Unilever Tea Tanzania Limited (UTT)

ANALYSIS OF THE EXTENT OF HUMAN PRESSURES AND IMPACT ON NATURAL FORESTS OF UNILEVER TEA TANZANIA LIMITED

FINAL REPORT

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December, 2007

CRITICAL ECOSYSTEM PARTNERSHIP FUND

EXECUTIVE SUMMARY

1. Introduction

The Unilever Tea Tanzania Limited located in Mufindi district, Iringa region has a long-term lease of 20,000 hectares out of which relatively undisturbed natural forests, wetlands and grasslands cover 65%, which are part of the Udzungwa biodiversity 'hot spot', one of 24 in the Eastern Arc Mountains of Kenya and Tanzania. The UTT forests are interlinked with other natural forests in Mufindi including Kigogo forest.Communities bordering the estate's boundaries are exerting pressure on the forests because of demand for its products mainly for fuel wood, building materials and medicinal plants. This is likely to affect the biodiversity found in the natural forests. The aim of this study was to establish the extent of local community dependence on the natural forests and propose mitigating measures for protection of important animal and plant species in the forest 'hot spot' through the local communities. Fifteen villages are appraised and five of them having the most significant impact on the natural forest and biological diversity are identified for pilot interventions. The study was conducted in March - April 2007. The main methodology comprised Participatory Rural appraisal (PRA), interviews, administered questionnaires, discussion with various personnel at various offices, observation on the forests and communities and use of the available literature.

2. Major study findings

2.1 Socio-Demographic Profile of Households

The average household size was 5.0 people and the main activity undertaken by more than 91% of the households was crop farming. Land is the most important resource for farming activities, and because of high population and inadequate arable land, most households own between 0.5 acres per household (Kibao and Ihomasa) to 40 acres per household (Ludilo) with an overall average of 3.8 acres per household. A wide range of food and cash crops are grown but for most farmers, maize is the main source of food, mostly followed by wheat, Irish potatoes and beans. Land productivity and crop prices are low. The average rain fed productivity per acre for most households is 5 bags (100 kg/bag) of maize, 1 bag of beans, 1.7 bags of wheat, 3 bags of Irish potatoes and 12 bags of sweet potatoes. Almost all household respondents (92%) keep livestock mainly between 5 and 10 chicken. Other livestock kept include pigs, cattle, goats, sheep ducks and rabbits.

2.2 Forest Products and Services from forests

Analysis of products and services from forests in the study area has indicated that the major products include firewood, charcoal, building materials (poles and withies), medicinal plants and timber, and small quantities of wild fruits, wild meat, bamboo wine, wild vegetables, fodder, thatching grass, honey and charcoal.

Firewood, charcoal, poles, withies and timber

Firewood was in most villages ranked first of all the listed benefits/products. The lowest estimated household annual consumption was 3,898 kg (7 m^3) while the highest was 6,087 kg (11 m^3). Average consumption per villages was estimated to be 4,971.6 kg (9.0 m^3) per household out of which 1,289.1 kg (2.3 m^3) was estimated to come from natural forests. Total annual consumption of firewood from natural forests for 15 villages was estimated to be 10,472,341 kg equivalent to 18,876 m^3 of wood. For UTT employees, each household use about 4,680 kg (8.4 m^3) per year out of which 3,042 kg

(5.5 m^3) comes from company plantations and the remaining 1,638 kg (2.9 m^3) from natural forests. Thus, the total firewood consumption by all employees living within the company premises was estimated to be about 23.4 million kg (42,100 m^3) per year, 35% (14,700 m^3) being from natural forests. The most preffered indigenous species for firewood and timber include *Macaranga kilimandscharica*, *Myrica salicifolia, Bridelia bridelliodes, and Dodonea viscose*.

Selection of sites for collection of forest products was based on visibility and the tendency was to go anywhere interior of the forests in order to hide themselves from patrolling guards and/or forests owners. The average distance from homesteads to natural forests was about 2.2 km and mean time spent on firewood collection was about 1.2 hours.

From the household survey only 45% of respondents indicated use of charcoal and out of those about 45% used charcoal from natural forests, 22% from established forests, 20% from around their settlements while 13% obtained it from households' own woodlots. In most villages charcoal was from *Acacia* mearnsii (Black wattle*).*

Very few respondents (6%) indicated that they use poles. For the household which used poles the average consumption was estimated at 24 poles per year. Therefore the total annual consumption for all villages was estimated at 11,280 poles. Only few responses (5.3%) indicated the use of withes in the study area. For a household which used withies the average consumption was estimated at 19 headloads per year. Therefore the total annual consumption for all villages was estimated at 7,896 headloads. It seems that destruction of forests in the study area is not very much due to felling trees for use as poles and withies.

It was found that most of the timber used was coming from own grown trees. However about six villages indicated that they get timber from natural forests.

Wild Fruits, Traditional Medicine, Mushrooms, Bush Meat, Ropes

Very few responses were received regarding use of indigenous fruits and nuts. Of the few who collected these products, quantities varied from the average of 1.5 to 9 tins per household per year and mostly consumed at home.

