SOCIO-ECONOMIC STRATEGIES IN PROMOTING AGROFORESTRY PRACTICES IN PRIMARY SCHOOLS OF PERI-URBAN SINGIDA.

BY

LOYCE MTALAMILE MNYENYELWA

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ABSTRACT

This study investigated the socio-economic strategies in promoting agroforestry practices in primary schools of peri-urban Singida. Specific objectives were: (a) to identify the type of agroforestry practices being used in the primary schools; (b) to find factors if any, which constrain the adoption of agroforestry practices in primary schools; (c) to find more means of motivating pupils in adopting agroforestry practices; (d) to identify ways of broadening the knowledge and skills of primary school teachers for effective teaching and training of agroforestry practices; and (e) to make recommendation for more effective strategies in improving agroforestry practices in primary schools. A cross-sectional design was used for this study. Data were collected using self-administered questionnaire, personal observation and focus group discussion. Chi-square tests were used to test the relationship between variables. The findings show that tree/crop mixture was the major type of agroforestry practices used in primary schools. Inadequate skill of managing both trees and crops was the most important factor that constrains the adoption of agroforestry practices in primary schools. Inadequate skills and lack of agroforesters highly influenced agroforestry practices (at $P \leq 0.005$). Teaching agriculture as a separate subject was suggested to be the most important way of motivating pupils in adopting the practice. The results also show that 100% of the respondents support training as the most effective way of broadening the knowledge and skill of primary school teachers for effective teaching and training of agroforestry practices. About 66.7% of the teachers did not attend any training concerning agroforestry practices. The majority suggests construction of wells for irrigation, planting legume trees; extension workers should stay in villages and dissemination of the research results to the searched sites. The study recommends the government through its policy makers and the development planners to strengthening

agroforestry policy in order to maintain agroforestry quality and productivity on a long term. International organizations that sponsor agroforestry research should provide agroforestry information, funds, and technical assistance to primary schools.

DECLARATION

I, Loyce Mtalamile Mnyenyelwa, do hereby declare to the Senate of Sokoine University of Agriculture that the work presented here is my own creation, and has not been submitted for a degree award in any other university.

Signature----------

Date---12-09-2025----------

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DEDICATION

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ABBREVIATIONS

ANAFE	African Network for Agroforestry Education.
FAO	Food and Agriculture Organization of the United Nations.
HASHI	Hifadhi Ardhi Shinyanga
ICRAF	International Centre for Research in Agroforestry.
ILCA	International Livestock Centre for Africa.
ITTA	International Institute for Tropical Agriculture.
MoA	Ministry of Agriculture.
na	Not applicable.
NEMC	National Environmental Management Council
NGO	Non- governmental organization.
SCAPA	Soil Conservation and Agroforestry Program.
SECAP	Soil and Erosion Control and Agroforestry Program.
SEMA	Sustainable Environment Management Action.
SIDA	Swedish International Development Authority.
SPSS	Statistical Package for Social Sciences.
SUA	Sokoine University of Agiculture.
TRSC	Tanganyika Relief Christian Services.
URT	United Republic of Tanzania.
WFS	World Food Summit.
WWF	World Wide Fund.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Sustainable rural development involves successful management of resources for agriculture to satisfy changing human needs while enhancing the quality of the environment and conserving natural resources. Agriculture provides food, income, employment, and foreign exchange; therefore it has to be managed and developed sustainably. While the rapid depletion of forest resources is a major global concerns, sustainable rural development still faces a number of problems such as cutting of trees for fuel wood, poles, fodder and timber. Other problems are soil erosion, low yield of crops per unit land, inadequate knowledge and skills on environment conservation. According to MNRT (1998), Tanzania loses about 91,000 hectares of forest and woodland annually through extensive agriculture and wood fuel demand. To arrest the problem of rapid forest depletion the government started a national tree planting campaign in 1967 in order to rehabilitate degraded land, and reduce pressure on natural forest to sustain wood supply and to alleviate poverty (Lulandala *et al.*, 1989). Following the rather slow adoption of village afforestation and recognition of importance of addressing the above problems the government through the Ministry of Agriculture promoted agroforestry by including it in its category one of its research priority areas (MoA, 1991). However, general knowledge on trees management is inadequate for establishment of agroforestry system (URT, 1988). According to Ndunguru (1981), a school was believed as an educating community, which could tackle societal problems. A school is used, not only by children but also by the adults of the community, serving as a community centre, a place for adults' education and recreation, and a focal point for the community. Teachers also are full participating

members of the community development (Sinclair and Lillis, 1980). Therefore if agroforestry practice in primary schools can be improved and promoted then it can be part of the school activities. According to URT (2001) more than 74% of the population of Tanzania are youths found in primary schools and few in secondary and tertiary institutions. This population therefore attributes the high demand for the use of this very precious resource.

Most primary school leavers do enter the world of work. Thus, primary education needs to serve as a preparatory ground for those who progress to secondary schools and those who do not. Rural people's access to formal education is largely restricted to primary schools since access to secondary school depends upon parents' financial capabilities to meet the school fees and materials (Jazairy, 1992). Again, youths, aged between 15 to 24, accounts for 60% of the unemployed (URT, 2001). Approximately, 400,000 youths who complete primary education each year; only 10,000 youths get the opportunity to continue to secondary education. Thus, 85 to 90% of the primary school leavers constitute a valuable productive age group (URT, 2001). It is therefore clear that if we want to rectify the problem of rapid forest depletion we have to put into consideration on how to involve these youths and make them be well informed on how to plan, manage, use, conserve and develop their economic activities without depleting the forests. This study therefore aimed to promote agroforestry practices in primary schools through the use of socio-economic strategies. The need to study the socio- economics of agroforestry comes from the fact that, regeneration and vitality of forestry in general and of agroforestry in particular, are much dependent on their social and economic relevance (Khot, 1999). Studying fundamental dynamics between social and economic values and the 'status of agroforestry' is essential for development of agroforestry.

Agroforestry as the growing of trees and crops on the same land with or without animals has great potential as an approach to rural development. It can improve the use of natural resources on a sustainable basis and can offer solutions to meet the most of rural people daily needs in terms of fuel wood, poles, shade, fodder, and timber to mention a few. The practices can also contribute to soil conservation, reduce soil loss and improve soil fertility, which may improve crop and fodder yields. Trees can also provide shade for their homes and wood/non wood products can be sold to generate income. In general agroforestry practices can contribute significantly to sustainable rural development through improving the quality of the lives of rural people.

Agroforestry projects are being introduced in most African countries with the assistance of national governments, donor agencies and international research organizations such as the International Council of Research in Agroforestry (ICRAF), the International Institute for Tropical Agriculture (IITA) and the International Livestock Centre for Africa (ILCA). One of the main constraints on the rapid introduction and implementation of agroforestry projects is the shortage of professional and sub-professional staff and inadequate knowledge (Nair *et al.*, 1988).

Currently, most primary schools in Tanzania have established income-generating activities in order to raise funds. These income-generating activities help to finance operational and running cost of the school. Primary schools' income generating activities are mainly of agriculture type such as growing food crops, horticultural crops and livestock keeping. Agroforestry practices are not considered as useful as income generating activities. According to Rutatora (1993), incorrect land use and management by small farmers are not done intentionally but are the result of ignorance, socio-economic socio-cultural and

political pressure. Therefore, the adoption of socio-economic strategies by primary school pupils can be the best alternative in promoting agroforestry practices.

Therefore, promotion of agroforestry practices in primary schools is important to: -

- Introduce pupils to the reality of life that soon after graduating they can use knowledge and skills of agroforestry in the rural areas;
- Provide an opportunity to the pupils to have knowledge and skills on agroforestry practices that can be used at their homes;
- Engage pupils in agroforestry practices at school instead of them being idle; and
- Enable the schools to be self-reliant from the agroforestry products.

In Peri-urban Singida many people are destroying the land through deforestation for charcoal, poor farming systems, shifting cultivation, overgrazing and therefore using the pupils we can easily communicate and educate them on how to reduce destruction of forests and plan the best alternatives of improving income through agroforestry practices such as the cultivation of fast maturing crops integrated with permanent tree crops. However, no studies have been carried out to quantify why and how primary schools can be used to promote agroforestry practices in Tanzania for sustainable rural development and at the same time to provide sufficient information on agroforestry practices to the rural communities.

1.2 Agroforestry practices in Singida region

Singida region forms part of the central plateau of Tanzania, which sloped away in the east to the main Rift valley and to the west into Wambere Depression at about latitude 30° 52' and 7° 34'South of the equator and Longitude 33° 27' and 35° 25'East of Green witch.

Five regions border the region. Arusha in the north; Dodoma in the east; Iringa and Mbeya in the south; Tabora in the west and Shinyanga in the northwest. The region has four districts, which are Singida urban, Singida rural, Manyoni, and Iramba. The region covers about 49,341 km^2 of which 11,144 km^2 is arable land, 19,747 km^2 grazable, 7544 km^2 thicket reserves, and 500km^2 are for any other activity.

Climatically, the region falls under the semi-arid zone of the country with mean annual rainfall ranging from 500mm to 800mm. Agroforestry practice in the region has been in operation for about fifteen years ago. Religious Institutions especially Missionaries from the Roman Catholic church were the first to start the practice early after their arrival. They started to plant trees especially fruit trees together with crops, around their mission compound including the churches. The main reason was to improve their environment and hence to live comfortably. People living near the mission started to imitate it, as any thing practice by whites is good. As the result they were given tree seedling to plant in their farms. Ten years later, different development projects started to initiate agroforestry. Between 1973 and 1983, the Australian Development Assistance Bureau was engaged in wells operation so as to solve the problem of water. Later on, after leaving, the Tanganyika Relief Christian Services helped the region to sustain the project although the main aim was to deal with refugees. Together with that, the TRCS was also engaged in agriculture especially on tree planting. In 1984 to 1999, The Singida Integrated Development Project started agroforestry practices by establishing the central nursery of tree seedlings. Tree seedlings were distributed free to the villagers. People were not serious in managing the seedlings. Most of the seedlings being raised were destructed with their livestock. According to Kessy (2004), among nine million of the seedlings distributed, few of them were survived and most of the survived one was a fruit tree.

Because of very low individual initiative the Singida Integrated Development Project started agroforestry practices in primary schools. To start with, primary schools were given free tree seeds to rise in their nurseries and sell the seedlings to the villagers as school incentive. More emphasis was placed on multipurpose trees especially fruit trees. Primary schools raised their school income in terms of cash. Therefore in 1989, 135 primary schools in all districts started to practice agroforestry. Each school was given ten thousands seedlings to raise it. Later on the primary schools were told to incur 50% of the expenses of seed rising. Hence they were given tree seeds, polthene bags, water cans and wheelbarrow on loan. Schools competitions were used as a strategy in promoting agroforestry practices. The school leadership and villages established a bylaw that enforced every household to plant ten tree seedlings each year. In 1992 the primary schools and other institutions were told to buy tree seeds as other individual people interested in agroforestry (URT, 1998). In order to minimize the cost, primary schools started to improvise local polthene bags by using old sacs. Till today, some of the primary schools still have agroforestry practices of fruit trees; others have timber trees for school furniture's. The project of TRCS was faced out in December 1999. In January 2000, a non-governmental organization Sustainable Environment Management Action (SEMA) started to operate. SEMA emphasized on individual participation, after observing the setbacks of the previous organization. People were told to participate in rising and managing the seedlings. Home visitors (known as *warekebishi* in kiswahili), teachers and standard seven pupils were used by the NGO in transmitting the knowledge and skill of agroforestry practices to the villagers. According to Kessy (2004), out of 135 primary schools that were practicing agroforestry, only 40% still proceed to run agroforestry practices. SEMA, still insist individual household to plant ten trees each year in their farm. In Manyoni district, people of Itigi and Kilimatinde divisions, raise tree seedlings and plant

it together with tobacco. The location of Singida region and their districts including Singida urban district is shown in Figure 1.

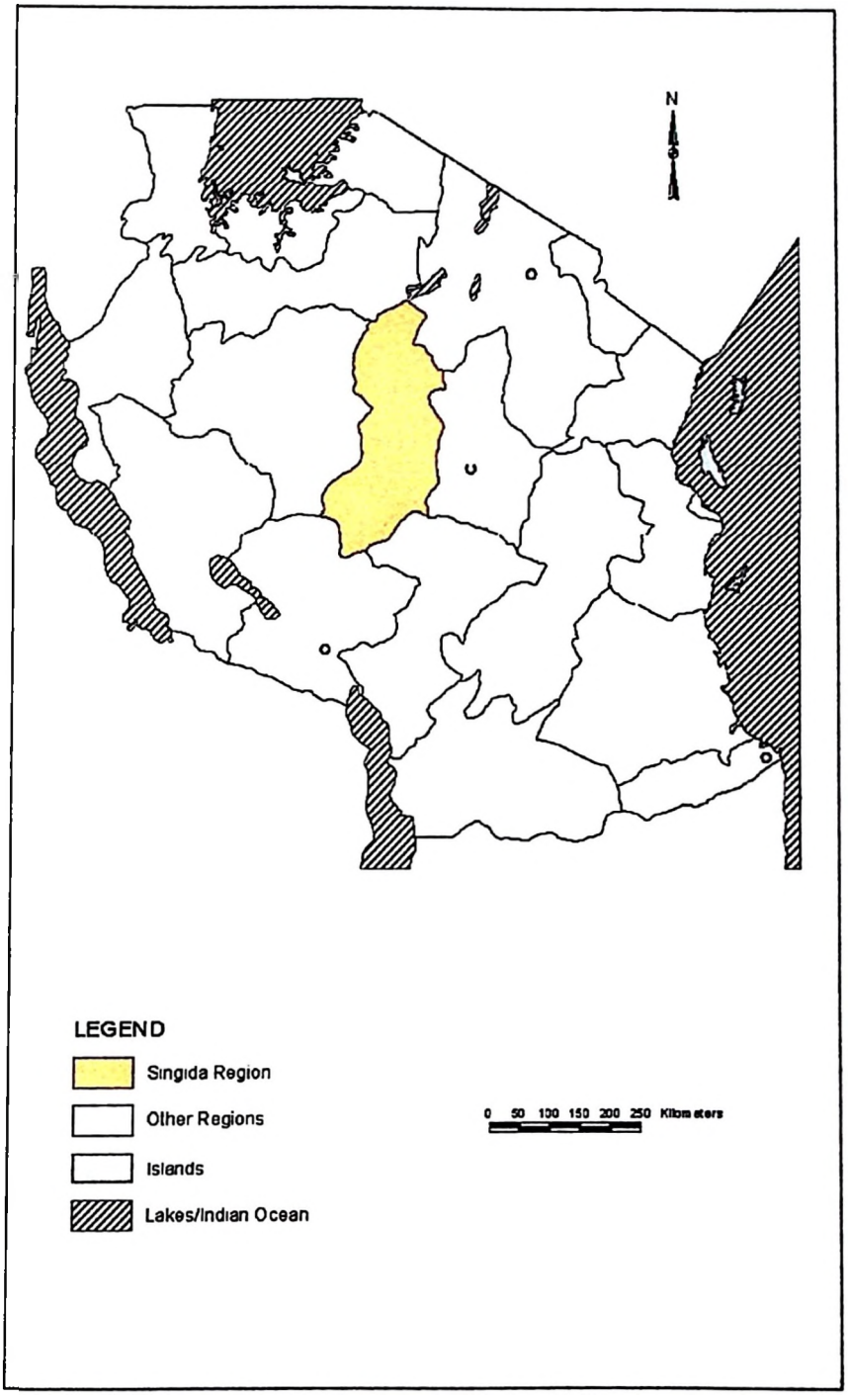

Figure 1: Map of Tanzania showing the location of Singida region

Source: (URT, 1998)

1.3 Problem statement

Agroforestry practices in primary schools has less consideration by policy makers, researchers and rural development agencies for sustainable rural development. Education has been viewed as a means of development and a part of development. According to World Food Summit (1996), education allows farmers to make use of new farming techniques and technologies. Research demonstrates that basic education has a clear effect on agricultural productivity. However, the existing agroforestry practices are correctly addressed in primary schools, thus mostly not productive to transform pupils' knowledge and skills. The better and cheap agroforestry technologies are not available. The less consideration is because in primary schools 'income generating activities are mainly of agricultural types such as growing food crops, horticultural crops and livestock keeping. Agroforestry practices are not considered as useful as income generating activities. Therefore it is important to investigate the existing agroforestry practices in primary schools and the participation of pupils in management, and whether pupils have skills and knowledge which could be used in rural areas after their graduation. This can be tackled through carrying out socio-economic strategies behind the promotion of agroforestry practices.

1.4 Justification

The problem of inadequate attention to primary school agroforestry practices by policy makers; researchers and development agencies lead to less adoption of agroforestry practices in rural areas. A World Bank study conducted in 1990 found that farmers in all countries when armed with a minimum of four years of education are able to increase their productivity by an average of 8.7 % (World Food Summit, 1996). Rural primary education is more efficient and/ or cost effective to encourage the entire community in

adopting new technology. The on going ICRAF study show that about 24% of the World's population both in rural and urban or 1.5 billion people in developing countries of Asia, Africa and Latin America depend largely on agroforestry products and services for their livelihood (ICRAF, 1997). Thus, wide spread application of agroforestry practices will offer great potential for sustainable farming systems which can lead to sustainable rural development. Through primary schools this can promote adoption of agroforestry practices. In order for something to disseminate it should start with the youth. Primary schools can be used to promote adoption of something through various campaigns. Therefore by giving much attention to primary schools as the focal point of development, will create awareness among the farmers on the environment management through agroforestry practices.

Moreover, the language used as the medium of instruction often is Kiswahili, pupils can understand and explain what they have learnt to their parents, compared to secondary schools where the medium of instruction changes from Kiswahili to English. Pupils will be assisted to run productive agroforestry such as the cultivation of fast maturing crops integrated with permanent tree crops as a means of earning income for self employment and hence transform the same agroforestry in their communities through acquired knowledge and skills on the agricultural crops, types, methods and management of agricultural crops and permanent tree crops for sustainable rural development. According to URT (1984), schools must be not only places where knowledge is passed on, but also where knowledge originates.

