ECONOMIC CONTRIBUTION OF PRIVATE WOODLOTS TO THE ECONOMY OF MUFINDI DISTRICT – TANZANIA

BY

WIDEWELL TIMOTHY SINGUNDA

A DISSERTATION SUBMITTED IN PARTIAL FUFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTERS OF SCIENCE IN FORESTRY OF SOKOINE UNIVERSITY OF AGRICULTURE.

MOROGORO, TANZANIA

2010

ABSTRACT

The main objective of this study was to asses and quantify the contribution of private woodlots to the economy of Mufindi district in the Southern Highlands of Tanzania in year 2008. The specific objectives were, to examine and quantify the levels of woodlot ownership coupled with capital asset acquisition, to asses and quantify the rates of tree planting in relation to the utilization rate by value added activities, to asses and quantify the contribution of private woodlots to the communities in terms of employment and revenue generation, to determine the contribution of woodlots to timber supply in Mufindi district, and to examine the actual and potential revenue contribution of private woodlots to the district. Data was collected using semi structured questionnaires in which a random sample of 270 households out of 900 in six villages and 30 traders were interviewed. A checklist was used to interview the key informants who included the village leaders, district natural resources officer, district trade officer. Other methods used in gathering information were personal observation and focused group discussion. The data was analyzed using the SPSS programme version 12.11 and EXCEL programme. Descriptive statistics such as frequencies, percentages and means were used to make inferences about the studied Woodlot owners. The study showed that 14.1 % of the woodlot owners were females, and 85.9% were males. Woodlots were planted on land acquired through inheritance, village allocation, and buying, and most of this land was former agriculture land. Average land size owned per household was 6.80 hectares and the average woodlot size was 2.60 hectares, thus, 36 % of the land was occupied with woodlots. Most of the woodlot owners started planting woodlots in years 1991 to 2008. Timber supplied from woodlots was 92% for the transmission poles while contribution of wood destined for sawn wood was less than 1% compared to Government plantation. However, the study revealed that the planting rate was higher compared to the utilization rate, implying that

there was more young stock compared to old stock. Furthermore the study showed that woodlots had created on average 5414 employment opportunities at farm level, while 120 permanent and 600 part time employment opportunities were created by processing units. Furthermore, the survey showed that 90% of the traders sold their produce through middlemen and this was done at production sites. Timber was mainly destined for local markets and Kenya. The survey revealed that the average income derived from sale of woodlots was Tsh. 232 143 and Tsh.455 452 for years 2007 and 2008 respectively. Revenue to the district accrued from sale of sawn wood and transmission poles collected, as cess was less than 1% of the potential revenue. Given the potential that woodlots have in improving the economy in resource poor areas, this study recommends increased establishment of woodlots and improved management in Tanzania while observing the land use plans, in order to exploit market opportunities tenable, because products have a big market inside and outside the country.

DECLARATION

I Widewell Timothy Singunda do here by declare to the Senate of Sokoine University of Agriculture that this dissertation is my original work and has not been submitted for a higher degree in any other University

_____ _____

Widewell Timothy Singunda Date

Msc. Candidate

The above declaration confirmed

_____ _____

Professor Yonika M. Ngaga Date

(Supervisor)

COPYRIGHT

No part of this dissertation may be reproduced, stored in any retrieval system, or transmitted in any form or by any means without prior written permission of the author or Sokoine University of Agriculture in that behalf.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to Sao hill Forest Plantation for the financial support without which my studies at SUA would have been impossible. I am indebted to my supervisor Ngaga, Y.M. of the department of forest economics for his guidance, constructive criticism and invaluable comments throughout the preparation and write up of this dissertation. Despite of him having tight schedule, he always had time for my work.

Thanks are also extended to the Mufindi district commissioner and District administrative secretary for introducing me to the Divisional secretaries. Thanks to the District executive director- Mufindi for introducing me to the Ward executive officers. I am indebted to the district natural resources officer for providing field assistants. I would also like to thank all the respective ward executive officers for introducing me to village government leaders. I would also like to thank all the village government leaders, indeed, the list of people to thank in Mufindi is long, but it suffices to direct appreciation to all respondents for their willingness to be interviewed and made the data collection possible, to them I say thank you so much.

Special thanks should go to my wife for permitting me to undertake this course and all the hardships she faced during my absence. Her moral support is highly appreciated.

Thanks are also due to SUA staff members, my fellow students, and friends who in one way or another encouraged me. Last but not least, I thank the Al mighty God for protecting and keeping me up to this moment.

DEDICATION

This work is dedicated to my late mother, Malita Maholi, who laid the foundation and inspiration in my education.

TABLE OF CONTENTS

ABSTRACT.....**ii**

DECLARATION.....**iv**

COPYRIGHT.....**v**

ACKNOWLEDGEMENTS.....**vi**

DEDICATION.....**vii**

TABLE OF CONTENTS.....**viii**

LIST OF TABLES.....**xiii**

LIST OF FIGURES.....**xv**

LIST OF APPENDIX.....**xvi**

ABBREVIATIONS AND ACRONOMY.....**xvii**

CHAPTER ONE.....**1**

1.0 INTRODUCTION.....**1**

1.1 Background Information.....1

1.2 Problem statement and Justification.....4

1.3 Objective.....5

1.3.1 Main objective.....5

1.3.2 Specific objectives.....5

1.3.3 Research Questions.....5

1.3.4 Hypotheses.....6

CHAPTER TWO.....**7**

2.0 LITERATURE REVIEW.....**7**

2.1 World woodlots situation.....7

2.2 Private woodlots.....10

2.3 Harvesting in Small Scale Tree Farms.....12

2.4 SMALL SCALE ENTERPRISE....13

2.5 INCOME GENERATION....15

2.6 POLICY, LEGAL AND INSTITUTIONAL ARRANGEMENT....16

2.6.1 National Forest Policy 1998....16

2.6.2 Legal and Institutional arrangements....18

2.6.3 Current status of private forestry and industry in Tanzania....19

CHAPTER THREE....20

3.0 MATERIALS AND METHODS....20

3.1 OVERVIEW....20

3.2 DESCRIPTION OF THE STUDY AREA....20

3.2.1 Location of Mufindi district, climate and topography....20

3.2.1.1 Climate....22

3.2.1.2 Economy....22

3.2.1.3 District administration area and demography....22

3.2.1.4 Forest resource....23

3.3 RESEARCH DESIGN....23

3.3.1 Questionnaire....24

3.3.2 Pre testing....24

3.4 SAMPLING PROCEDURE....25

3.4.1 Sampling....25

3.4.2 Sample Size....25

3.5 DATA COLLECTION....26

3.5.1 Data requirement and source....26

3.5.2 Primary data....26

3.5.3 Focused Group Discussion (FGD)....27

3.5.4 Key informants....27

3.5.4 Participant observation.....27

3.5.5 Field surveys.....28

3.5.6 Market survey.....28

3.5.7 Secondary data.....28

3.5.8 Estimation of actual and potential revenue to the district.....29

3.5.9 Estimation of timber volumes supplied from woodlots.....30

3.5.10 Estimation of Employment.....31

3.5.11 Estimation of price per cubic meter.....31

3.6 DATA PROCESSING AND ANALYSIS.....31

CHAPTER FOUR.....33

4.0 RESULTS AND DISCUSSION.....33

4.1 CHARACTERISTICS OF WOODLOT OWNERS.....33

4.1.1 Respondents gender and marital status.....34

4.1.2 Age.....35

4.1.3 Respondents education levels.....36

4.1.4 Respondents main occupation.....36

4.1.5 Household family size.....37

4.1.6 Housing condition.....38

4.1.7 Capital assets acquired by woodlot owners through tree sales.....40

4.2 LAND.....41

4.2.1 Ownership.....41

4.2.2 Land acquisitions.....42

4.2.3 Woodlot ownership.....43

4.3 WOODLOT ESTABLISHMENT TRENDS IN THE STUDY AREA.....44

4.3.1 Adoption of woodlot establishment.....44

4.3.2 Responses on tree species planted.....46

4.3.3 Tree establishment and utilization rates.....47

4.3.4 The main reasons of planting trees.....49

4.3.5 Land planted with woodlots.....50

4.3.6 Sources of seeds and seedlings.....50

4.3.7 Woodlot establishment mode in the study area.....51

4.3.8 Tree planting spacing.....52

4.4 HARVESTING AND SALE OF TREES.....53

4.5.1 Selling price of trees.....55

4.5.2 Major constraints affecting establishment of woodlots.....59

4.5.3 Improvement of woodlot management.....60

4.6 MARKET SURVEY OF TRADERS IN WOODLOT PRODUCTS.....61

4.6.1 Information on traders.....61

4.6.2 Responses on business knowledge and establishment.....63

4.6.3 Responses on background of traders and Capital formation.....64

4.6.4 Wood supply and sources.....65

4.6.5 Wood processing.....68

4.6.5.1 Common sizes produced.....69

4.6.5.2 Cooperation between traders.....69

4.6.6 Marketing of sawnwood and transmission poles.....70

4.6.6.1 Transportation of the produce.....70

4.6.6.2 Markets and marketing channels.....71

4.6.6.3 Selling prices of sawn wood and transmission poles.....72

4.6.7 Income to the communities and District.....73

4.6.7.1 Income to the communities.....73

4.6.7.2 Income to the District.....74

4.6.8 Contribution of woodlots to employment.....76

4.6.8.1 Employment at farm level.....76

4.6.8.2 Employment in the processing units in Mufindi district.....77

CHAPTER FIVE.....79

5.0 CONCLUSION AND RECOMMENDATIONS.....79

5.1 OVERVIEW.....79

5.2 CONCLUSION.....79

5.3 RECOMMENDATIONS.....81

REFERENCE.....83

APPENDICES.....99

LIST OF TABLES

Table 1: Total number of households owning woodlots and percentage of sampled households.....26

Table 2: Household characteristics of woodlots owners in Mufindi district.....34

Table 3: Summary of the family household's size.....37

Table 4: Summary of type of housing materials of woodlot owners in Mufindi District…39

Table 5: Summary of responses on capital assets acquired through sale of trees.....40

Table 6: Total land owned (ha) by woodlot owners in Mufindi district (hectares).....42

Table 7: Woodlot sizes, and adoption of woodlot establishment in Mufindi district.....45

Table 8: Summary of responses on source of planting material.....51

Table 9: Responses on tree planting mode, spacing and purpose of planting trees.....53

Table 10: Information on harvesting age of the trees.....54

Table 11: Selling price per tree.....56

Table 12: Woodlot owner's responses on price trend and wood demand.....57

Table 13: Summary of responses on the beneficiary of woodlots.....58

Table 14: Main constraints faced by woodlot owners pertaining to tree farming.....59

Table 15: Summary of responses on improvement of private woodlot management.....60

Table 16: Information on traders.....63

Table 17: Responses on locating woodlots and number of suppliers.....65

Table 18: Responses on pole supply and tree availability trends from woodlots.....66

Table 19: Softwood round wood timber supply, m^3.....67

Table 20: Responses on destination and mode of selling.....71

Table 21: Prices of sawn wood and transmission poles in different market centres.....72

Table 22: Revenue accrued from woodlots products by the communities in two years.….73

Table 23: Actual and Potential revenue collected as log cess from softwood timber.....74

Table 24: Actual and Potential revenue collected as log cess from transmission poles.....75

Table 25: The number of persons employed in woodlot establishment per acre.....76

Table 26: Employment in processing units.....78

LIST OF FIGURES

Figure 1: Map of Mufindi Diistrict showing study villages.....21

Figure 2: Proportion of tree species planted in the study area, Mufindi district.....46

Figure 3: Comparison of the tree establishment and utilization rates.....48

LIST OF APPENDIX

Appendix 1: Questionnaire for woodlot owners.....99

Appendix 2: Questionnaire for (market survey) traders in forest products.....106

Appendix 3: Checklist to guide the focused group discussion.....112

Appendix 4: Checklist for key informants (District Natural Resources officer).....114

Appendix 5: Checklist for key informants village government Leader.....117

Appendix 6: Checklist for key informants (District Trade officer).....120

Appendix 7: Miscellaneous legislation specimen.....121

ABBREVIATIONS AND ACRONOMY

FAO	Food and Agriculture Organization of the United Nations
FBD	Forest and Beekeeping Division
IFPRI	International Food Policy Research Institute
IPS	International Press Service
MNRT	Ministry of Natural Resources and Tourism
NBS	National Bureau of Statistics
NIPF	Non Industrial Plantation Forest
TOF	Trees outside the Forest
Tsh.	Tanzania Shillings
UNECA	United Nation Economic Commission for Africa
UNCED	United Nation Conference on Environment and Development
UNDP	United Nation Development Programme
URT	United Republic of Tanzania
USD	United States Dollar

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

World wide timber supply from natural and plantation forests is increasingly diminishing because of conservation, environmental and social concerns. Expansion of Industrial plantations which make up only about 5 percent of the total forest area but provide 35% of the world's wood supply is limited because of competition from alternative land use, conservation, environmental and social concerns (FAO, 2001; Holding *et al*., 2003; FAO, 2007). Yet the demand for timber and other forest and tree products is increasing at the local, regional and international levels.

Increasingly private woodlots are becoming important source of wood supply because of the dwindling supply from government plantation forest, secure tenure, and increase in price of wood and wood products have encouraged the private sector involvement in farm planting. On the other hand tree growth in communal land is getting depleted on the account of uncontrolled felling (FOSA, 2003).

A Woodlot can be defined as piece of land dedicated to tree planting usually located around a household or within a village. A woodlot may be owned by an individual, a household or by a community. A household woodlot is therefore a piece of land where the household members plant trees and have the rights over the trees planted and make their own management decisions (Chikoko 2002). Another term which embraces an (FAO 1998) definition is Trees outside the Forest (TOF), this includes tree resources on all land use categories outside the recorded forest area. Therefore TOF includes trees grown on farmland, unproductive marginal lands, along canals, roads, and in and around homesteads

and nearby settlements (Banko 2002). However, trees may also be planted around the house and along farm boundaries. This study will include as woodlots all trees planted by an individual, a family and households regardless of location or pattern of planting.

In the early 1990, it was estimated that, the industrial wood consumption in Tanzania was 750 000 cubic meters per annum and the sustainable long term supply from industrial plantation was estimated at 600 000 cubic meters per annum (URT, 2001). The demand for sawn wood for domestic consumption was expected to increase by 4 – 6 percent per annum implying 12 000 – 16 000 cubic meters more per annum. This situation ushered for new planting and replanting schemes in order to cover the gap (URT, 2001). There are about 361 forest based industries in Tanzania mostly dominated by small scale sawmills which used to obtain raw materials from industrial plantations and private woodlots. The supply of raw materials is critical on the northern part of Tanzania where there is a large number of individual saw mills (MNRT, 2005).

It is against this background of raw material shortage, defforestation and environmental degradation that Tanzania realized the wood shortage in the late 1960 and in early 1970 Tanzania embarked on private woodlot development which started as village afforestation programme under government sponsorship. Later, in the early 1980, the government of Tanzania in order to combat wood fuel shortages implemented aggressively several reforestation programs in rural communities with the aim of increasing the supply of fuel wood and wood products. This is the time when there was a countrywide tree planting campaign (Mnzava, 1985). In these efforts the government was joined by international and bilateral agencies through which several agro forestry, tree planting and wood fuel conservation progammes were initiated (Hakon 1999).

Today tree planting in the districts namely, Iringa rural, Kilolo, Ludewa, Makete, Mufindi, and Njombe, is being supported by individual efforts or community at village level. In Njombe district, there is growing concern that the cutting rate of the private woodlot is alarming due to increased demand of timber and fears are wide spread that the land will be left bare (Sosovele *et. al.*, 2002), Kendall *et al*., 1992) reported that management is not just exhaustive harvesting which result in boom and bust cycles, hence controls should be in place in order to provide assurance for future years timber supply. Although management includes harvesting, it also includes silvilculture systems which ensure future timber harvests through control of size volumes, intensity and frequency of harvest, and specific felling cycles as prescribed in management plans (FAO, 1987). Private woodlot involves, farm forestry, natural forest on titled land, and traditional forest reserves. To date the area under community and private wood lots in Tanzania is estimated to be between 70 000 and 150 000 hectares. This area includes community woodlots mostly of small sizes less than 1 hectare, large private plantation, and small portions of natural forest in titled land, and tree planting is done through individual efforts (Mariki, 2005).

In Mufindi district tree planting is mainly for the supply of fuel wood, sawn timber, fencing poles, and transmission poles. The species being planted are exotics i.e. *pinus patula* and Eucalyptus species. Records from the district natural resources office show that up to year 2005 about 23 million trees had been planted. This condition has attracted a number of small scale enterprises to utilize the resources in the established woodlots for the production of sawn timber, fencing poles, transmission poles and thereby creating demand on private woodlot (URT, 2006).

1.2 Problem statement and Justification

Most of the on going tree planting in Mufindi district is for timber production, poles and fuel wood. The area set for tree planting is slowly becoming smaller due to population increase, subsequent need for residential and agriculture area. However the planted trees for timber are being harvested at higher rates without timely replacement. This implies that in few years to come land may become bare (URT, 2006).The private woodlots in Mufindi district is growing because of favorable environment and presence of forest institutions which significantly contribute to the livelihoods and national economy. However, very little is known about the stewardship of the woodlots. While we have statistics on planting rate, there are no readily available statistics to show the important contribution that private woodlots make to the economy of Mufindi district. Also, although local communities benefits from woodlots, current literature does not provide economic data that relates woodlot ownership to livelihoods i.e. employment levels (Akida *et. al.*, 2006). It has been difficult to capture the current contribution of private woodlots to the economy because the small scale industry falls into the informal economy where it is not fully captured by formal statistics, as the transaction is conducted on cash basis. The contribution of these activities to the income of the woodlot owners, and the rate of re establishment have not been quantified. Also the contribution of timber supply from private woodlots and the impact to other land based activities have not been estimated.

Mufindi district is among the areas in Tanzania with good potential for private woodlot development whereby over 24,000 hectares of privately owned plantations are found (Haule, 2003). The activity has been practiced for more than 18 years and small scale enterprises have been operative for more than 10 years (Kajembe, *et. al.,* 1996).Therefore, the aim of this study is to capture the contribution of this industry to the economy derived from private woodlot activities and thus fill the information gap which is needed for

sustainable development. The findings will be used as baseline information for other districts which have high potential for woodlot development. These districts include, Ludewa, Iringa rural district, Makete, Njombe, in Iringa Region and Mbozi district, in Mbeya region (Munishi, *et, al.*, 2006).

1.3 Objective

1.3.1 Main objective

- To assess and quantify the extent to which private woodlots contribute to the economy of Mufindi district.

1.3.2 Specific objectives

i. To examine and quantify the levels of woodlot ownership coupled with capital asset acquisition.

ii. To asses and quantify the rates of tree planting in relation to the utilization rate by value added activities

iii. To asses and quantify the contribution of private woodlots to the communities in terms of employment and revenue generation.

iv. To asses and determine the contribution of woodlots to timber supply in Mufindi district.

v. To examine the actual and potential revenue contribution of private woodlots to the district.

1.3.3 Research Questions

i. What are the volumes of timber derived from private woodlots activities?

ii. What is the stewardship of the private woodlots and its status in relation to sustainable management?

iii. What is the contribution of private woodlots development in relation to employment; value added activities and the influence on other land based activities?

iv. What are the types of small-scale enterprises dependent on private woodlot development?

v. What is the actual and potential revenue contribution of private woodlot to the district?

1.3.4 Hypotheses

1. The private woodlots have significant contribution to the economy of the Mufindi District.
2. The private woodlots have no significant contribution to the economy of the Mufindi District.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 World woodlots situation

Throughout the world, there appears to be a trend to move away from Industrial forestry towards landholder based forest management and community forestry. This trend is especially clear in developing countries where community forestry and small scale forestry is of growing importance as seen in respective countries. For example, FAO, (1993) reported that non industrial plantation in developing countries were as follows: In 40 African Countries assessed 1 600 000 hectares were non industrial forest plantation and 1 400 000 hectares was industrial plantations. In Latin America, 3 500 000 hectares were non industrial forest plantations which involved 33 countries, while in the Asia and pacific regions, where 17 countries were assessed, 23 100 000 hectares were non industrial forest plantations. Trends in forestry development vary considerably between countries and a useful insight may be gained by examining differences in sizes of small scale forestry in a number of countries in terms of acreage, number of persons engaged and volume production into the respective national economies.

Small scale forestry in the United States of America is defined as Non industrial private forests (NIPF), these are forest lands owned by farmers, individuals and co operation that do not operate wood processing plants. NIPF accounts for about 59% of the total timberlands in the USA, and contribute nearly 50% of the countries timber production. There are in total about 7 million NIPF land owners, though only about 600 000 with holdings larger than 40 hectares who contribute 80% of the NIPF harvest (Harrison *et al.*, 2002).

In Canada there is an estimated 425 000-woodlot owners (Slivitzky, 2008). These privately owned woodlots make up more than 12% of commercially productive forestland i.e. 18 million hectares which provide an annual harvest equal to 39.6 million m^3 or 21% of national yield of commercial timber, and consequently wood lots make up a significant portion of the sustainable forest management equation. Japan which is among the densely forested countries in the world has 25 million hectares covered by forest which is 66% of the land area. Half of the forest land is owned by the private sector i.e. 2.5 million individuals ranging in size from 0.1 hectare to 2.7 hectares and have used forest certification as a tool for marketing (Ota, 2007).

FAO, (2003) reported that in Kenya there are 9.54 million hectares of woody vegetation, and this is found in farmland and settlements. Woodlots comprise 40% of all the planted trees of whose total volume equals that of indigenous forest combined with Government plantations. It is estimated to provide up to 9.3 m^3 per hectare and is increasing at the rate of 0.5 m^3 per hectare per annum.

It has been reported that 200 000 hectares of Rwanda's farmland is maintained by farmers as woodlots and wooded pastures. This exceeds the combined area classified as natural forest and state plantations. In China, each household tends 74 trees in the densely settled plains and it is estimated that 5.8 billion trees are planted around homes and villages, while in France, trees outside the forest occupy about 883 000 hectares (Brittannica, 1997).