The mean quantity of medicinal plants collected per household was about 2.4 kg per year. About 37% of the households interviewed collected medicinal plants from natural forests. Therefore the total annual collection of medicinal plants for all villages was estimated at 6,963 kg. A total of 31 (about 10%) respondents indicated their use of ropes from natural forests about 6 metres per year.

2.3 Present condition of natural forests and use conflicts

Forty nine percent of respondents indicated that the effect of human activities in natural forests was more evident a bit inside the boundary than the periphery. However, nearly 57% of the respondents had the opinion that the condition of the forests was just good (very little disturbed) while 36% indicated that it was good (relatively more disturbed) Most of the households (93%) interviewed in the 15 villages believed that natural forests are sources of water and that they should be conserved. Resource use conflict was

evident in many villages especially on forests because most of the villages are close to natural forests belonging either to UTTC, MTC, Central and/or local government, and there is pressure to extract products illegally from the forest.

2.4 Alternative sources of energy and efficient technologies

The villages surveyed are essentially rural and the major source of energy is fuel wood-firewood and charcoal; firewood being the dominant energy source. Other types of energy used are kerosene as indicated by 93% of respondents while 7% respondents indicated to use electricity as an additional energy source. It was further observed that fuel wood utilization is characterized by application of energy inefficient technologies. Other sources of energy include petroleum, coal, natural gas, solar and wind. However the supply of these products to rural areas is difficult due to distance, high initial costs and poor infrastructure.

It is clear that a more viable energy option in the villages studied is biomass energy, which mainly comes from wood materials. One among the available strategic options for proper energy conservation is conservation of wood fuels through introduction of improved and efficient conversion and utilization technologies. Use of firewood efficient stoves reduces consumption of firewood by about 50%. This implies that average annual consumption of firewood in the study villages will fall from 9 m^3 to 4.5 m^3 per household. If more than 75% of households can adopt the stoves, total annual firewood consumption from natural forests for the 15 villages and UTT employees can fall from 33,576 m^3 to 22,384 m^3 and about 11,192 m^3 can be saved annually. This saving is equivalent to about 132 ha of natural forests considering a high stock of miombo forests. Also about 62 hours annually used for firewood collection will be saved and could be used for other activities.

2.5 Possible mitigation measures to reduce degradation of natural forests and limitations

Challenges facing conservation of natural forests include increased fire incidences, inadequate awareness and knowledge on environmentsl conservation, and continued use of inefficient energy stoves. The demand for forest products is expected to increase as reported by 77% of the respondents interviewed. The main reason for increase in demand was population growth estimated at 1.5 (NBS 2002) as reported by 96% of the respondents, high prices of alternative energy sources such as electricity and kerosene and its availability in rural areas and poverty. Nearly 46% of the households are poor and living on slightly less than a dollar (0.8 USD) per day.

Basing on the knowledge and discussion with communities during field visits the following mitigating measures are considered:

(i) Effective tree planting schemes
(ii) Effective use of improved and energy efficient fuel wood and charcoal stoves some of which are already piloted in the villages
(iii) Awareness education to the communities on environmental conservation
(iv) Involvement of communities in forest management (Participatory Forest Management)
(v) Agriculture and Agro-forestry Development
(vi) Institutional Development and Capacity Building at all levels

(vii) Other measures include use of bricks for house construction, reduction in the cost of electricity, solar and biogas, In case of bricks it should be stressed that burning should be done using materials such as saw dusts and rice husks rather than use of fuel wood.

Some of the main limitations to the mitigation measures include inadequate land at hpusehold level, trained and skilled manpower and appropriate financing mechanisms, and weak institutions to support these interventions.

3. Selection of five villages of most pressure on natural forests

Factors considered for inclusion in the criterion for selection included proximity to natural forests, dependence on natural or established forests for various products, quantities of firewood collected from the forests, income levels and proportion of poor households, and availability of land per household. Based on these criteria five villages namely Lufuna, Kibao, Mpanga, Mtwango and Ludilo are proposed to be considered for the first pilot phase of interventions to reduce pressure on natural forests. Owing to observations made during the visit to the five selected village, the sixth village, Ifupira is also suggested for interventions. Furthermore, if one was to consider only the level of firewood collection from natural forests as an indication of the extent of contribution to biodiversity loss then Ikwega village should be considered. However it should be emphasized that the rest of the villages require some attention at least for some intervations such as introduction of energy efficient stoves, awareness creation on conservation and effective tree planting.

4. Conclusion

The results indicate that UTT natural forests support the livelihood of many people bordering the estates especially on collection of firewoods, poles, withies, timber, medicinal plants, wild fruits, mushrooms and vegetables and wild meat. Most of the villages are densely populated, with scattered rain fed croplands and settlements. Despite the availability of the resources, local communities are relatively poor most of them living in ordinary to poor houses and surviving on slightly less than a dollar per day. Emerging issues to the resources management include threats to natural forests and water supply, increasing demand for forest products and water, ecosystem degradation due to resources use and qrowing conflicts over use of resources.