1.5 Significance of the study

This study will be useful to pupils, teachers, policy makers, researchers and rural development agencies as well as education planners. Pupils as future farmers will be exposed to the knowledge and skills of agroforestry practices. The knowledge and skills will be transferred to the community and therefore contributing to the transformation and improvement of agriculture that is the backbone of our economy and make it more productive. Teachers will be equipped with knowledge and skills for effective teaching and training the pupils and communities. Policy makers, researchers and rural development agencies and education planners will formulate policies and strategies for promoting agroforestry practices to the community and find out means of supporting primary schools in running agroforestry practices. Also the study will help primary schools and villages to earn income due to diversification of agricultural activities.

1.6 Objectives

1.6.1 Main objective

- To investigate socio-economic strategies in promoting agroforestry practices in primary schools of peri-urban Singida.

1.6.2 Specific objectives

- To identify the type of agroforestry practices being used in the primary schools.
- To find factors if any, which constrain the adoption of agroforestry practices in primary schools.
- To find more means of motivating pupils in adopting agroforestry practices.
- To identify ways of broadening the knowledge and skills of primary school teachers for effective teaching and training of agroforestry practices

- To make recommendation for more effective strategies in improving agroforestry practices in primary schools.

1.7 Hypotheses

1.7.1 Null hypothesis

- Primary schools have no significant contribution in promoting agroforestry practices

1.7.2 Alternative hypothesis

- Primary schools have significant contribution in promoting agroforestry practices.

1.8 The conceptual frame work

Scarborough and Kyadd (1992) argues that a conceptual framework should help to indicate the most useful area(s) in which to focus limited resources and ensure that data collected are relevant to the objectives of the research. It was from that argument a conceptual framework for selecting variables and respondents was developed and shown in Figure 2.

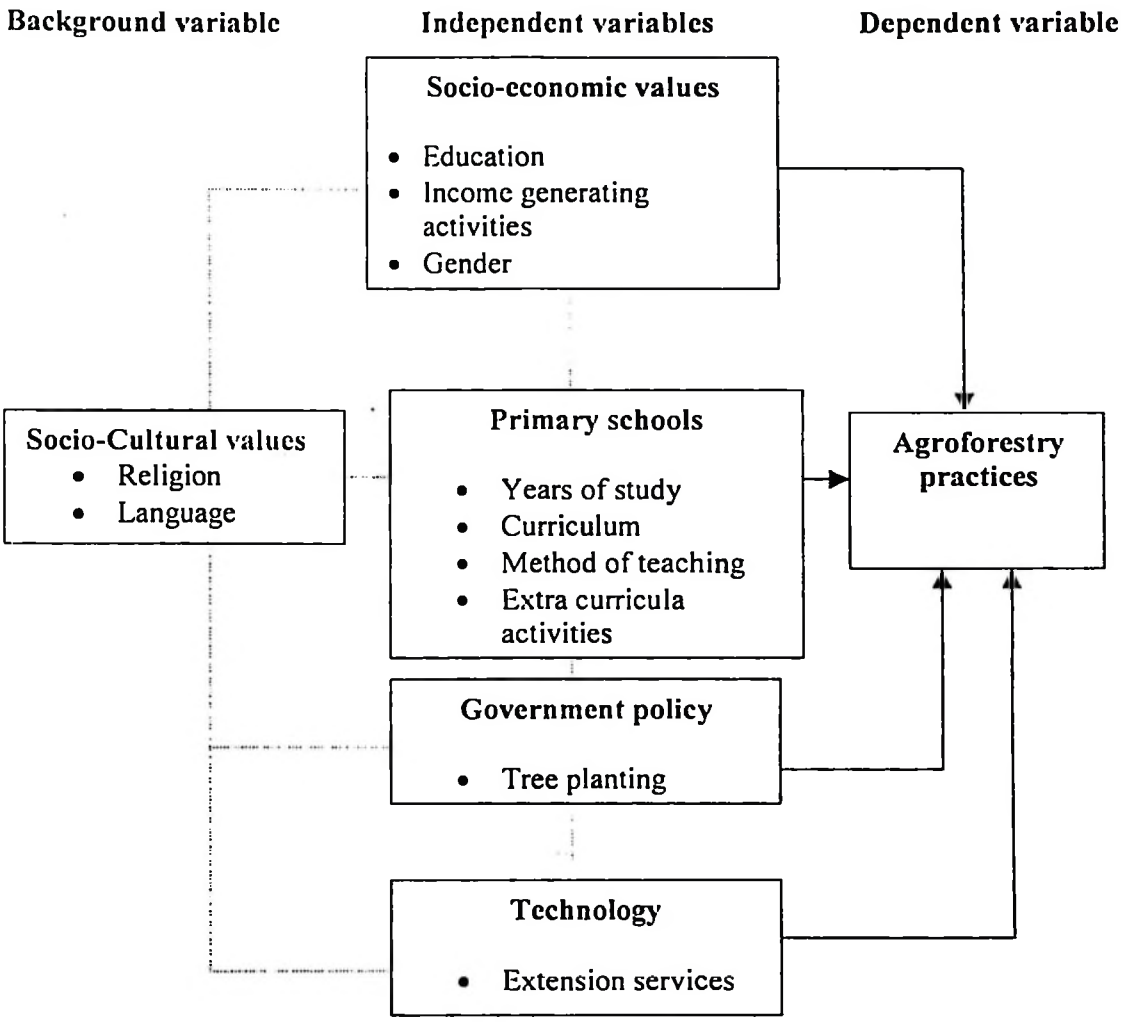

Figure 2: Conceptual framework for promotion of agroforestry practices in primary schools

Key ——▶Relationship for Primary analysis

------ Relationship for Secondary analysis

The study assumes that background and independent variables, were the most important factors which influenced the promotion of agroforestry practices in primary schools. There

was an assumption that socio- economic strategies have great influence in the promotion of agroforestry practices that finally will lead to sustainable rural development. However, there are other factors that contribute to the promotion. These were socio-cultural, primary schools, technology, and government policies. The interrelations of those factors are summarized in figure2. The indicators of each variable are presented in Table 1.

Table 1: Variables studied for promoting agroforestry practices

Variable	Indicator
Agroforestry practices	Land use practices
	Benefits of agroforestry practices
	Constraints of agroforestry practices
Primary schools	Years of study
Curriculum	Subject taught
Method of teaching	Participatory teaching methods and their strategies
Extra-curricula activities	Productive activities (agroforestry)
School and the community	Activities participated in the community
Socio economic activities	Income generating activities
Gender	Male/Female
Education of respondents	Highest level of education
Government policy	Tree planting
Technology	Extension services
Religion	Muslim, Christian, Tradition
Language	Kiswahili, English, Mother tongue

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter deals with literature review on the socio-economic strategies of promoting agroforestry practices in primary schools. In reviewing it, first the concept of agroforestry was introduced. This was followed by a review of the socio-economic of agroforestry, economic and social important of agroforestry, agroforestry practices, main features of agroforestry, agroforestry systems, constraints of agroforestry practices, approaches to promoting agroforestry and the ways of improving agroforestry practices in primary schools.

2.2 Agroforestry concepts

Agroforestry solves a large proportion of the problem of rural development by encouraging sustainability of the area. The ongoing International Centre for Research in Agroforestry study shows that about 24 % of the world population both rural and urban or 1.5 billion people in developing countries of Asia, Africa and Latin America depend largely on agroforestry products and services for their livelihood (ICRAF, 1997). However, environmental degradation threatens rural livelihoods and the economies of the most developing countries, which are based on natural resources. Over the past half-century more than a quarter of the worlds 8.7 billion hectares of agricultural land, pastures, forests, and woodlands have been degraded (Morrissey, 2002). Shortage of fresh water is threatening to be a serious obstacle to food security, and more than 70 % of the world's fisheries are over exploited (Morrissey, 2002). The major environmental degradation includes land degradation. According to World Wide Fund Tanzania Programme Office (2001), the factors causing land degradation include land deforestation, poor agricultural

practices, overgrazing, uncontrolled fires and other development activities. Land degradation manifest itself in various forms including soil erosion, loss of soil fertility, salinity, and desertification. In Tanzania, land degradation is found in one form or another and at varying degrees in most all 21 regions including Singida region. According to Kisanga *et al.* (1999), most parts of Tanzania especially the semi-arid areas such as Dodoma and Singida regions practice agro-pastrolism. The main problem of this systems are low and unreliable rainfall, resulting in high risk of crop failure and population pressure, which leads to both over cultivation and overgrazing, often with minimal encroachment on croplands and rangelands. Both phenomena in turn have led to exhaustion of an already low fertility status and vegetation degradation and severe soil erosion. However, a crucial issue is how to expand food and agriculture production in the lowest income in sustainable manner to the rural community. Morrissey (2002) urges that, achieving sustainable growth will need close attention to land and water degradation, nutrient management and conservation farming practices. It will also need policies and institutions that encourage better practices. Agroforestry practices, meet the demand of sustainable rural development According to Khot (1999), agroforestry solves many key issues facing all developing countries, such as food security, energy shortages, and unemployment. Agroforestry is an intervention in ecosystem to increase socially desired benefits, if practiced as a multiproduct, community directed activity based on local people's experiences, knowledge and needs. According to Nair (1989), the overall goal of agroforestry practices is to improve the existing situation through increasing both the quantity and quality production, to generate a sustained agricultural product, to reduce environmental damage and to raise the living standard of the human population. However, Mercer and Miller (1998) found that one of the reasons that agroforestry projects failed

was the lack of attention to socio-economic issues in the development of the systems as well as in the extension of the technologies. Therefore, much attention to socio-economic strategies will promote agroforestry practices in primary schools.

2.3 Socio-economics of agroforestry

Though originally, agroforestry may have emerged as a social solution for economic- basic human needs and problems, it is observed that over the years, agroforestry has suffered since the 'socio-economic' dimension was ignored. Needless to say, there is a vital relationship between 'socio-economic of agroforestry' and agroforestry'. Existence, regeneration and vitality of forestry in general and of agroforestry in particular, are much dependent on their social and economic relevance (Khot, 1999). The status of agroforestry in a given area is directly related to "how the related society views and values it", and the status (well being) of a society in a given area is in turn equally dependent on the status of agroforestry. The social and economic aspects are also interdependent. The social value of agroforestry is often directly proportionate to their economic value, and vice-versa. Studying fundamental dynamics between 'social and economic values' and the 'status of agroforestry' is essential for development of agroforestry. Divergences between social and economic objectives can kill the spirit of agroforestry. Virtually all-environmental concerns can be characterized as examples of economic externalities. Overemphasizing economic benefits has led to ways of extracting surplus from the land, and thereby unstable development, while a better understanding of socio-economic aspects can aid to sustainable development (Khot, 1999).

2.4 Economic and social importance of agroforestry

Economically, agroforestry contribute to national and international economy of most of developing countries. According to Leakey (2001), in Indonesia the sale of tree products from agroforests provided farm income approximately $1000 per ha per annum, which was well distributed over the year and from relatively low labour and capital imports. The economic returns from those agroforests were excess of those from other land uses, including plantation. Agroforestry also make farmers to obtain direct economic benefit from the trees that satisfy their needs for fire wood, posts, poles, saw wood, certain fruits, feed for cattle, flowers for honey and medicinal product (Nair *et al.*, 1988). Agroforestry as a land use provides a source of scientific insights on how to develop sustainable land uses.

Socially, agroforests are important in terms of the significant contribution that they make to employment, mainly through activities like harvest, transportation of products from the field to the village and market. These raise significant additional income and other benefits for the community especially children, and allows landless people to benefit from agroforestry activity from security (Leakey, 2001).

2.5 Agroforestry practices

There are numerous definitions of agroforestry (Nair, 1989), all of which cite the integration of trees, and other woody perennials, with crops/or animals, either in spatial mixtures or temporal sequences. This satisfies agronomist and foresters viewing the important socio-economic role of agroforestry from a production stand point. By definition, agroforestry is a collective name of land-use systems and technologies where woody perennial (trees, shrubs, palms, bamboo, etc) are deliberately combined with

agricultural crops and or/animals in some form of spatial arrangement or temporary sequence (Nair, 1993). According to Ngatunga (1993), agroforestry is an improvement to the traditional, way of integrating trees, crops and livestock in order to reap more benefits. Farmers have always been growing crops and trees and keeping livestock around their homestead and nearby fields albeit in the manner they liked. Agroforestry is a sustainable land management system which increases the yield of the land combines the production of crop (including tree crops) and forest plants and/or animals simultaneously or sequentially on the same unit of land, and applies management practices that are compatible with cultural practices of local population (Bene *et al.*, 1997). Agroforestry practices have been reported to increase yield of cereal crops, fodder and wood material for households (ICRAF, 1996). This is due to improvement of soil fertility and provision of woody and foliage products. Therefore the adoption of socio-economic strategies will promote agroforestry practices in primary schools.

2.6 Main features of agroforestry

According to Lulandala (2003). Agroforestry includes 10 key features, which characterizes the system and determines its potential.

2.6.1 Land use systems

Agroforestry consist of land use systems of tree/ pasture (i.e. animal) or tree/ crop /animal, tree/ aquosystem or tree / insect (i.e. Bee).

2.6.2 Practices

Agroforestry systems are practices, which have been in use variously worldwide over the years e.g. taungya systems, shifting cultivation, tree crop mixtures, home gardens, and shelterbelt.

2.6.3 Wood perennials

For any land management system to qualify as an agroforestry, there must be a presence of trees or shrubs fully integrated into the system. These trees/shrubs may be intended for wood, fodder, food (fruit, leaves, etc), shade, recreation, conservation etc.

2.6.4 Same land management unit

The various components to the production systems must be on the same land unit in the various forms of configuration both in space and time.

2.6.5 Herbaceous crops

Agricultural crops are among the key components of the production system e.g. maize, beans, groundnuts, sorghum vegetables, etc. Horticultural crops such as fruit trees, as normally considered as woody perennial under this systems.

2.6.6 Animals

These may range from the large ruminant animals such as cattle, sheep goats, etc. non-ruminants like horses, pigs, etc. to small ruminants such as rabbits, including poultry.

2.6.7 Spatial arrangement and temporal sequence

Since the system involves different plant and animal species in most cases occupying different levels of the vertical plane (tree/crop) and in some cases incompatible (crop/animal), the question of how best these components should be arranged on the land space both in space (spacing) and time (sequence) in order to promote mutual and beneficial co-existence, becomes important.

2.6.8 Ecological

Agroforestry provides strong ecological influences on the production systems. Trees, for example, can provide a moderating influence on the possible extremities in the climatic conditions (wind, temperature and relative humidity), which could affect crop yields. They can also significantly contribute to the overall nutrient availability their efficient use and conservation through nutrient recycling, biological nitrogen fixation and organic matter. Also may influence the systems hydrological cycle.

2.6.9 Economics

Agroforestry caters for economic consideration for instance, the increased number of farm products, lowered farm inputs marketing, incomes economic activities and land use efficiency.

2.6.10 Interaction

The system must provide for biological and economic interactions and care must be taken to take advantage on the beneficial ones and avoid the negative aspects of the interactions e.g. tree/crop interface, tree/grass animal/crop.

2.7 Agroforestry systems in practice

2.7.1 Agrosilvicultural systems

This system involves the combination of the agricultural crops and woody perennials of shrubs, vines and trees (Nair, 1985). In this system, land is used to produce crops, forest products and amenities. It is prevalent in areas where crop production is the dominant economic feature of the communities involved (Lulandala, 2003). According to Nair (1987) and Lulandala there are about ten distinctive agroforestry technologies that have potential applicability to maintain the soils fertility and improve its productivity. These included shifting cultivation, alley cropping multispecies tree gardens, home gardens taungya, tree in soil conservation and land reclamations, shelterbelts and windbreaks, multipurpose trees on rangelands, boundary planting of trees and woody hedges, and woodlots for green manure, woody much or fodder.

2.7.2 Silvopastoral system

This is a system, which involves the incorporation of tree and shrub management and animal husbandry (Burley, 1987). Lulandala (2003) defines it as a system which involves the deliberate integration of the trees/shrubs into the pasture or grassland to improve its productivity (meat and milk) and make wood based products available for the community. Thus in land management system; the animal is the main feature of the faming system.

2.7.3 Agrosilvopastoral system

This system is a combination of the two-agroforestry system above (Agrosilvicultural and silvopastrol systems). It includes agricultural crops, trees and animals in the same unit of land (Nair, 1985). According to Lulandala (2003), this system could be of value in areas where the agricultural crop production and animal husbandry go hand in hand as equally

important economic activities of the communities in question. The system can serve the true agricultural crop and animal components at the same time though a partial indirect arrangement so that during the cropping season the animal can continue benefiting from the system through a cut and carry mechanism of the fodder materials from the farm to the stall- fed/housed livestock or supplementing the pasture external to the agrosilvopastoral system. Lulandala (2003) added that, the system is spreading fast among the urban and especially peri-urban households.

2.7.4 Aquosilvicultural system

This is the system whereby management of the aquatic life forms, for instance fish, crocodiles, shrimps, etc require, either directly or indirectly plants of which trees/shrubs are main components (Lulandala, 2003).

2.7.5 Aposilvicultural system

This is a system, which involves a combination of trees based vegetation with keeping of insects. Beekeeping industry is highly dependent on the flowering plants of which trees/shrubs are main components (Lulandala, 2003).

2.8 Benefits of agroforesty practices

2.8.1 Productive benefits

Agroforestry contributes a wide range of goods to the rural community (Rocheleau *et al.* 1988). The production benefits played by agroforestry practices include the production of food fodder, fuel wood and fruits (Young, 1990). According to Lulandala (2003), agroforestry improves farm, productivity through increased outputs of tree products, increased yields of associated crops, reduction in system's production inputs, increased

labour use efficiency and thus satisfaction of the basic needs such as food, shelter clothing, medicine, cash income, raw materials for crafts, savings and investments and resources for social obligations (Rocheleau *et al.*, 1988).

2.8.2 Service benefits

Agroforestry practices contribute a wide range of service benefits. The most important of which is maintenance of soil fertility. The trees used in agroforestry practices provide services such as the improvement of soil fertility, the improvement of microclimate and the control of crop pests (Rocheleau *et al.*, 1988). The major effects of trees on soil fertility are control of soil erosion, maintenance of soil organic matter and physical properties, nitrogen fixation, improved up take of nutrients and nutrient recycling.

