separated	0	0
Total	n =200	100

Figure 6 below represents the same information in a pie chart.

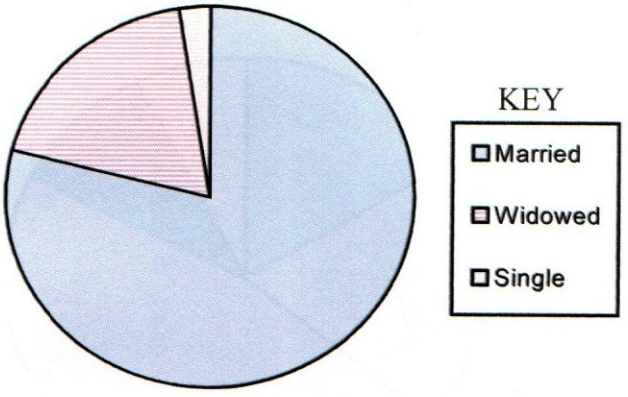


Figure 6: Marital status

4.1.3. Family Sizes of the Respondents

Majority (46.5%) of the households had 6 members while 16 % had 3 or fewer members. The latter were fairly young (couples) respondents. The mean family size was 6. Not all members of the household were available to provide labour for farm activities as would be expected. Although these appear large families by common standards, many

of the members would be away in urban areas most of the weekdays pursuing education, training skills or white- collar jobs.

Table 4.3. Family Size Distribution

Number of family members	Frequency	Percentage
3 or less	32	16.0
4 and 5	40	20.0
6	93	46.5
7	20	10.0
8 and more	15	15.0
Total	n= 200	100

This distribution can also be presented diagrammatically (in a pie chart) as follows:

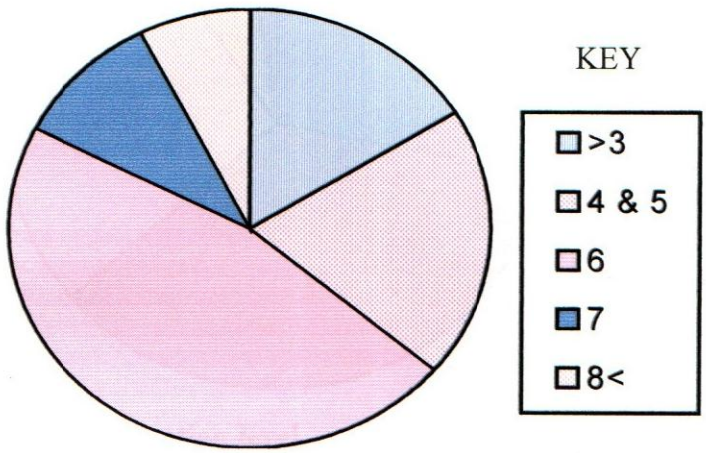


Figure 7: Family size (no. of members)

4.2. Socio-Economic Factors

4.2.1. Education Level of the Respondents

28% had not been to school, 35.5% had attained primary school certificate while 27.0% were secondary school graduates. Only 9.5% had gone beyond secondary level.

Table 4.4. Education Level

Level of education	Frequency	Percentage
Never went to school	56	28.0
Primary level	71	35.5
Secondary ('O' & 'A') level	54	27.0
College (trained) level	14	7.0
University level	5	2.5
Total	n=200	100

The pie chart below presents this result diagrammatically.

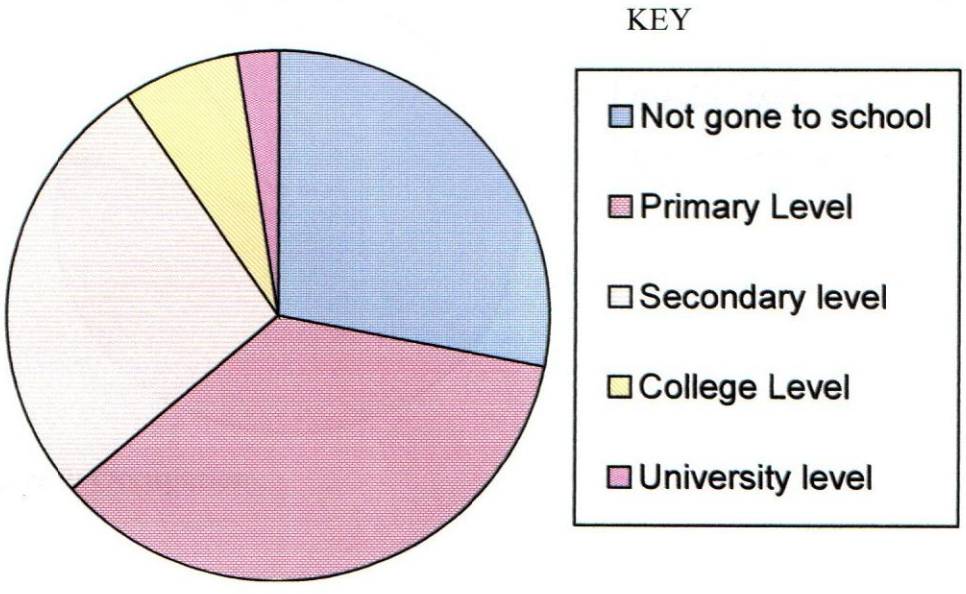


Figure 8: Education level

4.2.2. Occupation of the Respondents

Majority of the respondents were farmers (78.5%), followed by teachers/ civil servants (12.0%), business people (4.5%), others (4.0%) and managers (1.0%). See Table 4.5 below.

Table 4.5. Occupations of the Respondents

Occupation	Frequency	Percentage
Employed farm manager	2	1.0
Farmer/ housewife	157	78.5
Teacher/civil Servant	24	12.0
Business wo/men	9	4.5
Other	8	4.0
Total	n =200	100

The same result presented diagrammatically, thus:

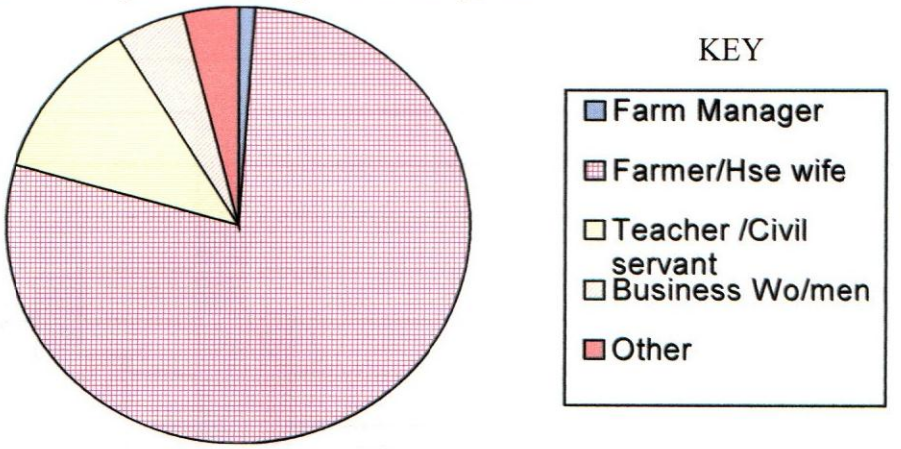


Figure 9: Occupation

4.2.3. Farm Sizes of the Respondents'

Although a few farmers owned disproportionately large farms (one had 800 acres), the majority of respondents (75.0%) had hardly 40 acres. There was a large disparity in land ownership. For example, of the 33.5% who had less than 20 acres, 48.5% owned less than 5 acres. See table 4.6 below.

Table 4.6. Farm Size

Size (acres)	Frequency	Percentage
Below 20	67	33.5
20 – 40	83	41.5
41 – 60	16	8.0
61 – 80	19	9.5
Over 80	15	7.5
Total	n =200	100

Presented diagrammatically, thus:

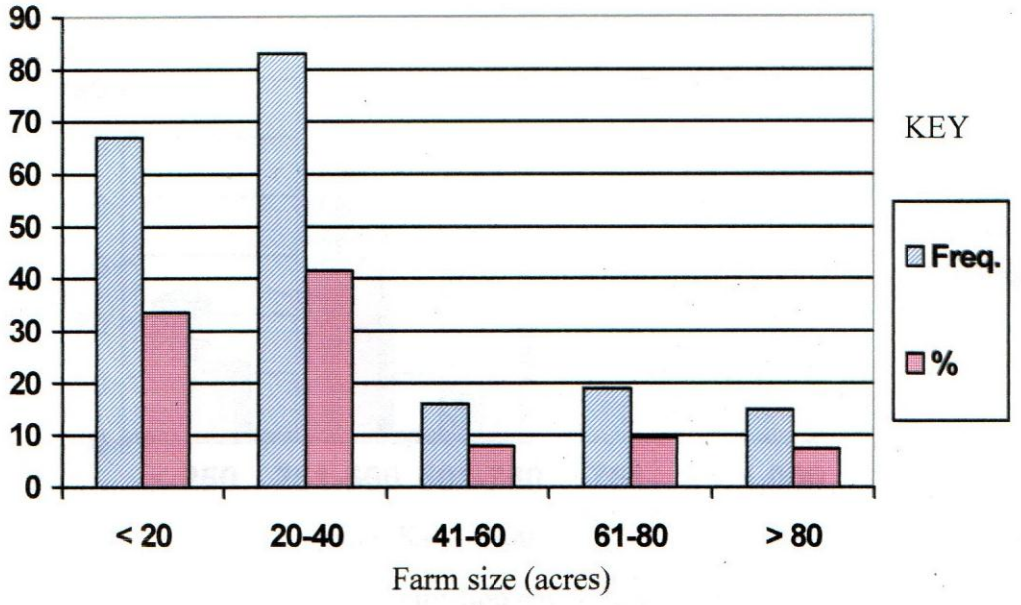


Figure 10: Farm Sizes

4.2.4. Income Distribution Among Respondents

Income distribution among the households appeared to follow farm size distribution, with some respondents living modestly and others somehow lavishly. The majority (57.5%) had annual incomes of between Ksh 250,000 and Ksh 750,000. 12.0% had less than Ksh 250,000 as annual income, while another 16.0% had more than Ksh 1 million (Table 4.7).