Mussak *et.al.* (1989) reported that there are 21 trees per hectare in Ecuador cocoa - coffee region, though under stocked but also is an economic one. Estimates of wood sold in 1982 to 1987 was between 4 000 to 10 000 m^3 indicating an average sale per farm of 5 to 14 m^3

and farm revenue of 769 000 USD. Sale of farm trees amounted to 17 000 USD, representing 2.2% of gross revenue of farmers. Furthermore, Mussak *et. al.,* (1989) reported that wood was sold to saw millers, 15% of round wood was sold as logs, 8% was sold in cubic meters .The rest was sold as standing trees at a fixed price per tree and prices ranged from 3 USD for softwood and USD 8 for hardwoods. In Finland, Jori (1991) reported that there were 330 000 .hectares of non- industrial private forest owners and accounted for about 76% of annual increment of forest in Finland. The average size of the non industrial woodlots was 32 ha. and about half the holdings were under 20 hectares of forestland and 40% of private woodlot owners were women.

Furthermore, Ravindran *et,al*.(2000) reported that the average woodlot size in Karnataka, India varied from 0.6 to 4.35 hectares and woodlots covered 52% of the cropped area of small farmers and 46% for larger farmers. They pointed out the ability of woodlots to contribute to the credit worthiness of the household. Income from woodlots contributed 45% to 86% of the household earnings. Social investment contribution ranged from 42% to 84% of the outlays required. Allen (1990) reported that homestead planting in two rural Swazi communities averaged 0.77 hectare and showed that only the wealthier had planted woodlots. Also, the average household woodlot size in Kwazulu Natal was 0.8 hectare (Foy, 1999).

Also, Ahblack (1992) reported that the total area of planted forest and woodlots in mainland Tanzania was not exactly known but could be in the range of 180 000 to 200 000 hectares and the proportion of individual planting was rapidly increasing. At the same time Mariki,(2001) reported that the area under private and community forestry is estimated to be between 70 000 hectares and 150 000 hectares, including community woodlots mostly of small sizes less than one hectare.

2.2 Private woodlots

Timber tree production on small-scale farms is a composite asset important to many smallholder farmers. Smallholder timber cultivation is typically practiced along with subsistence crop and livestock production systems. Trees are usually grown together with crops in conventional mixed farming systems and may be planted along farm boundaries, in the cropland, along the contours and sometimes in blocks (Holmgren *et al*., 1994; Tyndall, 1996). The tree and agricultural crops mix on smallholder farms is therefore a practice which seems to play a key role in securing many smallholder livelihoods (Lengkeek and Carsan, 2004). An example of the crucial links is perhaps depicted by the recent farmer experiences on poor prices of key agricultural crops such as coffee, cotton, sugarcane and where farmers turned to trees on farms as the alternative income generating enterprise. Trees on farm serve as a "safety net", providing not only income but a low-cost source of food, fuel, fodder and housing materials (Holding and Roshetko, 2003; Scher, 2004).

The critical role played by trees is reinforced by a number of studies and policy reviews which recognize the economic value of the tree resources on farms and the need to strengthen the sub-sector to attain social-economic objectives such as poverty alleviation (Magcale *et al.*, 1999). For instance, FAO (2005) noted that, local communities now control at least 25% of the developing world's forests, and in forest-scarce countries local farmers are actively growing trees for commercial use.

In countries with emerging economies like china, India and Brazil, small scale timber production has gained prominence owing to highest increase in consumption of round

wood, environmental campaigns, and natural disturbances of forest resources (Economist, 2004).

In East Africa demand for environmental services (e.g. carbon sequestration) from trees is further expected to raise the potential market value of timber tree crops owned by farmers (Scherr, 2004). In view of this the potential of agro forestry and small tree farms/private woodlots in providing raw materials in both contractual (corporate-smallholder partnerships) and open-market situations looks promising.

Also woodlot offer environmental services which are the benefits generated through the natural cycle of existence of the woodlots. These services include landscape greening, climate amelioration and regulation of water flow. With the clean development mechanism and carbon sequestration it has been argued that the situation should be expected to worsen due to the fact that out of every 20 hectares of forests which are clear felled only one hectare is planted in Tanzania (Mwandosya *et al*., 1999). One of the mitigation measures suggested is maintaining the existing stocks of forest through protection and conservation, expanding carbon sinks by means of afforestation, reforestation, enhanced regeneration and agro forestry practices (Mwandosya *et al*.,1999). Furthermore major emission reduction option could be attained by the use of sustainable grown wood e.g. Wood fuel plantation ,private woodlots or village woodlots to substitute for fuel wood obtained from natural forest and woodlands which are being depleted at an accelerated pace throughout the African continent. For example it was estimated that in 1990 Tanzania lost about 227 000 hectares of woodland for production of charcoal and firewood (Makundi, 1990).

It has been reported that as the demand for wood increase and supply from natural forests declines, growing trees on private land have become more popular especially where land

tenure is secure and in areas where cash crops become less profitable. For example, farm woodlots have expanded considerably in Kenya and have become the most important source of wood (FAO, 2003). Private woodlots provide other services through provision of other forest products and ecosystem protection, wood fuels, recreational uses and buffers undeveloped land. Some other value added processing includes treatment of poles, drying of wood, production of doors, and frames. (Online dictionary, 2007).

Rotational woodlots help to stabilize and maintain soil fertility, tap moisture from deep soil layers, help protect and improve crop yields and provide sources of fodder, fuel wood and green manure. Woody perennials integrated with crops or animals in agro forestry systems have been found to increase returns and diversify production on sustainable basis. This has been found to be the case where farmers intercrop food crops with nitrogen fixing (leguminous) trees for 2 – 3 years, which help replenish soil fertility and provide food and fodder (FAO, 1994; Ramadhan *et al*., 2002, (cited by Bensel, 2007).

2.3 Harvesting in Small Scale Tree Farms

The common forest harvest and sawmilling practices include static sawmilling which are either circular or band saw mills. Static sawmills are likely to be most viable, with a highly mechanized and efficient operations able to process tens or hundreds of cubic meters of timber per day (Loren, 2000). Other common sawmilling practice is mobile sawmill which range from small, portable saws to trailer mounted saws. Mobile sawmills are useful for cutting round timber over 25 cm in diameter and 2 m in length. Power can be obtained from the mill's own engine or from a tractor power take-off (Loren, 2000). However due to low tree stock densities and volumes, these harvesting and sawmilling practices are not viable for on site timber processing in agro forestry and tree farms (Pasiecznik, 2006). Sawmilling machinery suitable in situations with such low production must be very

portable, able to cut small dimensions, short and sometimes crooked logs efficiently. Also should cause less damage to useful plants and be of low capital cost if they are to be economical in such farms with few cubic meters of logs (Pasiecznik, 2006). These factors have resulted in portable sawmills becoming popular in many countries (Smorfitt *et al*., 1999). In developed countries, mechanized portable sawmills which include circular saws, band saws and chainsaws are very popular (Pasiecznik, 2006; Smorfitt *et al*., 2006). Furthermore in developing countries, the forest industries are a key link in improving the economic and social life of rural communities. Hence, small scale enterprises and private woodlots is increasingly becoming an important component in sustainable and integrated rural development as an income generating activity for small and middle income entrepreneurs (FAO, 1987).

2.4 Small Scale Enterprise

While working on some tree planting aspects in Njombe district, Kajembe *et al.* (1996), reported that pit sawing could absorb a number of school leavers who tend to migrate to towns and cities indicating that until then small scale sawmills were not operative in Iringa Region. In the late 1990s and early 2000, small scale sawmills were invited to operate in Sao Hill Forest Plantation. According to FAO, (1986) small scale sawmills are those with annual production capacity of under 6 000 m^3 per annum. The principle types of small sawmills are characterized by a circular heading, simple carriage, a two set edger and a diesel powered engine and have a log input not exceeding 5 000 m^3 per annum, and can employ 5 to 8 persons.

These sawmills are often an essential base for other forest based processing units which convert sawn lumber further into different end use products such as furniture. Kowero (1980) found that the introduced mobile sawmills in Tanzania proved to be financially and

economically profitable in the state of unstable economy. Mobile sawmills provide other benefits such as employment and serve to distribute wealth in rural areas of the country and should be adopted by the private and public sector.

In the Dominican republic, in order to prevent over exploitation of the forest for quick revenue, the law require forest owners to obtain a special permit for harvesting the forest and permits are issued only if proper forest management plan exists (FAO, 1987).

Jaakopoyry (1992) reported that wood industries have less environmental impact than pulp and paper mills because there is no water utilization or major source of emissions. Small scale enterprises and private woodlots are valuable tools for rural population in developing countries to earn income and gainful employment. FAO, (1986) reported that in Honduras small scale sawmilling provided employment of between 20% and 30% of the total rural labor force and total rural cash income derived from small scale operators ranged from 20% to 70 %.

Small scale enterprises have an important role in developing other sectors such as agriculture, animal husbandry, fisheries, forestry, industries, and in some countries they form the basis of livelihood for most of the population and they have been designed to meet demand of the local market. Small scale enterprises play an important role in transport, processing, marketing of wood products and non wood products. Increasingly, even wood production is now moving into the domains of small holders (Nair, 2007).

Future development of small scale enterprises and the relevance to various interventions should be gauged carefully as they remain a vibrant segment of most economies. Not withstanding the efforts to provide an identity based on criteria such as size of land

holding, and capital invested, small scale enterprises comprises of highly heterogeneous activities. They produce a variety of products and services using diverse technology and meet the demand for different markets. Hence, increased attention to their development largely stems from their role in enhancing income, employment, production of basic goods, services, and poverty alleviation (FAO, 2005).

2.5 Income Generation

Like in many other natural resources, forest products and services can offer development opportunities to the rural poor. Small and medium forest enterprises (SMFE) make up a significant proportion of those opportunities. Rough extrapolation from existing information suggests that about 80% – 90 % of forestry enterprises are SMFE. In many countries, over 50% of the forest sector employment is in the SMFE and this implies that 20 million people world wide being employed. This activity generates an estimate of over 130 billion USD worldwide per year of gross value added produced by small and medium forest enterprises (Duncan, 2006). It is reported by Seppo (1993) that the opportunity cost for labor in Tanzania is low and tree growing is not a profitable alternative in cases where family members can carry the produce from the public forest. On the other hand he noted that the opportunity cost for land is high because of increasing demand of food, making tree growing unprofitable. Due to lack of adequate data it is difficult to conclude and draw any conclusions on the profitability of forest operation generally at the level of operative economic units.

However, FAO (2002) emphasizes that access to information is important as most of the informal sector operates with imperfect information. This is so especially when products are traded on distant markets involving a network of intermediaries. Thus there is considerable scope for using improved technology to provide information on markets and

prices. This will minimize exploitation by intermediaries, thereby increasing interest of the producers in tree growing and managing the resources. It has been reported from other studies carried out in the Southern highlands of Tanzania that forestry was second to agriculture as an income earner for individual households, and the income of those with woodlots was much higher than for those household that own less than 1 hectare of woodlot (Munishi *et al.,* 2004). This depicts how important smallholder family's forestry could be in some areas in Tanzania especially as it relates to livelihood asset and income related poverty alleviation. Munishi *et al*, (2005) showed that based on the potential revenue accrued from the management of one hectare of trees in a farm forestry settings, tree production is a profitable venture with a positive net present value (NPV) equal to 33 961.40 Tanzanian shillings per hectare, relatively higher internal rate of return (IRR) of 13 %, and benefit cost ratio (BCR) of 1.36. All showing that tree planting investment is a worthwhile undertaking and profitable. The average woodlot size was found to be composed of 400 trees per hectare, and a farmer could earn up to 385 500 Tanzanian shillings per annum from sale of trees after a 12 year rotation period.

2.6 Policy, Legal and Institutional Arrangement

2.6.1 National Forest Policy 1998

The overall goal of the National Forest Policy of 1998 is to enhance the contribution of the Forest sector in sustainable development of Tanzania, conservation and management of her natural resources for the benefit of present and future generations. Its associated objective is to ensure sustainable supply of forest produce and services by maintaining a sufficient forest area under effective management. In practice this means that forests have to be managed in terms of socio – economic, ecological and cultural sustainability or in other words, in accordance with the principles of multi functionality and equitable benefits responsibility sharing. The National Forest Policy of 1998 contains a number of statements

in support of the private woodlot. For example Policy statement number 5 states *To enable sustainable management of forest on public lands, clear ownership for all forests and trees on those lands will be defined*. "*The allocation of forests and their management responsibility to villages, private individuals or to government will be promoted. Central, local and village government may dermacate and establish forests reserves"*.

Policy statement number 7 states that "*Private and forestry activities will be supported through harmonized extension services and financial incentives. The extension package and incentive will be designed in a gender sensitive manner."* Policy statement number 9 states to "*Establishment of private woodlots and plantation for wood fuel production will be encouraged and supported through research, extension services and financial incentives"*.

Policy statement number 39 which states, "*Local communities will be encouraged to participate in forestry activities. Clearly defined forest land and tree tenure rights will be instituted for local communities, including both men and women"* (MNRT, 1998b).

The Policy also recognizes the role of the private sector in management of forest resources. In this new policy, the responsibility of management of forest resources in future will be left in the hands of specialized agencies and the private sector, with the central government responsibility vested in management of forest reserves of national strategic importance (MNRT, 1998b).

The policy also has described the roles and responsibility of the private sector on various areas eg. In forest land management, it will be involved in conservation and management of village forest reserves and trees on farms, production of subsistence forest products, fuel wood and poles. Farmer to farmer advice, employment in forest management and

formulation of village by laws. In the area of forestry industry and products, the private sector will be charged with subsistence and commercial production and employment in forest based industry. In the area of ecosystem conservation and management the sector is charged with conservation and management of all village forest reserves and trees on farms. Implementation of the private woodlot development will not only be promoted by the National Forest Policy, but will also be influenced by Local Government Reform (1998), the Agriculture policy of 1997, the Energy Policy of Tanzania 1992, Land Policy of 1995, and the National Environmental Policy of 1997. For example, in the Energy Policy of Tanzania one of the overall goals is "*to arrest wood fuel depletion by evolving more appropriate land management practices and more efficient wood fuel technologies. It directs that households and villages will be encouraged to establish homestead woodlots"* (URT, 1992*).*

2.6.2 Legal and Institutional arrangements

Legal arrangements in support of private woodlots in Tanzania is revealed in the Forest act No. 14 of 2002, The Forest Act No. 14 of 2002 supports private woodlots as it categorizes national, local authority, village and private forest lands and makes full provision for the actors in each of these categories to declare forest reserves. FBD is not responsible for implementing the private woodlots activities. District councils have a crictial role to play in facilitating planning, implementation of forest management activities woodlots inclusive. District councils will provide technical assistance and capacity building for implementing woodlots activities on the ground. Through the local government reform programme, the district councils will be able to increase their capability in support of woodlot activities. Village councils perform executive and legislative powers together with other responsibilities and duties, including woodlots management (MNRT, 2002).

2.6.3 Current status of private forestry and industry in Tanzania

The national forestry policy (1998) and the forest Act (2002) formulated recognizes the need for creating an enabling environment for a strong Private sector. Currently investors in forestry industry source their raw materials from the government plantations as well as from individual and community woodlots. Today there are several small scale woodlots and medium sized plantations owned by smallholders, communities, districts, private companies, schools and faith based organizations estimated at 120 000 – 150 000 hectares. The woodlots are composed of all age class, but 20 years as a maximum. The sizes of the woodlots are estimated to range from 0.01 – 2 000 hectares. However, small scale tree farmers /woodlot owners cut their trees very prematurely due to acute cash crisis and poverty they face (Msemo 2008).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Overview

This chapter describes the methodology used for acquiring and analyzing data relevant to this study. The chapter includes a description of the study area, research design, sampling procedure, methods of data collection and analysis.

3.2 Description of the Study Area

3.2.1 Location of Mufindi district, climate and topography

This study was conducted in Mufindi district in Iringa region in the Southern Highlands of Tanzania. It is one of the seven districts in the region, and, it is located 30^0- 36^0 longitudes east and latitudes 8^0-9^0 south. It is bordered by Njombe district to the south, Mbarali district to the west, Iringa rural district to the north, to the east lies Kilolo district and Kilombero district in Morogoro Region. The district covers an area of 7 122 square kilometers (Fig.1). About 64 100 hectares are forest reserves and catchment forest. 62 748 hectares are plantations, 169 150 hectares are under cultivation, 38 910 hectares are not suitable for anything, and the remaining 376 286 hectares used as residential, grazing land, open space, and leased land. The altitude of the district varies from 800 to 2 200 meters above sea level. It is particularly known for its tea and now forest plantations.

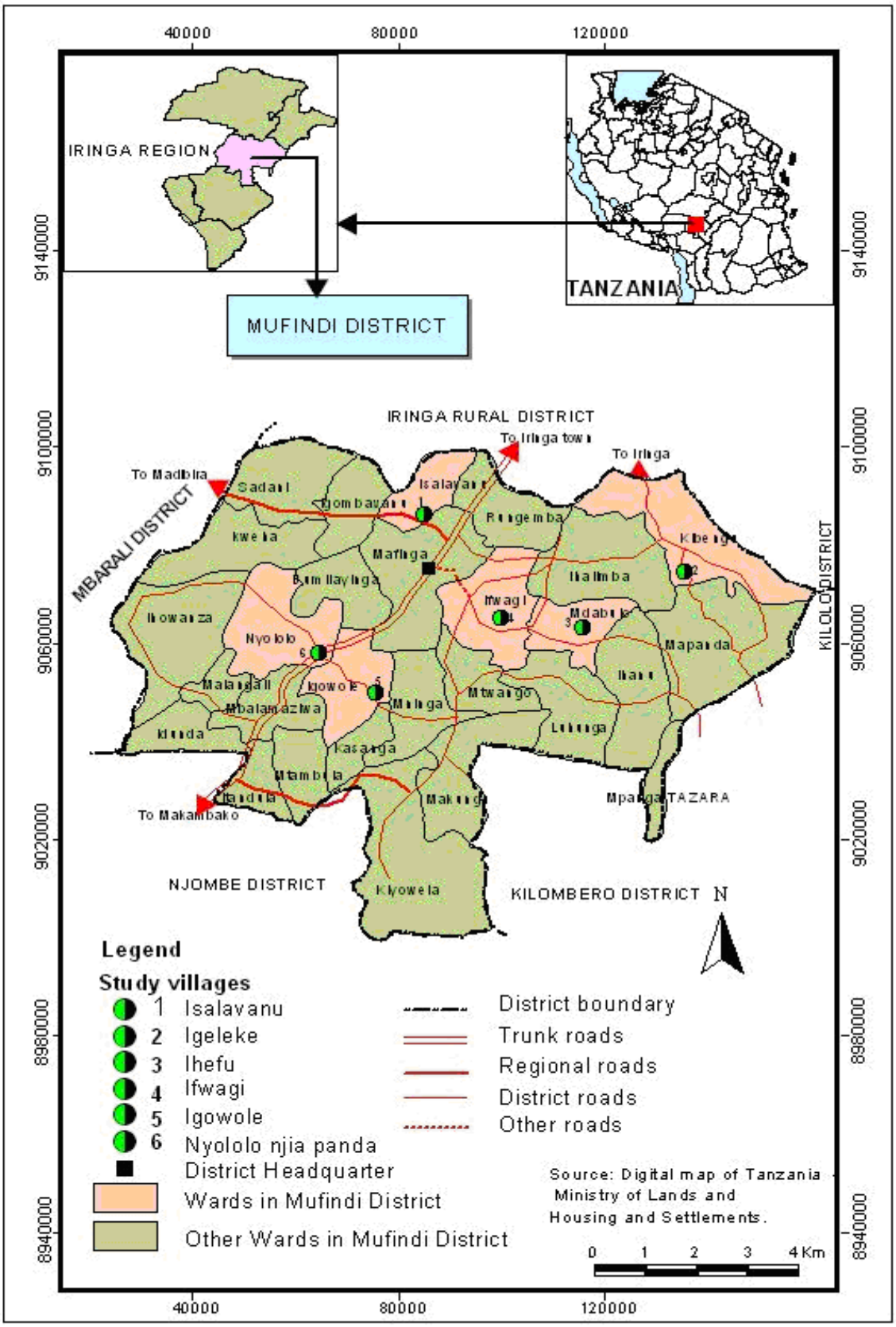


Figure 1: Map of Mufindi Diistrict showing study villages

3.2.1.1 Climate

The district is generally mountainous with one of the coolest and rainiest climate in Tanzania. The climate of the district varies with altitude which can be distinguished as highland and lowland. The temperatures vary from 13.2 degrees Celsius in July to mean monthly maximum of 18.4 degrees Celsius in November. The rainfall pattern of Mufindi district is unimodal with a single and long rain season from November to April and contracting dry season from May to October. Rainfall ranges from 950 mm.-1 600 mm (URT, 2006).

3.2.1.2 Economy

The economy of the district depends mainly on subsistence agriculture which employs more than 90% of the population and provides more than 85% of people's income (URT, 2006). The other activities of economic importance are livestock keeping and forestry. Both livestock keeping and agriculture are undertaken traditionally with low productivity levels. Large multinationals are engaged in tea production and contribute greatly to the district GDP which was estimated at TShs. 190 000 in 2004. Other cash crops include tobacco, tea, sunflower, pyrethrum, and coffee. Wood related manufacturing industries have sprung up, and the most important ones being Mufindi paper mill, Sao hill industries, Mufindi wood pole plant and timber, and Duville wood works, and other small processing units (URT, 2006).

3.2.1.3 District administration area and demography

The Mufindi district is divided into five administrative divisions. The divisions include Ifwagi, Kibengu, Kasanga, Malangali and Sadani. This forms 28 wards and 132 villages. The district Population is estimated at 282 071 comprised mainly of Iringa residents, of which 106 403 are males and 122 495 are females. Also the population census showed that

the dependent group constituted 49% of the total population (NBS, 2002). Based on the 1988 – 2002 growth rate of 1.5 percent, the population of the district was estimated to be 286 334 in 2003 and 290 661 people in year 2004. By year 2007 the population is estimated to be 304,040 people. This implies a population density of about 43 people per square kilometer (URT, 2006). Again, this calls for intensive farming in order to feed the growing population and better means of managing the environment to avoid its degradation. The ethnic groups are the Hehe, who constitute 85%, other ethnic groups constitutes the remaining 15% who migrated into the district from other parts of the country (URT, 2006).