2.8.3 Protective benefits

The vegetative cover provided by the trees, crops and grasses facilitates the protective benefits of agroforestry practices. According to Nair (1984), the protective cover provided by vegetation on the soil prevents erosion through mulching.

2.8.4 Socio-economic benefits

Socio-economic benefits of agroforestry practices refer to the level of inputs of management (low input, high input) or intensity or scale of management and economical goal (Subsistence, commercial, intermediate) (Nair, 1985). Subsistence level of production is the one that the use of land is directed toward satisfying the basic needs, and is managed mostly by the owner or occupant and his family (Nair, 1985). Agroforestry practices in this level provide subsistence need and generate income. It also plays a key role in supplying food for families. As such they are essential to support the villages' life and life

and life style. In Baobab, Tanzania, home garden agroforestry systems are reported to have met almost all household calorific requirements (Rugalema, 1992).

Agroforestry practices are termed commercial when the production of output, usually a single commodity for sale is the major objective (Nair, 1985). Examples include commercial production of shade tolerant plantation crops like coffee, tea, and cocoa under over story shade trees (Johnson and Nair, 1985), commercial grazing and pulp plantation (Joffre *et al.*, 1988). Intermediate agroforestry systems are those that are between commercial and subsistence scales of production and management (Nair, 1985). The production of perennial crops and subsistence crops is undertaken on medium to small sized farms where the cash crops cater for the cash needs, and the food crops meet the family's food needs.

2.9 Socio-economic approaches to promoting agroforestry

2.9.1 Understanding the sociocultural background

Society exploits all the benefits, goods and services possible from an agroforestry ecosystem. Choices of what to exploit and what to avoid, vary from culture to culture and from one historical period to another. In order to promote agroforestry, we should develop policies based on the existing sociocultural perceptions, practices and desires about utilization and exploitation of ecosystem for needs fulfillments. A wide range of sustainable and non-sustainable benefits is potentially available from a forested system. Some of these uses have markets, some do not, but if the local communities perceive them as important benefits, the community will try to extract it from the ecosystem (Khot, 1999). Agroforestry planning efforts must begin with a study of socio-cultural

environment in a given community. This can lead to an appropriate strategy for planning the basics of agroforestry what to plant, where, by whom, how much and when.

2.9.2 Tapping the local potential

The rural and tribal people have great potential to plan the policy for what and how of agroforestry in their own area. Even the landless, for example contribute a great deal, if given special incentives to fulfil their livelihood issue. Nothing motivates more than a sense of security, and possession of even a small piece of land, even if on a long –term lease (Khot, 1999). Small and marginal farmers require as much attention as landless. These small and landless farmers become a priority sector to include in agroforestry intervention.

2.9.3 Holistic participatory planning

Numerous agroforestry programmes have failed because they are "social under designed". A detail study of requirements of total food, fodder, fuel and timber volume, the present availability and shortage, of a given community and of each family, and then planning the combinations of trees and arable crops on their basis, is essential. If the why and how much of plantation is known to those who are undertaking it, they are likely to participate in the "how" of it more keenly (Khot, 1999).

2.9.4 Capacity building

Educational efforts pay off the most in promotion of sustainable agroforestry. If a society predominantly views 'trees' as imperative to the 'quality of their lives', the tree will be taken care of and will serve the purpose. Wherever and whenever the society stops caring, the status of 'trees' and therefore of their own lives are endangered. Therefore creating

awareness of how systematic land use planning through agroforestry can improve the quality of lives is taken up on priority (Khot, 1999). The objective of capacity building is building positive attitudes, stimulating self confidence and self reliance, expanding horizons of people's aspirations, introducing alternatives to change the circumstances and progressing towards desirable aspirations and improving the participation capabilities by generating respect and faith in people's knowledge and power.

2.9.5 Technical training and credit support

Technical training and credit support in agroforestry promotion is necessary for improving in soil through land development. Water Resource Development, Management and Irrigation. Selection of cropping pattern for food security. Selection of trees, herbs and shrubs to take care of other needs (fodder,fuel,timber and cash income). Selection and provision of germplasm most suitable to the ecosystem and requirement. Selection of livestock, which can be sustained in the available resources. Improving the breed of livestock to optimize yields. Enhancing their access to land (share cropping). Processing the agroforestry products to maximize their utility and conversion in cash (Khot, 1999). Also. Khot (1999) insists that, re-orientation of government officials, NGOs, teachers and social leaders is essential.

2.9.6 Organizing rural poor and institution building

If given a stake in the future and if organized into groups, the poor will respond psychologically and physically to engage in constructive activities of their own, thereby sustaining an essentially self- reliant effort (Khot, 1999). This means that if primary school pupils will be organized properly they will respond positively in agroforestry practices activities.

2.9.7 Involving women

It is important that women be given a relevant position if the message concerned our environment and sustaining the same is to be developed. It is common knowledge that as far as the environment is concerned, there is no person better informed than woman. If a woman is educated on the advantages of agroforestry, then the entire country will be enlightened and consequently, the whole world. All over the world, the role of women in fetching water, firewood, and cleaning and clearing the homesteads and fields is obvious. Thus, it becomes even more crucial that when we talk about agroforestry, women should be the important figure since her life is closely woven with the very issue at stake (Khot, 1999).

2.10 Constraints of agroforestry practices

2.10.1 Incompatibility

This is a condition that makes it difficult or impossible for some components of the agroforesty system to exist together on the same land management unit at the same time. Incompatibility can result from:

2.10.2 Allelopathic effect

Production or release or exudation of substances that are toxic to other components in the system) either of the tree on the crop or the crop on the tree. This can however, be avoided through careful selection of the plant components (woody perennial or crop) (Lulandala, 2003).

2.10.3 Time and space

Some components cannot occupy the same space at the same time, for example the crop and the animal or the crop and the grasses for pastures due to some practical negative interactive constraints. This problem can be readily avoided through the temporal sequencing the components of the system. (Lulandala, 2003).

2.10.4 Competition (i.e. tree/crop, tree/grass)

Competition in agroforestry system is mainly between the plant components. Competition may either be above ground and or below ground. Above ground competition includes competition for sunlight (i.e. shade), and growth space Belowground competition includes the competition between components plants for soil moisture, plant nutrients, growth space for root (Lulandala 2003).

2.10.5 Pests and diseases

According to Lulandala (2003), pests and diseases include the following:-

2.10.5.1 Animals (both wild and domestic)

The presence of the tree vegetation on the land management unit may attract wild animals that can in turn cause problems to the associated crops. The monkeys and various rodents are typical examples. Similarly, grazing livestock can escape into crop-farms.

2.10.5.2 Birds

The trees that provide ready resting and nesting grounds while the associated crops become reliable food sources for they may attract Birds.

2.10.5.3 Pathogens

The importation of the tree/shrubs into crops farms, might import with them pathogens and encourage their infestation and cause disease problems to the whole system.

2.10.5.4 Insect pests

These can be attracted by the trees/shrubs in the agroforestry system. As their populations' build-up and the trees are unable to sustain their food needs, insects may infest the associated crops in the system. Therefore in promoting agroforestry practices, these constrains must be taken into consideration.

2.11 Socio-economic limitation of agroforestry practices

The literature suggests that there are a number of socio-economic constraints that limit the adoption of agroforestry practices. In particular, most agroforestry practices require access to substantial quantities of Labour and land if they are to be effective. The technology also requires effective control over land for substantial periods of time. Access to markets may stimulate the adoption of new technologies, as provides an outlet for products as well as supply of inputs. Lack of institution support, appropriate research focus and project format can cause difficulties in the development and dissemination of new technologies. It is also always worth remembering that farmers have their own technologies, and that these may be fairly optimal, considering the socio-economic in which many resource poor farmers operate. Any new technology may have to consider these socio-economic constraints (land, Labour, market, farmer culture, tree ownership, research culture, institutional support and project culture) that are worth for farmers' adoption (Atta-Krah and Francis, 1987).

2.12 Ways of improving agroforestry practices in primary schools

Different literatures suggest various ways of improving agroforestry practices in primary schools by considering the curriculum of primary education, medium of instruction, method of teaching, extra curricular activities, institution support, market availability, micro policies, technology, sociocultural factors, and socio-economic factors.

2.12.1 Primary schools

Primary schools are those schools, which provide basic education or primary education. A complete basic education is normally provided free of fees, since it is essential for the acquisition of the knowledge, skills and attitudes needed by society. Basic education is country specific, but typically encompasses at least primary education and often-lower secondary education (World Bank, 1995). In Tanzania; primary school education consists of seven years of basic education after pre- primary schools. This education is universal and compulsory to all school age going children. The primary school cycle begins with standard one on entry, and ends with standard seven in the final years (URT, 1995). The main objective of primary education is to lay the socio- cultural foundations, which characterize a nation. This education is intended to enable a child to acquire broad and integrated knowledge, skills and understanding needed for survival, conservation of the environment and life long education (URT, 1995). Promotion of agroforestry practices in primary school is essential, because seven years of basic education will make pupils adapt and retain the knowledge and skills of agroforestry permanently. According to the World Development Report (1993), four years of primary education boosts farmers' annual productivity by nine percent on average. This implies that seven years of primary education in Tanzania can transform rural people and do wonders to their production.

2.12.2 The curriculum of primary education

The curriculum defines the subjects to be taught and furnishes general guidance regarding the frequency and duration of instruction. In some cases an accompanying syllabus specifies more precisely what is to be taught and what will be assessed. Curricula and syllabi should be closely linked to perform standards and measures of outcome. The curriculum typically includes fewer subjects at lower levels and more subjects at higher ones. At the primary level there are broad international similarities in relative emphasis placed on approximately eight major subjects; reading, writing, and mathematics account for about 50 percent of curricular emphasis (The World Bank, 1995). This means that education takes place through the medium of the curriculum. According to Ndunguru (1981), the curriculum offers the learner opportunities to encounter a number of components, which help him to realize the one important goal, which is to learn. In Tanzania, the curriculum of the primary education includes fewer subjects namely: Mathematics, English, Kiswahili, Science, Social studies and Technical skills. Religious education is also provided. Ndunguru (1981) urges that these subjects would be used in so far as they help to clarify the problems and to suggest solutions to them. Given the nature of the existing education programmes in Tanzania, we can use those subjects to teach agroforestry education. According to World Wide Fund Tanzania Programme Office (2001), all subjects taught in primary school are important in promoting agroforestry practices. The World Development Report (1993), Urges that, in Nepal farmers with better mathematics skills are more likely to adopt, profitable new crops. These, mathematics together with other subjects are important to foster the knowledge and skills of agroforestry practices. Therefore looking on the curriculum of primary education it is possible to introduce agroforestry education.

2.12.3 The medium of instruction in primary school

According to the World Bank (1995), learning is more effective and time is saved, if instruction in the first several grades is in the child's native language. This approach allows for mastery of the first language and promotes the cognitive development needed for learning a second language. Once solid skills in the first language have been acquired, a national, religional, or metropolitan language can be learned in the later primary grades to prepare for secondary education. In Tanzania, the medium of instruction in primary school is Kiswahili, a nation language. English is a compulsory subject. According to URT (1995), full development of language skills is vital for a fuller understanding and mastery of knowledge and skills implied in the primary school curriculum. Children at this level of education will continue to be taught in a language, which is commonly used in Tanzania.

In laying the socio-cultural foundations that is ethically and morally characterize the Tanzanian citizen and nation, primary education provides opportunity and enables every child to acquire, appreciate and effective use Kiswahili and respect the language as a symbol of nations unity, identity and pride (URT, 1995). According to the World Bank (1995), the ability to speak, read, or write one or more languages, is important aspect of human capital. Building up language capital begins early, with the development of oral fluency in one's native language. The development of language capital in the native language continues in school and elsewhere. In promoting agroforestry practices dominant language is important for acquisition of knowledge and skills. According to Nair *et al.*, (1988), one important constraints of agroforestry education in Indonesia is the language barrier. This inhibits communication as well as the exchange of experience and materials internationally. The World Bank (1995) urges that, not knowing the dominant language may limit a person's training opportunities, job mobility, and earning and reduces that

person's chance of escaping poverty. Therefore the language we use is often an indication of our attitude as well as a device for changing attitudes of others. Hence it is vital for adopting agro forest practices.

2.12.4 Methods of teaching in primary school

According to Tanzania Institute of Education (1999) learning is a process of acquiring knowledge and skills that lead to change of attitudes and development of values over time. The knowledge, concepts and skills to be acquired by the learner have to be communicated to him or her in various ways. The selection of appropriate method and strategies is important. Learning has to be learner centered in order to achieve the outcome in education. Therefore, participatory teaching method is the one, which is used in teaching primary schools. Strategies used are discussion, role-play, simulation, drama, case studies, demonstration, field study, projects, concepts map, concept cartoons, value clarification and future wheels.

Experiences have shown that non-participatory teaching methods, which are knowledge, centered, lack variety of teaching strategies and technique. Tanzania Institute of Education (1999) defines teaching technique as an activity performed to achieve the method. Group work, book exercises, discussions and lecturing are example of technique. A strategy is simply the sequencing or ordering of the technique a teacher has selected to teach a lesson. The methods, techniques and strategies are often used interchangeably. Therefore in teaching primary schools participatory methods are mostly used. The methods / strategies used which are more learner centered include, discussions, role play, simulation, drama, case studies, develop field study, projects, concepts maps, concepts cartoon, value clarification and future wheels.

The same method, technique and strategies can be applied to promote agro- forestry practices in primary school for sustainable rural development. According to ICRAF (1999), drama is used to promote climbing beans and agroforestry among farmers in Kabale District in Uganda. The study showed that drama was an excellent tool for reaching large number of people at low cost. About 13,000 people were estimated to have seen the play, at a cost of around USD 0.20 per person excluding the initial costs of training the actors. The study showed that, the play had indeed led to increased adoption of the technology. Therefore in the delivery of agro- forestry education, it is important to select appropriate methods and strategies that will enable the learner to develop positive attitudes and values towards the practices. However, there is no single method, which can be considered in isolation as the best teaching and learning method. Thus, the concern for agro -forestry education in our teaching is a concern for the curriculum as a whole.

2.12.5 Extra curricula activities

It was recommended that the curriculum should include any other productive work-study through which education can boost self- reliance attitude (Ministry of Education, 1984). Manual work was to be incorporated into the primary school curriculum to inculcate a healthy regard for the dignity of manual labour, teach practical skills and contribute to production to help cut down school running cost (Ministry of Education, 1984). Agricultural activities are mostly practices in rural primary schools. These activities are the same with those practices by their parents / community. If agroforestry practices are introduced in primary schools, automatically the whole community through their children will practice it. Since agricultural activities are mostly practiced in rural primary schools, agroforestry practices will be improved through the establishing seed nurseries,

demonstration plots, providing technical assistance, multdisplinary co operations and strengthening the income generating activities.

2.12.5.1 Establishing seed nurseries

The study carried by Bekengesi (2001), showed that Primary schools have been active in environmental issues, raising the tree seedlings and distributing them to villagers. Establishing seed nurseries and raising the tree seedling in primary schools will readily promote agroforestry practices.

2.12.5.2 Establishing demonstration plots

An agroforestry demonstration project is an excellent teaching tool that can benefit a variety of co operators, stakeholders, and customers. It is a cost-effective way to increase public awareness of agroforestry, promote adoption by landowners and obtain support from stakeholders (Irwin, 1997). In schools demonstration plantings establish a working example of an agroforestry technology under local conditions and show what it is, why it is used, and how it functions.

2.12.5.3 Providing technical assistance

If a project is not properly maintained it will be demonstrating what not to do. Maintenance is essential, and you must determine who will do it and how it will be done (Irwin, 1997). Maintenance activities include checking for tree survival, replacing trees that die, watering, checking for pest problems, pruning, thinning, and weeding (Irwin, 1997). In order to reach the goal, schools should be given technical assistance to those activities of management of planted trees in school farm.

2.12.5.4 Workshops, meetings, training and study tours for school teachers and students

According to Irwin (1997), a workshop for school teachers in East Usambara was transferred indigenous conservation knowledge to primary school pupils through songs, local dances, herbals medicine and stories.

2.12.5.5 Multidisplinary co operations with other disciplines

Multidisplinary co operations with other disciplines like livestock, agriculture, fisheries, community development and other interested fields will be encouraged for more advice to improve school's agroforestry activities (Irwin, 1997).

2.12.5.6 Strengthening the income generating activities

According to Irwin (1997) income generating activities such as vegetable gardens, tree nurseries for commercial purposes should be strengthened in the pilot schools. This can be sold as a way of raising their income of the school and gaining morally in tree planting.

2.12.5.7 Market access

Market access help to provide both incentives and inputs for the school. Lack of access to market is a problem for many primary schools. The availability of easy market access and a steady demand for produce are usually critical factors.

2.13 The school and the community

Primary school is composed of pupils, teachers and school committees.

The teacher is the most important actor in education and training. The teacher organizes and guides pupils in their learning experiences and interactions with the content of the

curriculum and promotes at all times students initiatives and readiness for their own learning (URT, 1995).

According to the World Bank (1995), around the world, parents and communities are becoming more involved in the governance of their children's schools. For example, the elected boards of trustees that manage schools in New Zealand are drawn from parents of children at the school. Many countries have found that communities that participate in school management are more milking to assist in the financing of schooling. In Tanzania, the school committee is responsible for the management and development of the school (primary school). The school committee's responsibilities include.

- To sensitize and involve all pupils, parents and school staff in respect of the roles they can play in maximizing the benefits of primary schools.
- To oversee the day-to-day affairs of the school.
- To work together with the head teachers and other teachers to prepare a whole school development plan (to mention the few) (URT, 2001).

URT, (2001) urges that the school committee would be accountable to the village council and in District Authorities. The school committee is composed of parents and pupils from the community and their teachers. Thus there is a great relationship between primary schools and the community to make sure that children receive better education.

According to Sinclair and Lillis (1980), a school was believed as an educating community, which could tackle societal problems. It is used not only by children, but also by the adults of the community, serving as a community center, a place for adult education and recreation, and a focal point for the community. Teachers are full participating

members of the community with the children, and carry out projects of community development (Ndunguru, 1981). These projects are part for the academic activities of the school but they bring together the children and the adults of the community to act on mutually agreed community problems and improvement projects. Hence, schools are expected to be productive units and integrated with the community (Ministry of Education, 1984.) Government use basic education to enhance national integration and unity within countries. It is believed that basic education is the key to modernization and a country's rapid social and economic development as people would apply scientific knowledge in the process of production (Ministry of Education, 1984). According to URT (1984), schools must be not only places where knowledge is passed on, but also where knowledge originates. The study carried by Bekengesi (2001), showed that primary schools have been active in environmental conservation through educating children on environmental issues, raising tree seedlings and distributing them to villagers. Therefore good relationship between school and community will help pupils to adopt agroforestry practices.