Table 4.7. Annual Incomes

Income (Ksh)	Frequency	Percentage
Below 250,000	24	12.0
251,000 - 500,000	69	34.5
501,000 – 750,000	44	22.0
751,000 – 1,000,000	30	15.0
Above 1,000,000	33	16.5
Total	n =200	100

Mean income = Ksh 660,983.00

Presented diagrammatically, thus:

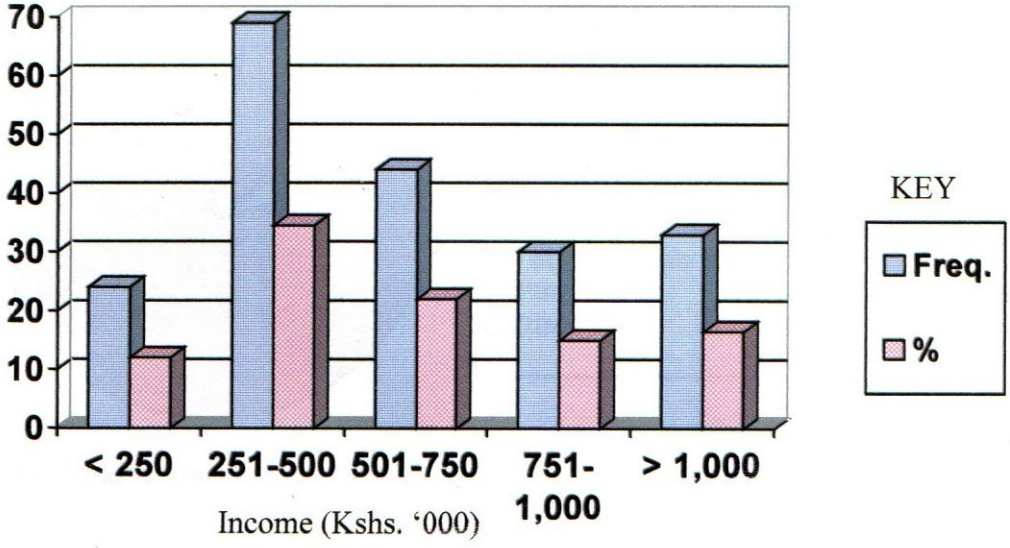


Figure 11: Annual Income Distribution (in Kenya Shillings)

4.2.5. Health Status of Respondents (as it Affects Tree Planting Activities)

10.5% of the respondents indicated they could not adopt social forestry as they were spending most of their money on medical care. 5.5% said they were unable to practice social forestry absolutely due to ill health, while 1.5% could not practice social forestry partially due to ill health (Table 4.8).

Table 4.8. Health Status

Response	Frequency	Percentage
Time spent looking after the sick	5	2.5
Capital spent on medication and care	21	10.5
Rarely able to care/plant trees due to illness	3	1.5
Totally unable to plant/care due to illness	11	5.5
Other	160	80.0
Total	n =200	100

Presented diagrammatically, thus:

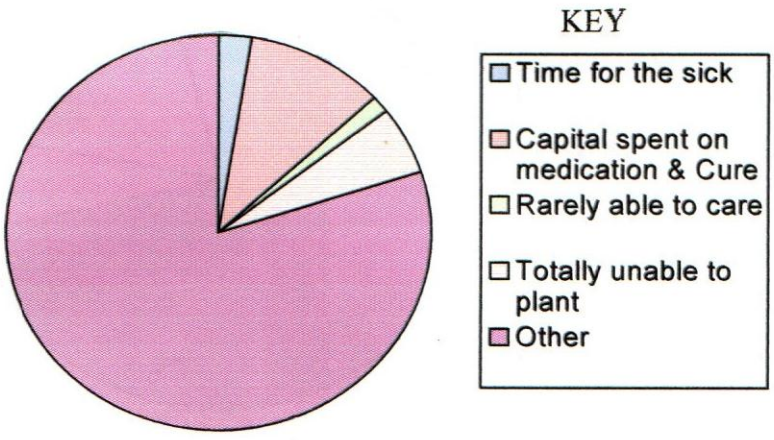


Figure 12: Health Status

4.3. Socio-Cultural Factors

4.3.1. Land Tenure

While majority (71.5%) of the farm owners were husbands, 18.0% of respondents indicated that farms had passed on from aged/ deceased parents to their offspring as heritage. Only 4.0% of the respondents had leased farms. Overall, 38.5% of the respondents did not have title deeds to their farms (including lessees and many sons/daughters who had newly acquired farms from their parents).

Table 4.9. Land Ownership

Land Owner	Frequency	Percentage
Husband	143	71.5
Wife	13	6.5
Son/daughter	36	18.0
Leased	8	4.0
Other	0	0
Total	n =200	100

Presented diagrammatically, thus:

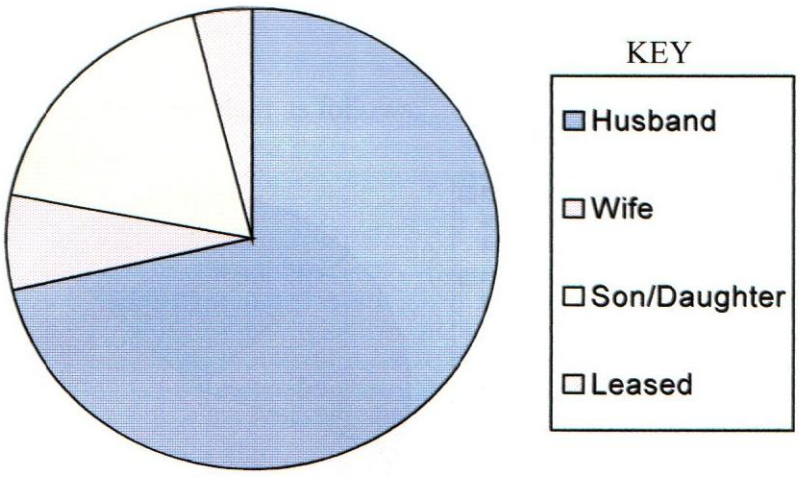


Figure 13: Land Ownership

4.3.2. Public Awareness of Social Forestry and its Benefits.

This parameter was measured using the knowledge of the respondent about tree species and their uses, exposure to social forestry through barazas, and the sources of wood products like firewood.

4.3.2.1. Respondents Knowledge of Trees and Their Uses

34.0% knew several uses of trees although not all their names, while 19.5% knew more types than uses of trees. A sizeable 30.0% knew both types and uses of most trees in their locality. 3.3%, mostly women could not march tree types to their uses, while 12.5% knew at least one type (Table 4.10 below). Appendices II and III show some of the

common tree species found in the study area, and their current applications/arrangements and combinations- as found on the farms.

Table 4.10. Respondents' Knowledge of Tree Types (Species) and Their Uses

Knowledge	Frequency	Percentage
Knows nothing about tree types and uses	7	3.5
Knows only one/two types but not uses	25	12.5
Knows more types but not uses	39	19.5
Knows uses but not the types	68	34.0
Knows several, both types and uses	61	30.5
Total	n =200	100

Represented by a pie chart as follows:

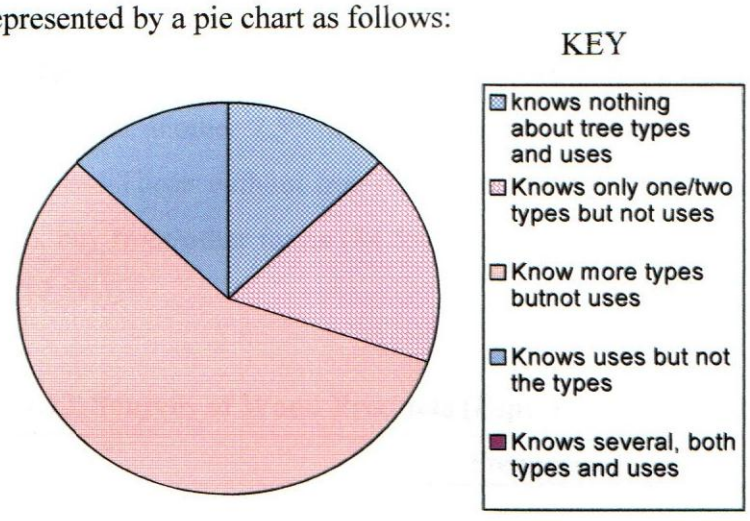


Figure 14: Public Awareness

4.3.2.2. Social Forestry Forums ("Barazas") Attended

As seen from Table 4.11 below, 29.5% of the respondents had never been to a social forestry forum ("baraza") before, while the majority (42.5%) had attended only one baraza. Only 9.5% of the respondents had attended three or more barazas. This situation was clearly reflected on the ground in that those who had attended had planted more trees

on their farms. Attendance was voluntary, according to the respondents. The main reason given for not attending was lack of information about scheduled/ upcoming forums.