5. Recommendations

Given the density population, scattered croplands, pastoralism and environmental concern efforts to harmonise resource uses must continue by addressing the recommended mitigating measure to reduce degradation of natural forests. Different options or management regimes should be considered and some of them will be beyond the scope of the Company.

Finally, the consequences of reduced access to natural or plantation forests of the Company must be integrated into Company plans and decisions if we want to maintain or improve the conditions of natural forests while maintaining the livelihood of local communities.

ACKNOWLEDGEMENT

This study was carried out by two consultants namely, Vedasto R.M. Muhikambele and Yonika M. Ngaga from the Bureau of Agricultural Consultancy and Advisory Services (BACAS) of Sokoine University of Agriculture (SUA).

The study was funded by Unilever Tea Tanzania. We are grateful to Mrs. Sylvia Rutatina and UTT staff that assisted in logistics and data collection. Thanks are also extended to Leaders and communities of the 15 villages visited for their assistance and cooperation during fieldwork. We would also wish to express our gratitude to the enumerators who assisted us in administering the questionnaires, and for staff in the Natural Resources office at Mafinga and those at the workshop of Mafinga Lutheran Vocational Training Centre for some invaluable information availed to us during the study.

Janet Barber, a member of Unilever Sustainable agriculture Advisory Board and other Unilever team members at Colworth in the UK are highly acknowledged for their constructive criticisms that helped in polshing the report.

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LIST OF ACRONYMS AND ABREVIATIONS

BACAS	Bureau for Agricultural Consultancy and Advisory Services
CBFM	Community Based Forest Management
CBO	Community Based Organization
CIROF	Centre for International Forestry Research
FBD	Forestry and Beekeeping Division
GoT	Government of Tanzania
Ha	hectare
Hh	Household
JFM	Joint Forest Management
Km	Kilometre
M&E	Monitoring and Evaluation
MNRT	Ministry of Natural Resources and Tourism
MTC	Mufindi Tea Company
NF	Natural Forest
NGO	Non-Governmental Organizations
NTFP	Non-Timber Forest Products
PRA	Participatory Rural Appraisal
PV	Photovoltaic
SD	Standard Deviation
SPW	Student Partnership Worldwide
SUA	Sokoine University of Agriculture
TaTEDO	Taasisi ya Kuendeleza Nishati Endelevu na Mazingira
TFCG	Tanzania Forest Conservation Group
TPPMCL	Tanganyika Pyrethrum Processing and Marketing Company Limited
Tsh	Tanzania Shilling (Tsh. 1200 = 1 USD)
USD	United State Dollar
UTT	Unilever Tanzania Tea Limited
UK	United Kingdom
VC	Village Council

1.0 INTRODUCTION

The Unilever Tea Tanzania Limited (Figure 1) in the Mufindi area of the Southern Highlands of Tanzania has a long-term lease of 20,000 ha owned by the Government of Tanzania, the Udzungwas, forming part of the Eastern Arc Mountains. Key facts important for the leased area are as follows:

- 15% of the land is used for tea production, 20% represents land converted to other uses including timber for construction on the estate, fuel wood, residential and other infrastructures and facilities.
- The remaining 65% of the Mufindi estate is covered by relatively undisturbed forests, wetlands and grasslands, which are part of the Udzungwa biodiversity 'hot spot', one of 24 in the Eastern Arc Mountains of Kenya and Tanzania. 'Hot spots' are the biologically richest and most threatened areas.
- Studies recently completed on endemic plants for the whole of the Eastern Arc Mountains show that 191 plant taxa (over 80% of the total) are endangered, and a further 986 plant taxa are potentially threatened. Many of the endemic plants (both endangered and threatened) occur on the Mufindi Estate. In addition, rare birds, amphibians, reptiles and butterflies with restricted ranges are known also to occur.
- Six main habitats can be identified, from east to west including the escarpment forests, plateau forests, plateau grasslands, plateau forest patches, plateau woodlands and plateau wetlands. Also important for biodiversity are converted habitats such as areas used for tea, fuel wood and timber.
- A range of endemic plant and threatened animal and bird species are found in the different habitats including the globally threatened flycatcher, the Iringa Akalat (*Sheppardia lowei*); also very rare shrubs include members of bamboo, 'myrtle' and 'witchhazel' families – respectively *Hickelia africana*, *Eugenia mufindiensis* and *Trichocladus goeztei*. In addition, a rich terrestrial and orchid flora including *Disa sp*. *Satyrium sp*. and *Habenaria sp*. which are under threat from high volume trade for food are found here. A small spiny succulent *Euphorbia caloderma* that occurs here has not been found in any other location.

The UTT forests are interlinked with other natural forests in Mufindi including Kigogo forest. UTT has benefited, for many years, from the field and academic research of many visiting and local biologists and naturalists at Mufindi. It has worked to determine the extent of species endemism, rarity and degree of threat to the biological diversity on its estate. These efforts made it possible to initiate the UTT Biodiversity Action Plan in 2000. In addition, work on the estates by academics from the University of York, UK, resulted in the development of protocols designed to monitor the spatial structure of natural habitat, habitat quality and human disturbance, within the estate. Work continues on identifying which of the endemic plant taxa in the Eastern Arc Mountains 'hot spot' are found in Mufindi and what their status is. Completing the list of plants and animals known from the Mufindi area is an ongoing task. UTT continues to welcome the many specialists visiting and working on the estates, who assist with this task.