2.14 Government policy

There are different micro-policies, which have been implemented through tree planting. These include the establishment of the National Environmental Management Council (NEMC), the Land Management Program for Integrated Development Program, the Hifadhi Ardhi Shinyanga, (HASHI) project, the Soil and Erosion Control and Agroforestry Program (SECAP) in Lushoto District, the Soil Conservation and Agroforestry Program (SCAPA) in Arumeru District (URT, 1994). In all these programmes primary schools have been participating in planting trees. According to Bakengesa (2001), in Shinyanga district, Mwamalili primary school has *Senna siamea* woodlot, Seseseko primary school has planted *Albicia lebeck* woodlot and raises tree seedling. Bugogo primary school has

Leucaena woodlot and raises tree seedlings. These, tree seedlings are distributed to the villagers. In Singida region since 1983,tree planting was being dependent on central government tree seedlings nurseries. The government of Switzerland through SIDA was being providing funds to support tree planting projects. Since 1992 SIDA and TCRS (Tanganyika Christian Refugees Services) were being providing polthene bags, for planting seedlings, watercans for irrigation, while the government was being providing agroforesters. Primary schools participated in preparing tree nurseries and distributing the tree seedlings to the villagers (URT, 1998). In 1989, 135 primary schools in all four districts started practicing agroforestry. Each school was given ten thousands seedlings to raise it. The establishment of agroforestry policies will enhance the promotion of agroforestry practices.

2.15 Technology

The term technology refers to a general type of agroforestry techniques, such as hedgerow intercropping, improved fodder banks or living fences. More narrowly, technology may refer to specific variations of an agroforestry and pole trees, at a specific spacing, under a specific management regime and for specific production and service functions. Finally "technology" may refer to an established technical practice, such as pruning or pollarding (Raintree, 1989). Extension services and support concerning the values of trees, answers to technical questions and clear rights to trees is mostly required by poor farmers. After all, tree farming for profit is a new economic activity where exotic trees are considers (Bekengesi, 2001). URT (1998) urges that, to ensure sustainable rural development increased awareness and skills amongst the people on conservation, management and utilization of forest resources; the capability of the forestry extension services will be

strengthened. This is because farmer's general knowledge on tree management is inadequately for establishment of agroforestry systems.

2.16 Socio-economic factors

2.16.1 Education

Education broadens horizons beyond habits and traditions of individuals, encouraging involvement of an individual in development activities (Madulu, 2000). Therefore, the farmer's educational background is important factor in determining the readiness to accept socio-economic strategies in promoting agroforestry practices. Through education, an individual becomes more critically aware of the need and scope for social change. According to World Food Summit (1996), education allows farmers to make use of new farming techniques and technologies. Rural primary education is more efficient and /or cost effective to encourage the entire community in adopting new technology. More years of formal education is associated with high level of comprehension of new technologies, for example a farmer can be more willing to use high yielding variety, insecticides and pesticides thus education attainment increases the rate of adoption (Machumu, 1995).

2.16.2 Gender

Gender issues form part of the development approach that puts people at the center and ensures their participation in the entire development process. According to Mwaipopo-Ako (1994), women in rural areas often have heavy workloads and little time to participate in different development activities and more so, for assessing technologies; Education and training programmes have favoured men, as women in most rural areas have low education level and more are illiterate compared to men consequently, this affects the way they can appreciate messages on technology adoption. Since gender refers not only to women or

men parse but also to the socially defined roles of each sex, as well as to the relation between them, gender in primary schools will empower both girl and boy students and hence break the difference among them. Thus, would facilitate the promotion of agroforestry practices.

2.16.3 Income

According to Ellis (1998), diversification of sources of rural livelihood can have a positive impact on livelihood by reducing the risk of a household being confronted by income failure. In semi-arid areas, where seasonal crop failures are common, crop production alone does not fulfil the requirement for survival for the majority of rural households. Studies conducted in Kilimanjaro by O'kting'ati (1985), revealed that 92.7% of farmers accepted trees as being useful in their farms, agroforestry created high employment than for other monocultures and from a profitability point of view, agroforestry is superior to other forms of land use.

2.17 Socio-cultural factors

According to Samovar and Porter (1994), culture refers to the accumulative deposit of knowledge, experiences, beliefs, values attitudes meanings, hierarchies, religious notions of time, roles, spatial relations, concepts of the universe and material objects and possessions acquired by a group of people in the course of generations through individual and group striving. Religion and language are the most important socio-cultural factors in promoting agroforestry practices. The main objective of primary education is to lay the socio-cultural foundations, which characterize a nation (URT, 1995).

2.17.1 Religion

Religion is a system of communally held beliefs and practices that are oriented toward some sacred supernatural realm. It is a system of beliefs and practices that has become institutionalised and shared by a community. Religion unites a community of believers by bringing them together periodically to enact various rituals and by providing them with shared values and beliefs that bind them together. Religion also provides individual with emotional support in the uncertainty of the world. It offers explanations of common human problems and predicaments and gives people a sense of meaning and purpose in a world that might otherwise seem meaningless. Religious education encourages awareness of varying attitudes towards the environment by different religions (World Wide Fund Tanzania Programme Office, 2001). Controversial environmental issues involve many moral considerations concerning exploitation and conservation of resources and personal responsibility for the environment. Religious knowledge fosters the understanding about what is good and what is bad to the environment.

2.17.2 Language

Language is the keystone of culture. Without it, culture could not exist. Culture, definition, is shared, and complex cultural patterns of thought, emotion, knowledge and beliefs could not be passed from individual to individual or generation-to-generation without the medium of spoken word. Through language we are introduced to the collective experience of our society. Language enables us to give meaning to the world. Without language, all but the most rudimentary forms of thought are impossible. With language, we can apply reason to the world. We can think logically from premises to conclusions; we can categorize; we can order our experience; we can contemplate the past and the future, the abstract and the hypothetical; we can formulate and utter ideas

that are entirely new. Language enables the learner to read literatures nationally and internationally. Nair *et al.*, (1998) insists that, a serious constraint to the development of agroforestry education in Indonesia was the language barrier. This prevented Indonesian students from having easy access to international literature. So, the use of dominant language in primary schools will foster agroforestry education.

2.18. Summary of the literature review

The literature review has shown that agroforestry practices meet the demand of sustainable rural development. The overall goal is to improve the existing situation through increasing both the quantity and quality production, to generate a sustained agricultural product, to reduce environmental damage and to raise the living standard of human population. However, the literature found that, there are a number of constraints, which limit the adoption of agroforestry practices. The most critical constraints were found to be of those of socio-economic factors. The literature suggests that, those constraints must be taken into consideration when promoting agroforestry practices. The data show that there is a vital relationship between ' socio-economic of agroforestry and agro forestry'. Hence the studying fundamental dynamics between social and economic values and the status of agroforestry is essential for development of agroforestry.

However, depending on the main features of agroforestry and agroforestry systems in practice, general knowledge on trees management is inadequate for establishment of agroforestry systems. The literature suggests that using primary schools the knowledge of agroforestry will be easily disseminated to the community. The literature insists that a school was believed to be an educating community, which could tackle societal problems.

The study shows that primary education in Tanzania if used effectively can transform rural people and hence agroforestry practices. Therefore, the literature review revealed that although many studies on agroforestry practices have already been done in many regions in Tanzania including Singida region, there is inadequate information on contribution of primary schools in the promotion of agroforestry practices. Also few studies have been done to identify socio-economic strategies, which can promote agroforestry practices in primary schools. Thus, a justification for current study.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter describes the methodology that was used in the study. It includes description of the study area, research design, population, sample size, instrumentation, questionnaire pre-testing, data collection, data processing and analysis.

3.2 Location, size, and population of the study area

The study was carried out in Singida urban district in Singida region. The region forms part of the central plateau of Tanzania, which sloped away in the east to the Main Rift valley and to the west into the Wambere Depression. It lies between latitudes 30° 52' and 7° 34' south of the equator and longitudes 33° 27' and 35° 25' east of green witch. Five regions border Singida. Arusha in the north; Dodoma in the east; Iringa and Mbeya in the south; Tabora in the west; finally Shinyanga in the northwest. Administratively, the region is divided into four districts; namely Singida urban, Singida rural, Manyoni and Iramba. It covers a total area of 49,341 km^2. The region has a human population of 1,090,758 with average growth rate of 2.3% per year as per 2002 National census of which 531,015 were males and 559,743 females. An average household was 5.0 persons and the population growth rate of between 1988 and 2002 was estimated at 2.3% per annum (URT, 2003).

The region has 351 primary schools. Between them, 23 primary schools; 23 in Singida urban district; 71 in Manyoni district; 134 in Iramba and 123 in Singida rural. Among 346 villages in the region, each village has at least one primary school (URT, 1998).

Singida urban district borders Singida rural districts in all sides (North, East, West and South). It lies between latitudes 4° 4' and 50 south of the equator and longitudes34° 30' and 34° 50' east of the greenwitch. Administratively, it is divided into 13 wards and 19 villages. Among them, six wards with 15 villages are rural wards while the remaining seven wards with four villages are urban wards. The district has 23 primary schools; at least one primary school in each village.

Data were collected in peri-urban Singida, which, consisted of rural wards. Three villages with their primary schools were selected randomly. The villages included Kisaki, Itiri and Uhamaka in Unyamikumbi and Mandewa wards. The location of Singida urban district and the study areas (villages) is shown in Figure 3. The study area was chosen because of high rate of human and livestock population growth which increases environment destruction through shifting cultivation, bush fires, charcoal making, tobacco curing and deforestation. Also because of the inadequate knowledge on environmental conservation which caused many people to cut a lot of trees the situation which resulted to soil erosion, overgrazing and infertile soil (URT, 1998). Farming practices are still backward, as the end result is low productivity:-0. 88-1.3 t ha^{-1} of sorghum/millet instead of a possible 2.2-2.3 t ha^{-1} and 1.1-1.8 t ha^{-1} of maize instead of 3.4 –4.4 t ha^{-1} (Kandoro, 2000). Also in that area there is no permanent tree crop like cashewnut. Also because of easy accessibility of roads throughout the year and the population in the peripheral engage in other economic activities like livestock keeping, beekeeping, timber sawing and agriculture. Agriculture remains the most important sector, employing 90% of the population. The average size of the family cultivation area is 1.6 ha. Agricultural

development has environmental damage that affects the sustainability of production systems.

3.2.1 Climate

Singida region is characterized as semi-arid, thus rainfall amount, pattern and variation assume a major role in the functioning of the ecosystem of the area. Singida urban district receives a mean annual precipitation ranging from 600-800mm, which falls between November and early May. Annual temperatures range between 15° c to 27°c. The physical feature of the district includes the Singida plateau and small lakes of Kindai and Singidani (URT, 1998). The district depends on pump wells and other sources of water safe for domestic use. Lake water is not good for human consumption due to extremely salty and sometimes is very dirty.

3.2.2 Soil

There is a varied soil status within the district, sand dominated, followed by clay loam. Generally sand soil has low natural fertility while clay loam has high natural fertility (URT, 1998).

3.2.3 Natural vegetation

Singida region was extensively forested with miombo woodland, bushland species and long grasses known as *Echinoclea helplophada* .The grasses are found in dry areas which have salty. The tree species dominated include *Acacia* species such as *Acacia tortilis, and Cordia ovalis*. Others are *Pterocarpus angolensis* and, *Terminalia sericea.* The vegetation provided potential grazing conditions for livestock and fertile land for cultivation. However, a great part of the vegetation has been infected by tsetse flies. That made a large

part of the land, improper for grazing. Pastrolists are being enforced to use just a few areas, which have no tsetse flies (URT, 1998).

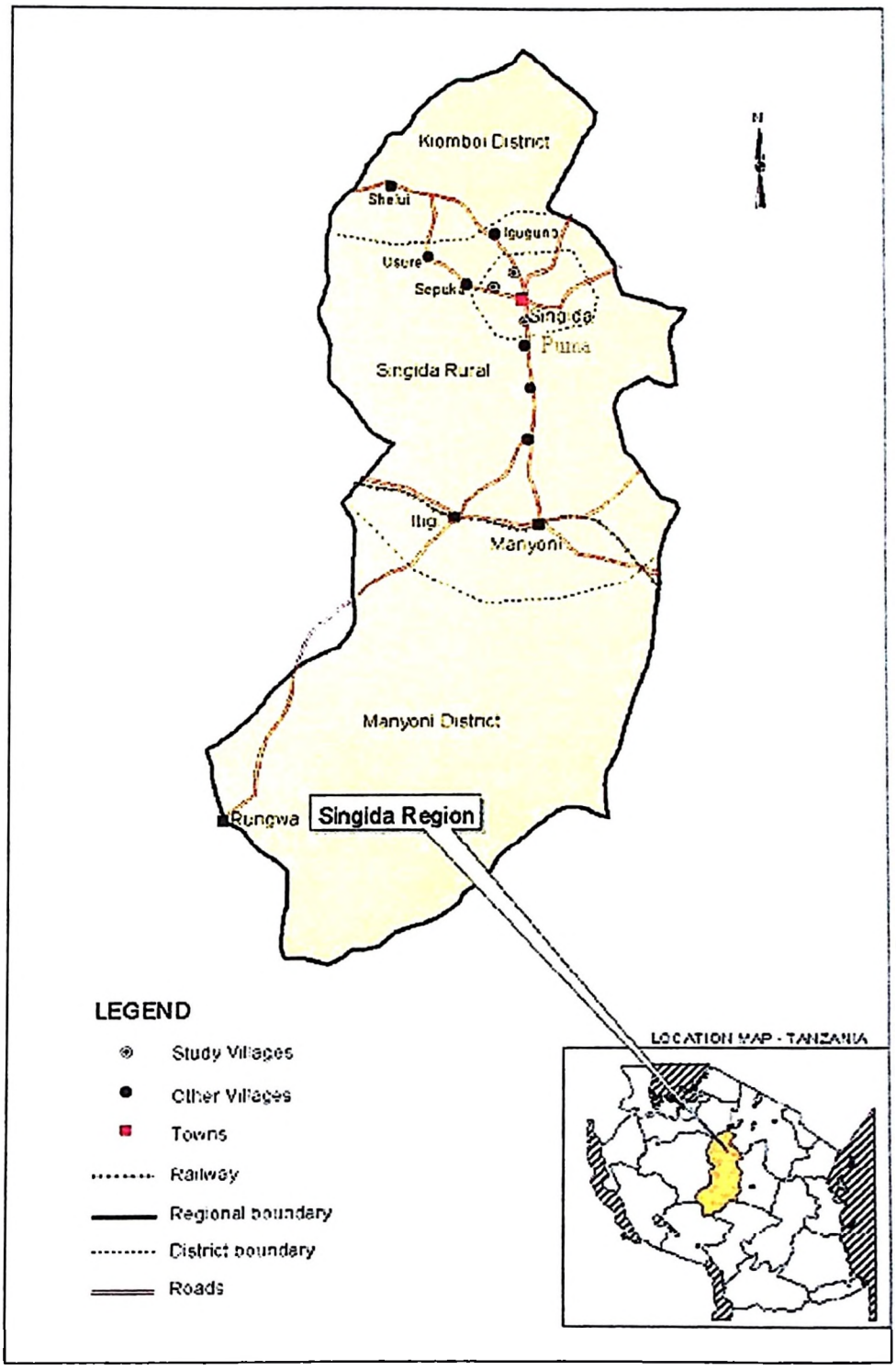

Figure 3: Map of Singida region showing the location of Singida urban district and the study area.

Source:(URT, 1998)

3.2.4 Socio-economic activities

The Singida region is almost entirely dependent on agriculture and animal husbandry, which are locally practiced in rural area at subsistence level. The main staples grown in the region include sorghum, millet, cassava, sweet potatoes, paddy, maize, beans and bambaranuts. The major cash crops are cotton, sunflower, onions, groundnuts and finger millet. These crops are grown in all four districts including Singida urban district. Sorghum, maize, and millet are grown in mixtures with legumes. With increasing uncertainties in cotton production, more farmers are opting growing more sunflowers as a cash crop.

Livestock is the second contributor to the regional economy. The regional ranks fifth in the country in terms of livestock number, including cattle, goats, sheep, donkey and poultry (URT, 1998). Livestock are regarded as an insurance against crop failure where farmers sell them during food shortage. Natural resources, which include forestry, wild life, beekeeping and fishing, is another sector in which peopie are engaged for their livelihood.

3.2.5 Forestry and tree planting

In general forestry conservation in the region deal with all the villages surrounding the forestry area for making sure that villagers they do participate in security. SIDA are the one who funds that activity. Since 1993, tree planting in the region was being dependent on central nurseries. However, a lot of tree seedlings that was distributed, their survival rate were low. This was due to inadequate knowledge and skill on tree planting and management. From 1992,different institutions such as primary schools and other people were initiated to establish their own nurseries. SIDA and TCRS were being providing

polthene for seed planting and water cans for irrigation. The government was being providing knowledge and skills by using agriculturists/foresters, that is agroforesters.

3.2.5.1 Problems/Constraints on forestry promotion

The problems that face the region in promoting the forestry sector are the following;

- High rate of human and livestock population growth, which increase environment destruction through shifting cultivation, bush fires, charcoal making, tobacco curing and deforestation;
- In natural forestry, most of the timber makers they do prefer on certain type of trees especially *Carpus angolenisi,* which result in decreasing of such trees;
- Inadequate knowledge on environmental conservation caused many people to cut a lot of trees the situation which resulted to soil erosion, overgrazing and infertile soil; and
- Destruction of raised trees with livestock and uncontrolled fire on tree nurseries made many people to be discouraged on tree planting (URT, 1998).

3.3 Research design

A cross-sectional research design was used. A design was used on the basis that, it allows collection of data on different groups of respondents at one time. The design has greater degree of accuracy and precision in social sciences studies than other design (Casley and Kumar, 1998).