Table 4.11. Number of Social Forestry 'Barazas' Attended by Respondents

Number of 'barazas'	Frequency	Percentage
0	59	29.5
1	85	42.5
2	37	18.5
3	15	7.5
Over 3	4	2.0
Total	n =200	100

4.3.2.3. Sources of Wood Supplies

Table 4.12 below shows that only 9.0% of the respondents grown their own woodlots while another 7.5% had not planted but inherited tree resources from previous farm owners. Those without tree resources on their farms claimed to buy from vendors (31.5%), buy from other farms (34.5%), or collect from riverbanks or other public utility lands (17.5%).

Table 4.12. Sources of Wood Products (Especially Firewood) for Respondents

Source	Frequency	Percentage
From riverbanks/forests	35	17.5
From other farms/forests	69	34.5
Bought from vendors, etc	63	31.5
Inherited in farms	15	7.5
From own woodlots	18	9.0
Total	n =200	100

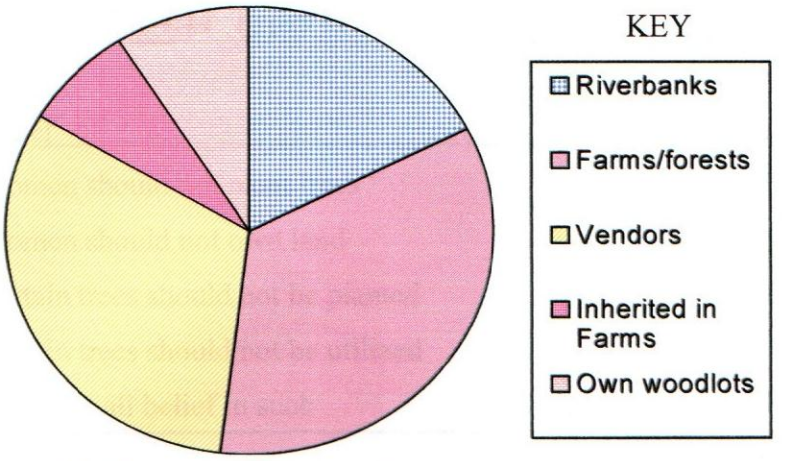


Figure 15: Sources of Firewood

4.3.3. Availability of Social Forestry Extension Services to Respondents

Majority (53.0%) of respondents had never had an encounter with an extension agent. 21.0% said they rarely visited with an extension agent in a year while 4.5% admitted seeing an agent at least once a year. 3.5% visited or were visited regularly (nearly every month); 18.0% visited or were visited only once in several months.

Table 4.13. Visits to or by Social Forestry Extension Officers

Visits	Frequency	Percentage
Never visit/visited	106	53.0
Rarely visit/visited	42	21.0
Visit/visited once a year	9	4.5
Visit/visited once in months	36	18.0
Visit/visited regularly	7	3.5
Total	n =200	100

4.3.4. Traditional Beliefs Concerning Trees/Tree Planting Among Respondents

Majority (77.0%) of respondents did not subscribe to traditional beliefs while 15.0% said women should not (be allowed to) plant trees. 7.0% did not believe women should own land. Some (1.0%) said certain types of trees were associated with bad omen.

Table 4.14. Types of Beliefs

Belief	Frequency	Percentage
Women should not plant trees	30	15.0
Women should not own land	14	7.0
Certain trees should not be planted	2	1.0
Certain trees should not be utilized	0	0
Do not at all belief in such	154	77.0
Total	n =200	100

Represented by a pie chart as follows:

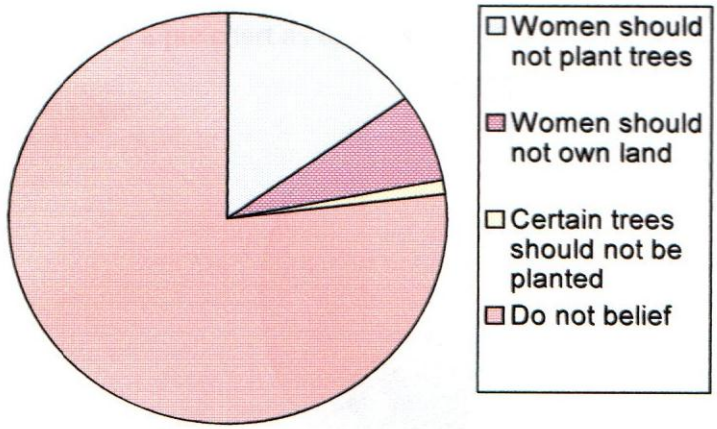


Figure 16: Types of Beliefs

4.4. Women Participation in Social Forestry

4.4.1. Women Involvement in Tree Planting

Out of the total number of female respondents interviewed, 41.2% had either planted or known other women who had grown tree seedlings or trees on their farms. 17.0% of respondents indicated wives were responsible for planting trees; while a greater number (29.5%) indicated both wives and husbands were indeed responsible for the same. Most of the existing trees seemed to have been planted by non-family members

(other = 35.0%). These others included previous farm owners and farm workers. 10.0% said children (sons and daughters) were responsible for tree planting on the farms.

Table 4.15. Planting of Trees.

Tree planter	Frequency	Percentage
Husband	17	8.5
Wife	34	17.0
Husband and wife	59	29.5
Children	20	10.0
Other	70	35.0
Total	n =200	100

Represented by a pie chart as follows:

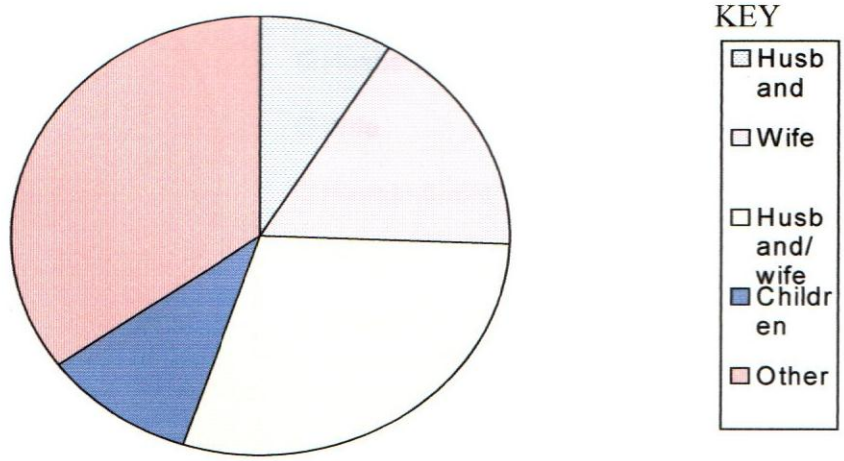


Figure 16: Tree Planting

4.4.2. Women Involvement in Tree Management and Care

Majority (48.0%) of respondents indicated that women were responsible for the day-to-day care and management of trees. It was explained that this was so because women spent more of their time around the farms and homesteads than their male counterparts. 25.5% said husband and wife were both responsible for management and

Table 4.16. Care for Trees.

Care provider	Frequency	Percentage
Husband	27	13.5
Wife	96	48.0
Husband and wife	51	25.5
Children	6	3.0
Other	20	10.0
Total	n =200	100

Represented by a pie chart as follows:

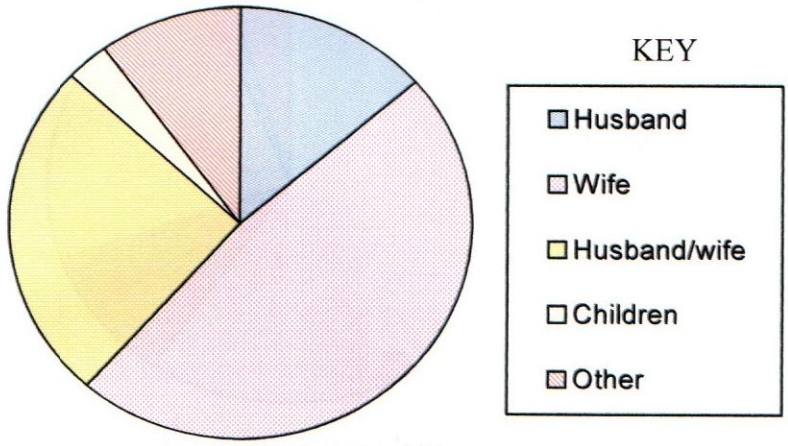


Figure 18: Care for Trees

4.4.3. Women Involvement in Tree-Harvesting Decisions

Majority (59.5%) of respondents said husbands were the decision makers in respect to tree harvesting, while only 10.0% attributed decision-making to women. 24.5% said tree-harvesting decisions were made jointly by husband and wife. Others, who could make tree-harvesting decisions, depending on circumstances, included grown-up children (1.5%) and farm managers or close relatives (4.5%).

Table 4.17. Making Tree-Harvesting Decisions?