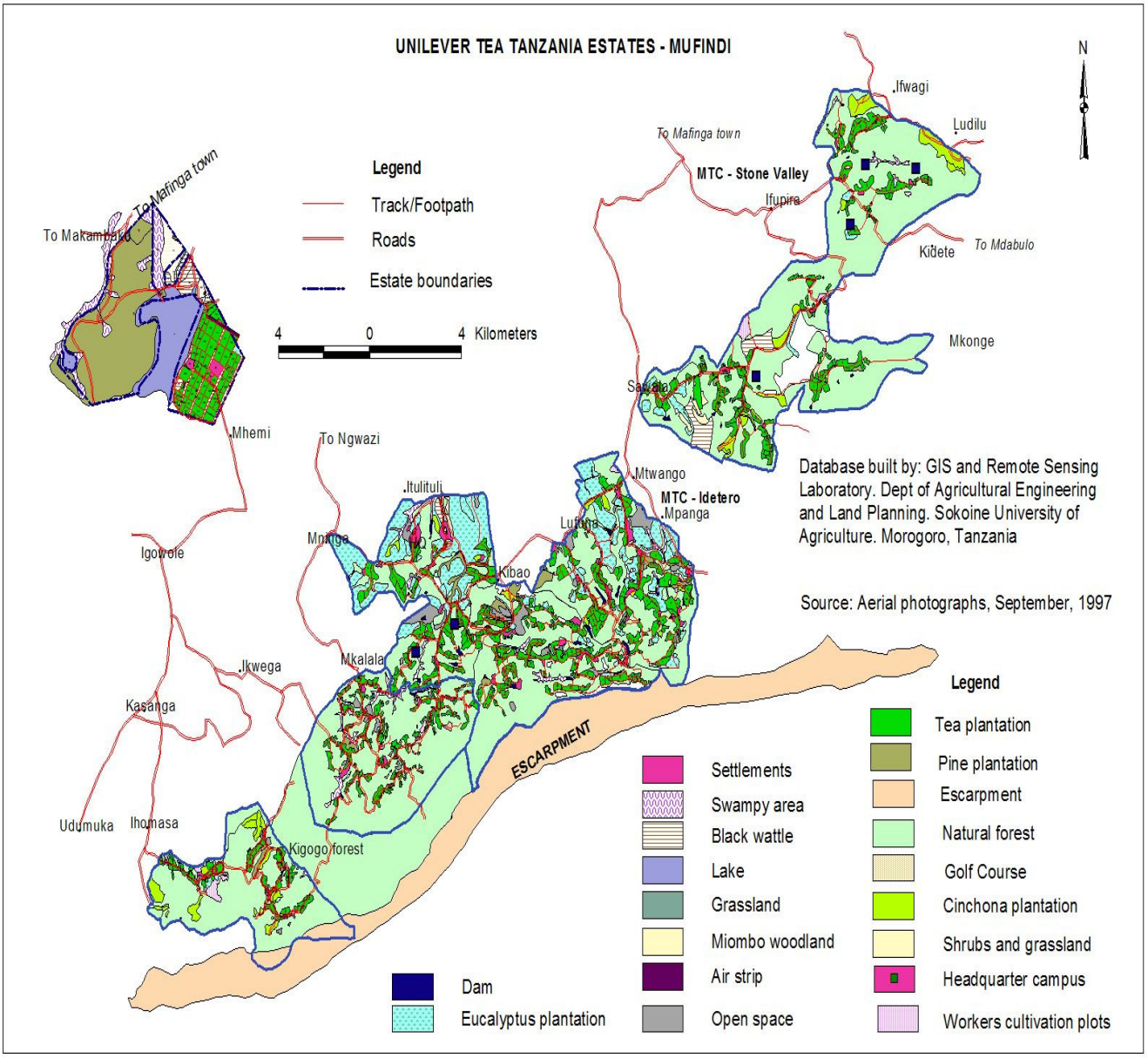

Figure 1. A map showing Unilever Tea Tanzania Limited Estates.

1.1 Current situation and rationale for the project

There are 15 villages within the 6 legislative districts of Mufindi with total human population of 100,000; the villages are located within 10 km of the estate's boundaries. The forest is experiencing increased pressure from these communities; its products are in demand mainly for fuel wood, building materials and medicinal plants. Thirteen primary and two secondary schools with a total of 8,000 students are also located within 10 km of the company. Approximately 7,000 people are employed by UTT; the majority living within the estate's boundary.

From previous studies, it was known that the villages have an impact on the forests. The present project was proposed to ascertain the extent of this impact and seek solutions to address this issue. Research was required to establish the volume of materials gathered, locations affected, the needs of the local communities, and the extent to which households are dependent on these natural resources, either for cash income or subsistence.