3.4 Sampling procedure

3.4.1 Population of the study

The target populations for the study were pupils, teachers and ex-standard seven leavers from Kisaki village, Ititi village and Uhamaka village. These villages were from Unyamikumbi and Mandewa wards of Singida urban district in peri-urban areas. The choice of the district with their wards was based on the availability of the schools involved in agroforestry and advice from agricultural district official.

3.4.2 Sample size

A sample size of 111 respondents was used whereby 60 pupils, 15 teachers and 36 ex-standard seven leavers were selected randomly. Each school provided 20 pupils and five teachers, and each village provided 12 ex-standard seven leavers. The sample size was statistically large enough to make scientific conclusion. A multistage sampling technique was used. In the first stage simple random sampling was used to select 3 rural wards from the sample frame of 6 rural wards. By using the same method one village was selected from each ward to obtain a total of three villages. Purposeful sampling was used to select 12 ex- standard seven who recently completed primary education. The register was used as sampling frame. From each village selected, one primary school was selected to make a total of three primary schools. Stratified sampling was used to group the pupils into homogenous categories (boys and girls) and then 10 girls and 10 boys were selected randomly from each primary school so as to make a total of 60 pupils. Teachers from each primary school were selected randomly; five for each school and hence make a total of 15 teachers.

3.4.3 Sample unit

The unit on which measurement of variables was done was the primary school and village.

3.5 Methods of data collection

The study involved multiple data collection methods. The application of more than one instrument in data collection was vital in order to provide checks and balances as regards shortfalls characterized by each of the data gathering instruments. Data were gathered from both secondary and primary sources. Primary data were gathered using a questionnaire, direct observation, face to face interview and focus group discussion. Secondary data were obtained from the documents and from the members of the meetings in village offices, ward office, district and regional agriculture offices, region and district forest office and at SUA Main library and publications relevant to the topic. The following method were applied:

3.5.1 Questionnaire

That method involved administering questions to the research respondents in order to get the required data. The advantage of the questionnaire is that it involves several respondents who will answer the set questions.

3.5.2 Observation

Observation involved observing issue that was relevant to the study. The school activities, posters displayed on school walls and information dissemination activities were observed.

3.5.3 Focus group discussion

That method involved the use of a checklist of probe questions in order to enrich the information obtained through the questionnaire. The method involved group discussion of eight ex-standard seven leavers who recently completed primary education in order to see the impact of the study.

3.6 Instruments

3.6.1 Questionnaire

This was a set of questions that was applied on the issue related to the topic of research. These were distributed to the participants of the research. The choice of the questionnaire as the main data-gathering instrument resulted primarily from the advantage it provides when compared to other type of instruments. According to Kidder *et al.*, (1986), questionnaires give respondents a greater feeling of anonymity, which in turn encourages openness to questions and minimizes the interview bias. Structured and standardised questionnaire with both open and close-ended questions were administered to pupils, teachers and villagers. The questionnaires were formulated by researchers to obtain the socio-economic strategies that affect the promotion of agroforestry practices in primary schools of peri-urban.

3.6.2 Interview guide /Checklist.

These were a set of questions that was used during the interview on issues related to the research. They were administered to the educational and agricultural staffs, forestry and village leaders. Checklist was administered to ex-standard seven leavers.

3.6.3 Observation guide

This was outlined issue to be observed at the schools in order to get hand information.

3.7 Data analysis and presentation

The Statistical Packages for Social Sciences (SPSS) Computer Soft ware and Micro soft was used to analyse quantitative data. The collected data was first classified into meaningful categories that were furthered assigned numerals/codes to assist in the analysis. Analysis was done by the use of descriptive statistics where percentages and frequencies were determined. Cross tabulation was used to determine the relationship between variables and then Chi-square values was used to test whether the relation was statistically significant or not. Thereafter research findings were put into categories based on the research objectives. Presentation was done through the use of tables. Content analysis technique was used to analyse qualitative data. The components of verbal discussion and the qualitative information from the open-ended questions were analyzed in detail using content analysis method. In this way, the content of the interviews was broken down into smallest meaningful units of information. This will help the researcher in ascertaining values and attitudes of respondents. Responses and proceedings of the focus group were recorded. The cut and paste analysis (Stewart and Sharudasan, 1990) was used to select the relevant information from ex-standard seven leavers group which was compiled forming the results and discussions chapter.

3.8 Data quality control

3.8.1 Pre-testing of the questionnaire

Pre-testing of the questionnaire was done before actual data collection to determine their clarity and relevance to the objective of the study. Pre-testing was done for the purpose of

controlling the quality of questionnaires and their information that obtained from them. The questionnaires for pretesting were administered to ten respondents drawn from the population that was in the survey prior to the commencement of the study. Those respondents had similar characteristics as the respondents included in the main survey. The questionnaires were modified to incorporate lessons drawn from the pre-testing. All the respondents who where involved in the pre-testing were excluded from the sample.

3.8.2 Triangulation

Triangulation of the source of information was used in the study. Methods of data collection and instruments that were used in data collection were also used for the quality control purposes of the collected data.

3.8.3 Avoiding bias

Careful sampling was done in order to avoid biasness. The primary schools that were used in the study were purposeful selected to represent different primary schools in the study area. Pupils were randomly selected using simple random sampling.

3.9 Limitations and Delimitation

3.9.1 Limitations

In the course of conducting the fieldwork the main problem encountered was unreliable transport. Schools of peri-urban Singida are very scattered and so are very far from each other. There was no reliable transport, unless otherwise you hire a car.

3.9.2 Delimitation

The study was conducted in only three primary schools of peri-urban Singida. Those schools were Kisaki, Itiiti and Uhamaka in Unyamikumbi and Mandewa wards.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter describes the result of the study and some observations made during the study. The results and discussion of the findings are presented in line with the study objectives (specific objectives).

4.2 Background characteristics of respondents

The Table 2 gives a breakdown of the background characteristics of the respondents. The parameters included are gender, education level, religion, language and teaching subjects.

Table 2: Distribution of respondents by background characteristics

	Pupils		Teachers		Ex-STD VII	
Characteristics	N	%	N	%	N	%
Gender						
Male	30	50.0	7	46.7	20	55.6
Female	30	50.0	8	53.3	16	44.4
Total	60	100.0	15	100.0	36	100.0
Education level						
Primary Education						
STD V	7	11.7	na	na	na	na
STD VI	53	88.3	na	na	na	na
Certificate	na	na	12	80.0	na	na
Diploma			3	20.0	na	na
Total	60	100.0	15	100.0	36	100.0
Religion						
Christian	40	66.7	1	6.7	22	61.1
Muslim	20	33.3	14	93.3	14	38.9
Total	60	100.0	15	100.0	36	100.0
Language						
Kiswahili	36	60.0	na	na	27	75%
Mother tongue	24	40.0	na	na	9	25%
Total	60	100.0			36	100.0
Subject taught by teachers						
Maths, English, Kiswahili	na	na	2	13.3	na	na
Both primary school subjects	na	na	13	86.7	na	na
Total			15	100.0		

4.2.1 Gender

The selected sample for the present study comprised 60 students, 15 teachers and 36 ex-standard seven leavers. Of 60 interviewed students 50 % were boys and 50% were girls. For teachers 46.7% and 53.3% were male and female respectively. For ex-standard seven leavers 55.6% and 44.4% were male and female respectively (Table 2). This gives an indication that in primary education, gender equity is not a major issue, but it is an issue at secondary and tertiary levels. Gender equity in primary schools empowers both male and female pupils/teachers to break the difference among them. Thus, gender as a background variable can play role in facilitating the promotion of agroforestry practices in primary schools.

4.2.2 Education level

Education is perceived as being among the factors that influences an individual's perception of an intervention (agroforestry practices) before making decision to take part. Also, it imparts desire of individual to learn more, attend training, and seek information regarding agricultural and non-agricultural activities (Kombo and Temu, 1987). In my study it was found that from a level of standard V, VI and VII pupils could be able to use their knowledge and skill to accept socio-economic strategies in promoting agroforestry practices. A certificate and diploma teachers become more critically aware of the need and scope for social change. The variation in level of education does not show differences in interest and cooperation. All can have great influence on their pupils in ways of their doings (Table 2).

4.2.3 Religion

Religion is among students, teachers and ex-standard seven leavers' characteristics, which is of ten examined as a background that may influences the promotion of agroforestry practices. In this study, about 66.7% of the students were Muslims and 33.3% were Christian. For teachers only 6.7% were Muslims while 93.3% were Christian. For ex-standard seven leavers 61.1% and 38.9% were Muslim and Christian respectively (Table 2). This result revealed that most of the people in the area are Muslims and few are Christians. Moreover, there is no anybody who has no religion. All have a system of beliefs and practices that has institutionalized and shared by a community. Religion provides individual with emotional support in the uncertainty of the world. According to World Wide Fund Programme Office (2001), religious education encourages awareness of varying attitudes towards the environment by different religions. Controversial environmental issues involve many moral considerations concerning exploitation and conservation of resources and personnel responsibility for the environment. Religious knowledge fosters the understanding about what is good and what is bad to the environment.

4.2.4 Language

Language enables to give meaning to the World. With language, we can apply reason to the World. We can think logically from premises to conclusions; we can categorize; we can order our experience; we can contemplate the past and the future, the abstract and the hypothetical; we can formulate and utter ideas that are entirely new. In this study, 60% of the students spoken Kiswahili at home and 40% use mother tongue, 75% and 25% of ex-standard seven leavers spoken Kiswahili and mother tongue respectively (Table 2). This indicates that Kiswahili, which is a national language, dominates and it can be used to

present issues concerning agroforestry practices. Language provides opportunities in understanding the background of the respondents.

4.2.5 Subject taught by the teachers

This was done only for teachers. Of 15 interviewed respondents 13.3% taught Mathematics, English, and Kiswahili, 86.7% taught both subjects of primary education (Table 2). This result reveals that, teachers could use such subjects to impart pupils' knowledge and skills of agroforestry practices. Each subject has some topics, which are related to agroforestry practices. The teacher can link up the content he/she is teaching with the learner's environment in order to make learning true and meaningful. Every subject teacher, no matter what subject is being taught; he/she can develop an understanding and interest in teaching the components related to agroforestry practices. Cooperation among the teachers of various subjects is the basis for the success of the promotion of agroforestry practices.

4.3 Types of agroforestry practices

This sub-section presents the types of agroforestry practices being used in primary schools of peri-urban Singida. The main respondents were pupils, teachers and ex-standard seven leavers. Table 3 presents the distribution of respondents on the type (s) of agroforestry practices being practiced in primary schools.

Table 3: Distribution of respondents on the type(s) of agroforestry practices

Type of agroforestry practices	Pupils		Teacher		Ex standard VII leavers	
	N	%	N	%	N	%
Mixture of crops and trees	59	98.3	15	100	36	100
Mixture of crops, animals and trees	01	1.7	0	0	0	0
Total	**60**	**100**	**15**	**100**	**36**	**100**

4.3.1 Tree crop mixture type of agroforestry practices

The study results as presented in Table 3, indicate that, the type of agroforestry practices being used in primary school was tree crop mixture. About 98.3% of the pupils mixed crops and trees in school farms, only 1.7% mixed crops, animals and trees. The result from ex-standard seven pupils and teachers shows that all of them (100%) mixed crops and trees (Table 3). From the study results. it can be judged that, tree crop mixture is the most important agroforestry practices being practiced in primary schools of peri-urban Singida. According to Lulanda (2003) tree crop mixtures belongs to agrosilvi-cultural systems. In this system, land is used to produce crops, forest products and amenities. The practice can offer solutions for primary schools to meet most of their daily needs. Trees can provide shade for their schools and wood products can be sold to generate income.

4.3.2 Crops mixed with trees

Table 4 presents the distribution of respondents on the types of crops mixed with trees and their uses.

Table 4: Crops mixed with trees and their uses

Type of crops mixed with trees	Pupils		Teacher		Ex standard VII	
	N	%	N	%	N	%
Maize, sorghum, millet, cowpeas and cassava	37	61.7	15	100	02	5.6
Sunflower, ground nuts and bambaranuts	0	0	0	0	03	8.3
Both 1 and 2	23	38.3	0	0	31	86.1
Total	**60**	**100.0**	**15**	**100.0**	**36**	**100.0**
Uses of crops						
Food	05	8.3	10	66.7	0	0.0
Food and business	55	91.7	05	33.3	36	100.0
Total	**60**	**100.0**	**15**	**100.0**	**36**	**100.0**

Crops mixed with trees are maize, sorghum, millet, cowpeas, cassava, sunflower groundnuts and bambaranuts. Table 4 shows that 37% of the pupils mixed maize, sorghum, millet, cowpeas and cassava, with trees. 23% mixed maize, sorghum, millet, cowpeas, cassava, sunflower, groundnuts and bambaranuts with trees. 86.1% of ex-standard seven leavers mixed maize sorghum, millet, cowpeas, cassava, sunflower, groundnuts and bambaranuts. All teachers (100%) mixed maize, sorghum, millet, cowpeas and cassava with trees. This gives an indication that most of the crops grown in the area are mixed with trees. Schools decide on the type of cereal crops and legume that should be mixed with trees. When pupils asked to give the uses of those crops, 91.7% of them said that, they used crops for food and business while few of them (8.3%) used crops for food only (Table 4). All ex-standard seven leavers (100%) used crops for food and business. About 66.7% of teachers used for food only, the remaining 33.3% used for both food and business (Table 4).

4.3.3 Types of trees mixed with crops

Table 5 presents the distribution of respondents according to the type of trees being mixed with crops.

Table 5: Trees mixed with crops

Trees	Pupils		Teacher		Ex standard VII	
	N	%	N	%	N	%
Cashew nut, citrus, guava, leucaena, papaya,	33	55.0	08	53.3	14	38.9
Moringa, guava leucaena	20	33.3	05	33.3	0.0	0.0
Both 1 and 2	07	11.7	02	13.3	22	61.1
Total	60	100.0	15	100.0	36	100.0

When the respondents were asked to mention the type of trees being mixed with crops about 33% of pupils mixed cashew nut, citrus, guava and leucaena while 20% mixed *Moringa oleifera,* guava and leucaena, 53.3% of the teachers' mixed cashewnut, citrus, guava, and leucaena, 38.9% of ex-standard seven leavers mixed cashew nut, citrus, guava and leucaena while 61.1% mixed cashew nuts, citrus, guava, leucana and Moringa (Table 5). These results indicate that, there was a variation of tree species grown in the study area. For example, at Uhamaka Primary School, they just concentrated with *Moringa oleifera* as a new multipurpose species. Such species was mixed with cereals especially sorghum and millet. Other crops like maize, bambaranuts/cowpeas were mixed with guava and leucana. There was no cashewnut in the school. All crops were planted between rows. In Itiri and Kisaki Primary schools they concentrated on cashew nuts as a new species. Cassava and other cereal crops were mixed with it in rows. Other trees like leucana species was also mixed with crops.

When teachers asked how they benefit from that practice, they said that the practice brought food for pupils and teachers, and it also provided high amount of products that were sold to raise the school income. This indicates that agroforestry caters for economic consideration. It increased the number of farm products, income economic activities and

made the land to be used efficiently. Table 6 shows the uses of trees that were mixed with crops.

Table 6: Uses of Trees

Tree name		Use value
Common name	Scientific name	
Cashew nuts	*Anacardium occidentalle*	Fruits, fuel wood, improving soil fertility, fodder shade and bee forage.
Citrus	*Citrus limon*	Fruits, fuel wood
Guava	*Psidium guajava*	Fruits, fuel wood, medicine
Leucaena	*Leucaena diversifolia*	Improving soil fertility fuel wood, poles, fodder
Pawpaw	*Carica payaya*	Fruits
Moringa	*Moringa oleifera*	Cooking vegetable (food) cooking oil medicine, fuel wood, fodder, soil fertility improvement
Euphobia	*Euphobia tirucali*	Boundary
Syzigium	*Syzigium cuminii*	Fruits, fuelwood, shade

4.4 Socio-economic factors which constrain the adoption of agroforestry practices in primary schools

Under this section the socio-economic factors that constrain the adoption of agroforestry practices in primary schools and their reasons for such factors given by both pupils and teachers are discussed. Table 7 presents the distribution of respondents (pupils) on the factors that constraint adoption of agroforestry practices in primary schools.

Table 7: Distribution of respondents (pupils) on the factors that constraint adoption of agroforestry practices in primary schools (N=60)

Constraints	Positive response		Negative response		Total	
	No.	%	No.	%	No.	%
Drought	56	93.3	04	6.7	60	100.0
Pests disease and birds	48	80.0	12	20.0	60	100.0
Inadequate skills	48	80.0	12	20.0	60	100.0
Ignorance	5	8.3	55	91.7	60	100.0

4.4.1 Drought

Table 7 shows that about 93.3 percent of the pupils faced the problem of drought as the main factor which constrain the adoption of agroforestry practices in primary schools. Their teachers also faced the same problem. All teachers (100%) responded to problems of drought as the main factor, which constrain their adoption (Table 8).

4.4.2 Pests, disease and birds

Table 7 shows that 80% of the pupils faced the problem of pests, diseases and birds as the main constrain to their adoption of agroforestry practices. Table 8 shows that about 46.7% of their teachers also faced the same problem. The main reason provided by both pupils and teachers was the negligence of villagers leaving livestock in school area (Table 9 and 10). However Lulandala (2003) reported that, pest and diseases include both wild and domestic animals. Grazing livestock can escape into crop farms. Most of the primary schools have no fences to their school boundary that can prevent livestock and any other wild animals to enter the school area. The trees can also provide ready resting and nesting grounds while the associated crops can become reliable food source for birds. Due to the nature of the study area, cereals that are grown are those that resist drought and most of them contain fine and small grains. These include sorghum and millet. Birds easily attach sorghum and millet.