Harvester	Frequency	Percentage
Husband	119	59.5
Wife	20	10.0
Husband and wife	49	24.5
Children	3	1.5
Other	9	4.5
Total	n =200	100

Represented by a pie chart as follows:

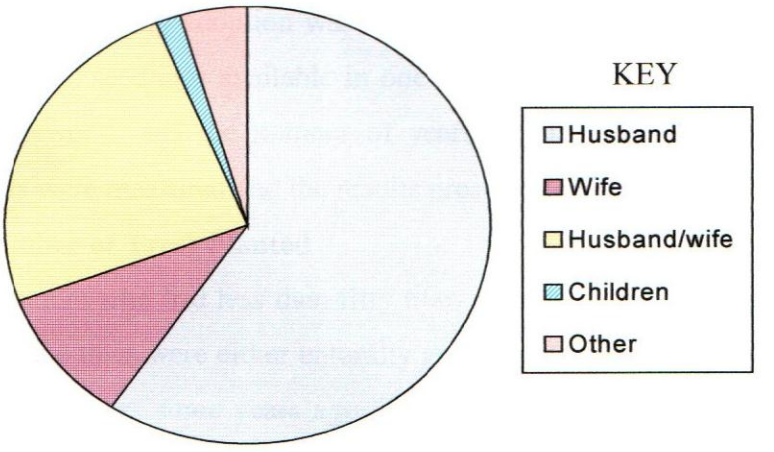


Figure 18: Tree Harvesting Decisions

4.4.4. Constraints That Hinder Women Participation in Social Forestry?

The following constraints (Table 4.18) were given by both male and female respondents as hindering women participation in social forestry in the study area. The majority (53.5%) indicated lack of capital and inputs as the most crucial impediment to women participation in social forestry; followed by lack of time (21.5%); lack of technical know-how (16.5%); lack of community encouragement (6.5%); and others (2.0%).

Table 4.18. Constraints to Women Participation in Social Forestry

Constraint	Frequency	Percentage
Lack of time	43	21.5
Lack of capital and inputs	107	53.5
Not encouraged (by community)	13	6.5
Lack of technical know-how	33	16.5
Other	4	2.0
Total	n =200	100

4.5. Social Forestry Adoption

Social forestry adoption was treated as a function of the number of trees planted, number of tree seedlings available in one's nursery (if any), the amount of time taken to procure firewood, and the number of years spent in practicing social forestry. These parameters were measured and the results presented in Tables 4.19 to 4.22 below).

4.5.1. Number of Trees Planted

Farmers who had less than fifty trees were treated as not having planted any trees as most of the trees were either naturally growing, shrubs or were very old trees inherited from white farmers some years ago. Therefore, majority (52.0%) had not planted trees while 35.0% had planted between 51- 100 trees (Table 4.19 below). Most of the farmers planted trees only recently and which are yet to mature for utilization. Most of the recent plantings were in the form of live fences and hedges meant to create windbreaks, increase privacy and foster home security or as land boundary demarcations.

Table 4.19. Number of Trees Planted on Respondents' Farms

Number of trees	Frequency	Percentage
Below 50	105	52.5
51 – 100	70	35.0
101 – 200	15	7.5
201 – 300	7	3.5
Over 300	3	1.5
Total	n = 200	100

Presented in a bar chart as follows:

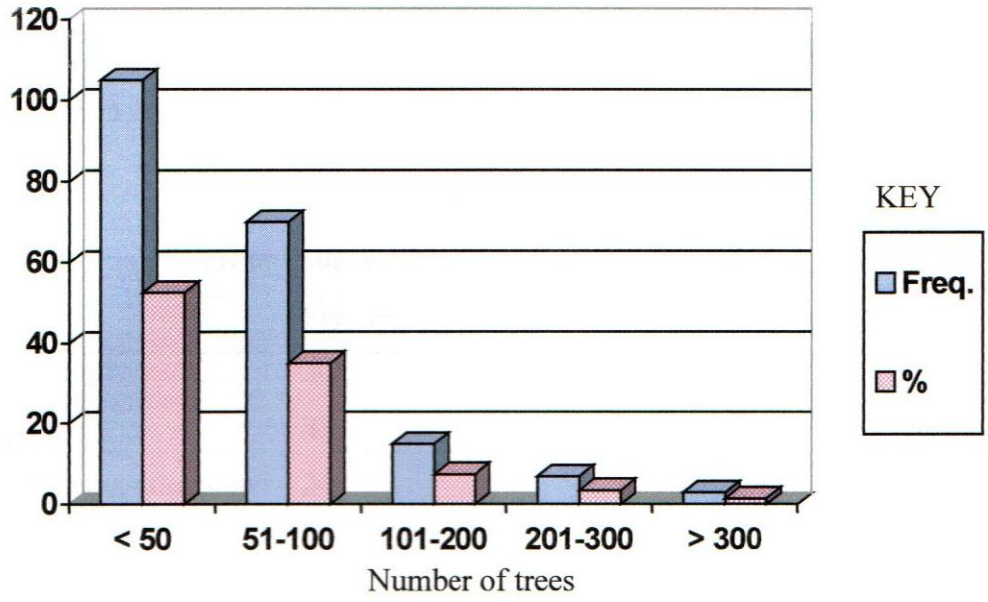


Figure 19: Number of Trees Planted

4.5.2. Number of Tree Seedlings in Nursery

The majority (48.0%) of respondents had neither seedlings nor nurseries. 15.0% had less than 50 seedlings while 25.5% had between 51- 100 seedlings. The rest (11.5%) had more than 100 seedlings at their disposal (Table 4.20).

Table 4.20. Number of Trees Seedlings Found in On-Farm Tree Nurseries

Number	Frequency	Percentage
0	96	48.0
Below 50	30	15.0
51 - 100	51	25.5
101- 200	6	3.0
Over 200	17	8.5
Total	n = 200	100

4.5.3. Time Spent to Procure Firewood

10.0% of respondents said it took them less than 2 hours to procure firewood, 16.5% took 2-4 hours while 12.0% took at least half a day. Sources of firewood were variously given as riverbanks, own woodlots, other farms, vendors and public forests.

Table 4.21. Time Spent to Procure Firewood

Time (hours)	Frequency	Percentage
Less than 2	20	10.0
2 - 4	33	16.5
Whole morning/afternoon	24	12.0
One day	0	0
*N/A	123	61.5
Total	n = 200	100

*This proportion of farmers (61.5%) purchased firewood, hired transport to deliver it, or used their own transport, and so they did not either go out to search for or spend significant time procuring firewood.

4.5.4. Time Spent in Social Forestry Practice

The majority (48.0%) had spent zero years in the practice of social forestry. That is to say they had not practiced social forestry at all. 28.5% had only recently started to practice (1-4 years ago) while 11.0% had practiced for 10 years or more.

Table 4.22. Number of Years Spent Practicing Social Forestry

Number of years	Frequency	Percentage
0	96	48.0
1 – 4	57	28.5
5 – 9	25	12.5
10 – 19	17	8.5
20 and over	5	2.5
Total	n =200	100

4.6. Constraints to Social Forestry Adoption by Farmers

The majority of respondents (51.0%) believed that trees on farm would interfere with mechanized farming while a sizeable number (12.0%) saw their land as too small to accommodate tree planting. 4% were leasing agricultural land and therefore could not undertake tree planting as land was not theirs. 26.0% of the respondents gave other reasons for not planting trees. Of those who gave other reasons for not adopting tree planting, 35% cited lack of tree seeds/seedlings; 26.5% claimed that trees attracted pests (especially birds) that damaged/fed on their crops; while 7.5% had no specific reasons.

Table 4.23. Constraints Faced by Respondents (Both Men and Women)

Constraint	Frequency	Percentage
Lack of interest	2	1.0
Lack of information	3	1.5
Lack of enough land	24	12.0
Lack of time	3	1.5
Lack of capital	5	2.5
Land not owned	8	4.0
Long maturity periods	0	0
Trees interfere with mechanized farming	102	51.0
Tree cutting forbidden by government	0	0
Not authorized by husband /culture	1	0.5
Other	52	26.0
Total	n=200	100

4.6.1. Overcoming the Constraints

Respondents suggested the following measures to overcome cited constraints:

(i) Social forestry education campaign to increase awareness among rural dwellers

(ii) Provision of suitable tree species to farmers

(iii) Provision of continuous extension services by the government and other

relevant rural development partners

(iv) Provision of pest control measures, especially birds, by the Pest Control and Crop Protection Branch in the Ministry of Agriculture

(v) Abolition of government restrictions on tree harvesting, especially the requirement for a government permit before a farmer can fell a tree or transport tree products.

The merits and demerits of these measures and their effects on sustainable development and environmental conservation were further discussed in the next chapter.

4.7. Other Indicators of Respondents' Level of Resources

The following information was collected to determine whether social forestry adoption had any thing to do with the level of respondents' resources.

Table 4.24. Number of Animals Owned by Respondents

Type/number	Frequency	Percentage
a) Cows		
Less than 5	57	28.5
5 – 20	96	48.0
21 – 40	33	16.5
more than 40	7	3.5
b) Goats		
Less than 5	24	12.0
5 – 10	5	2.5
10 – 15	9	4.5
c) Sheep		
Less than 5	70	35.0
5- 20	79	39.5
21 – 40	19	9.5
More than 40	5	2.5
d) Chicken		
Less than 5	52	26.0
5 – 20	114	57.0
21 – 40	25	12.5

More than 40	9	4.5

NB: Not all the farmers/respondents had all the animals indicated in table 4.24 above. Besides farm animals, the farmers also had been harvesting cereals seasonally and disposing of some for cash. Some of the farmers (22.5%) also had farm machinery, which included tractors (19.0%), lorries (2.5%) and chaff-cutters (1.0%). Other farmers (7.5%) had other types of vehicles including pickups (5.5%) and saloon cars (3.5%).

Table 4.25. Types of Houses

The following table gives a description of respondents' houses as an indication of socio-economic status.