1.2 Project aims and objectives

The aim of the project was to secure long-term protection for important animal and plant species in the Mufindi forest 'hot spot' through empowerment of the local communities.

Objectives

(i) To appraise all 15 villages and identify the 5 villages having the most significant impact on the natural forest and biological diversity.

(ii) To develop activities with these 5 communities to mitigate impacts of human activity on the natural forests, such as:
- Identifying alternative energy sources to wood;
- Planning sustainable forest management schemes which yield wood for fuel, building materials, and medicinal plants; and
- Piloting the use of fuel-efficient stoves to reduce demand.

(iii) To promote an understanding by all communities and stakeholders of their dependence on the forest (resources and ecosystem), and institutionalise sustainable community management of the forest.

(iv) To build on work already undertaken; such as expanding the analysis of human impact on the natural forest.

Communities and stakeholders include UTT employees, the Mufindi Tea Company and the National Forest Service.

2.0 Background

2.1 General background

Tanzania is a well-endowed country from a natural resource point of view; with its area of more than 945,000 km^2 of which 388,000 km^2 is forests and woodlands constituting about 40 percent of the land area. About 6 percent of the land cover consists of permanent crops, 40 percent of permanent pastures and 7 percent is inland waters. Most of the forested land is Miombo woodland under different types of management regimes and provides for critical wood and non-wood products both to rural and urban areas.

Nevertheless, there have been many cries about degradation of forests and the environment in general threatening extinction of biodiversity and water catchments. Many efforts are being taken by governments, NGOs, conservationists, communities in various places and other stakeholders to address these problems. The rapid population growth, increasing land scarcity, coupled with declining yields in agriculture following reduced use of fertilizers and other inputs, has created a situation where the pressure

on remaining stocks of forestland has increased substantially. Research indicates further that it is in particular poor and vulnerable groups that increasingly seek to use forest resources, including timber, poles and non-timber forest products (NTFP) in a bid for survival and livelihood. The decline in accessible forest resources and forestland has been substantial. According to the Government of Tanzania (GoT, 2002 web), the decline in forest cover may have been as much as 0.3 percent per year from 1955-1990 and from 1990-1993 as much as 3 percent. In addition, forests land under some kind of protection has also suffered from substantial encroachment efforts, resulting in reduced qualities and quantities of the forest resources.

Many of the forest reserves are suffering from degradation and encroachment by both local people and by outsiders. One major factor is the widespread poverty in the areas and the lack of alternative means of livelihood for many people. People need land for agriculture, access to grazing areas, fuelwood and poles etc. The lack of provision for such resources could of course in part be attributed to lack of effective policies addressing rural problems and poverty in general. For most local people, it does not seem fair or legitimate that they are banned even from what they themselves perceive as sustainable use of various forest resources.

The forest is there as a present, potential supply of important means of production and livelihood. But the problem is that one yet has not found ways to share, in sustainable ways, resources with local people. On the contrary, the reserves occasionally bring costs to people in terms of wildlife and weeds or pests invading agricultural fields. Another, more subtle example is the tree planting campaigns where people are encouraged to plant trees on their own farms. However, a species like *Pterocarpus angolensis* even if grown in individual farms cannot be harvested without a formal permission. Such kind of regulation does not encourage people to leave saplings of particular species to grow when found in their own farms, and is also quite detrimental for a good relationship between local people and the authorities.

Two major resources directly at stake for local people are fuel wood and fodder/grass. In some catchment forest reserves, the management allows for both sustainable use, but also partly quite unsustainable use (i.e. grazing in some of these forests) of such resources.

The new forest policy has provided opportunities to develop initiatives for participatory forest management. This must include increasing benefits and reducing costs for local people of having the reserve close by. A question is to what extent the “tree cops” of the past will be able, willing and competent to interact and develop good models of cooperation. More time and effort must be spent with local people and with the present rather tense situation found in many catchment forest reserves this may be a formidable challenge, possibly beyond the capacity and competence of the present system.

2.2 Brief Overview of the Forest Sector in Tanzania

Tanzania’s forests constitute around 40 percent of the land area. Out of 13 million ha of legally protected forest that have been established and officially gazetted, nearly 90% comprise of miombo woodlands (Temu, 1979). One of the important functions of protected forests is to regulate the flow of headwater in catchment areas and maintain

the quality and quantity of such waters upper and downstream. Most of these Miombo woodlands are under different types of management. They provide for critical wood and forest products both to rural and urban areas. The Miombo is low in biodiversity values, but still provides a valuable habitat for wildlife, which again supports the tourist industry.

In addition, there are forest reserves, in general in mountain areas, and where the biodiversity is rich. The Eastern Arc mountain forests are spread across 10 separate mountain blocks in Tanzania and represent one of the oldest and most stable terrestrial ecosystems on the continent. It is recognised to be one of 25 global biodiversity hotspots, with a substantial amount of endemic species. Most of the forests have been gazetted as Central Government forest reserves (10 mill ha) and some are Local Government Reserves (3 mill ha). Around 20 million ha of forest land in Tanzania has no formal protected status.