3.2.1.4 Forest resource

Mufindi district has a large area of forest reserves and many resources are obtained from them. Forest reserves cover an area of 64 106 hectares among which 47 416 are forest reserves and 16 690 hectares are catchment forests. The forest reserves cover a portion of the Eastern Arc Mountains in Tanzania that are scenic and reknown internationally for their diversity and endemic species of flora and fauna. There are about 80 000 hectares which are under miombo woodlands on the lower western side of the district. Grassland covers about 35 610 hectares. The district has a programme of planting trees annually where, by, year 2005 a total of 23 000 000 trees had been planted, forming part of the private wood lot development. Therefore, the source of wood supply in the district in terms of acreage effective 2008 was 66 748 hectares.

3.3 Research Design

Data for this study was collected by using a cross sectional design, whereby a questionnaire was administered. In a cross sectional design, data are collected at a single point in time without repetition from a sample selected to represent some large population

(Kothari, 2008). This design is considered useful for descriptive purposes and determination of relationship between variables (Oliver, 2006). This design was preferred because it is economical in terms of fund and time.

3.3.1 Questionnaire

The questionnaire for this study was designed as structured and semi structured with both open and close ended questions. The questions in the questionnaires were structured such that they permit acquisition of quantitative and qualitative information. Reliability of the data was checked by asking the respondents detailed information about the issue in question and also asking the same question in different ways. Then the answers were compared.

The information collected included social economic data such as occupation, education, household size and acreage owned .Other information was on number of trees planted, number of trees sold, capital assets acquisition, prices, market and constraints. The questionnaires were designed in English and later translated to Swahili.

3.3.2 Pre testing

According to Kothari (2008), detail surveys are an essential part of research after reconnaissance survey. Prior to the actual surveys, the questionnaires were tested. Pre testing of the questionnaire was done under field conditions using a random selected sample of 12 households from one village, who were not part of the final sample and these were interviewed. The aim of this exercise as pointed out by Kajembe *et. al.* (1996) was to check the validity and reliability of the questions. Then the initial draft of the questionnaire was modified to fit the conditions based on the pre test results.

3.4 Sampling Procedure

3.4.1 Sampling

The population of this study consisted of woodlot owners, and traders of forest products in Mufindi district. The population in Mufindi is organized into 5 divisions 28 wards and 132 villages. The study was conducted in the five divisions of the District. It is from these divisions where woodlots are found. Purposefully procedure was employed to select 6 six wards where private woodlots activities are active. In each ward, one village was randomly selected to form a representation of the respective administrative area. Therefore, a total sample of 6 villages was taken as indicated in Table 1 corresponding to about 6% of the villages in the district

The sampling units were the households in the selected villages, who were obtained from a list of people owning woodlots prepared in collaboration with the respective government village leaders. This formed the sampling frame from which a simple random sampling technique was used in selecting the households. The woodlot owners selected were the representative samples of woodlot growers in the district from which data were collected through interviews. In addition, extension workers, traders, and key informants were interviewed.

3.4.2 Sample Size

According to Kothari (2008), a random sample should at least contain 5 percent of the total households to be represented. A simple random selection of two hundred seventy (270) household was made from the sampling frame, representing at least 30% of the total number of households in the selected villages (Table 1).

Table 1: Total number of households owning woodlots and percentage of sampled households

Name of village	Total number of households owning woodlots	Number of sampled households	Percent of sampled households
Isalavanu	54	16	30.0
Nyololo njia panda	44	13	30.0
Igowole	166	45	30.0
Igeleke	152	39	30.0
Ifwagi	210	69	30.0
Ihefu	269	80	30.0
Total	**900**	**270**	**30.0**

3.5 Data Collection

3.5.1 Data requirement and source

Both primary and secondary data were required for this study

3.5.2 Primary data

The primary data was collected through interviews using a questionnaire which was the main tool in acquiring the data from households and traders. A checklist was used for the key informants. This was done by the researcher and field assistants.

In conducting interviews assistance was sought for Research assistants from the District natural resources office in Mafinga who were then trained, The Research assistants were conversant with the most important local language of *Hehe* spoken by the dominant ethnic group in the study area and as well understood the area. Researcher's personal observations and informal discussion with key informants were also conducted for the purpose of enriching and corroborating the findings. The questionnaires was divided into two main portions namely woodlot owners and traders. Respondents were asked a

question and given ample time to think and give explanation on issues asked. After the interview efforts were made to visit the household woodlots.

3.5.3 Focused Group Discussion (FGD)

Probe questions were used to guide collection of data from discussants that are knowledgeable about woodlots and value added activities in villages studied. Six (6) focused group discussion (one at each village) were conducted in order to complement, supplement, and as such evaluate the accuracy of data collected from the interviews and the questionnaire. These groups were formed with the assistance of two village government leaders after narrating to them the qualities of persons sought for the FGD. The qualities for were that the group should be composed of elders who know the history of the village, male or female, a woodlot owner who have long experience, sub village leader, cell leader and traders. Each group was comprised of 10 participants and was gender sensitive.

3.5.4 Key informants

Discussion with key informants involved, Natural resource officers at various administrative levels, Community development officers, Village government leaders and any other informed person about woodlots and small scale sawmilling. The group discussion concentrated on contribution of woodlots to household income and impact on other land based activities that influenced household earnings. Information collected included establishment rate, cutting rate, markets and prices.

3.5.4 Participant observation

Participant observation as the name implies is distinguished by the fact that the observer him/herself becomes part of the situation he or she is studying and collects information by simply observing what is going on in the area. According to Katani, (1999) much

information can be obtained simply by observing what goes on. This method was used to check information from the survey especially from those aspects concerning village life which most villages would avoid to discuss openly in an interview e.g. backyard nurseries, household asset and areas harvested. Curiosity, willingness to learn from the other people and ability to adapt to their rhythm and life style were the main tools.

3.5.5 Field surveys

A simple survey of woodlots was carried out to asses the spread of the woodlots in the study area using causal observation. The survey gave a general picture indicating the availability of the woodlots in relation to the responses from the interviewee. The survey was conducted with the help of the informants and it was based on number of stems, spacing and species, this information was recorded.

3.5.6 Market survey

Market survey was conducted to establish market outlets, prices, demand and average amounts being bought and utilized for different purposes so as to estimate the value of the products in monetary terms. This was carried out at trade centers located in the selected villages and impregnation plants in the district. The prices collected helped calculate the contribution of woodlots to the economy. During the survey, traders were interviewed to discuss the market constraints and opportunity tenable in the district and elsewhere.

3.5.7 Secondary data

Primary data was complemented by secondary data, which were obtained from reports and other documents from relevant institutions at the district level. Secondary data (whether published or unpublished) was sought from various sources inclusive, natural resources officers at district level, extension officers at divisional and ward level, district planning

office, district trade office, village office, non government organizations and documented information in libraries, internet websites. Key informants such as government institutions were interviewed and consulted to gather secondary information to complement the primary data. From Sao hill Forest Plantation, data was obtained of wood supply from plantation, From SNAL data on woodlots from other countries was retrieved, and The DNRO office provided information on the description of the study area and actual revenue collection.

3.5.8 Estimation of actual and potential revenue to the district

Potential revenue was calculated from the demand of wood supply shown by the traders and traded for the years under study. The rates used are those applied by the Sao Hill Forest plantation in the respective diameter classes and according to the Government General Notice Number 231 of November 2007. For the transmission poles, the total demand was multiplied by the average volume per pole to obtain the total volume. The transmission poles traded are between 22 to 35 cm, bottom diameter, the rate chargeable per cubic meter Tshs. 22 000 was then multiplied by the total volume. The 5 percent as cess was calculated to get the potential revenue for the district derived from transmission poles. In finding the potential revenue for sawn wood, the total number of trees consumed was found from the traders. The total number of trees was divided by 1111 which is the number of trees for the conventional hectare planted at the spacing of 3 x 3 m. The number of hectares obtained was multiplied by the maximum volume of 350 m^3 which is the stipulated production per hectare at the mentioned spacing and harvesting age of 13 years. Total volume found was multiplied by the rates chargeable for the Sao Hill forest plantation traders that of Tshs. 2000 per cubic meter as the diameter of trees are unlikely to exceed 20 cm. Then 5 percent of total amount chargeable as cess was calculated to get the expected revenue from the sample. The sample data was then translated to village level,

and then in order to get the potential revenue this figure obtained for villages studied was extrapolated to include all the 132 villages in the district to enable obtain revenue to be collected as potential revenue by the Mufindi district. This was made on the assumption that the factors which have produced the existing situation will hold over time and space. The actual revenue collected was obtained directly from the records kept in the District Natural Resources Office. The actual revenue was then compared to the potential revenue to enable get the percentage in order to gauge the performance.

3.5.9 Estimation of timber volumes supplied from woodlots

Timber volumes harvested from woodlots was estimated by finding the total number of trees which were legible to be sold in the respective years (primary source data). The total number of trees was then divided by 1111 trees pre hectare based on the spacing of 3m x 3m which was adopted by many woodlot owners. This figure was then multiplied by 350 m^3 per hectare which is the maximum volume production per hectare at 13 years rotation for the *pinus patula* which is inline with results obtained by Malimbwi *et al*. (2001). This gave the total volume of harvested softwood in the respective year from the sample. The sample figure was augmented to villages studied. The figure obtained in this way was extrapolated to cover all the 132 villages in the district to enable get the timber supply in the respective year. The volume obtained from woodlots was added up with volumes obtained from Sao Hill forest plantation for the respective years to get total timber supply in the district. The contribution of the woodlots was found by dividing the woodlots share with the total supply and multiplying by 100 to get the corresponding percentage share of timber supply in the district.

3.5.10 Estimation of Employment

To measure the employment opportunities created by woodlot establishment, employment was looked at farm level where core activities e.g. land preparation, planting, weeding, pruning, and protection were considered at farm level. Total number of persons required to accomplish the task was found basing on male adult of 15 to 64 years of age (Norman 1973). The area for woodlots was recorded in acres and later converted into hectares taking 1(one) hectare equivalent to 2.5 acres Total number of persons used for establishment were found and then divided by the number of hectares established to derive number of persons per hectare. Part time and fulltime created employment opportunities were obtained directly from the processing units (primary source data). These are the number of persons who were mentioned as engaged during the study period. Also core activities were considered e.g. felling, skidding, transportation, sorting, and processing. Weighted average for the number of persons employed was calculated at farm level to find employment per hectare and at the processing units.

3.5.11 Estimation of price per cubic meter

Average prices of sawn wood at various locations were estimated from conversion of price per cubic foot to cubic meter of the commonly produced sizes. The conversion was 1 m^3 equivalent to 35 $ft.^3$ Average prices for transmission poles were obtained as they are sold per piece.

3.6 Data Processing and Analysis

The record of each interview was inspected for its accuracy immediately after it was completed and before moving to another village. This was to make sure that the questionnaire was filled accurately and complete. Data obtained from the questionnaire was coded to allow entry in computer software. The data was systematically analyzed

using the statistical package for social science programme version 12.11 and Excel programme to generate descriptive statistics such as frequencies, percentage, arithmetic means, histograms, pie charts and tables were used to obtain variability of the variables. Weighted averages were calculated for tree prices, income, woodlot size and total acreage owned and employment with the following formula

$$\overline{X}\ \text{w} = \frac{\sum_{i=1}^{n} X_i W_i}{\sum_{i=1}^{n} W_i}$$

Where

$\overline{X}$ w = weighted mean

X_i = average of the data set

W_i = weight (data set)

In this case data elements with high weight or frequencies contribute more to the weighted mean than do elements with low weight or frequencies. The weights must not be negative; some may be zero but not all of them.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the results and discussion on the characteristics of respondents including, age, occupation, gender, residence, and, household composition. The second section discusses land issues pertaining to the acquisition tenable in the study area. Third section discusses about woodlot establishment and number of persons required to establish the same. The fourth section examines revenue accrued from sale of woodlot products, prices, and trends of timber supply coupled with acquisition of capital assets. Also, it examines the tree utilization rate and tree establishment rates.

The fifth section examines production from woodlots in comparison to the government plantation. The sixth section examines employment in value added units and related actual and potential revenue for the district accrued from private woodlots products.

4.1 Characteristics of Woodlot Owners

The household characteristics of the woodlots owners in the villages surveyed are as summarized in Table 2.

Table 2: Household characteristics of woodlots owners in Mufindi district

Household characteristics		Woodlots owners	Percent	Total
Gender	Male	232	(85.9)	270 (100%)
	Female	38	(14.1)	
Marital status	Married	239	(85.50	270 (100%)
	Single	16	(5.9)	
	Widowed	12	(4.4)	
	Divorced	3	(1.1)	
Age	15-30	57	(21.1)	270 (100%)
	31-45	114	(42.2)	
	46-60	75	(27.8)	
	>60	24	(8.9)	
Education	No formal education	15	(5.6)	270 (100%)
	Primary school	219	(81.1)	
	Secondary school	24	(8.9)	
	Tertiary	12	(4.4)	
Occupation	Farmers	230	(87.0)	270 (100%)
	Workers	28	(10.0)	
	Retired	4	(1.5)	
	Students	2	(0.7)	
	Others	2	(0.7)	

Note: Figures in bracket represent percentage of respondents and outside represent frequency of respondents

4.1.1 Respondents gender and marital status

The results show that the households were mostly (86%) male headed and a few (14%) female headed households implying that the results of the survey have inputs from both types of Gender. The respondents were highly skewed on gender as 86 percent of the respondents were male and only 14 percent were female (Table 2).The pattern was largely due to the fact that traditionally most of the households are headed by men. The female headed household had elderly, divorced, widowed women, and polygamous families. This trend of female owning woodlots is a sign of cultural change, where by male patriarchy is losing dominance in the face of external forces carved in the principle of power with responsibility and economic realities of life (Yaro, 2006). The other reason for this

phenomenon could be attributed to the aspect of emancipation of women especially over the last 20-30 years or so, with more women attending schools and being employed before marriage (Quizumbing *et al.*, 2009).

Most of the respondents (89 %) were married while 6 percent were singles, 4 percent widowed and only 1 percent divorced (Table 2). The high marriage percentage can be explained by the fact that in rural Tanzania most men and women marry once they have completed their primary school education (Gonzalez, 2003). NBS (1992) also reported that households headed by two persons in rural areas in Tanzania mainland had time to engage in extra economically productive activities for earning extra income for their children and running their households. This could influence the woodlot establishment in the study area positively as it is part of the agricultural system. In other studies in western Kenya it was observed that the average number of trees planted was significantly higher for male headed households, also women with husbands away from home had more trees on the farm in comparison with women with husbands at home, it was explained that perhaps women had greater autonomy for farm management with husbands away or greater need for the supplemental income provided by trees (Sarah, 1994).

4.1.2 Age

Age of woodlots owners was grouped into four age classes of 15 years interval to facilitate the data analysis. The ages of the respondents ranged from 15 to 80 years, Out of these respondents, 42.2% were between 31 and 45 years, 27.8% were between 46 and 60 years, 21.1% were between 15 and 30 years, and finally 8.9 percent were above 60 years (Table 2). The results show that more than half (63%) of the woodlot owners are young people between the age 15 to 45 years which is the prime and most energetic age class. Also, it is reflecting the level of awareness among young people on tree planting which is

a good sign for tree planting development Less than one third of the woodlot owners were between the age of 46 and 60 years (Table 2). Generally we can therefore say that almost all woodlot owners are within the economically productive age range (NBS, 2004) hence useful for woodlot establishment and management.

4.1.3 Respondents education levels

The results revealed that 81% of the woodlot owners had primary school education, as opposed to 6 percent who were without any formal education. Only 9 percent had secondary education, while, 4 percent had tertiary education (Table 2). High percentage of people with primary, secondary, and tertiary education indicated that woodlot owners are relatively knowledgeable and that could influenced appreciation of the value of trees hence establishment of woodlots. Also they stand a good chance to adopt new technologies in the establishment of woodlots, processing and utilization of its products because they are equipped with formal knowledge and skills (Kajembe, *et al.*, 1996; UNDP 1991).

4.1.4 Respondents main occupation

The occupation of the respondents were divided into five categories namely, farmer, worker, retired, student, and others. The results revealed that a majority of the respondents, (87%) were engaged in farming as a full time activity, while 10 percent were engaged in employment, about one percent was composed of retired employees, and nearly one percent was composed of students, and others respectively (Table 2). These results indicate that, a good number of the respondents practiced farming as their main economic activity. This could partly explain why they are engaged in woodlots establishment in the study area.

4.1.5 Household family size

Nearly half of the households (41%) had 5 to 8 children, while 31.5% had between 1 -4 children and 27.8% had more than 8 children (Table 3).

Table 3: Summary of the family household's size

	Frequency	Percent
No. of persons		
0-4	85	31.5
5-8	110	40.7
>8	75	27.8
Total	**270**	**100**

Average household size in the study area revealed by this study was 5.1 persons per household. This figure compared well to the national and district average household size which was estimated at 5.1 persons per household in the rural areas while Mufindi district was estimated at 5.3 according to the National population and housing census (URT, 2002). However, studies elsewhere in Tanzania rural communities showed that household's size between 2 – 10 could cultivate big areas of agricultural crops in comparison to household's size of 1 or greater than 10 (NBS,1992). As such, labour availability for social economic activity depends amongst other factors on the number of members available in the household; the higher the household size the higher the labour availability for development of the resources (Makawia, 2003).

4.1.6 Housing condition

The information on the housing conditions is useful as it reflects the household socio economic status. Results from the study indicated that 55% of the respondent's house walls were of burnt bricks, followed by 40.7% made of mud bricks, and only 2.6 percent made of mud walls (Table 4). Also, the results indicated that, 56.3% of the respondent's houses were of mud floors, while 41.5% of the houses floors were cemented. Almost 72% of the respondents lived in houses roofed with corrugated iron sheets, while 24.4% lived in

thatched houses and 1.9 percent lived in tiled houses (Table 4). This state can partly be explained by the previous campaigns on building modern houses. Moreover it was mentioned during the focused group discussion that young men are not prepared to build thatched houses as the material for building modern houses are readily available. Furthermore, the household budget survey carried out in 2007 showed that the distribution of households in the rural areas according to construction material was as follows. Floors made of earth were 83.1%, cement 15.6%, others 0.9% percent. Walls made of poles 16.9%, mud only 22.0%, mud bricks 26.4%, mud and stones 22.0%, burnt bricks 18.8%. Concrete 3.1% percent and others 0.9% percent House roof made of grass 48.2%, corrugated iron sheets 41.8%, others 0.6% percent, asbestos 0.2% percent, tiles and cement 0.0% percent NBS (2008). These results imply that there is an improvement in the living standard of the woodlot owners in Mufindi district which can presumably be attributed to tree growing.

Table 4: Summary of type of housing materials of woodlot owners in Mufindi District

Variable	Frequency	Percent
Wall		
No response	5	1.9
Burnt bricks	148	54.8
earth	7	2.6
Unburnt bricks	110	40.7
Floor		
No response	5	1.9
Cement	112	41.5
Earth	153	56.7
Roofing		
No response	5	1.9
Iron sheet	194	71.9
Thatched	66	24.4
Tiles	5	1.9
Total	**270**	**100**

In other earlier findings by Kamuzora *et al*. (2000). Based on the earlier housing budget surveys reported that nearly two thirds of Tanzania rural households lived in poor housing of earth//mud//thatch, this could probably be attributed to geographical location and time of the study. Similarly household budget survey (URT 2000) showed that houses built using industrially produced materials such as cement, corrugated iron sheet and roofing tiles were 13% for floors, 17% for walls and only 31% for roofs in the rural areas in Tanzania for the year 2000 as cited by (Mosha, 2006).

4.1.7 Capital assets acquired by woodlot owners through tree sales

About 16% of the respondents had acquired houses and bicycles and 16.3% had acquired houses and planted new areas through sale of trees. Also 7.4 percent of the respondents had acquired machinery.

Table 5: Summary of responses on capital assets acquired through sale of trees

Variable	Frequency	Percent

Asset acquired		
Acquired nothing	142	52.6
House, bicycle	43	15.9
House, planted new area	44	16.3
Livestock	4	1.5
Machinery	20	7.4
Planted new area	17	6.3
Total	**270**	**100**

The acquisition of machinery was limited to a few respondents due to the fact that these items are expensive to buy and maintain. Furthermore sale of trees had enabled 6.3 percent of the respondents to plant new areas, while 1.5 percent of the respondents had acquired livestock (Table 5). About 53% of the respondents had acquired nothing as their woodlots were still immature. Similary, URT (2006) in its analytical report found out that 33.5% of Tanzania mainland population owned bicycles. It has been observed in other areas that when poor people have access to cash, they usually tend to invest in livestock which gain value through reproduction (IFPRI, 2002; (cited by Sanginga,(2006). Therefore the household development in the surveyed area depended to some extent on the woodlots establishment. It should be taken that the woodlot industry is one of the source of income, and saving from woodlots enabled households to establish other businesses. Probably woodlot growing can take a leading role in the Mufindi economy.

4.2 Land

4.2.1 Ownership

The survey showed that total land owned by woodlot owners varied greatly between households. The findings summarized in Table 6 revealed that 29.6% of the respondents owned land between 0.4 – 4 hectares, 29.6% owned between 4.4 -8 hectares, 9.3 percent of the respondents owned land between 12.4-16 hectares, and the same percentage for category of 16.4-20 hectares, while 12.2% owned land greater than 20 hectares (Table 6). The average land owned per woodlot owner was about 6.80 hectares. Woodlot owners have big land holdings and there is room for expansion of woodlots. This compares well

with the findings of Mandalo (2006), who found out that the average land holding in Lindi rural district was between 3 to 8 hectares. Another study by Semra (2005) in Babati district reported that 98% of the Tanzanian rural households own some land and the average size land for the household was about 2.4 hectares in the district, and concluded that there was no shortage of land, a factor which is closely linked to poverty in many developing agrarian countries.