Type	Frequency	Percentage
a) Walls		
Mud	117	58.5
Bricks	4	2.0
Semi-Permanent	5	2.5
Wooden	65	32.5
Blocks	9	4.5
b) Floor		
Mud	132	66.0
Cemented	43	21.5
Wooden	25	12.5
c) Roof		
Tiles	9	4.5
Iron Sheets	139	69.5
Grass Thatched	52	26.0

4.8. Measurement of the Level of Association Between Variables

The Pearson's Product Moment Correlation Coefficient (two-tailed test) was used to measure the level of mutual association between social forestry adoption (dependent variable) and the socio-economic and socio-cultural factors (independent variables). Table 4.26 shows the variables entered for analysis while table 4.27 shows the matrix for Pearson's Product Moment Correlation Coefficient (r).

Table 4.26. Variables Entered for Analysis

Variable	Label
Income	Income index
Occup	Occupation index
Farmsi	Farm size index
Educle	Education level index
Healths	Health status index
Paware	Public awareness index
Aextser	Availability of extension services index
Laten	Land tenure index
Tradbel	Traditional beliefs index
Sfadopt	Social forestry adoption index

All the above variables were previously defined under section 3.7 of Chapter Three.

Table 4.27. Matrix for Pearson's Product Moment Correlation Coefficient (r)

Variable	Income	Occup	Farmsi	Educle	Healths	Paware	Aextser	Laten	Tradbel	Sfadop
Income	1.000	-.041	.534*	.250	.005	.186	.081	.174**	.066	.023
Occup	-.041	1.000	-.234	.430**	.016	.362**	.346**	.202	.021	.451**
Farmsi	.534*	-.234	1.000	-.201	.356**	.325**	.267*	.053	.010	.025
Educle	.250	.430**	-.201	1.000	.125	.405**	.387**	.165	.366	.535**
Healths	.005	.016	.356**	.125	1.000	.010	.128	.038	.281	.380**
Paware	.186	.362**	.325**	.405**	.010	1.000	.377*	.211	.130	.279**
Aextser	.081	.346**	.267*	.387**	.128	.377*	1.000	.142	.091	.180
Laten	.174**	.202	.053	.165	.038	.211	.142	1.000	.131	.391**
Tradbel	.066	.021	.010	.366	.281	.130	.091	.131	1.000	.073
Sfadopt	.023	.451**	.025	.535**	.380**	.279**	.180	.391**	.073	1.000

* Correlation is significant at the 0.05 level (2 – tailed)

** Correlation is significant at the 0.01level (2 – tailed)

The results indicate that:

1) There is no significant correlation between income and social forestry adoption ($r = .023$, $p>0.05$).
2) There is a positive significant correlation between occupation and social forestry adoption ($r = .451$, $p<0.01$).
3) There is no significant correlation between farm size and social forestry adoption ($r = .025$, $p>0.05$).
4) There is a positive significant correlation between the education level of respondents and social forestry adoption ($r = .535$, $p<0.01$).
5) There is a positive significant correlation between health status and social forestry adoption ($r = .380$, $p<0.01$).
6) There is a positive significant correlation between public awareness and social forestry adoption ($r = .279$, $p<0.01$).
7) There is a no significant correlation between availability of extension services and social forestry adoption ($r = .180$, $p>0.05$).
8) There is a positive significant correlation between land tenure and social forestry adoption ($r = .391$, $p<0.01$).
9) There is no significant correlation between traditional beliefs and social forestry adoption ($r = .073$, $p>0.05$).

Then a linear regression model was used to test the effects of these socio-economic and socio-cultural factors on the adoption of social forestry among respondents. As already explained under methodology (section 3.8), the model used was of the form:

$$Y = B_O + B_1X_1 + B_2X_2 + \ldots\ldots + B_nX_n + E$$

The following assumptions were made:

- The variance of the dependent variable was constant for all values of the independent variables
- The value of the dependent variable was normally distributed

- The differences between the observed (independent variables) and the dependent variable are normally distributed, and
- The values of the residuals are independent of each other such that they are randomly distributed along the line of best fit (Sharma, 1988).

The model was used because it has certain advantages. First, it eliminates the bias of extraneous variables by including them as regressors. Second, the inclusion of additional variables reduces the residual variance (r^2), thereby improving confidence intervals and tests. Third, the model also measures the contribution of each independent variable thereby enabling the selection of good predictors of the dependent variable. The square of the correlation coefficient R^2 was used to show the percentage of the total variations of the dependent variable that are explained by the addition of the independent variables in the model. Table 4.28 gives a summary of the results.

Table 4.28. Summary of the Regression Model

	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
Model					**R Square Change**	**F Change**	**df1**	**df2**	**Sig. F Change**
Income	.289	.084	.066	.9291	.031	7.983	1	199	.005
Occup	.054	.003	.009	.9565	.000	.127	1	198	.721
Farmsi	.047	.002	.006	.9639	.000	.073	1	197	.787
Educle	.240	.058	.039	.9421	.053	13.436	1	196	.000
Healths	.052	.003	-.078	.9689	.000	.092	1	195	.250
Paware	.514	.262	.242	.8304	.155	63.091	1	194	.000
Aextser	.053	.003	-.009	.9661	.000	.108	1	193	.713
Laten	.048	.002	-.002	.9621	.002	.518	1	192	.472
Tradbel	.041	.002	-.002	.8751	.000	.3865	1	191	.000

CHAPTER FIVE: DISCUSSION

5.1. Current Level of Social Forestry Adoption in Moiben Division

The study found that only 47.5% (Table 4.19) of the population is practicing social forestry in the division. This is less than half the human population of the division and implies that social forestry adoption is unsustainably low. Even for most of those who have adopted social forestry, most of the trees were planted along farm boundaries or as hedges or live fences meant to boost home security rather than for their wider socioeconomic and environmental benefits. Farmers did not appear aware of these latter benefits as they only continued to concentrate mainly on large-scale cereal farming alone, leaving huge chunks of their farms open and devoid of trees. The farmers did not seem aware that, because of the current government ban on exploitation of gazetted forests, trees and tree products from farmlands had become even more profitable than cereals.

5.2. Level of Women Participation in Social Forestry

Research else where has shown that women were the key to successful adoption of social forestry in rural areas. Thus the study sought to establish the level of women participation in the practice as a first step in trying to unravel the factors affecting adoption of social forestry in the study area. Although 65.0% of the respondents were women, it was found that their role in making key social forestry decisions did not match their numerical strength. It turned out that only 17.0% of the women could decide to plant trees on their own (Table 4.15), while only 10.0% could decide to harvest them (Table 4.17). This was in sharp contrast with the fact that nearly half the women (48.0%) were the managers and care-providers for the growing trees (Table 4.16). This obviously looked fraudulent and amounted to a raw deal for women in the practice of social forestry in the area. Women generally spent more time on the farms and around the homestead, providing and caring for other family members, while the more learned men ventured out in the towns doing businesses, working or looking for jobs. In other parts of the country, women participation is particularly associated with social forestry in form of home gardens. Home gardens may include trees and shrubs of diverse mixtures, such as medicinal plants, fruits, vegetables and fodder grasses in



Plate 1: Deforested Hills Behind Extensive Wheat and Maize Farms in Moiben Location, Moiben Division



Plate 2: The Open and Tree-bare Landscape Common in the Area, as Seen in Karuna Location

small intensively cultivated plots in and around home compounds. Such home garden technology increases productivity as it is labour-intensive and, being near the homestead, the labour required can be combined with home and childcare responsibilities (Tengnas, 1994). In North Maragoli, it was found that female-headed and female-managed households had planted more trees than male–headed and male-managed households (Mutoro, 1997). Therefore women are the key participants in social forestry projects and the main stakeholders in the management of natural resources (Rocheleau et al. 1988).

Similarly, women were the key players in the management of all human activities and in the conservation of biodiversity in and around Ol Donyo Sabuk National Park, Machakos District (Lelo, 1994). Curiously, most women in Moiben seemed to deliberately avoid basking in the glory of their own achievements without their husbands, even when the latter had clearly not participated in the events. They preferred to enjoin their absentee husbands in various activities, especially when there was credit to be given. This obliged the researcher to create an extra entry for 'husband and wife', alongside those of 'husband' and 'wife', although it is still felt the credit should have gone to the women entirely. Constraints that hinder women participation in social forestry were given by respondents as lack of capital and inputs (53.5%); lack of time (21.5%; lack of technical know-how (16.5%); and, lack of community encouragement for women participation in social forestry (6.5%) (Table 4.18). Majority of those who claimed lack of time also admitted to lack of interest in social forestry.

5.3. Socio-Economic Factors

5.3.1. Income Level

Annual income distribution ranged between less than Kenya Shillings 250,000 and more than Kenya Shillings 1,000,000 (Table 4.7). Majority (57.5%) of the respondents had annual income of between KSh. 251,000 and KSh. 750,000. 12.0% had annual income of less than KSh, 250,000 while 16.5% had more than KSh. 1 million. No significant relationship was found between income levels of the respondents and social forestry adoption, as seen in Table 4.27 ($r = .023$, $p>0.05$). This means that adoption of social forestry was not necessarily informed



Plate 3: Big, Old and Inherited Trees Stand on a Farm in Sergoit Location, Moiben Division



Plate **4: An Up-coming Shelterbelt Around a Homestead in Tembelio Location**

by the respondents' income levels. Regression analysis further showed that there was no significant contribution by the income variable in the variation of social forestry adoption. This can be understood to mean that, despite claims by some respondents, lack of capital (income) did not actually contribute significantly to the low level of adoption of social forestry practices by the community. There must, therefore, be other more influential factors. The logistics, inputs and costings of, for example, starting a tree nursery in the area were worked out as shown in Appendix IV. It turned out that the cost of establishing and maintaining a commercial tree nursery for one year would cost (at current rates in the area) about Ksh. 22,300.00. It was found that with moderate effort the same could easily generate a profit of more than Ksh. 50,000.00 during the same period (one year). This is a demonstration that social forestry is not a capital- intensive investment but an affordable technology that is simple to adopt, as compared to other technologies. Therefore there is need to galvanise people's attention towards this viable economic option. However, research elsewhere has shown that income can, indeed, be one of the factors influencing the adoption of social forestry. For example, Ong'ayo (1994) found that tree planting in Western Kenya was influenced by the income of individual farmers. This means that those farmers who had higher incomes were found to have planted more trees than those who had lower incomes. Social forestry adoption in Moiben Division seemed to be influenced by factors other than income.