The forests constitute an important source of income and livelihood for people living in the surrounding areas, especially for poor people.

The World Bank (2001) sums up some of the main challenges facing Tanzania's forest policies. They relate to weak oversight for forest and woodland management, which are "rooted in problems of accountability and supervision in the current institutional framework". This has led to:

- Movement and settlement of people into reserved forests.
- Unsustainable and illegal harvesting of wood for commercial purposes.
- An ineffective system of decentralized forest administration, which separates the need for enforcement and regulation from the needs of rural communities for forest and woodland products.
- Inadequate systems for revenue collection.
- Inadequate systems for revenues collected to be used for forest management or shared with local communities.
- No targets set for revenue collection (less than 10 percent collected today).
- Inadequate institutional mechanisms for forest biodiversity conservation.
- Disparate systems of tenure over forested lands and weak incentive systems to undertake community-based forest conservation.
- Limited scope for publicly financed forest biodiversity conservation and heavy dependency on donors.

The quality of Tanzania's forests has deteriorated over time, which may partly be seen in light of the contraction of public sector capacity, also to control and manage forests resources. In addition, the pressures for conversion of forestland to agriculture and for general encroachments have also increased.

The National Forest Policy (MNRT, 1998) must be seen as an attempt to meet some of these challenges. The main objectives are cited to be:

- Ensured sustainable supply of forest products and services by maintaining sufficient forest area under effective management.

- Ensured ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility.

While the Forest Ordinance of 1957 represented a traditional government "Fortress – stick and fence policy approach", the new approach (MNRT, 1998) encourages community and private sector involvement in forestry away from central control. "The ownership of land and natural resources, access and the right to use them are of fundamental importance not only for more balanced and equitable development, but also to the level of care accorded to the environment. It is only when people can satisfy their needs, have control of the resource base as well as have secure land tenure that long-term objectives of environment protection can be satisfied. The communal tenure of village lands which are administered by village committees (VCs) provides a good legal environment for the development of community-based forest and woodland management".

3.0 STUDY AREA AND METHODOLOGY

3. 1 Description of the study area

This chapter provides a brief description of the Mufindi district, in Iringa region, where the Unilever Tea Tanzania Limited is located.

3.1.1 Location

Mufindi district is one of the seven districts in Iringa Region located in Southern Highland of Tanzania. Mufindi district lies between latitude $8^0.00'$ 9^0 $15'$South and longitude 34^0 $35'$–35^0 $55'$ East. The district is bordered by Iringa district to the north, Morogoro region to the East, Njombe district to the South and Mbeya region to the West. Administratively the district is divided into five (5) divisions, 28 wards and 132 villages. The district is situated about 80 km from Iringa Municipality and boarders Iringa rural in the north, Kilolo in north east, Njombe in the south, Kilombero in the south east and Mbarali in the west.

3.1.2 Climate

The Mufindi district is characterized by two distinctive features; the Eastern Highlands and the Mufindi Plateau. The eastern highlands lie at an altitude of 1700-2200 m asl. The feature ranging from south west to the eastern part which is the part of the Eastern Arc Mountains and the Kihansi Dam and its Catchments. The mean annual rainfall ranges between 1200-1600 mm. The average precipitation is 1400 mm per annum where by the east and south are the wetter parts while the west is much drier. Temperatures are often below 15^{o}C, the mean monthly is 18.4^{o}C (maxima-November and February) and the minima is 13.2^{o}C (July).

The Mufindi plateau is extensive and uniform covering halfway of Iringa rural through Mafinga up to Makambako. Its altitude ranges from 1700-2000 m asl. The average mean annual rainfall is 950 mm. In the eastern part of the plateau the annual rainfall is slightly higher than 950 mm. The average evapotranspiration is 1300 mm per annum,

where as the maximum temperature is 18.3°C (February) and the minimum is 13.1°C (July).

Mufindi District has one rainfall season starting from early November and ends up in June. Rainfall is critical for agricultural production which is the mainstay of the Mufindi district's economy and livelihood. Thus, human settlement and land use patterns are influenced by the distribution of rainfall such that there is a concentration of people on the eastern highland area.

3.1.3 Topography

The eastern highlands is characterized by its steep topography; mostly the land form is steeply dissected with slopes of more than 30% gradient, often as steep as 50%. Flatter top slopes of 2-8% and 8-16% gradient comprise an average about 10 % of this land unit. The drainage pattern is very dense, with infield flat bottom lands generally less than 20-mm width. Vegetation includes low/shrub land and scattered forests. The soil is generally red clay of moderate fertility with dark top soil having high organic matter content. Much of the land is at risk of erosion due to steep slopes of over 30% gradient.