Table 6: Total land owned (ha) by woodlot owners in Mufindi district (hectares)

Variable	Frequency	Percent
Land size (Ha)		
0.4 - 4	80	29.6
4.4 - 8	80	29.6
8.4 - 12	27	10.0
12.4 - 16	25	9.3
16.4 - 20	25	9.3
>20	33	12.2
Acquisition mode		
Buying	43	15.9
Inheritance	141	52.2
Inheritance and buying	46	17.0
Inheritance and village allocation	27	10.0
Inheritance, village allocation and buying	7	2.6
Village allocation and buying	6	2.2
Need more land		
Buying	234	86.7
Lease	1	0.4
No need	19	7.0
None	2	0.7
Village	14	5.2
Total	**270**	**100**

4.2.2 Land acquisitions

The survey showed that 52% of the woodlot owners obtained land by inheritance as a family property. About 17% acquired land through inheritance and buying, 16% acquired land through buying, 10% acquired land through village allocation and inheritance, 2.6 percent acquired it through inheritance, village allocation and buying, and the last 2.2 percent of the respondents acquired land through village allocation and buying. When the woodlot owners were asked if they needed more land what were the options available, most of the respondents (86.7%) indicated that more land could be acquired through buying from other households in the village, 5.2 percent indicated that they would apply to the village government, and 7.7 percent indicated that they didn't need more land. This means that land ownership can be an important factor for someone to engage in woodlot establishment as shown by most of the woodlot owners. It was reported earlier by gender

that 14% of female owned land in the study area (Table 2). This is not a common phenomenon observed else where in Africa or developing nations as women face barriers in acquiring land due to patriarchal process of asset ownership. For example in Ghana women rarely own farmland which is basically the most important assets families own. In Kenya, only 5 percent of the registered land holders nationally are women, while in Peru and Nicaragua women owned only 12.7% and 15.5% of all the farms respectively (Doss and Deere, 2006; (cited by Gina *et al.*, 2007).

4.2.3 Woodlot ownership

The respondents in the surveyed area owned woodlots ranging in size from 0.05 to 66 hectares (Table 7). According to the results, 28.1% of the respondents owned between 0 and 4 hectares, 22.6% owned between 4.4 and 8.4 hectares, 14.8% owned between 8.8 and 12.8 hectares, 15..2% owned between 13.2 and 17.2 hectares, 11.9% owned between 17.6 and 21.6 hectares, and, 7.4 percent owned more than 22 hectares (Table 7). The average land area per household across the surveyed area was 6.8 hectares as reported earlier, and the average land planted with woodlots in the surveyed area was about 2.6 hectares per woodlot owner which was about 36% of the total owned land area. It transpired during the focused group discussion that some nearby villages had planted nearly all the land they owned, consequently they were forced to seek land from neighboring villages for planting agricultural crops hence the caution of not reverting all the land to woodlots. Studies in Vihiga, Kenya showed that woodlots occupied 25% of the household land, while in the Philippines it showed that woodlots occupied 31% of total household land owned (Arnold 1991). This implies that land in this context gives more opportunity for expanding the woodlots.

4.3 Woodlot Establishment Trends in the Study Area

More than half of the respondents (57.4%) stated that they had been growing trees for the past 10 years, while 42.2% of the respondents narrated that they had been planting trees for the past twenty years (Table 8). These observations correspond to the time when the community forest programme evolve in 1985, when president of Tanzania, Alli Hassan Mwinyi, made an inaugural speech which stressed the importance of tree growing, and, at the same time the new party chairman by then Mwalimu Nyerere spoke on the radio about the country's tree loss, advising every Tanzanian to plant at least five trees a year henceforth. This created awareness and people started to change from communal woodlot policy to individual tree planting which enticed the smallholder farmer into the arena of national economic production (Shanks, 1990).

4.3.1 Adoption of woodlot establishment

About 34.8% of the respondents had started establishing woodlots between 2001 and 2008, 34.4% started planting trees between 1991 and 2000, 20.7% of the respondents started planting trees between 1981 and 1990, 7.8% of the respondents had started growing trees between 1971 and 1980 while 2.2% of the respondents had started growing trees before 1970 (Table 7). The Sao hill forest plantation, Tea companies and Tanwat where people worked as casual labourers probably might have influenced the people to plant trees though on small scale.

The small percentage of respondents who adopted planting trees before year 1980 can be explained by the fact that, tree planting at the time was being emphasized on communal woodlot whereby farmers were not happy and in some places they uprooted or cutting the planted trees deliberately as reported by Lulandala (1983) as cited by Mercer (2004). Individual tree planting started to be encouraged in the mid1980, and hence the highest

percentage since then. It has also been noted that during the decade of 1981 to 1990 there has been a considerable development in non industrial plantation (NIPF) in the form of tree planting and agro forestry (FAO 1993). From studies on farmers behavior in adopting new technologies especially in low income countries it has been found out that it is influenced by a complex set of socio economic, demographic, technical, institutional and bio physical factors (Masangano, 1996).

Table 7: Woodlot sizes, and adoption of woodlot establishment in Mufindi district

Variable	Frequency	Percent
Woodlot size (hectares)		
0 - 4	76	28.1
4.4- 8.4	61	22.6
8.8 – 12.8	40	14.8
13.2 – 17.2	41	15.2
17.6 -21.6	32	11.9
>22	20	7.4
Land use change		
yes	165	61.2
no	103	38.1
Not available	2	0.7
Year of woodlot establishment		
<1970	6	2.2
1971-1980	21	7.8
1981-1990	56	20.7
1991-2000	93	34.4
2001-2010	94	34.8
Total	**270**	**100**

4.3.2 Responses on tree species planted

The results indicate that just over half of the respondents (53.3%) had planted *pinus patula*, while 43% had planted *pinus patula* and *Eucalyptus saligna* together (Figure 2). Furthermore, 2.6 percent of the respondents had planted *Eucalyptus saligna* while 1.1 percent of the respondents had planted a combination of *pinus patula* and *Eucalyptus maidenii* (Figure 2).

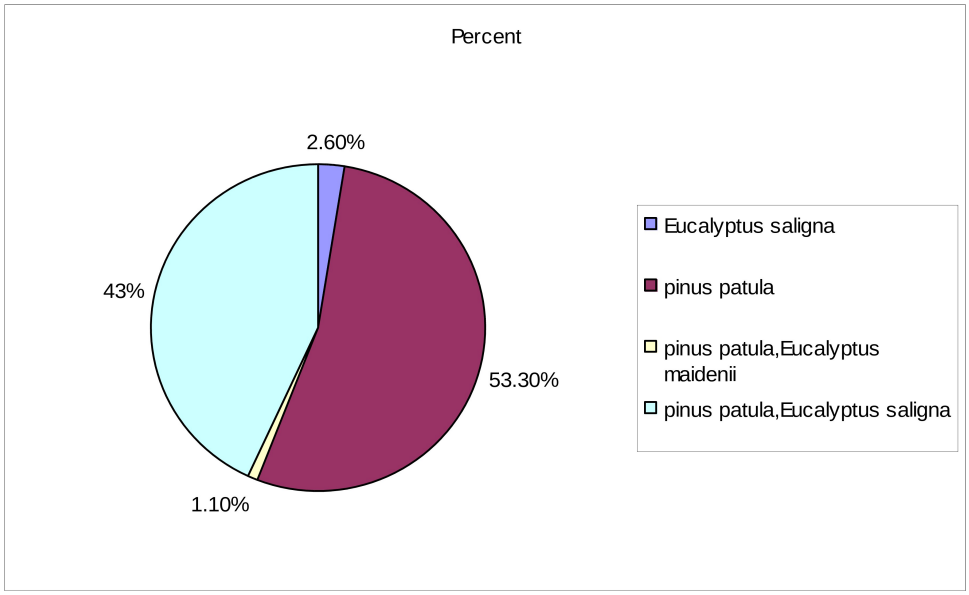


Figure 2: Proportion of tree species planted in the study area, Mufindi district

From the results it shows that pines occupied more than 90% of the area and Eucalyptus made less than 5% percent of the species composition planted by small holder farmers (Figure 2). It was reported during the focused group discussion that people preferred the pines because after harvesting could plant agricultural crops for three seasons unlike the Eucalyptus without using fertilizers. This observation is underscored by FAO (1989) which reported that one criticism of the Eucalyptus is that they may deplete nutrients on the site they grow. Also this situation might have been influence by the Sao Hill forest plantations where pines form almost 90%, *Eucalyptus Saligna* 9% percent being the main Eucalyptus species planted and Cypress 1% percent. Probably the high proportion of the

pines has been influenced by the plantation around or that the seeds of the species are readily available. It has been observed that even with adequate precipitation, optimal temperatures, and suitable soils, it is possible that other factors will influence the type of tree grown. This is well depicted by (Steiner, 1984; Dean *et al*., 1995, Katherine, 1997) that there may be economic concern such as commodity prices, social factors like consumer taste and preference, tradition or even political reasons. Also, price stability can determine the tree species choice that a farmer makes.

Studies in Uganda, have shown that wood farmers are interested in short term returns and therefore plant Eucalyptus trees to harvest small poles at 2 or 3 years old (Mwima *et al.*, 2004). The study further showed that there were quite few farmers who have plantation aimed at production of timber or electricity transmission poles, and until recently, most of the plantation timber was not recognized in the construction and furniture industry in Uganda.

4.3.3 Tree establishment and utilization rates

The number of trees planted in years 2007, 2008, and projection for year 2009 was established, and compared with the number of trees sold during the year 2007, 2008, and the expected number of trees to be sold in year 2009. The purpose of this comparison was to gauge the situation. Figure 3, shows that planting rate surpassed the cutting rate in all years, except for the projected amounts for year 2009, where the planting rate equaled the cutting rate. Comparison was based on the mean number of trees planted to the mean number of trees sold. This showed that there were more people getting involved in woodlot establishment or possibly the existing ones planted more areas. About 10 hectares were planted, while one hectare of trees was being cut in the respective years (Figure 3). Similar trends were observed in Uganda, where it was found out that in 1960 the

agricultural land contributed 35% of the tree cover, but this had risen to 58% by 1995 due to more trees on farms (Place and Otsuka, 1997).

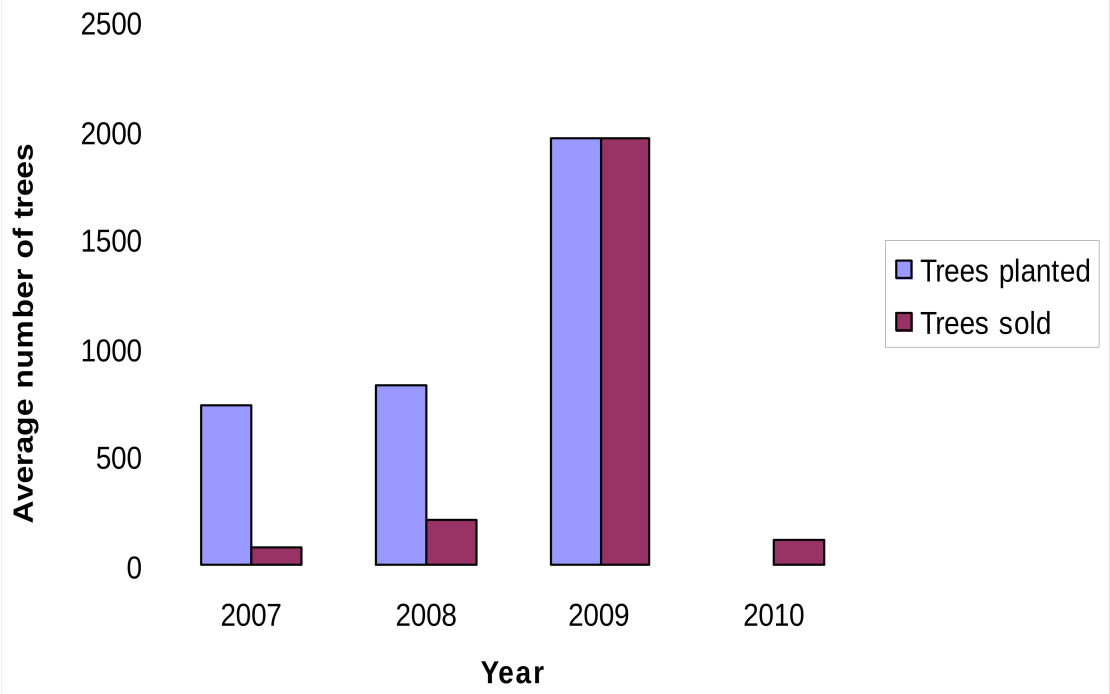


Figure 3: Comparison of the tree establishment and utilization rates

This observation is supported by one key informants who said that the tree planting rate had suddenly increased and pointed out that it would still increase greatly, cautioning that this trend would encroach on the agricultural crop land. Studies in China indicated that, there are about 1.8 billion eucalyptus trees planted on farms compared to only 0.95 billion trees in industrial plantations, while In Thailand and Vietnam, there were about 15 times more trees planted on farms than in large scale plantation (Harwood,1997). Furthermore, IPS (2009) argues that for African countries, heavily burdened by deforestation and struggling to climatic change, this situation could strengthen the demand for inclusion of agro forestry deal on reduction of emission from deforestation and degradation. Also, it is cautioned by FAO (2002) from experiences in Gujarat India, that when small scale tree production was developed and then expanded, other villagers, attracted by income, began

to turn out the same product, causing glut which lowered the price. This situation was followed up by a total collapse of the market.

4.3.4 The main reasons of planting trees

Almost all of the respondents (95.2%) in the villages surveyed planted trees for the purpose of business (earning money) as well as future investment (Table 8). The remaining 4.8 percent planted trees for construction, firewood, and farm boundary maintenance (Table 8). Income generation was the main production objective of farmers and this pointed to the need to pay greater attention to the market for woodlot products and other intermediary stages. It was mentioned during the focused group discussion that initially though they knew the art of planting trees as influenced by from settlers, government and private plantations, they were hesitant to plant trees as they thought could die before reaping the fruits. But now they have seen changes in life from their relatives who planted trees earlier and sold. Studies carried elsewhere in pilot sites in Malawi, Uganda, and Tanzania showed that small scale farmers are not always attracted by higher income returns (Sanginga *et al.*, 2004). Rather they use a range of economic and non economic criteria for selecting their existing crops and livestock for new markets, as well as new crops for new markets .Therefore woodlots can be viewed as a cash crop to the owners. This was indicated during the focused group discussion where it was pointed out that there was excess demand and that harvesting of woodlots enabled them earn money, offered employment to the youth, and got timber. Furthermore, it has been found out that the income that is gained from tree harvesting forms a motivation to the farmers or local communities to plant more trees in their homesteads as reported by (Kajembe and Mgeni, 1996; cited by Machumu (2008).

4.3.5 Land planted with woodlots

About two third of the respondents (61.1%) indicated that tree growing had taken place on land which formerly supported other agriculture crops, while about one third (38.9%) of the respondents had established woodlots in former grassland areas (Table 7). The reason for this phenomenon is that farmers tended to plant trees on marginal lands which could no longer support agricultural crops. Trees thus in this case are used to reclaim the soil, also, sustain land tenure. An opposite phenomenon was observed in India where by better off individual farmers planted commercial woodlots on good agriculture or former common land (DANIDA, 1989). It has been noted that the conversion of agriculture land to forestry depends on the prices of agricultural crops, and it is a two way movement between lands for agriculture and that for forestry is not a permanent loss as compared to other land development. However, other development activities lead to a permanent loss of forest land (Ralph, 1992). Also, it has been reported from Ethiopia that farmers tended to grow exotic trees on land that are less valuable or have been degraded to some extent (Gerrit *et al*., (2006).

4.3.6 Sources of seeds and seedlings

About 79.6% of the households used seeds from the local sources, and 20% purchased from the Tanzania Tree Seed Agency (Table 8). Probably this is due to many woodlot owners not being aware of the presence of the Agency. It is encouraging to note that some of the households in the study area have started to use improved seeds. However, ICRAF (2008) noted that farmer’s access to quality seed was one of the greatest constraints to the adoption of some agro forestry technologies.

Table 8: Summary of responses on source of planting material

Variable	Frequency	Percent
Seed source		
None	1	0.4
Locally	215	79.6
TTSA	54	20.0
Seedling source		
None	5	1.9
Group nursery	13	4.8
Individual nurseries	81	30.0
Institutional nursery	6	2.2
Own nursery	163	60.4
Wildings	2	0.7
Total	**270**	**100**

Regarding the source of tree seedling for woodlot establishment, 60.4% of the respondents obtained tree seedlings from their own nurseries (Table 8). Another 30% of the respondents bought seedlings from individual nurseries while 4.8 percent bought seedlings from group nurseries. There were also a few individuals who obtained seedlings from relatives as gifts and use of wildings as source of seedlings. The high rate of individual nurseries that is almost 90% probably is due to the extension services which were done by various NGO,s and projects in the past years. Though woodlot owners have been able to source their own seed supply it is imperative that they should get good quality seeds. The Tanzania Tree Seed Agency should intervene to provide knowledge of obtaining good seeds in order to get improved planting material.

4.3.7 Woodlot establishment mode in the study area

Most of the respondents (97.8 %) in the surveyed villages adopted a mode of planting trees in rows (Table 9). The remaining 2.2 percent planted trees along the boundary of the farms and inside the farms. These results show that most woodlot owners have adopted planting trees in pure blocks. It was narrated during the focused group discussion that trees planted in such manner attracts many buyers at maturity in comparison to solitary planted

trees. Also the results show that tree growing along the boundary can be one of the means of boundary demarcation.

4.3.8 Tree planting spacing

The results revealed that 94.4% of the respondents had adopted the 3 x 3 m spacing, while 4.1 percent had adopted the planting spacing of 2.7 x 2.7m (Table 9). The remaining few (1.1%) used 4 x 4 m spacing. These results indicate that many of the woodlot owners had adopted the spacing of 3 by 3 as recommended by the Technical specifications for management of forest plantation in Tanzania. Probably this is because many of the woodlot owners or their relatives do work for the government or private plantations in the district and copied the changes. Also the big spacing adopted might probably due to experience that what matters most is the size of a tree and not the number of trees in order to get a good price. This implies that with good extension services the woodlot owners would be able to adopt good management practices.

Table 9: Responses on tree planting mode, spacing and purpose of planting trees

Variable	Frequency	Percent
Spacing		
2.7m x 2.7m	11	4.1
3m x 3m	235	94.4
4m x 4m	3	1.1
2m x 2m	1	0.4
Planting mode		
Planted on boundary	3	1.1
Planted interspersed	3	1.1
Planted in rows	264	97.8
Tree planting purposes		
Boundary, construction and firewood	13	4.8
Business and future investment	257	95.2
Total	**270**	**100**

4.4 Harvesting and sale of trees

The sale of trees is mainly due to the need for cash by the woodlot owners to fulfill various obligations and permission was never needed or sought to harvest trees. About 53% of the respondents indicated that they have never sold trees due to the fact that their trees were less than 10 years old, while only 47% indicated that they had sold trees. This observation can be explained by the fact that planting of individual woodlots was given impetus in the 1985. On tree harvesting decision at household it was found out that 29.6% of those interviewed harvesting decisions was made by both husband and wife, against 24.4% who indicated that only men decides on harvesting. It should be noted that these are the villages where tree planting is most advanced.

The harvesting age for various species varied greatly. For the pinus patula, 31.5% of the respondents indicated that the harvesting age was between 8 and 12 years, while 25.6% indicated that it was between 13 and 17 years. Also 6.3 percent of the respondents indicated that the harvesting age was between 18 and 22 years, 1.9% indicated that the harvesting age was between 23 and 27 years. About 35% of the respondents were among the household whom it was the first time to plant trees and had not harvested (Table 10).

Table 10: Information on harvesting age of the trees

Variable	Frequency	Percent
Pine harvesting age (years)		
Not harvested	94	34.8
8 – 12	65	31.5
13 – 17	69	25.6
18 – 22	17	6.3
23 – 27	5	1.9
Eucalyptus harvesting age (years)		
Not harvested	202	74.8
6 - 10	13	4.8
11 - 15	19	7.0
16 - 20	24	8.9
21 - 25	6	2.2
26 - 30	6	2.2
Total	**270**	**100**

Harvesting of Eucalyptus varied according to the product being desired for, such as withies, fuel wood, building poles, transmission poles, and sawn wood. The majority of the respondents (74.8%) had not harvested and therefore did not know the harvesting age, while 4.8 percent of the households indicated that the harvesting age was between 6 and 10 years, 7.0 percent of the household pointed out that the harvesting age was between 11 and 15 years, 8.9% of the households indicated that the harvesting age was between 16 and 20 years, 2.2% of the households indicated that the harvesting age was between 21 and 25 years concomitant with ages between 26 and 30 years. This means that many people had already harvested pines while very few had harvested Eucalyptus. The mean harvesting age for the pine was 13 years and that for the Eucalyptus was 17 years. This observation tallies well with findings by Munishi *et al.* (2004). Reported that farmers have a high discount rate that they wanted to reap the fruits at the soonest. Therefore it is very likely that the trees can be harvested below the indicated ages depending on the urgency for cash. Also, Chamshama *et al.* (2004). Reported that only farmers with good wealth

and income situation could afford to wait for the 8-10 years gestation before plantation maturity.

4.5.1 Selling price of trees

Farmers sold their trees directly to village traders and middlemen who transacted on their behalf, while some of them did the lumbering themselves. Those who decided to do the lumbering did on the account that they wanted to add value to the products and make more money in comparison to selling trees. According to one of the key informants price per tree before year 2006 used to be lower than Tshs.1000 and some farmers sold young woodlots when caught in a situation of cash dire stress. The price for trees was based on the prevailing market, negotiation, and in some instances buyers dictated the price.

Prices were fixed per tree and averaged for the whole woodlot; the process of individual negotiation on a case by case basis is suitable when the volume of product exchange is small as reported by Godwin (1994). More than half (72.2%) of the woodlot owners had not sold their pine trees hence were not aware of the prices (Table 11). However, 17.8% of the woodlot owners indicated that the price per tree for pines varied between 1 000 and 2 000 Tsh. 6.7 percent of the respondents indicated that the price was between Tshs. 2 000 and 4 000. About 3% of the respondents reported that the price was between Tsh.4 001 and 6 000. The average weighted price for the pines was Tshs. 2 443 per tree thus making the price to be Tshs. 7755 per m^3, while the average royalty (price) of pines in the government plantation per tree commensurate with size tenable in woodlots was Tshs, 12000 per m^3 according to the Government General Notice no.231 of November2007 (URT,2007). This shows that prices of pines in private woodlots were relatively low when compared to prices charged in government plantation. This is partly explaining why there are many processing units operating in private woodlots.