4.4.3 Inadequate skills

Inadequate skills in running agroforestry practices was seen by both pupils and teachers as the problem that constrain the adoption of agroforestry practices. Table 7 shows that about 80 % of the pupils faced the problem, 73.3 % of their teachers also faced the same problem (Table 8). In the course of the discussion, Focus group discussion members also faced the

same problem. They didn't know even the distance from one crop to trees, and the number of trees that are preferred in one farm. The main reason given by both pupils and teachers was the lack of agroforesters in schools (Table 9 and 10). Management of both trees and crops need adequate skills. Activities such as sowing, planting pruning, thinning, weeding, checking for tree survival, replacing trees that die, and watering need technical assistance to the pupils and teachers. Lack of agroforesters in schools attribute to inadequate skills in establishing and running agroforestry practices and hence restrict the benefits that expected to provide. According to Raintree (1989), pruning is a major silvicultural which allows manipulation of the growth and development of the tree and pasture components while improving the quality and the price of the final tree crop. In the study area Kisaki primary school and Itiri primary school had demonstration plots of cashew trees mixed with cassava sometimes with cereals. The skill of pruning is highly needed; otherwise unrestricted branch growth will decrease the value of the sawn product. Table 8 presents the distribution of respondents (teachers) on the factors that constraint adoption of agroforestry practices in primary schools.

Table 8: Distribution of respondents (teachers) on the factors that constraint adoption of agroforestry practices in primary schools (N=15)

Constraints	Yes		No		Total	
	N	%	N	%	N	%
Drought	15	100.0	0	0.0	15	100.0
Less attention by education officials and policy makers on agroforestry practices in primary schools.	14	93.3	1	6.7	15	100.0
Pests diseases and birds	7	46.7	8	53.3	15	100.0
Inadequate skills	11	73.3	4	26.7	15	100.0
Ignorance	5	33.3	10	66.7	15	100.0
Inadequate farming inputs	12	80.0	3	20.0	15	100.0
(Land size) small areas to run agroforestry	8	53.3	7	46.7	15	100.0
Lack of market	7	46.7	8	53.3	15	100.0

4.4.4 Inadequate farming inputs and implementations tools

This constrain was given only by teachers. Table 8 shows that 80% of the teachers faced inadequate farming inputs as one of the factor which limited the adoption of agroforestry practices in primary schools. Farming inputs in primary schools depend only on their school financial position. There is no any support unless pupils bring them from home, such as farmyard manure. Pupils came with farm tools such as hoe from home but it is difficult for them to bring other inputs such as seeds, insecticides and herbicides. If there is no any support, schools find problem to practice agroforestry. However, pupils responded that poverty was the main reason, which constrain the school not to get farming inputs and agricultural tools.

4.4.5 Land size (Small area to run agroforestry practices)

Table 8 shows that 53.4% of the teachers faced the problems of land size as one of the factor, which constrain the adoption of agroforestry practices in primary schools. This result reveals that, although other primary schools in rural areas have larger farm size, other schools have smaller farm size. Larger farm size in schools is important variable in adoption of agroforestry practice. Experience with the Green Revolution in Asia shows that large farms became early and major adopters (Avila and Jabbar 1990). Large farms have the ability to spread learning and acquisition costs over a larger volume of output.

4.4.6 Inadequate market

Table 8 shows that 46.7% of the teachers faced the problems of market. This indicates that inadequate market of agroforestry products limited the adoption of agroforestry practices in primary schools. This situation was experienced in Uhamaka primary school, where *Moringa oleifera* a new multipurpose tree specie grown in that school with other cereal

crops. Pupil's harvested a lot of seeds, that could be processed to produce cooking oil and the remaining by products could be used as fodder for livestock. Unfortunately, no one was able to buy it since it was new to them and people in such area prefer sunflower oil than any other type of cooking oil. As the result, the products became wastes instead of useful ones. Pupils and teachers demoralized despite their useful values of the tree. Access to efficient market serve as an incentive for pupils to specialize in the production of agroforestry crops that are comparatively advantageous. Mtenga (1999) insists that, in the absence of readily available markets for produced crops, farmers may experience problem with disposing of their produce.

4.4.7 Ignorance

Both teachers and pupils saw ignorance as a factor that constrained the adoption of agroforestry practices in primary schools. Table 7 shows that only 8.3 % of the pupils faced the problem of ignorance, 33.3% of the teachers faced the same problem (Table 8). These results reveal that education is one of the factors for the adoption of agroforestry practices in primary schools. Although most of the primary schools have been active in environmental issues and rising tree seedlings but still lack the knowledge and skill of agroforestry practices. However, generations of adoption studies have been emphasizing the role of education in adoption. For example, levels of education, both formal and informal have been found to influence technology adoption through four effects: the innovation effect, whereby better educated farmers know why, what, when, and how of the technology, its cost and benefits, and where to look for information and capital; the allocation effect, whereby optimal choices in the use of available resources are made; the worker quality effect, whereby tasks are performed better, the externality effect, whereby

others are helped to learn and adopt (Avila and Jabbar,1990). Agroforestry education is highly needed in primary schools.

4.4.8 Less attention by education officials and policy makers on agroforestry practices in primary school

Table 8 shows that 93.3% of the teachers faced the problem of less attention by education officials on agroforestry practices. This actually comes when curriculum developers removed agriculture subject to the primary schools. In the previous years agriculture subject in primary schools was taught separately, but now days most of the topic of the subject are included in other subjects such as social studies, technical skills/ life skills and science subjects. Although in primary schools, the curricular already contain agriculture, but it is difficult for teachers to introduce agroforestry principles. Also the practice has received less attention by policy markers who mostly enhance national campaigns. Table 9 presents the main reasons of the factors that were given by the pupils.

Table 9: Distribution of respondents (pupils) on the reasons of the factors that constraint adoption of agroforestry practices in primary schools (N=60)

Reasons	Yes		No		Total	
	No.	%	No.	%	No.	%
Unreliable rainfall and infertile soil	36	60.0	24	40.0	60.0	100.0
Negligence of villagers leaving their livestock in school area	26	43.3	34	56.7	60.0	100.0
Lack of agroforesters	24	40.0	36	60.0	60.0	100.0
Poverty	9	15.0	45	75.0	60.0	100.0

Table 9 shows that, only 15% of the pupils had seen poverty as the main reason for inadequate farming inputs and implementation tools. These pupils urge that, the issue of bringing some of the inputs like farm yard manure and some tools like hoes from home

made it difficult to be accepted by their parents since those inputs and tools are the only ones, which were used by their parents. So, not all pupils can bring tools to schools. About 36% of the pupils saw unreliable rainfall and infertile soil as the main reason for the problem of drought (Table 9). Also their teachers saw unreliable rainfall and infertile soil as the main reason that caused drought.

Table 10: Distribution of respondents (Teachers) on the reason of the factors that constraint adoption of agroforestry practices in primary schools (N=15)

Reasons	Yes		No		Total	
	N	%	N	%	N	%
Unreliable rainfall and infertile soil	12	80.0	3	20.0	15	100.0
Negligence of villagers leaving their livestock in school area	8	53.3	7	46.7	15	100.0
Lack of agroforesters	10	66.7	5	33.3	15	100.0
Poverty	3	20.0	12	80.0	15	100.0

Table 10 shows that, about 80% of teachers saw unreliable rainfall and infertile soil as the main reason of the problem. Since the district falls under semi arid area, it is obviously that drought is the main factor, which constrains the agroforestry practice in primary schools. According to URT (1998), in peri-urban Singida rainfall decreases from north to south with a regional average of 700mm. The type of soil that dominates is sand soil. Generally sand soil has low natural fertility and low rate of water holding capacity. It was expected that livestock would be included in their practice so as to improve the soil with farmyard manure, things which was not practiced in all primary schools in the study area. Mphuru (1991) insisted that, in developing research priorities, integration of crop, livestock and agri-silvi-pastoral systems should be considered. This system ensures a high soil protection against agents of erosion and gives high degree of nutrients recycling, thus enabling the production system to remain sustainable for a long time. Also 20% of the

teachers have seen poverty as the main reason for inadequate inputs and implementation tools in their primary schools (Table 10). The study also tested the relation between inadequate skills and lack of agroforesters for teachers using chi-square (Table 11).

Table 11: Relationship between inadequate skills and lack of agroforesters

	Lack of agroforesters		
Inadequate skills	Yes	No	Total
Yes	10(66.7%)	1(9.1)	11(73.3)
No	2(50%)	2 (50%)	4(26.7)
Total	12 (80%)	3(20%)	15(100)

Chi-square 3.068, df = 1 sign. = 0.040, (at $P \leq 0.05$)

The result from Table 11 shows that there was statistically significant correlation between inadequate skills that constrain the adoption of agroforestry practices and the lack of agroforesters as the reason for such constrain (at $P \leq 0.05$).

4.5 Means of motivating pupils

4.5.1 Subjects that explain the advantages of agroforestry or trees

Table 12 presents the distribution of pupils on the identification of the subjects that explain the advantages of agroforestry or trees.

Table 12 Distribution of the respondents (pupils) on the identification of the subjects that explain the advantage of agroforestry or trees. (N = 60)

Subjects	Number	Percentage
Social studies	29	48.3
Science	25	41.7
Both science and social studies	6	10.0
Total	60	100.0

In order to recognize the means of motivating primary agroforestry practices, pupils were asked to mention the subjects, which explain the advantages of agroforestry practices or

tree planting. Table 12 shows that 48.3% of the pupils, taught the advantages of agroforestry or trees in social studies subject, 41.7% taught in science subject 10% of pupils taught in both subjects. This result reveals that in primary schools, the curricular already contain agriculture. Agroforestry principles can be introduced in those subjects so that agriculture and forestry longer be compartmentalized. Emphasis should be placed on the environment and the role of trees, food crops and livestock within it. According to WWF Tanzania Programme office (2001), multidisciplinary approach can be used to teach environmental education where agroforestry education can be introduced due to the nature of the existing education programmes in Tanzania. Curriculum auditing should be carried to assess the amount of environmental education to the various topics of the different subjects. Through those topics, agroforestry education should be introduced.

4.5.2 The use of dominant language as a medium of instruction.

Table 13 presents the distribution of respondents on teaching language.

Table 13: Distribution of respondents on teaching language(N = 60)

Language	Number	Percentage
Kiswahili	60	100.0
English	0	0.0
Total	**60**	**100.0**

Table 13 shows that 100% of the pupils used Kiswahili language in learning agroforestry practices. In Tanzania the medium of instruction in primary school is Kiswahili. The language is used in primary school as medium of instruction. All primary school pupils can speak Kiswahili fluently. Language provides opportunities for learners to listen, read, discuss, write and appreciate literature about agroforestry. The World Bank (1995) urges that, not knowing the dominant language may limit a person's training opportunities, job

mobility, and earning and reduces person's chance of escaping poverty. Therefore, this result indicates that the use of Kiswahili as a medium of instruction in primary schools can motivate pupils to adopt agroforestry practices since they can read literature, communicate well and exchange experience and materials national and international. Nair et al., (1988) insists that, a serious constraint to the development of agroforestry education in Indonesia was the language barrier, which prevented Indonesian students from having easy access to international literature. So the use of Kiswahili in primary school should be insisted, to foster agroforestry education.

4.5.3 Integrating practical work with theory

Table 14 presents the distribution of respondents on practical work after theory.

Table 14: Distribution of respondents on practical work after theory (N=60)

Practical work	Number	Percentage
Yes	54	90
No	6	10
Total	**60**	**100**

When pupils asked to respond if practical works are being done after theory, 90% of them responded positively, 10% responded negatively (Table 14). The indication of this result reveals that teachers in primary schools did integrate practical work with theory. Table 15 presents the distribution of respondents on the activities being done during practical work.

Table 15: Activities that are being done during practical work (N=60)

Activities	Number	Percentage
Prepare bed seeds	4	6.7
Spread manure, planting, weeding and harvesting	5	8.3
Both 1 and 2 above	51	85.0
Total	**60**	**100.0**

Table 15 shows that 6.7% prepared bed seeds, 8.3% planted seeds and seedlings, weeding and harvested the products, 85% of the pupils did both the work. When pupils practice they do remember. According to Wambura, (1993) well planned teaching aids and practicals, motivate the pupils to participate more. Practical work on agroforestry should be emphasized by the use of appropriate teaching materials. Nair et al., (1988) insists that, the material needed for teaching agroforestry must cover both principles and practices. Most of the pupils regardless of the level of their study go to school having knowledge on most of agricultural activities. Schools should take the role of adding a skill on top of what learners have already known from the community and experiences.

4.5.4 Participation in relevant community activities

Table 16 presents the distribution of respondents on the activities participated in their villages.

Table 16: Distribution of respondents (pupils) on the activities participated in their villages

Activities	Number	Percentage
To prepare bed seed	4	6.7
To spread manure, planting, weeding and harvesting	5	8.3
Both the above	51	85.0
Total	**60**	**100.0**

Table 16 indicates that pupils participated on relevant agroforestry activities in their villages. 50% of the pupils planted trees, 20% distributed seedlings to the villagers, 30% did both planting and distributing seedlings. This result gives an indication that; primary schools are very active in helping the community on agroforestry activities. Participation of pupils to the community activities makes them become aware of their environment, release and appreciate the interrelationship between people, their culture and environment. Participation is one source, which can stimulate effective learning. Teachers will be able to recognize pupils' interests, needs and abilities. This will increase pupils' confidence in their decision-making. They will participate more in preparing agroforestry plans, which take more cognizance of their interests, needs and abilities. FAO (1986) insists that, external sources of agroforestry information will lead to the increased interests on leaning new ideas to the agroforestry activities. This will facilitate the planning and implementation of agroforestry activities of the school. However these activities are related to their subject taught but is not related to the type of agroforestry practices being practiced.

Table 17: Relationship between activities participated in villages and subjects on the advantage of agroforestry practices/tree planting

Activities participated in villages	Social studies	Science	Social studies and science	Total	X^2	Level of significance * *
Tree planting	19 (63.3%)	8 (26.7%)	3 (10%)	30 (50%)		
Distributing seedlings	2 (16.7%)	8 (66.7%)	2 (16.7%)	12 (20%)		
Both tree planting and distributing seedlings	8 (44.4%)	9 (50%)	1 (5.6%)	18 (30%)	8.5511	
Total	**29 (48.3%)**	**25 (1.7%)**	**6 (10%)**	**60 (100%)**		

Chi-square: 8.5511 df = 4 sign = 0.036 (at $P \leq 0.05$)

Chi-square test has shown significant correlation between activities participated in villages and subjects explaining the advantage of agroforestry practices/tree planting (Table 17). This means that, subjects have strong influence in fostering the knowledge and skill of pupils in adopting agroforestry practices. However, the same statistically analysis when carried out to test the relationship between activities participated in villages and the types of agroforestry practices being used in schools shows that, there was no statistical significant between them ($P > 0.05$). This result indicates that the subjects being taught in primary schools enhance more on tree planting without considering agroforestry practices. since there is no specific subject to deal with agroforestry parse.

Table 18: Relationship between activities participated in villages and the type of agroforestry practices being practiced in primary schools

Activities participated in villages	Mixture of crops and trees	Mixture of crops animals and trees	Total	X^2	Level of significance * *
Tree planting	30 (100%)	0	30 (50%)		
Distributing seedlings to the villages	11 (91.7%)	1 (8.3%)	12 (20%)		
Both tree planting and distributing seedlings to the villagers	18 (100%)	0	18 (30%)	4.068	
Total	**59 (98.3%)**	**1 (1.7%)**	**60 (100%)**		

Chi-square: 4.068, df 2 sign 0.131 ($P > 0.05$).

4.5.5 Tree species preference

Table 19 presents the distribution of respondents on trees species preference.

Table 19: Distribution of respondents on trees species preference (N = 60)

Trees for	Number	Percentage
Fruits	10	16.7%
Fodder	9	15%
Both fruits and fodder	41	68.3%
Total	**60**	**100.00**

The acceptance of agroforestry practices depends on the benefits of the trees. Nowadays people do accept new innovation if they see its advantage. It is difficult for a farmer to plant trees and crops without knowing what he/she will get from it. Because of that pupils were asked to mention the type of trees, which are mostly preferred to them. Table 19 shows that 68.3% preferred both fruit trees and fodder trees, 16.7% preferred only fruit tree and 15% preferred fodder trees. This result reveals that pupils become more motivated if they plant tree species that are desired. Kottak (1991) found that, desired trees have higher success rate than those that propose solutions to problem. If pupils plant fruit trees they always plant two trees at a time; for fruits and timber/firewood/poles. Hence they will enjoy it by eating fruits, leaves may become a good source of fodder at the same these products can be sold to generate school income. The result was supported through the focus group discussion that indigenous trees were mostly preferred than non-indigenous trees due to drought tolerance and disease resistance. Since primary schools consist seven years of the study, teachers and pupils can decide to plant fast maturing tree crops that are mostly desired so that pupils can receive the fruits before they finish schooling. Agroforestry has been the essence of economics, it enhances good selection of tree species which can increase the number of farm products and incomes. According to Lulandala (2003), agroforestry caters for economic consideration.

4.5.6 Formulation of by laws enforcing the conservation of agroforestry practices

Table 20 presents the distribution of respondents on legal action for those who destroy trees deliberately.

Table 20: Distribution of respondents on legal action for those who destroy trees deliberately (N = 60)

Action	Number	Percentage
To take legal action to the village government	45	75
To punish him by planting another tree	7	11.7
To educate him/her	8	13.3
Total	**60**	**100.0**

When pupils were asked the action which they should take if someone cut their planted trees, 75% recommended for legal action by the village government, 11.7% punished him by planting another trees, 13.3% educated him on the importance of trees (Table 20). This result gives indication that; legal action should be taken for those who destroy trees deliberately. Since tree is a main feature in agroforestry practices, it needs to be valued and conserved. The formulation of by-laws will restrict villagers grazing freely their livestock in school areas, grazing on conserved areas of agroforestry practices and cutting trees haphazardly. The by-laws also will restrict villagers to start unauthorized fires in school areas. If individuals destroy the planted trees will be sent to the village office and fined. Pupils will be motivated to engage themselves more in agroforestry practices.

4.5.7 Involving local experts

Table 21 presents the distribution of respondents on advice from extension workers.

Table 21: Distribution of respondents on advice from extension workers (N=60)

Extension workers	Number	Percentage
Yes	47	78.3
No	13	21.7
Total	60	100.0

When pupils asked if extension workers advice the schools in running agroforestry practices 78.3% responded that they received advice from extension workers. 21.7% didn't receive any advice from extension workers (Table 21). From this result, extension service in the study area was the most important factor, which influenced the adoption of agroforestry practices. For pupils to adopt a technology, they must first know it. For that matter, extension is the most important source of information. Multidisciplinary cooperations with other disciplines like livestock, agriculture, fisheries; community development and others should be encouraged for more advice to improve school's agroforestry activities (Irwin, 1997). Those disciplines will easily extend information on new technologies easily. The high rate of contacts of extension workers with pupils may be acting as a motive for the use of technologies. This finding is in line with that by Nowak (1983), which showed that exposure to extension programmes is important for the farmer to develop interest, and in some cases, to have access to the technologies required to adopt the practices.