The Mufindi plateau has a very extensive and uniform plateau extending from half way Iringa –Mafinga up to Makambako. Most of this land unit is undulating with slopes of 2-8%. Scattered areas and slops towards drainage lines are steeper with slopes of up to 20% gradient. The drainage system is infield with moderately wide bottom lands. Also incised drainage occurs in areas where topography is steeper than general. Cultivated land is dominant. Miombo wood lands are common on the hill slopes in the eastern parts, while thicket vegetation and shrubs/grassland are more common in the western parts. The soils are uniform yellow highly leached clays. Fertility is low due to high degree of chemical leaching and the absence of humid or dark top soils. Most organic matter has already mineralized due to relatively dry and warm conditions. Most of the plateau consists of undulating plateau with slopes of less than 8% gradient. The zone is typified by extensive grassland characterized by clump shrubs and remnants of Miombo trees. Grasses are perennial with low nutritional value. The western part and North West of the zone are the main catchments of the Great Ruaha River.

3.1.4 Agro Ecological Zones

Crop cultivation, livestock husbandry and forestry are the main land use in Mufindi district. About 95% of the district is suitable for agriculture and livestock activities. Mufindi has marked differences in rainfall amount and pattern, land form and soil types and practices in land use.
In principal, there is enough land available for the cultivation of crops and livestock keeping. However, land tenure and lease hold system limits land utilization by small holder farmers especially in some parts of eastern highlands and central. Large tracts of land are leased to large scale farmers for growing tea (Unilever Tea Tanzania Limited and Mufindi Tea Company) and tree plantations (Sao Hill Forest), while the customary land tenure (Malungulu) system leaves some people with insufficient land for their use. Major economic activities are agriculture and specific crops are tea, coffee, pyrethrum,

wheat, round potatoes and temperate fruits like peas, peaches and plums. Livestock keeping is also practiced in a small scale.

3.1.5 Land area and uses

Mufindi district has a total area of 7,122 km^2 (712,200 ha). Out of the total district area, 6,765.90 km^2 (676,590 ha) is arable land. The total area under cultivation is 1,691.5 km^2 (169,150 ha), which is about 25% of the total arable land. The area suitable for irrigation is about 3,470 ha but currently only 110 ha (3.2%) is under irrigation. The total grazing land is 676,590 ha. The district has a large area of forest cover of about 144,028 ha and many resources are obtained from them. Forest reserves cover 47,416 ha while catchment forest reserves cover 16,690 ha. In totality, forest reserves cover 64,106 ha this includes portion of the Eastern Arc Mountains in Tanzania that are scenic and renowned internationally for the diversity and endemic species of their flora and fauna. There are about 80,000 ha which are under Miombo woodlands on the lower western side of the district. Grassland covers about 35,610 ha. The District has the program of planting trees yearly and by the year 2005 a total of 29,642,500 seedlings have been raised and 29,363,780 trees have been planted.

3.1.6 Population

According to the 2002 population and housing census, Mufindi district had total population of 282,071 people of whom 133,150 were males (47.2 %) and 148,921 females (52.8%). The district has a growth rate of 1.5% per year during 1988 to 2002. According to this growth rate, the district is estimated to have 294,834 people of whom 139,600 were males and 155,234 were females and the population density is estimated to be 40 persons per km2. In 2002 there were 67,664 households. The per capita income is estimated to be Tshs 180,750.

3.1.7 Main economic activities

The district is characterized by commercial agriculture, tree plantations and forest based industries. It is a fertile and productive district and has become an important source of agricultural products and a source of labour. Agriculture is the main economic activity in the district (engine of Mufindi's economy and livelihood). It employs more than 70% of the district population and provides more than 85% of the people's income. The district has about 676,590 hectares of arable land of which 169,160 or 25% has been cultivated. Major food crops grown include maize, sweet and round potatoes, wheat, beans, cassava, sorghum, ground nuts and peas. However, maize forms the main staple food but is also sold and contributes about 70% of the household income. The major cash crops are tea, coffee, sunflower, Artemisia, pyrethrum, paprika and horticultural products. The district is also characterized by agro-processing and agribusiness firms as indicated in Table 1. There are also small irrigation schemes of about 110 ha and 41 registered cooperative societies supporting farmers and business persons access to finances.

Table 1. Agro-processing firms

No	Name of Agro processor	Type of processing activity
1	Uniliver Tea Tanzania Limited (UTT)	Tea green leaf processing
2	Mufindi Tea Company (MTC)	Tea green leaf processing
3	TPPMCL (Tanganyika Pyrethrum Processing and Marketing Company Ltd	Pyrethrum processing
4	Consolata Fathers	Sunflower seed oil pressing
5	Sangale	Sunflower seed oil pressing
6	Lupembe	Sunflower seed oil pressing
7	Small Agribusiness firms (Farmers group)	5 fruit processors and 2 milk processors

Tea estates owned by big companies like Uniliver Tea Tanzania ltd, Mufindi Tea Company, Marenda Farm and other individuals are the major sources of employment, attracting manual labour workers from other districts of southern highland.

3.2 Study Approach

The Study began by collecting and collating information on the study area, to build up a reasonable picture of the UTT coverage. The UTT is surrounded by many villages but 15 of them are located within 10 km of the estate boundaries and exert significant pressure on the estate's forests. Therefore the field visits and study focused on the 15 villages. Detailed household survey was conducted and group discussions with village governments were carried out. Discussions with village governments served to gain a general understanding of household practices, agricultural practices, reliance on water, and use of natural forests.