Table 11: Selling price per tree

Variable	Frequency	Percent
Selling price pine (Tshs.)		
Not sold	195	72.2
1 000 – 2 000	48	17.8
2 001 – 4 000	18	6.7
4 001 – 6 000	9	3.3
Selling price Eucalyptus (Tshs,)		
Not sold	250	92.6
1 – 3 000	10	3.7
3001 – 6 000	7	2.6
6 001 – 9 000	1	0.4
9 001 – 12 000	2	0.7
Total	**270**	**100**

The prices for the Eucalyptus varied from Tshs.1 000 to 12 000 per tree. Most of the woodlot owners (92.6%) had not sold their trees hence didn't know the price. However, a few of them, 3.7 percent of the respondents indicated that the price was between 1 000 and 3 000 Tsh. per tree, and 2.6 percent of the respondents indicated that the price was between Tsh. 3001 and 6000 per tree (Table 11). The average weighted price for the Eucalyptus was Tshs. 5 420 per tree, pole size tree is close to $1m^3$. While that of the royalty from the Government plantation was about Tshs. 42 000 per m^3 for the common size of the transmission pole according to Government Notice no.231 November 2007 (URT 2007). This price difference explains why some of the impregnation plants have resorted to obtaining poles from woodlots.

About 60% of the respondents indicated that the price trend was increasing for both pines and eucalypt. Also, the demand for the tree product was envisaged to increase by the majority (91.5%) of the respondents in the study area (Table14).

Table 12: Woodlot owner's responses on price trend and wood demand

Variable	Frequency	Percent

Price trend		
Increasing	163	60.4
Same	21	7.8
Not sure	86	31.9
Wood demand		
Increasing	247	91.5
Decrease	4	1.5
Constant	11	4.1
Not sure	8	3.0
Total	**270**	**100**

The buyers normally fell and cross cut and carry the timber from harvested areas. Branches and slabs resulting from tree recoveries are left to the woodlot owner. The accompanying results showed that about a half of the respondents (47.8%) indicated that the woodlot owner benefited most since after harvesting still they retained their land.

Table 13: Summary of responses on the beneficiary of woodlots

Variable	Frequency	Percent
Beneficiary		
Owner	129	47.8
Middlemen	3	1.1
Trader	53	19.6
None	85	31.5
Total	**270**	**100**

This contradicts what Sammy (2006) found in Kenya who found that if the buyer carries these products, then the prices of the tree is adjusted upwards. This difference is probably due to the fact that there is plenty of it and market for the recoveries is not well developed in the study area. Another plausible reason for the difference could be that the transport cost is high per slab and therefore not paying to transport the products in the study area.

Price of the raw material was set by two actors, (83.3%) of the traders showed that prices are set by farmers, while, 16.7% indicated that prices are set by middlemen. Prices were normally reached at through negotiation. Many traders 43.3% indicated willingness to pay more than Tsh.5 000 per tree, while 23.3% indicated that they are willing to pay not more than Tsh.5 000, the other 20% and 13.3% were willing to pay betweenTsh.4 000 and Tsh3 000 respectively. For the pines, traders were prepared to pay the maximum of Tsh20 000 per tree depending on the size and form of a tree, while for the Eucalyptus, pole traders were prepared to pay up to the maximum of Tsh.25 000 per pole delivered at mill site. The average weighted price for the pines was Tsh.2 400, while for the Eucalyptus the average weighted price was Tsh.5 500. This showed that the woodlot owners are lowly paid and the timber in general was on high demand, this is exhibited by the high prices which the traders were prepared to offer for the raw materials.

4.5.2 Major constraints affecting establishment of woodlots

According to the results, 49.6% of the households felt that there were problems affecting the establishment of woodlots while 50.4% felt there were no problems (Table 14). Further examination of the problems, revealed that capital and fire were the major problems affecting the woodlot owners this was mentioned by 38.5% of the respondents. Capital, fire, seed was mentioned by 18.1% of the respondents and lack of capital was mentioned by 13.3%.

Table 14: Main constraints faced by woodlot owners pertaining to tree farming

Variable	Frequency	Percent
Constraint		
Yes	134	49.6
None	136	50.4
Constraints type		
None	4	1.5
Capital	36	13.3
Capital ,fire	104	38.5
Capital, fire and seed	49	18.1
Capital, fire, seed and price	69	25.6
Fire	8	3.0
Total	**270**	**100**

Also 25.6% of the respondents mentioned capital, fire, seed, and price as another constraint this entails that the woodlot owners are not sure if the price they receive from tree sale is genuine. Capital was mentioned as a drawback in the endeavor in woodlot establishment probably due to cash transaction being required for the purchase of land. Fire has also been relentlessly mentioned perhaps because tree growing is a long term undertaking and this has entailed farmers to form informal fire brigades. Furthermore, 43.7% of the respondents combined mentioned improved seed unavailability which means that they need to grow trees of acceptable growth and form. While 1.5 percent of the respondents were not affected by any of the mentioned problems and 3.0 percent were affected by fire only this means these are the few well to do woodlot growers (Table14).

The woodlot owners are no longer establishing woodlots for subsistence consumption but as a cash crop. That is why price was mentioned as one of the constraints. Studies carried out in the Philippines indicated that when production levels exceed subsistence levels, the need of the farmers, knowledge of marketing becomes a necessity (Hammet, 1992) as cited by Austria (1995).

4.5.3 Improvement of woodlot management

Woodlot owners gave suggestion on how to improve woodlot production commensurate with constraints they are facing. About half of the woodlot owners (48.9%) indicated that more trees should be planted in order to have enough trees to meet various demands in future (Table 15).

Table 15: Summary of responses on improvement of private woodlot management

Variable	Frequency	Percent
Factors for improvement		
None	19	7.0
Extension service	65	24.1
Fire protection	23	8.5
Infrastructure	2	0.7
Improved seed	29	10.7
Plant more trees	132	48.9
Total	**270**	**100**

The need for improved extension services for better tree management was indicated by 24.1% of the respondents, while 10.7% indicated the need for improved seed availability so that trees of good form are grown. This is also underscored by Ngamau (2004) in Nairobi who concluded that the focus was to improve the general income of the rural people by providing fast growing, quality planting material that provide reasonable returns through clone material. Infrastructure was listed by only 0.7 percent of the respondents as one of the aspects which need improvement, especially roads which need to be in good

condition to allow smooth transportation of the products throughout the year. Similar observation is underscored by UNECA (1991), which reported that rural roads are important as they bring traders, truckers and officials to villages and helps to encourage health and education personnel to live there and enable villagers to travel to markets and elsewhere. Improving marketing systems can be as important as introducing farming methods that increase yields.

4.6 Market Survey of Traders in Woodlot Products

4.6.1 Information on traders

The majorities of the traders were males and had primary school education. Interestingly 23.3% of the respondents had secondary school education and 16.7% had tertiary education (Table 16). This is an indication that the literacy level of the traders was good enough for them to carry out the woodlot product trading. Moreover, these results indicate clearly that education and especially post primary makes someone more likely to start or manage a business. This can be explained by the fact that this business is cumbersome and risks as it involves a lot of traveling on a motorbike scouting for trees (Table16). Moreover, UNCED (1992) reported that both formal and non formal education is indispensable to changing people's attitudes so that they have the capacity to asses and address their sustainability concerns. It is also critical for achieving environmental, ethical awareness, values, attitudes, skills and behavior consistent with sustainable development and for effective decision making. The type of trade was divided into the following categories, wholesale which involved a majority (80%) of the traders, followed by middlemen (13.3%) and retail (6.7%). Another plausible explanation can be that school leavers like to be self employed or it is easier to enter into this business and make a fortune. In other studies carried elsewhere in Tanzania similar results were reported by Mduma *et al*. (2005). who observed that even though education is important for

development in the rural labour markets relatively high education (in the rural context) induced participation in self employment because it is generally considered superior to rural wage employment.

Table 16: Information on traders

Variable	Frequency	Percent
Sex		
Male	30	100
Education level		
Primary school	18	60
Secondary school	7	23.3
Tertiary	5	16.7
Other occupation		
Permanent	22	73.3
Temporary	8	26.7
Trade type		
Whole sale	24	80.0
Retail	2	6.7
Middlemen	4	13.3
Time in business		
<1990	1	3.3
1991-1995	5	16.7
1996-2000	4	13.3
2001-2005	8	26.7
>2006	12	40.0
Capital formation		
Saving	6	20
Farming	8	26.7
Relatives	6	20
Credit	5	16.7
Trading	5	16.7
Total	**30**	**100**

4.6.2 Responses on business knowledge and establishment

The majority of the respondents were familiar with their business and the findings showed that they had been in business for more than four years. Most of the traders (73.3%) had this business as their permanent undertaking while, 26.7% were undertaking it on temporary basis (Table 16). About 17% had been doing trade since 1991. It shows that for many years the trade was dominated by few traders. The number started to increase gradually especially beginning 2001. Also the results showed that some of the traders had other activities the other activities undertaken by these traders included farming (66.7%), petty trading (shop) (26.7%) and employment (6.7%) (Table 16).

4.6.3 Responses on background of traders and Capital formation

The results indicated that about 43.3% of the respondents were previously engaged in pit sawing activities, while 23.3% were previously engaged in farming activities. Also 20% were formerly employed in wood related ventures and 13.3% had been students. The sources of capital also varied among the traders. About 27 % reported that they got capital from farming activities, while 20% of the respondents indicated that their capital was derived from savings and the same percentage got capital from relatives. In addition, 16.7% of the respondents got capital from bank credit facilities and the same percentage got capital from other trading ventures.

According to Mboya *et al*. (1994) in earlier studies carried out in the urban centres of Arusha, Dar es salaam, Mwanza, Mbeya, and Tabora showed that major sources of finance for starting up enterprises varied, thus 66% was accounted for by own sources, 21% was accounted by loans from relative and friends, 7 percent was accounted by gifts, and 2 percent was accounted by loans. These results indicate that the businesses of most traders (83.3%) are small and it was a few of the traders who run their business on formal grounds. However, studies carried out in other parts of Tanzania have shown that the presence of large share of non formal enterprises may be explained by the fact that being formal is costly due transaction costs and taxes. At the same time the informal enterprises have been found to be a key source of income growth and diversification for the rural poor in Tanzania (Tidiane *et al*., 2008).

4.6.4 Wood supply and sources

Majority of the traders indicated that their main supply of wood was within the district. The results showed that 60% of the respondents scouted for wood, while 33.3% of the respondents indicated that woodlot owners followed them. Also 3.3% of the respondents

indicated that both the traders and woodlot owners scouted each other, and the same percentage of 3.3 respondents indicated that they harvested their own woodlots (Table 17). This indicates that majority of traders or middlemen were the ones who went to the woodlot owners and bought the merchandise.

Table 17: Responses on locating woodlots and number of suppliers

Variable	Frequency	Percent
Locating woodlots		
Own trees	1	3.3
Scout	18	60.0
Scout Sellers	1	3.3
Sellers	10	33.3
Supplier number		
None	26	86.7
1 – 10	1	3.3
11 – 20	2	6.7
21 – 30	1	3.3
Total	**30**	**100**

Information on (Table17) show the responses on locating woodlots and number of supplier's wood as it existed during the study period. Nearly 87% of the respondents indicated that they didn't have suppliers (Table 17), while 6.7% of the respondents had suppliers who ranged between 11 and 20 persons, 3.3% of the respondents had between 21 and 30 suppliers, and 3.3% of the respondents had between 1 to 10 suppliers (Table 17). Suppliers were employed mainly by the pole impregnation plants, as the trees were widely scattered, some planted in inaccessible areas and involved covering long distances. Trend on wood supply to the impregnation plants, was indicated as increasing by 13.3% of the respondents but the harvestable sizes in the area had dwindled. Further 3.3% of the respondents indicated that the level of supply was the same. 83.3% of the respondents didn't own impregnation plants so had no opinion (Table 18).

Table 18: Responses on pole supply and tree availability trends from woodlots

Variable	Frequency	Percent
Pole supply trend		
Increasing	4	13.3
Constant	1	3.3
No opinion	25	83.3
Tree availability for timber		
Increasing	6	20.0
Decreasing	19	63.3
No opinion	5	16.7
Total	**30**	**100**

Wood supply to the mobile sawmills which used softwood for sawn wood was indicated as decreasing by 63.3% of the respondents, while 20% of the respondents indicated that the supplies were increasing, and 16.7% had no comment on softwood (Table 18). These situations suggest that wood supply is dwindling and the processors will have to find alternative sources of supply.

Table 19: Softwood round wood timber supply, m^3

Year	2007	2008	2009	2010
Government plantation	370 908	518 487	530 000	560 000
Private woodlots	1 330 882	1 169 542	188 804	323 642
Total	1 701 790	1 688 029	718 804	883 642
Percentage from woodlots	**78**	**69**	**26**	**36**

Supply of Transmission poles (No.)

Year	2007	2008	2009	2010
Government plantation	2 269	3 609	20 130	120 000
Private woodlots	22 140	36 860	51 800	108 000
Total	24 409	40 469	71 930	228 000
Percentage from woodlots	**90.7**	**91.08**	**72.01**	**47.36**

Table 19 summarizes timber supply in Mufindi district to various end users. The results from the responses showed that merchantable timber supply for sawn wood derived from woodlots is nearing exhaustion. For instance woodlots contributed 78% of wood in year 2007 and 69% in year 2008, it showed a sharp decline for projection in year 2009 and 2010 where its contribution was projected to be 26% and 36% respectively. This projected decline in merchantable timber supply presumably can be explained by the fact that increased demand on forest product fueled up by price increase led to over harvesting of woodlots which also led to harvesting even of immature woodlots which should have formed part of the future timber supply.

The picture exhibited by the supply of transmission pole from woodlots showed that, woodlots contributed 90.7% in year 2007 and 91% in year 2008. This confirms observation made by Munishi (2007) that Eucalyptus from smallholder farms contributed a significant share in the timber market and large scale trade in transmission poles. The observed phenomenon is also reported in studies done in Latin America where a high percentage of the harvested volumes of *Cordia alliodora* came from farms practicing agro

forestry systems where farmers sold trees to compensate for the low coffee and cacao prices (Beer *et al*., 2000). Also in Sri Lanka it was found out that 73% of timber and 80% of fuel wood was produced in home gardens and farmland (Gunasema, 1997). The projected supply of the transmission poles from private woodlots for years 2009 and 2010 showed that there will be a decline thus woodlots contributing 72% and 47.3% respectively. The situation is explained by the fact that the merchantable Eucalyptus for transmission poles from woodlots is nearly exhausted. This was gathered during the focused group discussion as some operators moved out from the government plantation in preference to the lowly priced woodlot trees. In the absence of the woodlots the situation could have been adverse in timber supply; therefore woodlots are complementary in both products and functions as adduced by Temu (1999).

4.6.5 Wood processing

After the raw material has been purchased it is processed mainly by the pole impregnation plant for poles and mobile sawmills for sawn wood. Processing is done on site where the woodlot is situated. In case of the transmission poles they are transported from the field to the mill sites. The buyer is the one who is involved in the processing. For sawn wood which used logs of 3.60 meters long, output per tree varied from one to three pieces of the common sizes of sawnwood. This depended so much on the size of the tree. Processing of trees for sawlogs to sawnwood involved, tree clear felling, delimbing, cross cutting, sawing and head transport of lumber to loading site. For transmission poles, processing involved tree clear felling, debarking, skidding, and loading by human effort, transportation to mill site, unloading using machinery, sorting and sizing, culminating with the treatment process.

4.6.5.1 Common sizes produced

The type and quantities of products produced is determined by the market requirements, hence, the sawn wood produced was according to raw material received and market satisfaction. The common sizes of sawn wood produced were of the following dimensions, 50x100 mm; 50x150 mm was indicated by 16.7% of the respondents. Sizes 50x100 mm, 50x150 mm, and25x200 mm was indicated by 13.3% of the respondents. The other common size produced was 50x100 mm, 50x150 mm.25 x150 mm, 25x200 mm which was indicated by 33.3% of the traders, and size 50x100 mm, 50x150 mm, 50x75 mm was indicated by 20% of the traders. The market for transmission poles were mainly the Kenya Power Lighting Company and Tanzania Electricity Supply Company. The common pole sizes produced were 9m,10m,11m,12m,13m,14m, and occasionally 17m. This was indicated by 16.7% of the traders.

4.6.5.2 Cooperation between traders

About 97% of the respondents indicated that they had various forms of cooperation amongst traders themselves. The cooperation was in informing each other on available markets and sharing of equipment which was indicated by 43.3% of the traders interviewed. Sharing of equipment and finance advances was indicated by 23.3% of the traders while information on markets and financial assistance was by 13.3% of the traders. Also 10% of the respondents indicated that they assisted each other on instruments and chemicals, while about 7% showed that they assisted each other in loaning equipment and chemicals. This implies that traders in order to accomplish their tasks depend on each other.

4.6.6 Marketing of sawnwood and transmission poles

The majority (80%) of the traders sold their produce at the points of production, while 13.3% sold their produce in Kenya, and 6.7% of the traders sold their produce in Dar es Salaam and Kenya. According to 90% of the respondents, the produce is sold to middlemen who in turn transported the material to retailers in Dodoma , Arusha and Dar es salaam (Table 20). Also, 6.7% of the respondents indicated that they sold to individuals within the villages while 3.3% of the respondents indicated that they sold to wholesalers who came to the village looking for the merchandise (Table 20).

The majority of the traders (93.3%) indicated that the present sales were more in comparison to the past three years, while 6.6% of the traders indicated that the sales were less in comparison to three years ago. This was attributed by many people joining the industry as they thought that it was a profitable business. The other explanation offered by 93% of the respondents was that there is high demand for sawnwood due opening of markets in Kenya and Somalia. Annual sales were computed from the monthly average sales, and 50% of the traders indicated that they sold between 1 000 and 6 000 pieces of sawnwood per year. About 23% of the traders showed that they sold between 6001 and 12000 pieces of timber, while 13.3% of traders indicated that they sold between 12 001 and 18 000 pieces of timber. Others, 3.3%, 6.7% and 3.3% of the traders sold between 18 001 and 24 000, 24 001 and 30 000, more than 30 001 pieces of timber respectively. Regarding price trend, almost all traders (96.7%) indicated that prices had increased.

4.6.6.1 Transportation of the produce

It was revealed that, 60% of the traders did not transport their produce but sold at the production site, while 36.7% of the traders transported their produce using hired means. However 3.3 percent of the traders transported their produce using their own means of

transport. This situation implied that buyers are the one who followed the produce and transported after purchase.

4.6.6.2 Markets and marketing channels

The survey showed that the business was conducted from producer to wholesalers to retailers. Another mode was from producer to retailer, while the last arrangement was from producer, to middlemen and consumer. This arrangement was prominent for produce destined to Kenya as it was mentioned that it was difficult for the producers to win the tender in Kenya. Hence the traders have not been able to penetrate the Kenyan Market. Marketing channels are important in the sense that even if a producer wants to handle the whole distribution job, sometimes it is simply not possible as customers have established buying pattern and sometimes the only way to reach the customer is through a wholesaler (Kottler 1985). Moreover if retailers who serve target customers make most of their purchases from specific wholesalers, the producer may have to work with these wholesalers. This is one reason why most firms that produce consumer products relay so heavily on indirect channels. Also middlemen may invest in inventory which is costly to the producer (Perreault *et al.*, 2002).

Table 20: Responses on destination and mode of selling

Variable	Frequency	Percent
Destination		
Kenya	4	13.3
Kenya D salaam	2	6.7
Local	24	80.0
Mode of selling		
Wholesale	1	3.3
Individuals in village	2	6.7
Middlemen	27	90.0
Total	**30**	**100**

4.6.6.3 Selling prices of sawn wood and transmission poles

Prices of products at different locations are summarized in Table 21.The prices varied according to distance from the district head quarters.

Table 21: Prices of sawn wood and transmission poles in different market centres

Products	Location				
	Village	District town	Iringa town	D salaam	Kenya
Sawn wood Tsh per m^3	85 260	101 350	147 000	177 500	315 000
% change in price	0	19	74	108	268
Transport cost per m^3	0	15 000	22 000	26 000	72 000
% transport cost vis price	0	14.8	14.9	14.6	22.8
Transmission poles price Tsh./pole	0	150 000	0	201 250	230 000
% change in price	0	0	0	34	53

The average price for sawn wood per m^3 in the village ranged from Tsh.53 250 to Tsh.124 250, and at the district headquarters (Mafinga Township) it was Tsh.101 350. The price at the regional headquarters (Iringa town) was Tsh.147 000, while price in Dar es Salaam was Tsh.177 000 and in Kenya it was Tsh.315 000 (Table 24). The trade on transmission pole was through middlemen who had won the tender in Kenya and on the average prices varied from Tsh.150 000 to Tsh.230 000 per pole. The wholesale price difference was attributed by the transport distance and the demand of the product as the market has been liberalized. On further analysis of the prices of timber at various locations, the results showed that the price increased by nearly 108% in Dar es Salaam and 268% in Kenya when compared to prices tenable at village level. When the transport cost was compared to selling price it showed that it was only 15% for domestic sold wood and 22% for wood sold in Kenya. Showing that the price difference was still appreciable compared to base price. This perhaps explains why there are many middlemen in this business as most of the profit seems to be at the end of the market chain. On the other end it can imply that most

of the profits are exported to Kenya. For the poles the results showed that the price change was nearly 34% when compared to the mill prices. The increases in prices are attractive in any scale of business.

4.6.7 Income to the communities and District

4.6.7.1 Income to the communities

Table 22, Shows that only 22.6% and 14.4% of the woodlot owners were able to sell their trees in years 2007 and 2008 respectively.