5.3.2. Occupation

The majority (78.5%) of the respondents were house wives/farmers while 12.0% were civil servants/teachers (Table 4.5). An interesting revelation was that nearly all the civil servants / teachers had planted a lot of trees on their farms, followed by others employed in the private sector, then business people and farmers, in that order. Correlation analysis, indeed, yielded a positive significant relationship ($r = .451$, $p<0.01$) between occupation and social forestry adoption (Table 4.27). This means that respondents of certain occupations had planted more trees than others (and vice versa). In similar studies in Western Kenya, Ong'ayo (1994) also found that tree planting was influenced by the occupation of respondents. This, perhaps, could be due to either the varying exposure of members of different occupations or the

different educational backgrounds of members of different occupations, or a combination of both. As if to support the case for educational background, a positive significant correlation was also found between education level (as a socio-economic factor) and social forestry adoption (see next section 4.2.3.3.).

5.3.3. Education Level

Of those interviewed, 28.0% had never gone to school, 35.5% were of primary level while 27.0% were of secondary ('O' and 'A') level (Table 4.4). Only 7.0% and 2.5% had attained college and university levels, respectively. Correlation analysis showed there was a positive significant correlation ($r = .535$, $p<0.01$) between education level and social forestry adoption among the respondents (Table 4.27). This means that education levels of the respondents had significant influence on social forestry adoption. In Ainabkoi division, Uasin Gishu district, Busienei (1991) similarly found that literacy (education) levels had quite significant influence on farmers' participation in agroforestry. Social forestry adoption in Western Kenya was significantly influenced by the education level of the respondents (Ong'ayo, 1994). This means that education (both formal and informal) is a key factor that should also be addressed during the formulation of intervention measures.

5.3.4. Farm Size

Many (49.5%) of the respondents had farm sizes between 20 and 60 acres. 33.5% had below 20 acres while 7.5% had over 80 acres (Table 4.6). These are quite large farms by Kenyan standards. However, there was no significant relationship between farm sizes and social forestry adoption ($r = .025$, $p>0.05$) among respondents (Table 4.27). Therefore social forestry adoption did not significantly depend on sizes of farms, contrary to claims by some respondents that farms were inadequate. Indeed, some respondents owned hundreds of acres of land yet they had not planted any more trees than those who owned much smaller parcels. In Central Kenya, Chitere (1985) found that land size was a factor in the adoption of tree planting. Similarly, farm size was an important factor in the adoption of agroforestry practices in Western Kenya (Kimwe and Noordin, 1994). The land holding per capita being much smaller in both Western and Central Kenya than in Uasin Gishu District, it would appear farmers in Western and Central Kenya have incorporated tree farming in order to maximize

returns from their otherwise small parcels, compared to their colleagues in Rift Valley who seem contented with cereal and dairy proceeds from their extensive farms. 51.0% of the farmers of Moiben indicated that trees would actually be inimical to their mechanized farm operations (Table 4.23). On the other hand, farming in Central and Western Kenya (and most other heavily populated regions of the country) is not mechanized and therefore trees can be grown and cultivated in intimate mixtures with food crops without any inconveniences.

5.3.5. Health Status

This factor was incorporated in the research for measurement in order to determine whether it had any significant effect on social forestry adoption in the study area. This was important in view of the setbacks allegedly inflicted by disease, especially HIV/AIDS, on critical sectors of the Kenyan economy. HIV/AIDS prevalence in the area was 12.1% in 2004 (ROK, 2002). The effects of disease in the adoption of social forestry in many parts of the country continues to be largely unstudied and unquantified. Despite this noble intention, however, it turned out that respondents were not free to discuss the subject because of the social stigma associated with the disease. As a result the issue of HIV/AIDS was not broached with respondents, and instead general questions on health were used (see appendix 1). Respondents would only be required to indicate whether or not they were able to plant or manage trees due to any health related reasons. About 20% of the respondents indicated they had been affected in various ways (Table 4.8). Correlation analysis yielded a low positive significant relationship, as seen in Table 4.27 ($r = .380$, $p<0.01$). Although the influence of disease may not have been very significant at the time of this research care must be taken to ensure that disease incidence in the area does not escalate but is contained.

5.4. Socio-Cultural Factors

Although it has been argued that socio-cultural factors are also socio-economic factors, the study sought to define the two differently and so as to differentiate between the two sets of factors for purposes of the investigation. Thus in the context of this research public awareness, social forestry extension and land tenure were considered as socio-cultural aspects. After all, impacts of extension services and the

levels of public awareness and even the land tenure systems have been known in Kenya to vary from one community to another, and very much depending on the traditions and customs of the communities themselves. In such a context, the three factors would be considered in the realm of socio-cultural aspects of those communities.

5.4.1. Public Awareness on Social Forestry

Of the respondents interviewed, 3.5% knew neither types nor uses of trees; 19.5% knew types but not uses of trees; and 30.5% knew both types and uses of trees (see Table 4.10 and also some common trees and shrubs in Appendix II). 29.5% had never attended any social forestry demonstration (baraza); 42.5% had attended once; 18.5% twice; and 7.5% thrice (Table 4.11). 17.5% of the respondents were not sure of their next source of wood requirements, especially firewood and thought they would just get it from the banks of nearby rivers (Table 4.12). Their next alternative would be to collect debris or cow dung, from their own or neighbours' farms. A positive significant correlation ($r = .279$, $p<0.01$) was found to exist between the level of public awareness and social forestry adoption among the respondents (Table 4.27). This means that public awareness was an important factor in the adoption of social forestry. Regression analysis further found this variable to be a good predictor of the dependent variable. Similar research else where has shown that public awareness was indeed a key factor in social forestry adoption. For example, Mutoro (1997) found that adoption of agroforestry technologies by women in Vihiga District depended on the levels of awareness about the existence of such technologies. This is a major challenge and calls for more concerted efforts among social forestry practitioners to publicize their wares.

5.4.2. Availability of Social Forestry Extension Services

Available social forestry extension services were found to be wanting. 53.0% of the respondents claimed that they had neither visited nor been visited by social forestry extension officers prior to the study (Table 4.13). Only 3.5% had had regular contact with extension officers from Ministry of Environment and Natural Resources, Ministry of Agriculture, Ministry of Livestock Development, or church- related NGOs. Such respondents, incidentally, happened to be prominent personalities or

living near government administrative quarters (next to the officers). A low positive correlation, though insignificant, was found to exist between availability of extension services and social forestry adoption ($r = .180$, $p>0.05$), as seen in Table 4.27. There was no doubt that the issue of extension services went hand in hand with that of public awareness, and research has shown it was an important factor in the adoption of any agricultural innovation in the market. For example, Mutoro (1997) found in a similar study that use of forestry extension services significantly influenced social forestry adoption in Western Kenya. Those farmers who were utilizing extension services were found to have adopted social forestry better than those who were not.

5.4.3. Land Ownership/ Tenure

When the respondents were asked who owned the land, 71.5% said the husband (men), 6.5% said the wife (women) and 18.0% said sons (Table 4.9). A further 4.0% had leased the farms. The women and children (wives and sons) had inherited farms from their husbands and fathers (men), some of who had since passed on. In few cases, living but elderly parents had subdivided and allotted farms to their offspring, even though the title deeds for the younger owners had not been obtained. Those leasing farms were mainly civil servants and teachers posted to work in the region. In all, 42.5% did not have title deeds to their farms and hence were reluctant to adopt social forestry. A moderately positive significant correlation was found between land tenure and social forestry adoption ($r = .391$, $p< 0.01$), as shown in Table 4.27. This means that land tenure had some influence on social forestry adoption in the study area. Land tenure refers to the possession or holding of the rights associated with each parcel of land. In similar studies, land tenure has often been regarded as a major constraint in agriculture and as a limiting factor for farmers to make long-term investments. Most farmers in Kenya find it unacceptable and unattractive to invest in tree planting on land, which has not legally been confirmed as belonging to them (Tengnas, 1994). In Ainabkoi Division, Uasin Gishu District, low participation in agroforestry was found to be due to lack of title deeds (Busienei, 1991). Closely related to land tenure was also the issue of tree tenure. Farmers who did not own the land tended to feel they could not possibly own the trees, hence no need of planting

them. Women in Vihiga District called for the sorting out of the issue of tree ownership before they could be persuaded to plant trees (Ipara, 1992).