4.5.8 Introduction of agroforestry education in primary schools

When teachers were asked to suggest the ways of motivating pupils in adopting agroforestry practices several ways were provided as indicated in Table 22.

Table 22: Distribution of respondents (teachers) on the means of motivating pupils.

(N=15)

Means of motivation	Yes		No		Total	
	N	%	N	%	N	%
Provision of agroforestry education.	11	73.3	4	26.6	15	100.0
Establishment of demonstration plots.	12	80.0	3	20.0	15	100.0
Agricultural subject should be taught separately.	13	86.7	2	13.3	15	100.0
Schools should be given farm tools and inputs.	13	86.7	2	13.3	15	100.0
Schools should be given at least one agroforester.	12	80.0	3	20.0	15	100.0

The result in Table 22 shows that 73.3% responded to the provision of agroforestry education, 26.7% responded negatively. This result reveals that, introduction of agroforestry education is important to give pupils a broad knowledge about agroforestry as a land use system. A survey of educational institutions conducted by ICRAF in 1987 revealed that agroforestry is found as an option for specialization in undergraduate as well as in postgraduate M.Sc., diploma programs in forestry, agriculture, natural resources and others (Zuberti, 1990). From that survey, it is obviously that in primary schools there is no any element of agroforestry unless other wise they link it with other subjects that explain about trees. The linkage with other subjects will not exhaust all about agroforestry. The only solution is to provide agroforestry education that will motivate pupils to learn and practice agroforestry practices.

4.5.9 Establishment of demonstration plots

Table 22 shows that 80% of the teachers responded that the establishment of demonstration plots of agroforestry practices will motivate pupils to adopt the practice. The indication of this result is that; an agroforestry demonstration plot is an excellent tool for motivating pupils to adopt the practice. According to Irwin (1997), demonstration plantings established a working example of an agroforestry technology under local conditions and

show what it is, why it is used, and how it functions. Demonstration needs monitoring and maintenance. Monitoring and maintenance activities include checking for tree survival, replacing trees that die, watering, checking for pest problems and controlling weeds. Since the pupils with the guidance of the teachers and local experts will do all these activities, can enable pupils gain skill on agroforestry management.

4.5.10 Agricultural subjects should be taught separately

Table 22 shows that 86.7% of respondents indicated agricultural subjects should be taught separately. This gives indication that agricultural subject is not taught separately in primary schools, it is included in other subjects such as technical study (life skill), social studies and science subjects. For this case it is difficult to explore all-important skills of agroforestry practices. An analysis of several integrated science syllabi done by Riedmiller (2002,) showed that they commonly contain few agricultural topics of a rather general nature only and are, as a whole, too rigidly sequenced. This would make localized teaching of agriculture difficult even for experienced and committed teacher. If agricultural subjects will be taught separately pupils will become more experienced in agroforestry activities. Well-arranged practices will enable effective learning that will draw attention to pupils. Practical sites for the subject will be used as productive sites; this will enable pupils to directly relate facts from the lesson to the actual production. According to Riedmiller (2002), the majorities of primary school leavers do not have any chance of further formal education and vocational training, but will have to depend on farming. Therefore if agriculture will be taught separately, and be the focal center of agroforestry teaching, pupils will highly be motivated to adopt the practice.

4.5.11 Schools should be given farm tools and inputs

Table 22 shows that 92.9% of the respondents responded that schools should be given farm tools and inputs so as to motivate pupils to adopt agroforestry practices. The fact that many primary schools in rural areas suffer from severe financial problems. This limits to have adequate farm tools and inputs. A successful plot of agroforestry practices requires financial resources, which can enable to purchase appropriate tools and instruments together with farm inputs. This should be given priority. If primary schools will be given support to such implements obviously every pupils will engage fully in agroforestry activities.

4.5.12 Schools should be given at least one agroforester

Agroforestry practices as a new area of study and activities demands for agroforesters for primary schools. Table 22 shows that 80% of respondents needed agroforesters for schools while only 20% didn't need any agroforester. This gives an indication that agroforesters are needed in primary schools to facilitate agroforestry practical activities. Agroforestry is multidisciplinary branch, which includes disciplines like Forestry, Agriculture, Livestock and Horticulture. Since each discipline has its own expert, it becomes difficult for schools to consult all experts for advice at a time. What is important is to have one expert who will be concerned with that specific field of agroforestry practices. So, if agroforesters will be employed in schools, they will assist the schools in managing agroforestry projects at the same time providing agroforestry education to the pupils and teachers and the community.

4.6 Ways of broadening the knowledge and skill of primary school teachers

Under this section ways of broadening the knowledge and skill of primary school teachers for effective teaching and training of agroforestry practices are discussed. Results are shown on Table 23 to 28.

4.6.1 Teachers should be given training on agroforestry practices

Table 23 presents the distribution of teachers if they have received agroforestry/tree-planting training.

Table 23: Distribution of respondents (teachers) if they have received agroforestry/ tree planting training

	Number	Percentage
Yes	5	33.3
No	13	66.7
Total	**15**	**100**

From table 23 we observe that only 33.3% received the training, 66.7% did not receive any training. This result reveals that, most of the primary school teachers have not received any training of agroforestry practices or tree planting.

Table 24: Distribution of respondents (teachers) if they needed agroforestry practices

Agroforestry training.	Yes		No		Total	
	N	%	N	%	N	%
Teachers	15	100	0	0	15	100

When teachers were asked if they needed agroforestry training, all (100%) responded positively (Table 24).

Table 25: Distribution of respondents (pupils) on what should be done in broadening the agroforestry knowledge and skills of primary school teachers. (N=60)

Ways	Number	Percentage
Teachers should be given training on agroforestry practice		
Yes	60	100
No	0	0

The results from table 25 give indication that only training can make teachers equipped with agroforestry knowledge and skills. Training can be given in form of seminars, workshops, school meetings, audiovisual aids, sensitization and awareness programmes, formal training and the provision of awareness materials. Ndunguru (1981) insists that, a well-experienced teacher, highly skilled is likely to influence more pupils to participate in the learning than inexperienced one. For a learning to occur, individual has to be motivated to learn. A skilled teacher is the only one who can motivate pupils to learn.

Table 26: Distribution of respondents (Ex-standard seven leavers) on where they got agroforestry knowledge or tree planting knowledge (N=36)

Where they have got agroforestry /tree planting knowledge.	Yes	
	N	%
Home	0	0
School	36	100
Total	**36**	**100**

The result from Table 26 indicates that all respondents got the very knowledge from school. This shows that, school is the only place where people can receive adequate knowledge and skill of agroforestry practices. Although the school is the only place that people can receive adequate knowledge and skills, but that knowledge and skills cannot be

acquired without a teacher. A teacher is the person who can motivate pupils to learn. Again, a teacher is the only person who can show pupils' expectations. The way he/she communicate with them, can determine their expectations. Although the determination is within the ability of the learner, but only a teacher is the one who can foster to receive maximum stimulation from the environment. Stimulation depends on the environment the teacher sets up. The more the senses are stimulated, the more the experience the learner is ready to receive. For unskilled agroforestry teacher, he/she will get problem in communicating well with pupils. The result, pupils will create negative attitude to agroforestry practices. Since communication takes place through teaching methodology, it will be difficult also to select appropriate teaching methods that will aim at creation of awareness, enhancement of knowledge and development of attitudes and skills of agroforestry practices. The study from Kiroka Primary schools in Morogoro district revealed that, through WWF Tanzania workshop, teachers initiated a series of "greening" activities to their barren wasteland school grounds (Nathaniels, 1998). Through training the primary school teachers will be equipped with knowledge, skills and resource materials and lead the pupils to appreciate their agroforestry practices and take on the responsibility of maintaining it. The following Table 27 shows the distribution of respondents on the participation of tree planting.

Table 27: Distribution of respondents (ex- standard seven leavers) on the participation of tree planting (N=36)

	Number	Percentage
Yes	36	100
No	0	0
Total	**36**	**100**

The result from Table 27 shows that all ex-standard seven leavers participated in tree planting. Figure 4 shows that since 1980, they started planting trees. The figure also shows that, tree planting increases from year 1990 to 2003. This also shows that, due to increasing political campaign on tree planting in the country, more pupils became more engaged in tree planting. They finished schooling with adequate knowledge and skills on tree planting.

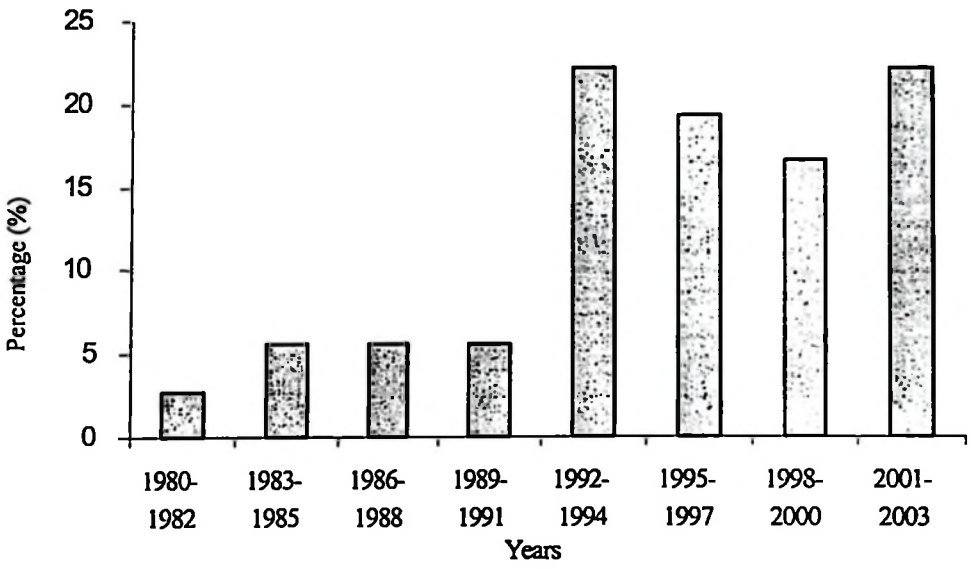

Figure 4: Distribution of respondents on the years involved in tree planting

When ex-standard seven were asked if they have inadequate skill on managing both trees and crops they responded positively. Table 28 shows that all (100%) had inadequate skill in managing both trees and crops. This result indicates that, although respondents have knowledge and skill on tree planting, they still face problems in managing both trees and crops. This means that, if the knowledge and skills of agroforestry practices would be given in schools, obviously they will be able to practice at home. This result still emphasizes on the importance of training on agroforestry practices to the teachers as the

only persons who can influence pupils to participate in agroforestry practices at schools and at their homes before and after schooling. It is understood that training teachers can reach all local people more swiftly and effectively. The teaching of a teacher is a great seed for the future". This means that, if a teacher teaches 45 pupils, he/she is both teaching 45 pupils that will become teachers about agroforestry practices. The education of agroforestry practices will continue to grow, for the pupils will also teach others. Therefore, the school must be the places where knowledge originates.

Table 28: Distribution of respondents on the reason of training. (N=36).

Reason	Number	Percentage
Inadequate skill on Managing both trees and crops		
Yes	36	100
No	0	0
Total	**36**	**100**

Table 28 shows that all ex-standard seven leavers had inadequate skill in managing both trees and crops.

4.7 Respondents' views on effective strategies of improving agroforestry practices in primary schools

Respondents' views on effective strategies of improving agroforestry practices in primary schools are summarized in Appendix 2. Pupils, teachers and ex-standard seven leavers provided suggestions which included:

4.7.1 Education and training on agroforestry practices

Pupils, teachers and ex-standard seven leavers gave this strategy. Appendix 1 shows that 88.3% of the pupils suggested on education and training on agroforestry practices. At the

same time 86.7% of their teachers also suggested on the same strategy (Appendix 2). Also Appendix 2 shows that 86.1% of ex-standard seven leavers suggested on the provision of education and training on agroforestry practices. These results reveal that, education and training are effective ways of improving agroforestry practices in primary schools. They are important factors to agroforestry development. Through education, primary schools will become aware of what is needed in agroforestry practices. Without education in agroforestry as a land use system, it would be very difficult for them to acquire knowledge and skill on agroforestry practices and be able to solve most of the socio-economic problems, which depend on increasing agricultural production. Agroforestry has been identified as one option for overcoming many of the prevailing problems and constraints, and is internationally accepted as an approach to future oriented land use. Due to increasing demand for know-how in agroforestry, agroforestry education is needed for incorporating technical know-how on the specific needs of school, interaction of different agroforestry components, selection and planting of multipurpose trees and nitrogen fixing trees, and selection and planting of agroforestry systems and practices in primary school agricultural land. Since, agroforestry education is mostly provided in the curriculum of higher learning, there is a need for primary schools to have agroforestry education and training. Agroforestry training will further the understanding and practice of agroforestry. These results go on line with Nair *et al.*, (1988), who emphasizes that agroforestry is a new area of study and activity in the context of the word. So, education and training is highly needed.

4.7.2 Construction of wells for irrigation

Only pupils gave this strategy. Appendix 2 shows that 95% of the pupils indicate that, construction of wells for irrigation will improve agroforestry practices in primary schools.

same time 86.7% of their teachers also suggested on the same strategy (Appendix 2). Also Appendix 2 shows that 86.1% of ex-standard seven leavers suggested on the provision of education and training on agroforestry practices. These results reveal that, education and training are effective ways of improving agroforestry practices in primary schools. They are important factors to agroforestry development. Through education, primary schools will become aware of what is needed in agroforestry practices. Without education in agroforestry as a land use system, it would be very difficult for them to acquire knowledge and skill on agroforestry practices and be able to solve most of the socio-economic problems, which depend on increasing agricultural production. Agroforestry has been identified as one option for overcoming many of the prevailing problems and constraints, and is internationally accepted as an approach to future oriented land use. Due to increasing demand for know-how in agroforestry, agroforestry education is needed for incorporating technical know-how on the specific needs of school, interaction of different agroforestry components, selection and planting of multipurpose trees and nitrogen fixing trees, and selection and planting of agroforestry systems and practices in primary school agricultural land. Since, agroforestry education is mostly provided in the curriculum of higher learning, there is a need for primary schools to have agroforestry education and training. Agroforestry training will further the understanding and practice of agroforestry. These results go on line with Nair *et al.*, (1988), who emphasizes that agroforestry is a new area of study and activity in the context of the word. So, education and training is highly needed.

4.7.2 Construction of wells for irrigation

Only pupils gave this strategy. Appendix 2 shows that 95% of the pupils indicate that, construction of wells for irrigation will improve agroforestry practices in primary schools.

This result shows that, present water sources are not sufficient to supply adequate water to most of the primary schools. This gives difficult to run agroforestry practices especially in dry seasons. Since the study area falls under semi-arid zone, it faces the problem of low availability of soil moisture due to low rainfall, erratic distribution of rainfall, high runoff and high evaporation losses. Construction of wells for irrigation will enable primary schools to run well their agroforestry practices even in dry season. Since, pupils are the only available labour source of the school; they decided to suggest this strategy so as to reduce their burden for bringing water outside the school that is obviously very far from them. This result concur with the study carried by Bakari *et al.*, (1998) which shows that, soil moisture conservation and supplementary irrigation through water harvesting are some of the methods which are currently been given much emphasis for the effective capture and use of water from rainfall so as to improve crop production in semi-arid areas. Because the knowledge and skill of water harvest in most of the primary schools is not yet reached, construction of wells is seen as the only means of alleviating that problem.

4.7.3 Planting legume trees

Only the pupils gave this strategy. Appendix 1 shows that 93.3% of the pupils seen that, the planting of legume trees will improve agroforestry practices. This result shows that, nitrogen-fixing trees are very important tree species due to the nature of the type of soil in the study area. According to URT (1998), sand soil dominates in the district (Singida urban district) and that soil has low natural fertility. Planting of legume trees will fix nitrogen in the soil and make it fertile.

4.7.4 Provision of farm inputs and implementation tools

Both teachers and ex-standard seven leavers gave this strategy. Appendix 2 shows that 66.7% of the teachers seen that the provision of farm inputs and implementation tools will improve agroforestry practices in primary schools. Also, Appendix 2 shows that 61.1% of the ex-standard seven leavers seen that, provision of farm inputs and implementation tools will also improve agroforestry practices in primary schools. These results show that, farm inputs and implementation tools limit the development of agroforestry practices in schools. Since, there is no support on income generating activities in primary schools, most they face financial problem and then be unable to purchase their own tools and sometimes inputs. Pupils bring home some of the tools; sometimes the schools themselves improvise agroforestry instruments for the practices. For example, in Kisaki primary school, pupils used small gourds to bring water to school. These gourds were tool small to satisfy the need of water in agroforestry practices plots, and sometimes it was time consuming. At the same time, it was easily to be broken down. This means that, when appropriate tools and instruments for agroforestry practices activities are provided in schools, those schools will be able to improve their agroforestry practices.

4.7.5 Village government should give primary schools enough agriculture area

Teachers gave this suggestion only. Appendix 2 shows that only 40% of the respondents seen that, the provision of enough agriculture area to the primary schools will improve agroforestry practices. However, 60% of respondents did not see as the solution for improving agroforestry practices, and hence they responded negatively. These results reveal that, an agroforestry practice is the solution to small lands. Although large farms allow good distribution of the trees and crops but small area does not constrain agroforestry practices.

4.7.6 Agriculture subject should be taught separately

Teachers gave this suggestion only. Appendix 2 shows that all (100%) teachers seen that, if agriculture subject would be taught separately will improve agroforestry practices in primary schools. This result reveals that, agriculture in primary schools is longer taught separately. It is included in other subjects. However, the inclusion of other subjects was not done with agroforestry practices in mind. Agriculture subject was the only subject, which was emphasizing the area of agroforestry practices. For this case, it is difficult for teachers to provide adequate knowledge and skills of agroforestry practices.