Table 22: Revenue accrued from woodlots products by the communities in two years

Annual Income	2007		2008	
T shs. (×1000)	Frequency	Percentage	Frequency	Percentage
0	209	77.4	231	85.6
1-400	37	13.7	20	7.4
401-800	11	4.1	5	1.9
801-1200	4	1.5	2	.7
1201-1600	2	.7	2	.7
Above 1600	7	2.6	10	3.7
Total	**270**	**100.0**	**270**	**100.0**

The survey showed that a large part of the woodlot owners who had sold their trees earned income which was between Tsh.100 000 to Tsh.400 000 per year and this was followed by those who earned between Tsh.401 000 to T sh. 800 000 per year (Table 25). Also, in the survey it was revealed that only a few woodlot owners earned higher income. For example 0.7% earned income between Tsh.801 000 and 1 200 000, and Tsh.1 201 000 to 1 600 000 respectively. The highest income was greater than Tsh.1 600 000 which was earned by 2.6 percent and 3.7 percent of the respondents in years 2007 and 2008 respectively presumably implying that initially only a few people planted many trees. These amounts represented a weighted average annual income of about Tsh.232 143 for the year 2007, while for the year 2008 the weighted average annual income was about Tsh.455 452. These amounts are higher and attractive compared to the national per capita income which

was reported to be about Tsh.400 000 for year 2006 (URT, 2007), and the district per capita income which was estimated at Tsh.190 000 in year 2004 (URT, 2006). Furthermore studies carried out elsewhere in Mufindi district showed that the estimated annual household income was Tshs. 600 000 (Ngaga, 2007). Njenga *et al.* (1999) indicated that tree crops contributed 18% to 51% of total household income at the farm level in Kenya, and Mercer (2004), noted that there was widespread adoption of agro forestry technology jn Kenya since the annual net benefits from the adoption ranged from 60 USD. to 212 USD. Spears (1987), observed that for many rural families this revenue represented their only significant source surplus of farm income, as most of the food produced on the farm is needed for subsistence.

4.6.7.2 Income to the District

For any economic activity it is essential to gauge its contribution to the society in monetary terms in these instance woodlots which occupy more than 30% of the woodlot owners land. Table 23 and 24 shows the results on actual and potential revenue collected as log cess from softwood timber and transmission poles.

Table 23: Actual and Potential revenue collected as log cess from softwood timber

Variable	**Year**	**Year**
Revenue	**2007**	**2008**
Actual Tshs.	91 000	25 000
Potential Tshs.	985 688 000	866 254 400
Percentage collected	**0.90**	**0.30**

Table 24: Actual and Potential revenue collected as log cess from transmission poles

Variable	Year	Year
Revenue	**2007**	**2008**
Actual Tshs.	0	0
Potential Tshs.	23 209 362	39 640 338
Percentage collected	**0**	**0**

The district has a miscellaneous legislation which was passed by the District Full Council in year 2006. The legislation mandates the council to collect revenue in the form of produce cess from traders who move the products out of the district; the legislation was passed as a supplement of the Local government Finance Act 1982 which allows district councils to impose a produce cess of maximum of 5% of gross sales value (URT, 1982). The legislation stipulates that the charge per pole longer than 3 meters would be Tshs 800 per pole, while charge per piece of sawn wood regardless of size will be Tshs. 50. The results from this study showed that the maximum amount collected for the year 2007 was only 0.90% while for year 2008 it was only 0.30% of the potential revenues respectively. Despite the abundance of woodlot in Mufindi district it seems they do not contribute much to the district revenue or that potential revenue are for gone and this inevitably retards its economic development. The low level in actual revenue collection was attributed by lack of suitable mechanisms and organizational changes for revenue collection not being in place, also they were expecting the good will of the traders to come to the office and pay (Ubisimbali, J. personal communication, 2009). Collection from trade licensing was negligible as the business are registered only once in the life time. A recent survey in Makete district (one of the district in Iringa Region) which did no indicate the amount of revenue collected reported that, some five decades later after adoption of pine tree planting, pine trees have become the main source of income to the local communities and generates the biggest portion of the district income (Lawi, 2009).

4.6.8 Contribution of woodlots to employment

One of the specific objectives contends that woodlot and product processing created employment opportunities for the residents of Mufindi district. Hence, the purpose of this part was to gauge the contribution of the woodlots to employment status amongst the population in the district.

Woodlots generated employment in reforestation, silviculture operations, harvesting activities, and small scale timber processing. Classifications of employment at family level and the created employment opportunities are described. Employment in the processing industries was divided into two categories, permanent persons and part time persons.

4.6.8.1 Employment at farm level

In the study area, jobs were generated in the planting and tending operations. Table 25 show responses by woodlot owners on the labour required to establish an acre of woodlot.

Table 25: The number of persons employed in woodlot establishment per acre

Variable **Number of persons**	**Frequency**	**Percent**
1-10	35	13.0
11-20	105	38.9
21-30	70	25.9
31-40	50	18.5
41-50	3	1.1
>51	7	2.6
Average per hectare	49	0
Total	**30**	**100**

According to the respondents nearly 39% of the respondents, required labour between 11 and 20 persons, about 26% indicated labour needs between 21 and 30 persons, 18.5% required labour between 31 and 40 persons, 13% of the respondents required labour between 1 and 10 persons. In totality woodlot establishment employed a total of 5305 persons, which brought an average of about 49 persons per hectare. These findings are

lower compared with those by Mnzava (1987) who found out that a conventional government forest plantation employed about 97 persons to establish a hectare. Studies in India also showed that it was cheaper to establish a woodlot compared to normal government forest plantations (FAO, 1985). Therefore, one could reasonably argue that woodlot management is a source of employment as asserted by (Poschen, 1997, FAO, 1999). A study by Kamuzora (1990) as cited by Teklu (1995), reported that in rural Tanzania, that there is a sizeable amount of rural employment, it was estimated that it was 2.4% for men and 2.6% for women hence woodlots can possibly alleviate this situation as reported by IPS (2009) which showed that in transforming farmland to plantation it requires a lot of labour in the initial stage but in the next years, 10 – 30 years, there is very little to do while the trees grow.

4.6.8.2 Employment in the processing units in Mufindi district

The permanent employment in the processing units (sawmilling and impregnation plants) varied greatly. Nearly 37% of the traders indicated that they did not involve any permanent persons, while 40% of the traders employed permanent persons who ranged in number from 1 to 5. Another 13.3% of the traders employed between 6 and 10 persons, the other 6.7% and 3.3% of the traders employed between 11 to 15 and 16 to 20 persons respectively (Table 26). Hence the average employment on full time basis was about 4 persons per processing unit making a total of 120 persons for 30 processing units.

Table 26: Employment in processing units

Variable	Frequency	Percent
Full time persons		
0	11	36.7
1-5	12	40.0
6-10	4	13.3
11-15	2	6.7
16-20	1	3.3
Part time persons		
1-10	4	13.3
11-20	14	46.7
21-30	7	23.3
31-40	4	13.3
41-50	1	3.3
Total	**30**	**100**

The number of part time employed persons varied in number from one processing units to another. According to the respondents interviewed, 13.3% employed between 1 to 10 persons, 46.7% of the processing units employed between 11 to 20 persons, and 23.3% of the units employed between 21 to 30 persons (Table 26). Further more 13.3% and 3.3% of the processing units employed between 31 to 40 and 41 to 50 persons respectively (Table26). This meant that each processing unit on the average employed 20 persons on part time basis making a total of 600 persons. A great advantage of this arrangement is that it provided a productive way of absorbing the rural labour force either on fulltime or part time there by improving employment and income of rural people. At the same time it reduced the actual physical rural to urban migration (Tomar, 1990). Furthemore, it is reported that the non farm private sector in Tanzania has grown too big to ignore and encompasses more than one million of small rural enterprises and suggested that almost 28% of rural households have at least one family member working in a rural non farm enterprise (Tidiane *et al*., 2008).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Overview

This chapter presents the conclusions and recommendation based on the findings of the study. The chapter is divided into two sub sections conclusion and recommendations

5.2 Conclusion

The findings revealed that woodlots undertaking is a significant contributor to the livelihood of the communities and the income earned from woodlots was making a significant contribution to household income. The income earned enabled woodlot owners to acquire various capital assets, start other businesses and planted more areas. Thus had they planted big areas earlier the amount of asset acquisition could even be higher, In other words, what began as a welfare oriented programme has been transformed into a promising private enterprise involving many petty businesses.

In Mufindi district, the woodlot owner's posses land on the average of 6.80 hectares and on average 2.70 hectares 36% of land owned is occupied by woodlots. A good number of farmers had their own individual nurseries. This is a positive change in the attitude, because they have changed from waiting for transplants from groups or institutional nurseries. Again the woodlot owners have started using improved seeds from the Tanzania Tree Seed Agency.

Woodlot establishment is a land based activity that employed the owner at least through out the year especially when combined with nursery activities as against other activities which employ during the rain season only. It was noted that employment opportunities were created at farm level and processing units. Part time employment was higher than

permanent employment in the processing units. This absorbed both rural and urban unemployed population present in all developing countries, Tanzania inclusive.

The traders sold their merchandise to middlemen, wholesalers, and retailers. The points of sale were within the village, District and regional headquarters, Dar es Salaam, finally Kenya. It was evident that the traders were yet to penetrate the Kenyan market. The quantities sold and the prices showed increasing trend, this situation fueled up the demand for raw material.

The wood supplies for sawn timber derived from woodlots showed an increasing trend, but indicated that most of the sawn wood was contributed by the government plantation. However, most of transmission poles were derived from the woodlots. Generally woodlots provided cheap wood in comparison to wood derived from government plantation.

Comparison of establishment rate against utilization rate showed that more trees are being planted than being cut; hence this is a healthy situation. Never the less, the planted woodlots are not yet mature for exploitation hence there can be an impasse of supply of merchantable wood derived from woodlots.

Income to the communities from woodlots has increased, this was attributed to increase in the price per tree and number of trees sold showing that income could have been much higher had they taken up the planting earlier and planted in bigger areas. This shows that people have been able to utilize land as capital asset and use it to generate income and wealth.

From this study it has been observed that private woodlot business is also a source of income to the district which accounted for almost 1% of the potential revenue. Revenues could have been higher had the enforcement of the current district council legislation been implemented.

5.3 Recommendations

On the basis of this study, the following recommendations are made

i. The results revealed that woodlots presently occupied 36% of total acreage in the study area; hence it is an important economic activity in the district it is recommended that efforts should be made to educate woodlot owners through extension services on tree management and proper land use in order improve quality of trees and to avoid turning all the land towards tree planting.

ii. During the survey it was revealed that woodlot owners had high interest and willingness to acquire improved seeds, even the traders indicated strong desire for trees of good forms. Hence the Tanzania Tree Seed Agency should capture and exploit the opportunity by providing the desired species. This could be done by popularizing the Agency in private woodlots by distributing simple leaflets and visits in villages. Also there is a need to train the woodlot owners on how to select and keep the plus trees or seed trees.

iii The district council should put in place elaborate measures for the collection of revenue due from woodlots as it does for log cess derived from government forest plantation in order to capture all finances. This could be done by close monitoring of the movement of the products in the District.

iv. To improve the returns that woodlot owners get from the sale of their trees, it is recommended that they be equipped with tree management techniques with fire management inclusive and marketing skills, such as the knowledge of estimating volumes of their trees as well as negotiating appropriate prices for their trees

v. Since farmers are selling immature trees, there is a need for extension services to provide information on profitability of trees as they mature. Therefore, there is a need for a study on profitability of tree growing at different ages of the tree i.e. How does the value of tree increase with age. Also, farmers should be encouraged to develop TGAs which can provide them with immediate income while waiting for trees to mature.

REFERENCE

Ahblack, A. J, (1992). Why and how to mobilize all rural people of Tanzania to tree planting. PhD Thesis, Graduate School of the University of Minnesota, USA 179pp.

Akida, A. and Blomley, R. (2006). Trend in ownership, forest resource tenure, and institution arrangement: Are they contributing to better forest management and poverty reduction. A Case Study of the United Republic of Tanzania. [http//www.fao.org.forestry/media/12503/1/19/ htm]. site visited on 14 /7 /2008.

Allen, J. A. (1990). Homestead tree planting in two rural Swazi communities. *Agroforestry systems:* 11, 5, pp11 -22.

Arnold, J. E. M. (1991). Economic Considerations In Agro forestry. In: *Farms, Trees, and Farmers.* Earthscan publications Ltd. London. U. K. pp177- 180.

Austria, I. (1995). Social forestry products: Phillipine experience. In: Developing a Community Based Marketing Information System. *Unasylva*, 46, (4): 45 – 46pp.

Banko, J. (2002). Trees Outside the Forests an Ignored Dimension of Forest Resources Assesment. [http://www.foretry Nepal/org./biblio htm.] site visited on 12/8/2009.

Beer, J. Ibrahim, M and Schlon Voigt, A. (2000). *Timber production in Agro forestry systems of Central America.* Proceeding of the 21st IUFRO World Congress papers, Kuala Lumpur, Malaysia, 786 pp.

Bensel, T. (2007). Fuel wood, Deforestation and Land Degradation: 10 years of Evidence from CEBU province, Phillipines. [http://www./webpub.Alleghery.edu/employee/t/Bensel./-20artid htm] site visited on 26/8/2009.

Brian, C. Leonce, A. Jim, G. Forrester, K. Kajembe, G. C. Mbano, B. Vonoertzen, I. Sibylle, R. M. (2006). Management of natural resources-TAN 092 Final Evaluation report to the Ministry of Natural Resources and Tourism Royal Nowregian Embassy Dar es Salaam [http//www.Scribd.com/doc/2886951/htm] site visited on 3/9/2009.

BRITANNICA (1997). The new encyclopedia Britannica fifth edition reprint 1997. (19). Encyclopedia Brittanica inc. Chicago, U. S. A. pp 411 – 414.

Bull, G. Q .and Nillson, S. (2004). An assessment of Chinas Forest Resource. *International Forest Review* 6 (3 – 4): pp210 – 220.

Chamshama, S.A.O. and Nwomwu, F. O.C. (2004) Forest Plantation in Sub Saharan Africa Lessons Learnt on Sustainable forest Management in Africa. [http://www.209.85.135..132/search?qz cache: MM-3yj4f77w htm] site visited on 9/7/2009.

Chikoko, G. M. (2002), A comparative analysis of household owned woodlots and fuel sufficiency between female and male headed households. A pilot study in rural Malawi, Africa. Thesis for the Award of Doctor of Philosophy Degree Oregon State University, USA. [http://www.joyhechf.net/mulanje/refs/chikoko – dss – gender – fuelwood. Pdf.htm] site visited on 10/8/2009.

Chris, J. and Steed, (2003). Success Stories in Africas Drylands: Supporting Advocates and Answering Skeptics in Global Mechanism of the Mechanism to Combat Desertification. [http://www.effrn.org/ETFR/Workshop/degradedlands/documents/ reiji.pdf.html.] site visited on 19/8/2009.

Cooper, N. and Jamieson, D. (1996). *Commercially growing and selling pinus radiata in the Cannberra,region*. Proceeding of the Region Farm forestry conference, Yaas, Australia, 27 March 1996. 34pp.

DANIDA, (1989). Enviromental issues in Agriculture in Humid Areas- Tanzania, A Strategy for Agriculture in Humid Areas. 38 pp.

Dean, C. Ernst, L. and Sara, J. S. (1995). The costs and benefits of agroforestry to farmer. The World Bank research observer, 10(2) Oxford University Press. London, UK. 151-180 pp. [http://www.jstor.org/stable] site visited on 12/04/2009.

Duncan, M. Sharmisth, B. Septi, B. Cornelius, K. Sharon, O. Noem, P. Horst, W.(2006). Working Together: Forest linked small and medium enterprises, [http: //www.209.85.135.104/search?q=cahe:q3yxomtwy YE:APL.ning.com/Friers/ktpy www pQh.KdnAJSRAT cREyE UN2 Hneo* 6Hjiy FFIC/htm.] site visited on 8/7/2008.

Economist, (2004). The Dragonand the Eagle: The Economist 20th. October, London, U.K. [http:// www.economist.com./ display story cfm htm] site visited on 11/5/2008.

Edwin, S. (1990). Communal Woodlots in Tanzania-Farmers Responses and Evolving Extension strategy-Woodlot studies in Africa. *Canadian Journal of African Studies*, Vol. (2) 282.[http:// www. odi.Org.uk/Networks/rdfn/ htm] site visited on 22/8/2009.

Ellis, F. (2005). Small Farms, Livelihood diversification and Rural Urban Transition: Strategic issues in Sub Saharan Africa. Proceedings of Workshop on The Future of Small Farms. Witherston Conference center Wye,Kent, UK. 26 – 29 June 2005. [http//www. Ifpri.org/events/seminars/2003/smallfarms/ellis.pdf htm] site visited on 22/8/2009.

FAO (1985). Small and Medium sawmills in Developing countries. FAO Forestry paper No. 28 Rome, Italy. 60pp.

FAO, (1985). Tree growing by rural people. FAO Forestry paper No. 64, Rome, Italy. 86pp.

FAO, (1986). Appropriate Forest Industries. FAO Forestry paper No. 68, Rome, Italy. 88pp.

FAO, (1987). Small scale forest based processing enterprises. FAO Forestry paper No. 79, Rome. Italy. 239pp.

FAO, (1989). The Ecological Effects of Eucalyptus FAO Forestry Paper No.59 Rome, Italy. 25pp.

FAO, (1993). Forest Resource Assessment of Tropical Countries. FAO Forestry paper No. 112, Rome. Italy. PP 55 – 57.

FAO, (1994). The Road From Rio: Sustainable Agriculture and Rural Development -Moving Forward in Forestry. Rome, Italy.18pp.

FAO, (1998). Forest Resource Assessment 2000 – Terms and Definitions: Forest resource assessment programme working paper No. 1 Rome, Italy. pp2 – 10.

FAO, (1999). Urban and Peri urban Forestry- Case Studies in Developing Countries, Rome, Italy. 11pp.

FAO, (2001). Global forest resource assessment 2000: main report, FAO forestry paper No. 140, Rome, Italy. 133pp.

FAO, (2002). Trees outside the forest-Towards better awareness. CIRAD (35). 72pp.

FAO, (2003). Forestry outlook study for Africa, Regional report opportunities and challenges towards 2020 FAO forestry paper No. 14, Rome, Italy. 59pp.

FAO, (2005). Global forest resource assessment: Progress towards sustainable forest management. Forestry paper No. 147, Rome, Italy. pp149 – 154.

FAO, (2007). Global Forest Resource Assesment 2005 Main report. FAO Rome, Italy. 479pp.

FBD, (2003). Technical order No.1 of 2003 Technical Specification for Management of Forest Plantation in Tanzania. Forest and Beekeeping Division, Dar es Salaam.

FOSA (2003). Forest out look study for Africa –Sub regional report East Africa in ADB/EEC commission to FAO –UNDP, [http;//www.64.233.183..104/search?q=eache:vihc.z16uzAO ftd:fao.org/] site visited on 14/7/2008.

Foy, T. J. Pitcher, M. J. (1999). Private sector/ community partnership for commercial Forestry development recent experience from South Africa. *The International* F*orestry Review* 4: PP 222 – 223.

Gerrit, V. W. Dave, P. Kindeya, G. Raff, A. and Muys, B. (2006).The potential and Risks of using exotics for the rehabilitation of the Ethiopian dry land Forests *Journal of the dry lands.* 1, (2): pp148-157.

Gina, A. Chowa, N. Ansong,D. Habiba, I.(2007). Asset Outcomes for Women and Children Centre for Social Development Developing countries research review. Washington State University Working paper no.7-28. [http://www.CSD.Wust.edu/publications/Documents/wpo7-28 htm] site visited on 13/7/2009.

Godsey, L. (2000). Economic budgeting for Agro forestry practices. University of Missouri, centre for Agro forestry: 20pp.

Godwin, J. W. (1994). *Analysis and Forecasting*, Agriculture Prices, John Wiley and Sons incorporated New York, Toronto, and Brisbane, Singapore 22pp.

Gonzalez, M. B. (2003). Domestic Violence, Bargaining and Fertility in Rural Tanzania. University of California, Berkeley, (department of economics). [http://www.sscnet.uda.edu/pollsci/wgae/papers4/Gonzalez htm]site visited on 13/7/2009.

Gunasema, H. P.M. (1997). Domestication of Agroforetry trees in Sri Lanka in Rasheko ,J. (ed) Galgah Mada University. Yogkarta, Indonesia. pp32 – 37.

Hakon, F. J. (1999). Fuel wood Scarcity in Tanzania in Terms of Severity ,Impact and Remedies. In: Burning With Enthusiasm [http://www.docs.google,com/gview?a=voa=cache.5163ZwkmFYUJtse2 in ch htm] site visited on 26/8/2009.

Hall, M. J. (1990). Trees For Rural Australia. In: Wood production. Inkata press, Melbourne [http://www.farmforestline.com.au htm] site visited on 20/1/2008.

Harrison, S. (2002). Non Industrial, Small holder, Small scale and Family Forestry. [http//www.nrsm.uq.edu.au/sfemp/Journals/vol/No1%/Harison] site visited on 3/8/2009.

Harwood, C. E. (1997). Domestication of Australian tree species for Agro forestry; In Rosheko, J. (ed) *Proceedings of South East Asian Regional Workshop on*. *Domestication of Agro forestry trees;* Gadgah,Mada University Yogyakarta; Indonesia; PP51 – 60.

Haule, E. F. (2003). Spatial Technology For Natural Resource Management, Environmental Monitoring,and Disaster Management; Proceeding of Regional on use of *Geo-spatial technology,2004;* Khartoum; Sudan; 5 – 8 April 2004 [http://www.unosa.org/pdf/sAp/2004 htm] site visited on 8/7/2008.

Haydon, J. and Clough, P. Barbara, H. Chris, P. (2008). Economic costs of hill country erosion and benefits of mitigation in New Zealand: Review and Recommendation of Approach SCION Next Generation Biomaterials [http://www.maf.govt.nz/mafnet/rural nz/sim hill htm] site visited on 3/7/2009.

Holding, A. C. and Rashetko, J. M. (2003). Farm level timber production: Orienting the farmers towards the market. *Unasylva*, 54, (1): pp48 – 57.

Holmgren, P. Masakha,E. J. and Sjoholm,H. (1994). Not all African land is degraded a recent survey of trees on farms in Kenya, *Ambio* 23 (7): pp390 – 395.

IPS. (2009). For Trees, Against Monoculture in Africa Feature. Daily News, Issue No. 9904. p. 14.

Jaako Pory – SIDA (1992). Industrial restructuring study on wood and paper industry – Tanzania fact book. Report to SIDA – Helsinki Feb. 1992. pp7 – 8.

Jori Kulluvannen, Jotma,salo. (1991). Timber supply and life cycle harvest of non – industrial private forest owners; An empirical analysis of Finnish case. *Forest Science Journal.* 37, (3-4): pp1011 – 1029.

Jylha, L. (2007). Forest management associations: Value from co operation for forest owners. *Unasylva* 228, (3): pp44 – 45.