5.4.4. Traditional Beliefs

Majority of the respondents (77.0%) claimed they did not habour any traditional beliefs concerning trees and tree planting (Table 4.14). Most would hasten to add that they were born-again Christians 'with no room for useless beliefs'. 15.0% of respondents said women should not be allowed to plant trees, as they might be tempted to claim the land too. About 7.0% (and among them women!) went on to insist that women should not be allowed to own land as they may never wish to get married. 1.0% insisted that certain types of trees should not be planted as they were associated with bad omen and this could cause untold calamities to the people. However, no significant correlation was found between traditional beliefs of the respondents and social forestry adoption ($r = .073$, $p>0.05$), as shown in Table 4.27. They denied the existence of any traditional taboos, especially regarding trees and tree planting. They professed a deep belief in the Christian faith. Else where in Vihiga, women participation was found to be hindered by the existence of taboos and beliefs (Ipara, 1992). Kerkhof (1992) claimed that the success of KWDP project was limited by cultural constraints in Western Province.

5.5. Other Household Factors

The age, marital status, family size and the level of family resources for every respondent were also recorded for extra analysis and enrichment of discussions. The majority (71.5%) of them were aged between 21 and 60 (Table 4.1). About 6.0% were aged below 20 while 22.5% were above 60. The majority (79.0%) of them were married, with only 18.5% being widowed / widowered and 2.5% being single (Table 4.2). No divorce or separation cases were recorded. 66.5% of the households had between 4 to 6 family members, 10.0% had 7 members, and 7.5% had 8 or more members, while 16.0% had 3 or fewer members (Table 4.3). Family size refers to the number of dependants in the household including children and relatives staying within the household. In many cases the household size provides a measure of the availability of family labour for farming activities. Chitere (1985) found in a similar study that there was a relationship between the family size and adoption of

agroforestry practices in Central Kenya. The more the family members in a household the more the number of trees they had planted on the farms. Age was also found to be a factor. Farmers adopted agroforestry technologies to varying degrees according to age (Aboud, 1997).

In this study, however, no relationships were found between these three variables (age, marital status and family size) and social forestry adoption. In addition, most farmers were also found to have kept a modest number of domestic animals, like cattle, sheep, goats, pigs, chicken, etc. (Table 4.24). About 22.5% of the respondents had farm machinery, which included tractors (19.0%), lorries (2.5%) and chuff-cutters (1.0%). Other farmers had other types of vehicles including saloon cars (3.5%) and pickup trucks (5.5%). Farmers also had housing structures of different standards, showing different levels of resources (Table 4.25). The purpose of recording all this information was to find out whether the level of resources determined in any way the adoption of social forestry among the respondents. No such relationship was found to exist between the level of family resources and social forestry adoption.

5.6. Constraints to Social Forestry Adoption

The majority of respondents (51.0%) believed that trees on farm would interfere with mechanized farming while a sizeable number (12.0%) saw their land as too small to accommodate tree planting (Table 4.23). 4% were leasing agricultural land and therefore could not undertake tree planting as land was not theirs. 26.0% of the respondents gave other reasons for not planting trees. Of those who gave other reasons for not adopting tree planting, 35.0% cited lack of tree seeds/seedlings; 26.5% claimed that trees attracted pests (especially birds) that damaged/fed on crops, while 7.5% had no specific reasons. Respondents suggested the following mitigation measures to their constraints: social forestry education campaigns in the villages to increase farmers' awareness about the technology; provision of suitable tree species to farmers, either free of charge or at subsidized prices; provision of continuous extension services; provision of pest control measures, especially birds, and; abolition of government restrictions on tree harvesting on farmlands.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

From the research findings it is evident that the level of social forestry adoption in Moiben Division is low. Only 47.5 percent of the population has adopted the practice. However, the adopters seem to have been prompted into practice by a sense of insecurity since most of them have planted the trees only around the homesteads as hedges or live fences to boost privacy. The lesson here is that farmers can and, indeed, have adopted tree planting toward a specific felt need. This is a clear indication that the farmers have long been left to their devices and have never been sensitized about the other beneficial and multiple uses of social forestry technologies. There were very few cases where farmers had grown trees in viable arrangements that could accrue greater benefits like firewood and timber, or for increased farm productivity (Appendix III).

Social forestry practice was generally skewed against the women folk. Only 17.0 percent of the respondents agreed women could plant trees and only 10.0 percent acknowledged women could harvest the trees without the sanction of their male relatives. This is a clear reflection of the unfortunate reality on the ground, that women are constrained in their efforts to adopt social forestry. Lack of capital and inputs, lack of time, lack of technical know-how, and lack of community encouragement also encumbered women in the adoption of social forestry. It seems gender, disguised as culture, might have been an organizing factor in the development and adoption of social forestry practices among the communities. Education and social awareness campaigns are necessary to bring about eventual change in perception, attitude and behaviour amongst community members so as to enable more women to participate in social forestry in future. Women could particularly be encouraged to start group tree nurseries as inexpensive commercial ventures that will help improve their incomes, while at the same time providing seedlings for their local planting (Appendix IV).

Socio-economic factors that influence social forestry adoption in the division are the people's occupation, their education levels and health status. Income and farm size, as socio-economic factors have no significant influence on the people's adoption of social forestry in the division. This probably explains why social forestry adoption has remained dismal despite the above-average income levels and relatively big farms in the area. In

terms of occupation, members of certain professional cadres (teachers, civil servants etc) were more successful in the adoption of social forestry than the plain farmer. These more enlightened, informed and successful members of the society should be used (as contact farmers) to reach and educate their ignorant neighbours, kin and kith. Farmer to farmer approach has been used in the promotion of new agricultural innovations more successfully (than officer to farmer approach), due to the shared common values among the farmers themselves. Education standards are also quite low in the division. Statistics indicated that out of the 200 respondents, 56 (28.8 percent) had never been to school, 71 (35.5 percent) only managed primary level, 54 (27.0 percent) secondary level, while only 14 (7.0 percent) and 5 (2.5 percent) attained college and university qualifications, respectively. While the situation might undoubtedly change with succeeding generations, there is need to provide further education services, including adult literacy classes. More resources and efforts are required to educate more residents of the division, so that social forestry adoption may also improve. The youth, women and the illiterate adults should be targeted in the new drive. Environmental education such as social forestry needs to be wrapped up in the curriculum so as to inculcate awareness at early stages of learning.

That there was a positive significant relationship, albeit low, between health status and social forestry adoption might be a wake-up call that ailment and mortality is beginning to take a significant toll. There is need for expert health personnel to examine the situation more closely with a view to confirming this position and taking the necessary steps to curb its escalation. It is largely documented that effects of disease, especially malaria, pneumonia and HIV/AIDS-related complications have already ramified and affected many sectors of the Kenyan economy (ROK, 2002). Improvement in the provision of health services, especially in form of material support and counseling, would go to assuage the sufferings of both the infected and the affected, thereby enhancing their chances of living to adopt social forestry.

Socio-cultural factors that affect adoption of social forestry among the communities of the division are public awareness and land tenure. Traditional beliefs and availability of extension services do not significantly affect adoption. As lack of land title deeds significantly affects social forestry adoption, farm owners who have not taken out title deeds for their land should be encouraged and facilitated to acquire them. This will

most likely boost their confidence to engage in social forestry. Equally, more public awareness by all means should be mounted so as to indulge as many farmers in social forestry as possible. Development of demonstration centres, field days, barazas, print and electronic media programmes, school/social drama sessions, and posters and publications are some of the methods, materials and tools that have been used effectively to raise public awareness and participation in up-coming rural development programmes. Social forestry extension services should also be made available and accessible deep in the remote countryside. That the people are not encumbered by unnecessary traditional beliefs portrays them as more approachable, flexible and readily receptive to contemporary innovations. This is viewed as a boon for potential social forestry interventionists- provided they are armed with the right approach and propaganda.

1) Farmers cited key constraints inhibiting them from adopting social forestry as (i) trees would interfere with mechanized farming, (ii) trees on farms would tremendously increase manifestation of crop pests, by providing resting and nesting sites for them, (iii) lack of tree seeds and seedlings, and (iv) trees require big space on their own, and land was not big enough to accommodate myriads of trees.

Land use planning has been particularly a gray area for many of the farmers. That is why farmers owning as many as 40 or 60 acres still believed land was not enough to accommodate trees. Citing the current government restrictions on tree harvesting and the inherent difficulty in transportation of wood and wood products as a result, farmers claimed it was not yet viable to begin growing trees for business. Rather than impose bureaucratic licensing mechanisms, government involvement and meddling in social forestry should be limited to provision of badly needed extension services and facilitation of supplies and marketing. The permit acquisition mechanism, according to the farmers, is not only a difficult and tedious exercise but has also become a corruption-prone mechanism for public officials. It is a source of disillusionment and a big disincentive to farmers and should therefore be lobbied against. More importantly, social forestry intervention packages ought to be clearly labeled with tangible social, economic and environmental benefits that would accrue to the farmer. That the farmers have been putting up trees according to their felt needs- mainly to secure homesteads and mark farm

boundaries, demonstrates that they only require further sensitization about other nudging household needs that can be easily addressed by social forestry, so as to facilitate them to embrace the technology fully. The unfulfilled household needs for forestry products ought to be captured, repackaged and presented to the farmer as pressing and priority issues, just like security, so as to capture their immediate attention and curiosity. At such a point farmers would definitely be ready to discuss the issues and the available opportunities in the adoption of social forestry in Uasin Gishu District.

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APPENDIX 1

SOCIAL FORESTRY PRACTICES IN MOIBEN DIVISION, UASIN GISHU DISTRICT, KENYA (This is a sample questionnaire as used during the study. It should not be used for any other purpose).

General Information

Location.....

Date of visit.....

Interviewer's Name.....

Interviewee's Name.....

Sex.....(1) Male (2) Female

1. Interviewee's age.....

2. Place of residence: Location.....

Sub location.....