4.7.7 Extension worker should stay in villages

Appendix 1 shows that 66.7% of respondents indicate that, if extension workers would stay in villages, agroforestry practices will improve. This result shows that, most of the extension workers do not stay in villages. Always they just come to visit for a time and go back to town. Because most of the primary schools of peri-urbans are situated in rural areas and in remote ones, it is not easy to get adequate services from extension workers and hence it is difficult to get appropriate advice from them. If it is possible for teachers to work and stay in remote areas, why not for extensions.

4.7.8 Researchers should disseminate results in a researched site

Appendix 2 shows that 80% of the respondents suggested that, researchers should display results in a researched site after completing the research. This result reveals that, result dissemination is important to feedback information to the people concerned in the study areas. Research study aim to generate new technology and knowledge, which must be made to bear positively on the target group by solving or minimizing the effects of the stated problem(s). So, dissemination will impart the potential users' new technology and

knowledge on the searched problem. This can be done through workshops, meetings, or seminars. Result dissemination of socio-economic strategies in promoting agroforestry practices in primary schools will contribute in solving chronic problems of adopting agroforestry practices. Research results aim in addressing agroforestry related problems.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This study examined the socio-economic strategies in promoting agroforestry practices in primary schools of peri-urban Singida. The study aimed to introduce effective ways of improving agroforestry practices in primary schools so as to foster sustainable rural development which involves successful management of resources for agriculture to satisfy changing human needs while enhancing the quality of the environment and conserving natural resources. In view of the findings and discussion from respective sections of the study in the previous chapters, some basic conclusions and recommendations can be drawn concerning the socio-economic strategies in promoting agroforestry practices in primary schools of peri-urban Singida.

5.2 Major conclusions

The following conclusion can be made basing on respective specific objectives of the study:

5.2.1 Types of agroforestry practices being used in primary schools

The result showed that, tree / crop mixture is the major type of agroforestry practices being used in primary schools of peri-urban Singida. According to the findings of this study 98 percent of the pupils and 100 percent of teachers practice the mixture of trees and crops. The practice offered solutions for primary schools to meet most of their daily needs. Trees provide shade for their schools and wood products sold to generate income. Crops are used for food and business.

5.2.2 Factors which constraint the adoption of agroforestry practices

The Chi-square test showed that inadequate skill was the most important factor that constrains the adoption of agroforestry practices. However, drought was found to be the biggest constraint in the study area. Other factors include: pests, diseases and birds, inadequate farming inputs and farm tools, lack of market, ignorance, and less attention by education officials and policy markers on agroforestry practices. Findings of this study revealed that the use of socio-economic strategies would improve agroforestry practices in primary schools. The use of those strategies will enhance adoption of the practice to the pupils.

5.2.3 Ways of motivating pupils to adopt agroforestry practices

The Chi-square test showed that a subject explaining the advantage of agroforestry practices or tree planting have strong influence in fostering the knowledge and skill of pupils on adopting agroforestry practices. However, the same statistical analysis showed that the activities carried by the primary school pupils were not statistically significant with the type of agroforestry practice being used in primary schools. The result revealed that, subjects taught in primary schools enhance more on tree planting than agroforestry practices. Teaching agriculture subject separately was seen as the most important way of motivating pupils to adopt the practice. The subject can make the teaching of agroforestry education more relevant and effective. Other ways of motivating pupils include: The use of dominant language as the medium of instruction, integrating practical work with theory, participation of relevant community activities, tree species preference, involving local experts, formulation of by-laws enforcing the conservation of agroforestry practices,

establishing demonstration plots, introducing agroforestry education, providing farm tools and inputs, and employment of agroforesters in primary schools.

5.2.4 Ways of broadening the knowledge and skill of primary school teachers

The result showed that training is the most effective way of broadening the knowledge and skill of primary school teachers for effective teaching and training of agroforestry practices in school. According to the findings of this study, 100% of the pupils and teachers suggested on training as effective way of broadening the knowledge and skill of teachers. From those findings it was seen that more than a half of the teachers did not attend any training concerning agroforestry practices and even tree planting. Because of that, training is highly needed.

5.2.5 Respondents views on socio-economic strategies in promoting agroforestry practices in primary schools

The result suggested that, the provision of agroforestry education and training in primary schools would be the only way of improving agroforestry practices. The result revealed that, since agroforestry is a new area of study and activity, education and training is highly needed. Other suggestions include: construction of wells for irrigation, planting legume trees, extension workers should stay in villages, and dissemination of the research result to the researched site. All these suggestions reveal that, the only right place for making implementation of the ways of improving agroforestry practices is in primary schools. Since there is no any suggestion, which directs other place different from schools to take part in promoting agroforestry, this means that school is the only place where people can acquire knowledge and skills of agroforestry practices. Even ex-standard seven leavers when they were asked where they got the knowledge and skill of tree planting, they were

said that, they had got to their primary schools. Therefore, primary schools have significant role in promoting agroforestry practices.

5.3 Recommendations

In the light of the above conclusions, the following recommendations are made, which might be useful to pupils, teachers, policy makers, education planners, researchers and rural development agencies.

1. Primary schools should include livestock in their school help projects so as to ensure high provision of farmyard manure. Farmyard manure is important in improving the soil, which is mainly sand soil. The soil has low natural fertility and low water holding capacity. Applications of farmyard manure will increase soil fertility, bind the particles of the soil and hence improve the water holding capacity and moisture content. Since the area fall under semi-arid area where drought is the main constraint, livestock should be mixed with trees and crops. The development of agroforestry technique could make leaves and small branches of multipurpose trees available for mulching. Mulching also should be used to reduce evaporation from the soil.

2. Rainwater harvesting technology should be introduced in primary schools. Schools should construct tanks or wells for preserving the collected water. Preserved water will be used during dry period and during water shortage. The technology also will help in saving time of collecting water from outside the school area.

3. Agroforestry plots should be economically attractive. In order for primary schools to increase their economy they should diversify their products. Tree / crops should be mixed with livestock especially small ruminants including poultry. Small ruminants such as rabbit and poultry bring the earning for a short period. Also the pupils mostly desire them. The period waiting for crop production or tree production will be compensated by the production of those small ruminants and poultry. The droppings of those animals also will be used to increase soil fertility.

4. Formulation of the agroforestry policy which can enhance and maintain agroforestry quality and productivity on a long term basis that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. The policy should integrate agroforestry issues in all development-oriented policies, planning and activities at national, region, district and local levels, with participation of the people. The policy also should raise public awareness to understand and appreciate linkages between agroforestry and development.

5. International organizations that sponsor agroforestry research should provide agroforestry information, funds, and technical assistance to primary schools that practice agroforestry. This will act as catalyst in promoting agroforestry in schools.

6. Agroforestry education should be introduced in primary schools. Teachers should be given training on agroforestry practices. The training should affect all teachers in school. All teachers and all subjects must teach agroforestry in multidisplinary approach. There must be agroforestry topics or messages in every subject in school

curriculum. Infusion of agroforestry education should be done in carrier subjects such as life skill / technical studies. Integration of agroforestry education should be done in non-carrier subjects. Integration can also done through other school activities such as morning parade and /or assemblies. These can offer a unique opportunity to pass agroforestry messages especially by school heads that may otherwise not have much time for interaction with the learners.

7. Heads of schools and other educational officials need to be constantly sensitized and receive frequent training seminars on the integration aspects of agroforestry to the carrier subjects.

8. The techniques of integrating subject contents in the carrier subjects to give agroforestry concept and skill should be clear to the agroforestry project implementers in order to give solutions to major problems in the society.

9. Within the school compound, there should be the following: -
   - School agroforestry demonstration plot, in which a variety of plants / crops and animals are displayed. This can act as a teaching tool that can benefit parents, stakeholders and customers. Agroforestry demonstration plot is a cost effective way to increase public awareness of agroforestry and promote adoption to the community. Planting establish a working example of an agroforestry technology.
   - Agroforestry notice board the big one for the school and the small one in the classes. New or important information gathered from the mass media or any other source should be pinned here for all to read.

10. There is a need to support the diversification of primary schools economics by expanding the level of forest-based economic activities. in particular supporting improving marketing of non-wood forest products and establishing small-scale. forest-based industries.

5.4 Suggestion for further research

The study was conducted in primary schools only. The same study could be carried to teachers training colleges to ensure that new teachers who are going to teach primary schools have appropriate pedagogical skills and knowledge on agroforestry practices.

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APPENDICES

Appendix 1: Measuring instruments

1a) Questionnaire to Primary School Pupils

Dear pupil,

Your school has been selected to provide some information on the Social-Economic Strategies in promoting agro-forestry practices in primary schools of peri-urban Singida. You have been selected randomly as one of the informants. Your opinion will help to draw some policy recommendation, which can improve agro forestry practices in Primary Schools. This is just a survey; there are no right or wrong answers, moreover, it is not a test. All the information you give will be treated with STRICT CONFIDENCE

Please do not write your name on this questionnaire.

PART A: Pupil Identification.

1. Name of the School ----------
2. District ----------
3. Division ----------
4. Ward ----------
5. Village ----------
6. Are you a boy or a girl 1. A boy 2. A girl
7. In which class are you ----------
8. Date of Interview. ----------

PARTB: Background Variables

9. What is your religion?
   1. Christian
   2. Muslim
   3. Tradition.
10. Which language do you speed at home?
    1. Kiswahili
    2. Mother tongue
    3. English

PARTC: Agroforestry Practices

11. What type of agro forestry is being practiced in your School?
    1. Mixing of crops and trees.
    2. Mixing of crops animals and trees.
    3. Others (specify)----------

12. What crops do you mix with trees?

Crop	Uses
1. ----------	----------
2. ----------	----------
3. ----------	----------

Which trees are present in your school farms?

Name of the tree	Functions /uses						
	Fodder	Timber	Poles	Fruits	Fuel wood	Boundary	Soil Conservation And wind break
1. 2. 3. 4.							

14. Does the crops and trees, which are present in your School form help to generate school income? 1. Yes. 2. No.

b. If No, what ways are used to generate the school income? ---
---

15. What type of Livestock do you keep in your School?

Livestock	Uses
1.	----------
2.	----------
3.	----------
4.	----------

PART D. Constraints of Agro forestry Practices

16. What problems do you face in running agro forestry practices in your School?
    1. Draught
    2. Crops and trees seedlings to be destroyed by livestock, birds, insects and wild animals
    3. Inadequate skills in managing both crops and trees.
    4. Both 1,2,3, above.

17. What are the reasons of the problems above?
    1. Unreliable rainfall and unfertile soil
    2. Negligence of villagers, leaning their livestock in school area.
    3. Lack of agro fosters
    4. Both 1,2,3 above.

PART E: Adoption of agro forestry practices

18. Which specific subjects do you study about agro- forestry practices /tree planting.
    1. Social studies
    2. Science
    3. Both 1,2,3 above.

19. What language is being used in teaching agro-forestry / tree planting?
    1. Kiswahili
    2. English

20. Do you practice during and after class hour?
    1. Yes
    2. No.

21. If yes, which activities are being practiced.
    1. Seedbed preparation
    2. Fertilizer, sowing, weeding and livestock
    3. Both 1&2 above

22. Which activity do you participate in your village
    1. Tree planting
    2. Distribution of tree seedlings.
    3. Both 1&2 above.

23. If you have bee given a tree to plant (either indigenous or exotic), which one would you prefer?
    1. Fruit tree
    2. Fodder tree
    3. Both 1&2 above.

24. If somebody cut your planted tree, what can you do for home workers----------

25. Do you have contacts with agricultural extension in School?

    1. Yes
    2. No.

PART F: Teachers' knowledge and skills on agroforestry.

26. What should be done in order to widen the knowledge and the skill of agro- forestry practices to the teachers?

    1. Teachers should be given education and frequency training about agro- forestry practices
    2. Other (specify)----------

PART G: Pupils view about agroforestry practices

27. What suggestions would you give in order to improve agro-forestry practices in your school?

1. ----------
2. ----------
3. ----------
4. ----------

Thank you for your help by completing this questionnaire.

1b. Questionnaire to Primary School Teacher:

Dear teacher

Your School has been selected to provide some information on the socio-economic strategies in promoting agro forestry practices in Primary Schools of peril-urban Singida. Your view will help to draw some policy recommendations, which can improve agro-forestry practices in Primary Schools. This is just a survey and there are no right or wrong answers. All the information you give will be treated with STRICT CONFERENCE.

Please do not write your name any where on this questionnaire.

PART A: Teacher Identification.

1. Name of the School----------
2. District----------
3. Division----------
4. Ward----------
5. Village----------
6. Gender 1. Male 2. Female.----------
7. Date of interview ----------

PART B: Background Variables

8. What is your religion?
   1. Christian
   2. Muslim 3. Tradition.

9. Professional training qualification
   1. Certificate
   2. Diploma
   3. Degree

10. What subjects do you teach----------

PART C: Agroforestry Practices

11. What type of agro forestry is being practiced in your school?

1. Mixing crops and trees
2. Mixing crops, animals and trees.
3. Others (specify)----------

12. What crops do you mix with trees.

Crop	Uses
1. ----------	----------
2. ----------	----------
3. ----------	----------
4. ----------	----------

13. Which trees are present in your School farm?

Name of the tree	Functions	Uses					
	Fodder	Timber	Poles	Fruit	Fuel wood	Boundary	Soul answer rainfall and wind areas
1. 2. 3. 4.							

13. How do you benefit from the interaction of trees, crops/livestock?

1. It generate more income
2. Provide subsistence needs
3. Supply food for pupils and teachers
4. Others (specify)----------

PART D: Adoption of Agroforestry Practices.

15. Have you attended any training on agro-forestry practices?

1. Yes
2. No.

16. Do you think you need more training on agro-forestry practices?

1. Yes
2. No.

PART F: Teacher's View

17. What suggestions would you give in
Order to motivate pupils in adopting agro-forestry practices?

---

18. What do you think should be done by the following in order to improve agro-forestry practices in Schools?
    a) Villagers----------
    b) The government ----------
    c) Teachers ----------
    d) Researchers. ----------

Thank you for your help by completing this questionnaire.

1C. Questionnaire to ex-standard seven leavers.

Dear Ex-standard seven leavers.

You have been selected to provide some information on Socio-Economic Strategies in promoting agro forestry practices in Primary Schools of Peri-urban Singida. Your opinion will help to draw some policy recommendations that can improve agro forestry practices in Primary Schools. All the information you give will be treated with strict confidence.

PART A: Ex-standard seven leaver Identification

1. Name of the Village----------
2. District----------
3. Divisions----------
4. Ward ----------
5. Gender 1. Male 2. Female
6. Date of interview----------

PART B: Background Variables.

7. What is your religion:

    1. Christian
    2. Muslim
    3. Tradition.

8. Which language do you speak at home?

    1. Kiswahili
    2. Mother tongue

PART C: Agroforestry Practices.

9. What type of agro forestry is being practiced in your home?

    1. Mixing crops and trees.
    2. Mixing crops, animals and trees.
    3. Others (specify)----------

10. What crops do you mix with trees.

Crop	Uses
1. ----------	----------
2. ----------	----------
3. ----------	----------
4. ----------	----------

11. What types of livestock do you keep at home?

Livestock	Uses
1. ----------	----------
2. ----------	----------
3. ----------	----------
4. ----------	----------

12. What type of tree is present in your farm
    1. Indigenous
    2. Exotic
    3. Both indigenous and exotic trees.

PART D: Constraints of Agro forestry practices in your home.

13. What problems do you face in running agro- forestry practices in your home?
    1. Drought
    2. Destruction of crops and trees with livestock birds insects and wild animals.
    3. Inadequate skills in managing both crops and trees.
    4. Both 1,2,3 above.

15. What are the reasons of the problems mentioned above?

    1. ----------
    2. ----------
    3. ----------
    4. ----------

PART E: Adoption of Agroforestry Practices

16. Highest education level.
    1. Primary education
    2. Secondary education

17. Where do you obtain the knowledge and skill of agroforestry practices /tree planting?
    1. At School
    2. At Home

18. Do you have participated in any kind of tree planting.
    1. Yes
    2. No.

If yes since when? (Please specify the year)----------

19. What are they for?
    1. Environmental conservation.
    2. Other (specify)----------

20. Does your primary school help villagers in transmitting knowledge and skill on agro forestry?
    1. Yes
    2. No.

If yes, how ----------and
If No, why? ----------

21. Do you think you need more agro forestry training
    1. Yes
    2. No.

If yes why do you think so? ----------

PART F: Ex-standard seven view about agroforestry practices

22. What should be done to primary schools so as to promote agro forestry?
    1. ----------
    2. ----------
    3. ----------
    4. ----------
    5. ----------

Thank you for your help by completing this questionnaire.

1d, Interview Guide/Checklist for:-

(i) Education and agricultural officers and village leaders.

1. What do you to do address where issue of agro-forestry practices in Primary Schools?
2. What do you do if there is low adoption of agro-forestry Practices in Primary Schools?
3. What problem do you face in addressing the problem of adoption of agro forestry in Primary Schools?
4. What are you futures plans?

(ii) Focus group discussion for ex-standard seven leavers.

1.What problems do you face in running agroforestry practices in your home?
2.What type of tree do you prefer? Why.
3.What should be done so as to improve agroforestry practices in primary schools?

1e, Observation guide

The following things will be observed.

1. School activities
2. Posters displayed in the walls of the School.
3. Information dissemination activities
4. Physical observation of pupils to determine where they have knowledge and skills on agro-forestry practices.
5. The School farm.

Appendix 2: Distribution of respondents on their suggestion of effective strategies of improving agroforestry practices in primary schools

Strategies of improving agroforestry practices in primary	Yes		No		Total	
	N	%	N	%	N	%
Provision of agrofrestry education to pupils	53	88.3	5	13.9	36	100
Ex-standard seven	31	86.1	2	13.3	15	100
Teachers	13	86.7	3	5	60	100
Construction of wells- pupils	57	95	4	6.7	60	100
Planting legumes trees- pupils	56	93.3	14	38.9	36	100
Provision of farm inputs- Ex-standard seven leavers	22	61.1	5	33.3	15	100
Teachers	10	66.7				
Village government should give primary school enough agriculture area- Teachers	6	40	9	60	15	100
Agriculture subject should be taught separately teachers	15	100	0	0	15	100
Extension workers should stay in villages Teachers	10	66.7	5	33.3	15	100
Researchers should disseminate results in a researched site- teachers	12	80	3	20	15	100