Kajembe, G.C. Luoga, E. J. (1996). *Socio – economic aspects of tree farming in Njombe district, Consultant report to HIMA – Njombe.* SUA, Morogoro. pp43–48.

Kamuzora, C. L. and Mkanta, W. (2000). Poverty and Household/Family size in Tanzania: Multiple Responses to Population Pressure. Research Report No.00.4 REPOA 2000. Tanzania printersLtd. Dar es Salaam, Tanzania. pp8 - 10.

Katani, G. C. (1994). The role of Gender based Knowledge in Developing Coping strategies Against Deforestation: A case study of Mwanza district dissertation for the award of Msc. degree of Sokoine university of agriculture, Morogoro, Tanzania. 110pp.

Katherine, W. (1997). Pattern of tree growing by farmers in East Africa. In ; *Farms trees farmers Response to agriculture intensification* "Edited by", (Michael, J. M. and Dewees, P. A.) Earthscan publications Ltd. London. U. K. pp90 – 137.

Kothari, C. R. (2008). *Research Methodology*: Methods and Techniques (second editions), Dharmesh Printers, Dehli, Reprinted 2008. 61pp.

Kotler, P. (1985). *Principles of Marketing*. Prentice Hall of India Private Limited New Dehli, India. 383pp.

Kowero, G. S. (1980). An economic evaluation of the mobile sawmilling industry in Tanzania. pp464 – 478.

Lawi, J. (2009). Focus on Iringa Region- Makete land of plenty and snow. Daily news, Issue No. 9851. 9pp.

Leakey, R. R. B. (1998). Agro forestry in the humid lowlands of West Africa: some reflection on future directions for reseach. In Dduguma,B. (ed) Agroforestry systems(special issue). 40, (3): pp253 – 262.

Lebora, H. M. (2007). The Contribution of Participatory Forest management and Poverty Reduction in Lindi Rural District, Tanzania. Dissertation for Award of Msc. Degree at Sokoine University of Agriculture. Morogoro, Tanzania. 123pp.

Lengleek, A. G. and Carsans, S. (2004). The process of participatory tree domestication in Meru - Kenya. Development in practice. *World agro forestry centre*. 14, (3): pp445 – 451.

Loren, E. (2000). On site sawmilling and timber conversion information pack woodland project report. 22pp.

Machumu, R. M. (2008). Present Consumption and Forecasting of Sawnwood in Arusha and Moshi Municipalities. Dissertation for the award of Msc. Degree at Sokoine University of Agriculture. Morogoro, Tanzania. 121pp.

Magcale, M. D. Menz, K. Rocamora, P. Predo, C. (1999). Smallholder timber production and marketing: The case of Gmelina arborea in claveria, North Mindanao, Phillippines. [http://www.cifor. cigiot.org/knowledge/publications htm.] site visited on 14/8/2009.

Makauki, A. F. (1999). Factors Affecting Adoption of Agro forestry Farming System in Turiani Division,Morogoro Rural District. Dissertation for an Award of M. A. Degree at Sokoine University of Agriculture,Morogoro, Tanzania. 92pp.

Makundi, R. I. W. (1990). Mitigation options in Forestry, Land use change and Biomass Burning in Africa – Lawrence Berkely National Laboratory, USA. [http://www.osti.gov/bridge/servelets/ htm] site visited on the 14/8/2009.

Mandalo, A. S. (2006). The contribution of medicinal and wildfood plants to the well being of rural communities in Lindi rural district, Dissertation For The Award Msc. Degree at Sokoine University of Agriculture, Morogoro,Tanzania. pp34 - 35.

Mariki, W.L.S. (2001). The role of forestry in poverty alleviation. published by Forest Department – FAO September 2001. 21pp.

Masangano, B. Ntakimayire, A. (2008). Rotational woodlot technology in Kigoryba sub county, Hoima district, Uganda. *Botany Research journal.* 1, (2): pp36-43. [http://www.medwellsJournals.com/fulltext/brj/2008/htm] site visited on 29/5/2009.

Mboya, S. D. Bagachwa, A. Sarris, H. and Tinics, P. (1991). Small Scale Urban Enterprises in Tanzania: Results From A 1991 Survey. [http://www.cfnpp.cornel.edu./images/wp44.pdf.] site visited on 6/9/2009.

Mduma, J. K. and Wobst, P. (2005). Determinants of Rural Labour Market participation in Tanzania. African Studies Quartely .The Online Journal For African Studies 8 (2). [http://www.africa.ufb.edu./asq/v8/v812&2.htm.] site visited on 6/9/2009.

Mercer,D. E. and Janaki, R. R. A. (2004). Valuing Agro forestry systems, methods and applications. Kluwer Academic Publishers-Netherlands. 310 pp.

Michael, M. C. (1981). Land Tenure Systems and Social Implication Of Forestry Development Programmes. World Bank Working Paper No. 52 Washington D.C. USA. 5pp.

MNRT (1998). National Forest Policy. Government Printers, Dar es salaam,Tanzania. 39pp.

MNRT. (2001). National forest programme for 2001 – 2010.Government Printers, Dar es salaam, Tanzania. 134pp.

MNRT. (2005). Evaluation of sawmills and other primary wood using industries in Tanzania. Forest and Beekeeping Division. Dar es Salaam. 80pp.

Mnzava, E, M, (1987). FAO Document Repository, FAO Cooperate Document Repository:Forestry and the crisis in Africa- Tanzania Tree planting, FAO, *Unaslyva* No. 150. FAO. Rome, Italy.

Mnzava, E. M. (1985). Tanzania tree planting; a voice from the villages. *Unasylva*. 37 (4). 33 – 41pp.

Moore, R. (1992). The Role of Trees on Sustainable Agriculture. Integrating Wood Production into Australian Farming System *Review papers Presented at the Australian Conference*, Albury, Victoria, Australia , October 1991. Kluwer Academic publishers Dreight- Boston. pp167 – 185.

Mosha, L.H. (2006). Realities of Energy Efficiency in Shelter Adequacy in Tanzania. [http://www,public/ ises.org/PREA/3- papers/6Best PracticeTz- Mosha.pdf.htm] site visited on 22/8/2009.

Munishi, P. K. O`ktingati, A. Monela, G. C. and Kingazi, S. P. (2004). Small holder forestry for employment, income generation and rural development in Tanzania. *Journal of The Tanzania Association of Foresters.* 10, (1): pp49 – 63.

Munishi, P. K. T. (2007). The Eucalyptus Controversy in Tanzania.FOFNC-SUA Morogoro. Paper Presented at *the TAF Annual General Meeting*, Dodoma – Tanzania. July 2007. 23-24pp. [http://www.taftz.org./reports/use htm] site visited on 29/5/2009.

Munishi, P. K.T, Kajembe, G. C, Ngaga, Y. M. Mvena, Z. (2005). Small holder forestry and its contribution to livelihoods, income, poverty alleviation and environmental conservation in the Southern highlands of Tanzania. Report to REPOA 2005. pp16 – 24.

Mussak, M. F. and Laarman J. G. (1989). Farmer's production of timber trees in the cacao/coffee region, of coastal Ecuador. *Agro forestry Systems journa.l* 9, (2): pp155 – 169.

Mwandosya, M. J. and Meena, H. E. (1999). Climate Change Mitigation in Southern Africa: Tanzania Country Study. [http://www.uneprisoe.org/EconomicsGHG/Tanzania, htm] site visited on 26/8/2009.

Mwima, P. M. Sembajjiwe, W. G. and Eillu, G. (2004). Forest Certification in Uganda. Paper presented at the Symposium, *Forest Certification in Developing and Transitioning Societies,social,economic, and ecological effects*. Yale school of Forestry and Environment Studies, New Haven, Connecticut, USA. June 10-1 2004 [http://www.yale.edu/forestcertification/smposium/ htm] site visited on 10/7/2009.

Nair, C. T. S. (2007). Scale, Markets, and Economics: Small scale enterprises in a globalizing environment. *Unasylva* 228; 3: pp3 – 11.

NBS, (2008). Household Budget Survey (2007) Main Analytical Report.Ministry of Finance and Planning.[http://www.nbs.go.tz/HBS2007/9 htm] site visited on 9/10/2009.

Ngaga, Y.M. (2007). Socio Economic Baseline Data and Information for Selected Areas of the Great Ruaha River Catchment Area Tanzania Consultancy Report to World Wide Fund for Nature Tanzania Program Office. 34pp.

Nillson, S. and Bull, G. (2005). Global wood supply analysis. *Paper presented at the forty sixth session FAO Advisory committee on paper and wood products*; 31 may 2006 Vancouver; Canada; [http://www.fao.org/forestry/foris/htm] site visited on 14/6/ 2008.

Njenga, A. Wamicha, W. N. and Van Eckert. (1999). Role of trees in small holder farming systems of Kenya. *Proceedings of a workshop on off forest Tree resources of Africa*, 12 – 16 July, Arusha, Tanzania. pp63 – 67.

Norman, D.W. (1973). African Rural Employment Research Network. Department of Agricutural Economics. Michigan state Univerisity, Lausing, Michigan. 37pp.

Oliver, P. (2006) *Writing your thesis* sixth print. Vistaar publications. New-Dehli India. 195pp.

Online dictionary (2007). Woodlot definition [http://www.answers.com/ htm.] site visited on 26/12/2007.

Ota, L. (2007). A forest owner cooperative in Japan; Obtaining the benefits of certifications for small scale forest. *Unasylva* 228, 3: pp64 – 66.

Pasiecznik, N. (2006). The potential of chain sawmilling outside forests. Agroforestry Net Holuaba, Hawaii. [http://www.agroforestry.netpubs] site visited on January 2008.

Perreault, W. D.Jr. and Jerome, E. M. (2002). Basic Marketing A Global Managerial Approach. McGraw Hill Irwin companies, New York, USA. 310pp.

Place, F. and Otsuka, K. (1997). Population density, land tenure, and tree resource management in Uganda. ICRA. Tokyo Metropolitan University. Pp26 – 35.

Poschen, P. (1997). Forests and employment more than meets the eye; *A residual Benefit or an area for active intervention -XI World forestry congress;13 – 22 october 1997;* Antalya; Turkey; volume 4 Topic 20 [http://www.Fao.org/forestry/docrep/ htm]site visited on 15/7/2008.

Quizmbing, A. Meinzen, D. R. (2009). Strengthening Women Assets – IFPRI Forum Volume 1. [http://www.Ifpri.Org/pubs/Newsletters/Ifpriforum/if24.pc.] site visited on 13/7/2009.

Ralph, J. A. and David, N.W. (1992). The Political Science of Forestry-Changes in Private Timber land statistics and projections: *Journal of Forestry*, 89, (4): pp31-37.

Ravindran, D. S. Thomas, T.H. (2000). Trees on farms, state of wealth and rural livelihoods Insights and evidence from Karnataka, India. *International Forest Review* 2 (B): pp182 – 185.

Reddy, S. V. and Robert, J. B. (1998). Measuring softwood lumber value; A Conjoint Analysis Approach, *Forest science A quarterly journal of Research and Technical progress* 44, (1): pp145-165.

Saket, M. (2002). Gaps in national level information on forests and trees in developing countries. *Unasylva* (53), 3: pp24 – 27.

Sammy, C. (2007). Sustainable Farm timber for small holder cropping Systems. Dissertation for Award of MSc. Degree at University of The Free State. 58pp. [http;/www.world Agroforestry.org/downloads/publications/pdfs/B15012pdf htm]. Site visited on 20/8/2008.

Sanginga, P. C. Best, R. Chitsike, C. Delve, R. Kaar, B. and Kirkly, R. (2004). Enabling rural Innovation in Africa: An Approach for integrating farmer participatory Research and market orientation for building assets of rural poor. International centre for tropical agriculture. Kampala, Uganda. *Uganda journal of agriculture science.* 942 -957pp. [http://www.ciat.Cgiar.org/africa. htm] site visited on 13/7/2009.

Sarah, J. S. (1994). Meeting household need: Farmer tree growing strategies in western Kenya. *Farm, trees, and farmers*. Earthscan publication Ltd. London. pp162 – 163.

Scherr, S. J. (2004). Building opportunities for small farm agro forestry to supply domestic wood markets in developing countries. *Agro forestry systems*. 61; pp357 – 370.

Semra, E. (2005). Perspective on Poverty and Agriculture in Tanzania Case of Babati District.[http://www.eldis.org/fulltext/esrf policy0.2 htm]site visited on 16/6/2009.

Seppo – vehkomiki (1993). Tanzania Forestry Action Plan: Tanzanian forestry sector in the economic context. Forestry working paper 1/993, FAO, Rome, Italy. 11pp.

Sharma, P. N. (1992). Looking for balance between conservation and development. In: Managing the World Forests Kendall/ Hunt publishing company. Iowa, USA. pp244–345.

Slivitzky, M. (2008). Private woodlot strategic initiatives – Natural resources Canada model forest net work research model. [http://www.modelforest.net] site visited on 4/7/2008.

Smorfitt, D. B. Herbohn, J. L. and Harrison,S. R. (1999). Factors in the acquisition and utilization of portable sawmills in Queensland. Journalof Australian forestry. 62, (1): pp45 – 50.

Sosovele, H. and Ngwale, J. J. (2002). Economic root causes at the loss of Bio diversity in the Ruaha catchment area.
[http://www.asset.panda.org/downloads/rcareporturuaha.htm.] site visited on 8/7/2008.

Spears, J. (1987). A Decade of ICRAF Development in Agro forestry. A Development Bank Perspective World Bank, Washington, D.C.- USA Printfast Kenya Ltd. Nairobi, Kenya. pp53 - 65.

Steiner, K. G. (1984). Intercropping in tropical smallholder agriculture with special reference to West Africa. *Agro forestry systems*. 137, (2): pp143 – 144.

Stewart, M. and Hanson, I. (1998). On site processing for farm forestry. Rural research and Development Cooperation. Balton A.C.T. Australia.

Teklu, T. (1995). Labour- Intensive Public Works: The experience of Botswana and Tanzania. [http://www.ifpri.org/pubs/books/von braun95ch.06.htm]site visited on 3/7/2009.

Temu, A. B. (1999).World of Forestry In: *Proceedings on Workshop on Off Forest Tree resource (tree resources outside Forests)*. Arusha, Tanzania. 12-16 July 1999. pp 63 - 67.

Tidiane, K. and Josef, L. L.(2008). Small enterprise growth and the rural Investment climate : Evidence From Tanzania. The World Bank,African Region Agriculture and Rural Development Unit. Policy research working paper No.4675. [http//www.afdb.org/fileadmin/uploads/afdb htm] site visited on 6/9/2009.

Toimar, J. S. (1990). Rural Development in Taiwan - Some Lessons.Agricole Publishing Academy, New Dehli – 208 defence colony flyover 11002 (India) CHAMAN offset Printers. pp115-122.

UNCED, (1992). Earth Summit 92- The United Nation Conference on Environment and Development. Rio de Janeiro. 1992. Regency press corporation. London, U. K. pp220 - 221.

UNDP (1991). Human Development Report: Published by Oxford University Press. New York, USA. 29 pp.

UNECA, (1991). Manual for the integration of population variables into development plans in African countries. UNECA, Addis Ababa, Ethiopia. M91 -1185 31pp.

URT, (1992). Agriculture Sample Survey of Tanzania Mainland. National Bureau of Statistics –Presidential Office, Planning Commission, Dar es salaam, Tanzania. 19pp.

URT, (1992). The Energy Policy of Tanzania 1992. Ministry of Energy and Minerals. The Government Printer, Dar es salaam, Tanzania. pp9 - 19.

URT, (2000). *The Local Government Finance Act 1982.* ACT No, 9: GN. 35 and 36 of 1983. Revised Edition 2002. Government printer, Dar es Salaam. 37 pp.

URT, (2002). Forest Act, 2002 Act No. 14 of 2002. Ministry of Natural Resources and Tourism. Dar - es- Salaam. 1281 pp.

URT, (2004). Mufindi district socio economic profile. Planning commission and Iringa Regional commissioners office. Tanzania. 75pp.

URT, (2006). Millennium Development Goals in Tanzania Progress Report. Ministry of Planning, Economy and Empowerment. Government Printer, Dar es salaam, Tanzania. 14pp.

URT, (2006). Njombe district environmental profile. Prime ministers office, Regional administration and Local government. Unpublished, pp64 – 131.

URT, (2007). The Forest Act Cap.323: The Forest Regulations 2004 Revised 2007. Government Notice No. 231 of November 2007. Government printer, Dar es Salaam. 119pp.

URT, (2007). The Tanzania Economic Survey 2006 Ministry of Planning Economy and Empowerment Dar es salaam,Tanzania. 129pp.

Yaro, J. A. (2006). A Study of the livelihood activities in rural Northern Ghana. Is Deagrarianisation Real. *The journal of modern African studies*. *Cambridge university press*, 44; pp125-128. [http://www.journals.cambridge.org.htm] site visited on 21/4/2009.

APPENDICES

Appendix 1: Questionnaire for woodlot owners

A. **Identification variables**

Questionnaire number…….

1 Date of interview……..

3. Name of respondent…….

4. Village…….

5. Ward……..

6. Division…….

7. **Section B: Household structure,**

(a). Information of respondent

Head household	Sex	Age	Marital status	Education level	Main occupation	Other occupation (specify)

Key:

1= head of household, 2= others (specify)

Sex 1= male 2= female

Marital status 1= married 2= single 3= widowed 4= divorced

Education 1= no formal education, 2= primary school, 3= secondary school 4= tertiary

Main occupation 1= farmer, 2= worker, 3= retired

(b). Household size……

(c). Number of dependants…….

(d). Type of housing material

Walls……

Floor…….

Roof…….

8**. Section C: Land and tree ownership**

9. Total acreage owned……

10. Mode of acquiring land

Inherited…..

Bought……

Village government allocation…..

11. How do you acquire more land……

11.1. How much land would you be ready or willing to buy for planting trees?.....

11.2. What are the benefits of planting trees…….

Section D. Private woodlots

13. Do you own a woodlot or trees……..

Trees……..

Woodlot…….

14. How much of your land has woodlot/trees……..

15. Has the value of your land increased by planting trees……..

16. Are you credit worth by planting trees……..

17. Do you increase security of your land by planting trees……

I8. Which trees species have you planted…….

19. What is the source of the seeds……..

19.1. What is the source of seedlings……

19.2. What is the source of the wildings……

19.3. Do you establish woodlot from natural regeneration? YES/NO

20. What is the mode of planting?

Planted in clumps…….

Planted along the boundary of the farm……..

Planted interspersed in the farm……

Planted in rows……..

21. What is the spacing…….

22. How many trees did you plant in year (2007)…….

23. How many trees did you plant this year (2008)?.....

24. What is the number of trees you expect to plant in year (2009)……..

25. Who plants the trees?

Man……

Women……

Children……

Hired labour……..

26. How much does it cost to establish an acre of trees……

Operation	mandays per acre
Seedlings……	……
Land clearing……	
Pitting……	
Planting……	
Filling in dead trees……	
Spot weeding……	
Acces pruning……	
Fire protection……	
Felling…….	

27. Is it a second rotation planting……..

28. How long have you been growing trees……

29. Has tree growing taken place of other agricultural crops……

30. Do you face any constraints in tree planting YES/NO?

If yes which are the constraints……

31. At what age is harvesting done…….

Pines…….

Eucalyptus……

32. Which other tree products (specify) do you get from your woodlot?.....

33. What is the rotation age per species?

34. What is / was the purpose of planting trees?

Business…….

Investment for the future……..

Inheritance……

Others (specify)……

35. What do you think are the main constraints pertaining to tree farming?

Less land…….

Land tenure……..

Lack of capital……

Unreliable prices…….

Unavailability of the planting stock……

Fires……

Others (specify)……

Section E Revenue from sale of woodlot products

36. Have you ever sold any of the products from the mentioned woodlots? YES/NO

37. If yes how many trees did you sell this year (2007)?.....and 2008……..

Price for pines……

Price for eucalyptus…….

38. Who sold the products?

Yourself……

Middleman……

Others (specify)……..

39. How do you fix the price……..

40. What was the total income from selling these products?

2007……..

2008……..

41. How do you compare income from woodlot with income from other agricultural crops

……..

42. Who makes the decision in the household pertaining to tree harvesting and

why…….

43. Do you do the lumbering and sell the timber……

Yes……

No…….

If no why?.....

If yes why……..

44. What was the price for various sizes?

Why produce only these sizes……..

45. How many pieces of timber do you get per tree pine/eucalyptus?

Sizes 2x2…….

Sizes 2x4……

Sizes 2x3……

Sizes 1x6……

46. What have been the price trends in the past two years?

Decreasing…….

Increasing……..

Same……

47. Do you need permission to cut your planted trees?

48. Is timber harvesting important in this area

Yes……..

No……..

If yes explain how it is important……..

49. Do you think demand for wood products will change?

Increase…….

Decrease……

Remain the same……

Why…….

50. How many trees you expect to sell in the next two years?

2009……

2010……..

51. What do you think you have acquired as a result of sale of woodlot products?

Milling machine……

Radio……

Bicycle……..

Motor bike…….

Car…….

C.I roofed house……

Improved toilet……

Paid fees……

Started a shop…….

Planted new areas…….

52. How do you compare yourself with those people who didn't take up tree planting……..

53. Who enjoys the benefits of the woodlots?

Owner……

Middleman……..

Trader……

54. What are your comments on improvement of management of private woodlot for the benefit you are getting from them?.....

55. How much income did the district/village get from sales of your forest product?.....

THANKS FOR YOUR COOPERATION

Appendix 2: Questionnaire for (market survey) traders in forest products

A**. Identification of variables**

Questionnaire number…….

1. Date of interview……

2. Name of respondent…….

3. Address of respondent…….

4. Position……..

5. Sex…….

6. Education…….

7. Type of trade

Wholesale

Retail

Middlemen

Others (specify)

B. Information about trading of products from private woodlots

8. For how long have you been in this business?.....

Permanent

Temporary

9. Are there other activities you normally do apart from trading?

Farming

Employment

Others (specify)

10. What did you do before you started this business of trading in forest product…….

11. Where did you obtain capital for your business?

    Saving

    Farming

    Relatives

    Credit

    Other business

    Others (specify)

12. To whom do you normally buy your merchandise……

    Farmers

    Middlemen

    Others (specify)…….