Village.....

Marital status

3. Marital status

(1) Married (2) Single (3) Widowed/widowered (4) Divorced (5) Seperated

4. Do you feel this status affects your tree-planting activities? (1)No (2) Yes

If yes, explain.....

Family size

5. Total number in the family

(1) Less than 3 (2) 4 and 5 (3) 6 (4) 7 (5) 8 or more

6. Do you feel this position affects your tree planting options? (1) No (2) Yes

If yes, explain.....

Education level and occupation

7. Education level

(1) None (2) Primary level (3) Secondary Level (4) College level (5) University level

8. Has this been useful in your tree-planting activities really? (1) No (2) Yes

If yes, explain.....

9. Occupation?

(1) Employed farm manager (2) Farmer (3) Civil servant/teacher

(4) Business wo/man (5) Other, Specify

Farm size

10. Size of farm?..... acres

11. Has size influenced your decision to plant/not to plant trees? (1) No (2) Yes.

12. If yes, how?

(1) Farm too small to accommodate trees (2) Farm too big to fill with trees

(3) Cereal profits are enough (4) Trees would interfere with mechanized farming

(5) Farm small hence trees supplement profits (6)Other, specify.....

Land Tenure

13. Who owns it?

(5) Husband (4) Wife (3) daughter/son (2) Leased (1) Other, specify.....

14. Do you have a title deed for the farm? (1) No (2) Yes

Does this affect your tree planting activities? (1) No (2) Yes. Explain.....

Public Awareness in Social Forestry

15. Are there any trees that you feel are important to yourself? (1) No (2) Yes

If yes, which species: species uses

....

....

....

16. Where would you get your next source of wood requirements? .....

17. Have you ever attended any public "baraza(s)" on environmental education?

(1) No (2) Yes

If yes, how often? (1) Once (2) Twice (3) Thrice (4) More

Women involvement

18. Who tends the trees?.....

(5) Husband (4) Wife (3) Husband and wife (2) Children (1) Other, specify.....

19. And whose are they?

(5) Husband (4) Wife (3) Husband and wife (2) Children (1) Other, specify.....

20. Who decides when and how to harvest them?

(5) Husband (4) Wife (3) Husband and wife (2) Children (1) Others, specify.....

21. Do you know of any woman /women /group engaged in tree farming? (1) No (2) Yes
Specify where and which one.....

22. Who does the farm management?
(5) Husband (4) Wife (3) Husband/wife (2) Children (1) Other, specify.....

Availability of Social Forestry Extension Services

23. How often are you visited by extension officers at your farm?
(1) Not at all (2) Rarely (3) Yearly (4) Once every several months (5) Often

24. How often do you visit the extension offices/officers?
(1) Not at all (2) Rarely (3) Yearly (4) Once every several months (5) Often

Traditional Beliefs

25. Do you believe?
(1) Some trees should not be planted
(2) Some trees should not be used for any purpose
(3) Women should not own land
(4) Women should not plant trees, or
(5) Do not belief at all.

26. Do you have any traditional beliefs concerning trees and tree growing? (1) No (2) Yes

27. If yes, give examples of trees and associated beliefs,

Tree (species)	Belief
.....	.....
.....	.....
.....	.....

(A notebook can be used if necessary)

28. Have your own tree-planting activities been affected by such beliefs? (1)No (2)Yes

Health

29. Has tree planting activities on the farm ever been affected by circumstances beyond your control, say ill health of a household member?
(1) Never been affected (2) Partially been affected (3) Fully been affected

30. How has it been so?
(1) Available time is spent giving sick attention
(2) Capital spent on medical treatment of self or relative

(3) Only occasionally able to plant due to illness

(4) Totally unable to plant trees due to illness

(5) Other, specify.....

31. So we are saying tree-planting has/not been affected by health issues? (1)No (2)Yes

(Remember to wish them quick recovery)

Social Forestry Adoption

32. Are there any trees on the farm now?.....(1) No (2) Yes

33. How many trees have you planted yourself so far?

(1) 50 and below (2) 51-100 (3) 101-200 (4) 201-300 (5) Over 300

34.How many tree seedlings have you raised in the farm?

(1) 0 (2) 50 and below (3) 51-100 (4) 101-200 (5) Over 200

35. For how long have you been planting trees, in terms of years?

(1) 0 (2) 1-4 (3) 5-9 (4) 10-19 (5) 20 and above

36. How long does it take to procure firewood when you need it?

(5) Less than 2 hours (4) 2-4 hours (3) Whole morning/afternoon (2) Day

(1) Not applicable

Constraints

37. What are the main constraints hindering the development of social forestry practices, for both yourself and other farmers?

(1) Lack of interest

(2) Lack of information / extension services

(3) Lack of water / land

(4) Lack of time

(5) Lack of capital

(6) Land not yours

(7) Long maturity period

(8) Trees not for mechanized farms

(9) Tree-cutting forbidden

(10) Not authorized by clan/culture

(11) Other, specify.....

38. What constraints hinter women especially from undertaking social forestry in this community? List them down in a notebook, if any.

39. How can all these constraints be overcome to improve adoption?

Constraint	Remedy
.....	.....

(A notebook may be used for listing them down)

Income

40. What are your sources of income, annually?

(1) Cereals.....Ksh

(2) Pyrethrum.....Ksh

(3) Livestock.....Ksh

(4) Tree resources.....Ksh

(5) Horticulture.....Ksh

(6) Salary / Wage / Pension.....Ksh

(7) Family members.....Ksh

(8) Business.....Ksh

(9) Other, specify.....Ksh

TOTAL.....Ksh

Level of other resources: observe and tick accordingly

Farm machinery? (1) Tractor (2) Lorry (3) Light vehicle (4) Matatu (5) Other, specify

Domestic animals? (1) Chicken (2) Pigs (3) Sheep (4) Goats (5) Cattle

House: WALLS;

(1) Mud (2) Wooden (3) Bricks/plastered (4) Stone / Blocks (5) Others, specify...

FLOOR;

(1) Mud (2) Wooden (3) Cemented / Tiled (4) Other, specify.....

ROOF;

(1) Grass / Thatch (2) Tree bark (3) Tin (4) Shingles (5) Iron sheets (6) Tiles

NB: Let the respondent ask any questions freely concerning the interview, then offer them thanks for their time and effort. Request to be shown around in order to be able to make further observations and ground truthing. Show appreciation.

Comments on the interview by: -

a) Interviewer

b) Respondent

Recorded by.....

Date.....

Checked by.....Date.....

APPENDIX II

SOME COMMON TREES AND SHRUBS IN THE STUDY AREA

Botanical name	Common name	Family
Prunus africana	Prunus ('Tendwet')	Rosaceae
Sysygium guinense	Blue apple ('Lamaiywet')	
Dombeya goetzenii	Dombeya	Sterculiaceae
Grevivillea robusta	Silk Oak ('Mukhiaa')	Proteaceae
Eucalyptus saligna	Gum tree	Myrtaceae
Cupressus lusitanica	Cypress	Cupresseceae
Cupressus arizonica	//	//
Olea africana	Olive ('Mutaiyu, Emtit')	Oleaceae
Jacaranda mimmosifolia	Jacaranda	Bignoniaceae
Persea Americana	Avocado	Lauraceae
Cordia abyssinica	-	Boragnaceae
Psidium guajava	Guava	Myrtaceae
Ficus sycomorus	Sycamore tree	Moraceae
Ficus natalensis	Bark cloth tree	//
Accacia abyssinica	Umbrella thorn tree	Mimosaceae
Accacia meansii	Black wattle	//
Spathodea campanulata	Nandi flame	-
Spathodea nilotica	//	-
Dovyalis caffra	K- apple	Flacourtaceae
Markhamia lutea	Markhamia	Bignoniaceae
Croton megalocarpus	-	Euphorbiaceae
Cassia siamea	Cassia	Caesalphinaceae
Cassia spectabilis	//	//
Albizzia gummifera	-	Mimosaceae
Citrus spp	-	-

APPENDIX III

SOME SOCIAL FORESTRY TECHNOLOGIES IN MOIBEN DIVISION

System	Tree species	Food crops
Woodlot	Eucalyptus spp	-
	Cupressus spp	
	Pinus spp	
Shelter belts	Eucalyptus spp	-
	Cupressus spp	
	Ekeya saligna/	
	Dovyalis caffra	
Home gardens	Persia americana	Beans
	Citrus spp	Cabbages
		Kales
Alley cropping	Grevillea robusta	Maize
	Leucaena leucocephala	Millet
	Calliandra calothyrsus	Beans

Source: Field Survey Data, 2004.

APPENDIX IV

ESTABLISHING A COMMERCIAL TREE NURSERY

Objective and purpose: To raise seedlings to protect and sustain the farming environment.

Basic requirement: Permanent source of water, tree seeds and forest (or good) soils.

Size of land required: 0.025 acres to raise 15,000 seedlings.

Costed activities	KSh.
1. Forest soil 1 lorry	3,000
2. Seed @ 800 per kg times 4	3,200
3. Poly tubes @ 800 per roll	800
4. Shavel, panga, jembe, wheelbarrow, watering can	3,300
5. Labour, 3 persons	12,000
Total	22,300
Estimated income 15,000 seedlings times 5/= per seedling	75,000
Net income (75,000 – 22,300)	52,700

Estimated time of return – one year

Services offered by government (MENR): Training, supervision, linkage with sources of tree seeds, networking with farmers for markets, etc.

Commitment of farmers: Provision of labour, land, forest (good) soil, and nursery tools