13. How many poles / sawn timber do you receive per week/month?.....

14. What mechanism do you use to locate people with woodlots…….

15. Who sets the price and how is it set……..

16. Is sawing done on site…….

17. Who does the sawing…….

    Buyer…….

    Trader……

18. How much are you willing to pay per cubic meter?.....

19. How many suppliers do you have?.....

20. How much will you be willing to pay next year for pole/ timber suplly?.....

21. What has been the trend in pole/ timber supply?

    Increasing…….

    Decreasing……

    Same……..

22. Do you further process the products……..

23. If yes what is your final product……..

24. What are the common sizes produced and why

25. How many people are involved in processing?

Permanent

Part time

26. What is the trend in the prices?

Increasing

Decreasing

27. How many units do you sell?

Per day

Per month

Per year

28. How do you compare present sales with three years ago?

More

Less

29. What do you think is the reason?

Availability

Demand

Others (specify)

30. How many poles/pieces of timber did you trade last year (2007)

No. Buying price selling price

31. How many trees / poles will you need this year (2008)?.....

2009……..

2010…….

32. Where do you sell most of the products purchased……

33. To whom do you normally sell your produce?

Wholesaler

Individuals in village

Middlemen

Others

34. How do you transport your produce to the selling point?

Own car

Hired car

Others (specify)……

35. What are the prices per unit in the local market……

In the village…….

In ward trading centers…….

At the district headquarters……..

36. What are the prices in other markets……

Softwood hardwood

Iringa…….

Dar es Salaam……

Kenya……

37. How do you receive price information?

News papers

Radio

Telephone

Fellow traders

Visit market places

Extension officers

Others (specify)

38. What is the number of persons needed to accomplish the following activities?

    Clear felling

    Sawing

    Loading

    Sizing

    Dipping

39. What is the price charged after the process per cubic meter……

40. How do you fix the price?

    Take market price

    Calculate cost involved

    Others (specify)

41. Do you know the prices in advance before taking the consignment to the market?

42. Do you sell on credit?

    Yes

    No

    If yes explain

43. Do you have any form of cooperation with other traders?

    Yes

    No

    If yes explain

44. Have you experienced some quality problems in your activities?

    A,……

    B…….

    C…….

45. If yes which are the major problems?

46. How does the district collect revenue from woodlot?

Sell of trees

Sawn timber

Both

47. What is your opinion in improving business derived from private woodlot products?

THANKS FOR YOUR COOPERATION

Appendix 3: Checklist to guide the focused group discussion

1. Date of meeting……

3. Village……

4. Ward

5. Division…….

6. Major economic activities…….

7. Area of woodlot in terms of number of trees per acre…….

8. What benefits are gained from woodlots…….

9. How do you manage your woodlots?

    Pruning

    Planting more

    Stopped planting

    Replanting

10. Are there any conflicts in woodlots management?

11. Do you have any land problem in planting more woodlots?

12. How do you record forest product movement?

13. How many units of value added activities are there in the village?

14. How much did the village earn from private woodlot activities this year?

15. What are the value added activities people are engaged on?

16. Where do you get lumber for construction

17. Is the number of people employed in woodlot activities increasing/decreasing?

18. How many known middlemen are there in the village?

19. What are the skills impacted by woodlot activities?

    Positive

    Negative

20. How do you view house holds with woodlots?

    Poor

    Rich

21. How would the situation be in the village without woodlots?

    Well off

    Worse off

25. Any comments for improvement of private woodlot business

Appendix 4: Checklist for key informants (District Natural Resources officer)

1. Date……..

2. Name of respondent……..

3. Designation……

4. Office…….

5. How long have you been in this District……

6. What are the sources of wood supply in the district in hectares effective 2008

Private plantation……..

Government plantation……

Woodlot……

Others (specify)……

7. How do you asses the planting for the past four years

2008

2007

2006

8. In which divisions is planting of woodlots

concentrated……

9. What are the reasons for the above?.....

10. What is the status of the woodlots in the District now?

Abundant

Scarce

11. How much volume does each source supply per annum……

12. What is the price today (2008) per tree?.....

Eucalyptus

Pine

13. How do you asses the harvesting rate of the private woodlots

Excessive

Normal

14. What is the reason for the above……

15. What enterprises depend on private woodlots in the District?.....

16. How many units are there in the district?

17. Is there market for the products derived from woodlots within the District……

18. What is the unit price of the following at District Level?

Fencing pole……

Telephone pole……

Transmission pole……..

Lumber…….

19. Do woodlots have any contribution to the economy of the District?

YES

NO

20. How does the district collect revenue from woodlots?

From woodlot owners……

From traders……

Others (specify) …….

21. If yes, how much was collected by the District

2007

2008

22. What is the expectation of the earnings next year (2009)?.....

23. Is there any legislation passed by the district council allowing it to collect revenue from woodlot products?

YES

NO

24. If yes name it…….

25. When was the legislation passed…….

26. What should be done to improve the economic contribution of the woodlots to the district economy?……..

THANKS FOR YOUR COOPERATION

Appendix 5: Checklist for key informants village government Leader

1. Date……..

2. Name of respondent……..

3. Designation……

4. Village/office…….

5. How long have you been in this village/……

6. What is the total land area of the village?

7. What is the total number of households in the village?

8. Is the number of livestock increasing or decreasing in the village?.....

9. What are the reasons on the above……..

10. How many house holds have woodlots?.....

11. What is the average clear felling age of the woodlots?.....

12. What is the status of the woodlots now in the village?

    Abundant

    Scarce

13. How do you asses the planting for the past four years

    High

    Same

    Low

14. What are the reasons for the above?.....

15. What do you think is the number of middleman in the village……

16. What is the number of timber traders in the village……..

17. How do you asses the harvesting rate

    Excessive

    Normal

18. What is the reason for the above……

19. Is there market for the product within the village?

20. What is the price today (2008) per tree?.....

    2007…….

    2006……..

21. Which of the following units are found in your village?

    Mobile sawmills…….

    Carpentry units……

    Furniture mart…….

    Impregnation plants…….

22. Do woodlots have any contribution to the economy of the village…….

23. If yes, how much was earned in the village

    2007

    2008

24. What is the expectation of the earnings next year (2009)?.....

25. How much was harvested and recorded……

26. How many trucks per week/month come to the village to collect forest products?

Capacity of truck (pieces of timber) …….

27. What is the average unit price of lumber?.....

28. What is the average price per untreated pole?

29. What is the population characteristic?

    Stable……..

    Migration……

    Emigration……

30. What are the reasons for the above……

31. What should be done to improve the economic contribution of the woodlots to the village……..

THANKS FOR YOUR COOPERATION

Appendix 6: Checklist for key informants (District Trade officer)

1. Date……..

2. Name of respondent……..

3. Designation……

4. Office…….

5. How long have you been in the District"……

6. Are the following enterprises found in villages or ward trading centers?

Mobile sawmills

Wood pole impregnation plant

Timber yards

7. Do you license enterprises using raw material from private woodlots in the district?

YES

NO

8. If no why?……..

9. If yes what is the trend in earnings from licensing?.....

Increasing

Decreasing

What are the reasons?.....

10. How much does the district earn from licensing enterprises deriving raw material from private woodlots?

2006

2007

2008

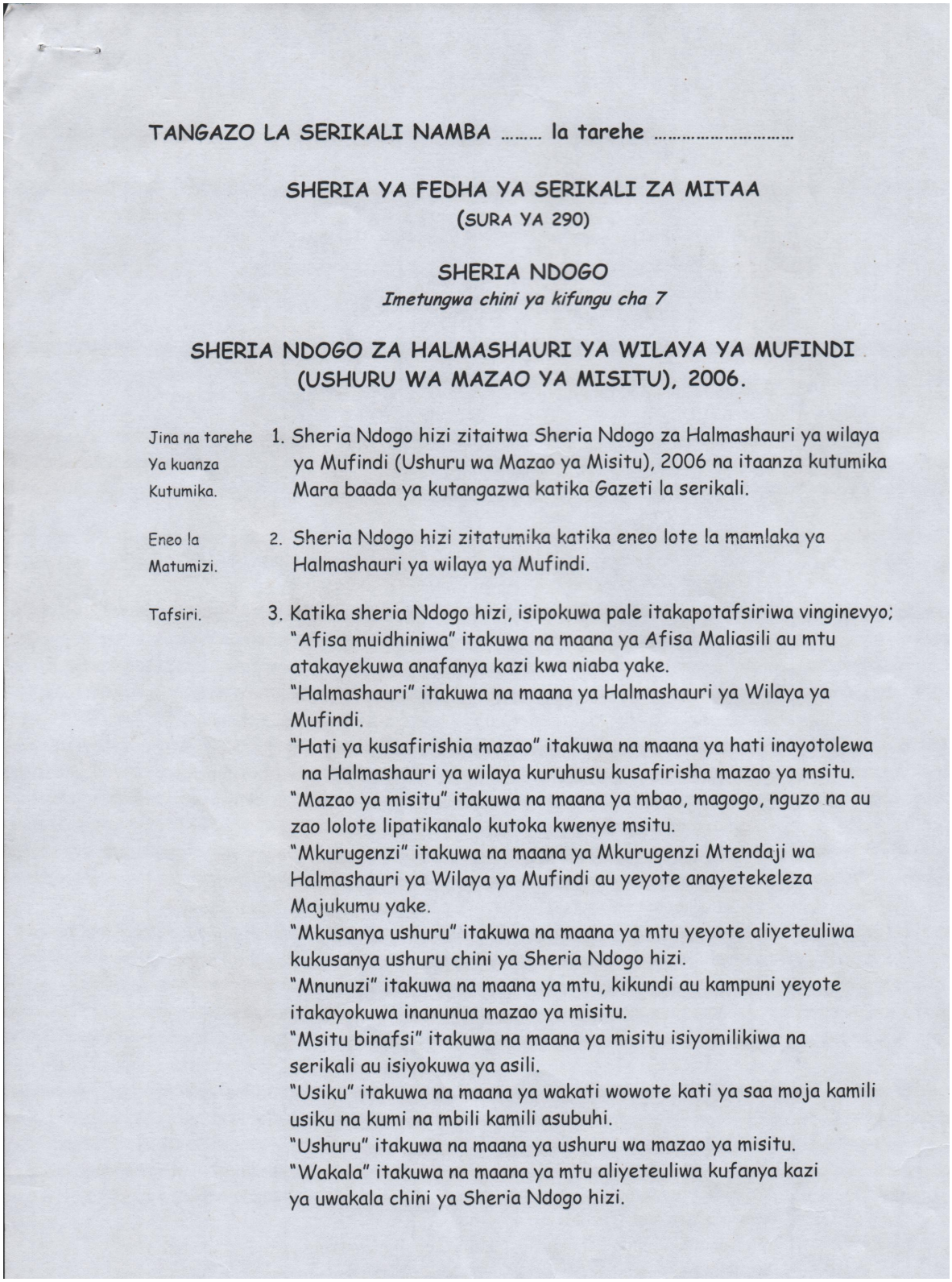
11. What is the expectation of the earnings in the following years?

2009

2010

12. What is the contribution to the district total income in percentage……..

Appendix 7: Miscellaneous legislation specimen



TANGAZO LA SERIKALI NAMBA …… la tarehe ……

SHERIA YA FEDHA YA SERIKALI ZA MITAA
(SURA YA 290)

SHERIA NDOGO
Imetungwa chini ya kifungu cha 7

SHERIA NDOGO ZA HALMASHAURI YA WILAYA YA MUFINDI (USHURU WA MAZAO YA MISITU), 2006.

Jina na tarehe Ya kuanza Kutumika.

1. Sheria Ndogo hizi zitaitwa Sheria Ndogo za Halmashauri ya wilaya ya Mufindi (Ushuru wa Mazao ya Misitu), 2006 na itaanza kutumika Mara baada ya kutangazwa katika Gazeti la serikali.

Eneo la Matumizi.

2. Sheria Ndogo hizi zitatumika katika eneo lote la mamlaka ya Halmashauri ya wilaya ya Mufindi.

Tafsiri.

3. Katika sheria Ndogo hizi, isipokuwa pale itakapotafsiriwa vinginevyo;
"Afisa muidhiniwa" itakuwa na maana ya Afisa Maliasili au mtu atakayekuwa anafanya kazi kwa niaba yake.
"Halmashauri" itakuwa na maana ya Halmashauri ya Wilaya ya Mufindi.
"Hati ya kusafirishia mazao" itakuwa na maana ya hati inayotolewa na Halmashauri ya wilaya kuruhusu kusafirisha mazao ya msitu.
"Mazao ya misitu" itakuwa na maana ya mbao, magogo, nguzo na au zao lolote lipatikanalo kutoka kwenye msitu.
"Mkurugenzi" itakuwa na maana ya Mkurugenzi Mtendaji wa Halmashauri ya Wilaya ya Mufindi au yeyote anayetekeleza Majukumu yake.
"Mkusanya ushuru" itakuwa na maana ya mtu yeyote aliyeteuliwa kukusanya ushuru chini ya Sheria Ndogo hizi.
"Mnunuzi" itakuwa na maana ya mtu, kikundi au kampuni yeyote itakayokuwa inanunua mazao ya misitu.
"Msitu binafsi" itakuwa na maana ya misitu isiyomilikiwa na serikali au isiyokuwa ya asili.
"Usiku" itakuwa na maana ya wakati wowote kati ya saa moja kamili usiku na kumi na mbili kamili asubuhi.
"Ushuru" itakuwa na maana ya ushuru wa mazao ya misitu.
"Wakala" itakuwa na maana ya mtu aliyeteuliwa kufanya kazi ya uwakala chini ya Sheria Ndogo hizi.

Ushuru.

4.(1)(a) Kutakuwa na ushuru wa mazao ya misitu utakaotozwa na kukusanywa

Kwa kila mnunuzi wa mazao ya msitu wa serikali kwa kiwango cha asilimia tano (5%) ya bei ya kununulia.

(b) kutakuwa na ushuru wa mazao ya msitu utakaotozwa na kukusanywa kwa kiwango cha shilingi hamsini (50/) kwa ubao wa mti laini na shilingi mia (100/) kwa zao la mti mgumu kutoka misitu ya watu binafsi au taasisi.

(c) kutakuwa na ushuru wa shilingi mia (100/) kwa kila gunia la mkaa utakaotozwa na kukusanywa kutoka kwa mnunuzi wa zao hilo.

(2) Bidhaa zinazotokana na mazao ya misitu kama vile samani Hazitotozwa ushuru.

(3) Ushuru wa mazao ya misitu utalipwa kabla ya mazao hayajaondolewa Kutoka eneo la la msitu ambako zao husika limevunwa.

(4) Mazao ya misitu yatakayotozwa ushuru ni yale yatokanayo na misitu inayomilikiwa na serikali, taasisi au mtu binafsi.

Wakala.

5.(1) Mkurugenzi anaweza kuteua kwa maandishi na kwa kufuata taratibu za zabuni zinazotumika katika Halmashauri za wilaya, mtu au taasisi yoyote kuwa Wakala wa kukusanya ushuru chini ya Sheria Ndogo hizi.

(2) Wakala atakayeteuliwa chini ya Sheria Ndogo hizi atakusanya ushuru na kuwasilisha katika halmashauri kiasi cha pesa atakachokusanya katika Halmashauri.

(3) (a) Wakala yeyote atakayeteuliwa chini ya Sheria Ndogo hizi kukusanya Ushuru, kwa makusudi akishindwa ama kupuuza kuwasilisha ushuru aliokusanya atakuwa ametenda kosa chini ya Sheria Ndogo hizi na akitiwa hatiani atatakiwa kulipa faini ya shilingi elfu hamsini au kifungo cha miezi sita,au adhabu zote kwa pamoja, yaani kifungo na faini.

(b) Pamoja na (3) (a) hapo juu, atatakiwa pia kulipa na fedha ambazo anadaiwa.

Mlipa Ushuru/ Mnunuzi

6.(1) Mlipa ushuru/mnunuzi chini ya Sheria Ndogo hizi atatakiwa kudai na kupewa stakabadhi halali kutoka kwa mkusanya ushuru kwa kiasi alicholipia ushuru.

(2) Mlipa ushuru/mnunuzi atatakiwa kuonyesha kwa Afisa muidhiniwa stakabadhi ya malipo ya ushuru na hati ya kusafirishia mazao wakati wowote atakapohitajika kufanya hivyo.

(3) Pale ambapo mlipa ushuru/mnunuzi ataposhindwa kuonyesha uthibitisho wa kulipa ushuru kama vile Sheria Ndogo hizi zinavyoagiza;

(a) Afisa muidhiniwa atakuwa na haki ya kukamata mali na kuhifadhi mpaka pale uthibitisho wa malipo utakapothibitishwa.

Ushuru. 4.(1)(a) Kutakuwa na ushuru wa mazao ya misitu utakaotozwa na kukusanywa

Kwa kila mnunuzi wa mazao ya msitu wa serikali kwa kiwango cha asilimia tano (5%) ya bei ya kununulia.

(b) kutakuwa na ushuru wa mazao ya msitu utakaotozwa na kukusanywa kwa kiwango cha shilingi hamsini (50/) kwa ubao wa mti laini na shilingi mia (100/) kwa zao la mti mgumu kutoka misitu ya watu binafsi au taasisi.

(c) kutakuwa na ushuru wa shilingi mia (100/) kwa kila gunia la mkaa utakaotozwa na kukusanywa kutoka kwa mnunuzi wa zao hilo.

(2) Bidhaa zinazotokana na mazao ya misitu kama vile samani Hazitotozwa ushuru.

(3) Ushuru wa mazao ya misitu utalipwa kabla ya mazao hayajaondolewa Kutoka eneo la la msitu ambako zao husika limevunwa.

(4) Mazao ya misitu yatakayotozwa ushuru ni yale yatokanayo na misitu inayomilikiwa na serikali, taasisi au mtu binafsi.

Wakala. 5.(1) Mkurugenzi anaweza kuteua kwa maandishi na kwa kufuata taratibu za zabuni zinazotumika katika Halmashauri za wilaya, mtu au taasisi yoyote kuwa Wakala wa kukusanya ushuru chini ya Sheria Ndogo hizi.

(2) Wakala atakayeteuliwa chini ya Sheria Ndogo hizi atakusanya ushuru na kuwasilisha katika halmashauri kiasi cha pesa atakachokusanya katika Halmashauri.

(3) (a) Wakala yeyote atakayeteuliwa chini ya Sheria Ndogo hizi kukusanya Ushuru, kwa makusudi akishindwa ama kupuuza kuwasilisha ushuru aliokusanya atakuwa ametenda kosa chini ya Sheria Ndogo hizi na akitiwa hatiani atatakiwa kulipa faini ya shilingi elfu hamsini au kifungo cha miezi sita,au adhabu zote kwa pamoja, yaani kifungo na faini.

(b) Pamoja na (3) (a) hapo juu, atatakiwa pia kulipa na fedha ambazo anadaiwa.

Mlipa Ushuru/ Mnunuzi 6.(1) Mlipa ushuru/mnunuzi chini ya Sheria Ndogo hizi atatakiwa kudai na kupewa stakabadhi halali kutoka kwa mkusanya ushuru kwa kiasi alicholipia ushuru.

(2) Mlipa ushuru/mnunuzi atatakiwa kuonyesha kwa Afisa muidhiniwa stakabadhi ya malipo ya ushuru na hati ya kusafirishia mazao wakati wowote atakapohitajika kufanya hivyo.

(3) Pale ambapo mlipa ushuru/mnunuzi ataposhindwa kuonyesha uthibitisho wa kulipa ushuru kama vile Sheria Ndogo hizi zinavyoagiza;

(a) Afisa muidhiniwa atakuwa na haki ya kukamata mali na kuhifadhi mpaka pale uthibitisho wa malipo utakapothibitishwa.

(b) Bila ya kuathiri aya ya 6.(3) (a) hapo juu,mlipa ushuru/mnunuzi Atagharamia gharama zote zitakazoendana na ukamataji wa mazao hayo.

(c) Pale ambapo mali iliyokamatwa itakapokuwa haijalipiwa ushuru katika muda wa siku kumi na nne toka tarehe ya kukamatwa kwa mali hiyo, mali hiyo itauzwa kwa njia ya mnada na kukusanya ushuru unaodaiwa pamoja na gharama za kuhifadhi mali husika na gharama za mnada kutoka kwenye mauzo hayo.

Mkusanya Ushuru. 7. Utakuwa ni wajibu wa mkusanya ushuru kutoa stakabadhi halali kwa kila Malipo ya ushuru atakayopokea.

Vizuizi. 8. (1) Kutakuwa na vizuizi vitakavyowekwa katika sehemu ambazo mkurugenzi ataona panafaa kwa lengo la kudhibiti ukwepaji wa ushuru unaotakiwa Kulipwa chini ya Sheria Ndogo hizi.

(2) Afisa muidhiniwa atakuwa na haki ya kukagua gari lolote ambalo atashuku kwamba limebeba mazao ya misitu kwa nia ya kuhakikisha kuwa ushuru unaotozwa chini ya Sheria Ndogo hizi, umelipwa.

Makosa. 9. Itakuwa ni kosa kwa mtu, kikundi au taasisi yeyote kuondoa ama Kusababisha kuondolewa mazao ya misitu kutoka katika msitu kwa wakati Wa usiku.

Adhabu. 10. Bila ya kuathiri kifungu cha 5(3) na cha 6(3), yeyote atakayekwenda Kinyume na Sheria Ndogo hizi atakuwa ametenda kosa na ikibainika Kutenda kosa hilo atatozwa faini ya shilingi elfu hamsini au kifungo cha Miezi sita au vyote kwa pamoja, yaani faini na kifungo.

Lakiri ya Halmashauri ya wilaya ya Mufindi imebandikwa katika Sheria Ndogo hizi kutokana na azimio la Halmashauri lililopitishwa tarehe 31 ya mwezi wa Oktoba 2006 mbele ya;

_____

H. H. HIDA,
MKURUGENZI MTENDAJI,
HALMASHAURI YA WILAYA YA MUFINDI.

_____

NAUSED K. NYAGANILWA,
MWENYEKITI WA HALMASHAURI
WILAYA YA MUFINDI.

NAKUBALI,

DODOMA,

_____

_____

EDWARD NGOYAI LOWASSA, (MB)
WAZIRI MKUU.