3.3 Data Collection

Two main approaches were used for data collection, Participatory Rural Appraisals (PRA) and household questionnaire survey. Researchers' observations and secondary data were also used to supplement information and data.

3.3.1 Participatory Rural Appraisals (PRA)

Various PRA techniques were used in which both visualization and discussion methods were applied. Visualisation methods aimed at focusing analysis around a specific phenomenon in question, where as the discussion methods helped to ensure that those involved remain curious and critical, and share their insights openly. The following were the pertinent PRA tools used:

(i) Participatory mapping and modelling of village resources (such as agricultural land, roads, schools, institutions/organizations, forests and rivers/streams) with emphasis on resources associated with the UTT. The map indicated the location of all forests (regardless who owns which) with respect to the settlements and other socio-economic infrastructure.

(ii) Pair-wise ranking of community-based problems analysis, particularly those associated with natural resources, main agricultural crops for food and cash, main sources of income, and all were ranked.

(iii) Matrix ranking analysed the benefits from natural forests and use value of tree species for wood and non-wood and was used to make a species preferential list.

3.3.2 Field visits and questionnaire administering

Structured household questionnaires were administered to 15 villages bordering the UTT estates and 20 households were randomly selected in each village giving a total of 300 households. Four enumerators were recruited and trained to assist in administering the questionnaires. The questionnaires were meant to give a general picture of the household characteristics in each village and at the same time used to crosscheck and improve information collected during PRA. The questionnaire (Annex 2) was administered to elicit household characteristics, land ownership, agricultural crops for food and cash, main sources of income, benefits they accrue (both goods and services) from forests. Also, information on perception of extent of natural forest degradation, causes, mitigation measures and future demand for forest products were explored. Efforts were also made to estimate the household use of goods and services providing direct benefits including construction. How much is harvested, sold and at what price. Dynamics of forest utilization and how the changes have influenced the livelihood of local communities were elicited taking into consideration sex, age, education, clan or ethnicity, status and roles, leaders and income levels. In addition, various uses for example current status and conflicts access associated with natural forests of UTT were investigated especially the degree of dependency and relationships and conflicts encountered between stakeholders. Possibilities of using alternative energy sources and efficient technologies were explored.

The checklists were developed for semi-structured interviews with village leaders (Annex 3) and Mufindi District Land and Natural Resources Officers and Community Based Organizations (Annex 4). Additional data and maps specific to the study area were collected from the offices mentioned, and literature review of relevant documents was accomplished.

3.4 Limitation of the Study

A minor practical concern was on interviewing people about their own illegal activities in the natural forests of UTT and other companies and therefore not being very willing in some cases, to reveal what they actually do.

Another problem was about relying on respondent's memory in some cases especially making estimates of how much they get from the forest especially non-timber forest products or agricultural production. Therefore estimates of forest products obtained from the forests and/or agriculture are not absolute. Nevertheless, we have tried to compare and where necessary adjust them with figures available in other studies of similar nature.

4.0 RESULTS AND DISCUSSION

4.1 Socio-Demographic Profile of Households

4.1.1 Household size, marital status, education level and main occupation

Majority of the respondents (67%) were males, most of whom were married (84%). The unmarried couples (Single or widowed) formed only 15% of the sampled heads of households out of which 13% were widowed. Divorced ones formed only one percent of the respondents. The average household size was 5.0 people (Table 2).

The average age of household heads was 41 years. In terms of education, about 89% of the respondents and 94% of their spouses had completed seven years of primary education while seven percent of the respondents and 3% of their spouses had achieved secondary education, indicating that the level of literacy in the study villages is fairly low (Table 2). The low literacy level is likely to have a negative impact on social and economic intervention to alleviate poverty (e.g. entrepreneurship).

Table 2. Average household family size, land owned and education levels in the surveyed villages bordering UTT estates

S/N	Name of village	No of households in the village	Average hh size	Average hh land size (acreage)	Education level (%)			
					Household head		Spouse of hh head	
					Primary	Secondary	Primary	Secondary
1	Mpanga	397	5	3.0	85	10	100	0
2	Itulituli	480	4	3.1	90	0	88	12
3	Lufuna	349	5	2.7	85	10	94	0
4	Kibao	850	5	3.4	80	10	86	7
5	Mninga	160	7	2.7	84	5	80	13
6	Ikwega	638	5	4.2	95	5	94	0
7	Ihomasa	648	5	2.3	90	0	100	0
8	Ifupira	411	5	3.1	85	10	100	0
9	Mkonge	750	6	3.8	90	10	93	0
10	Mkalala	450	5	3.2	95	0	95	0
11	Sawala	735	6	4.9	90	10	88	6
12	Mtwango	694	5	2.8	84	10	92	8
13	Ifwagi	525	5	5.4	90	10	100	0
514	Ludilo	304	7	6.7	90	5	95	5
15	Kidete	450	6	5.0	95	5	100	0
	Average		5	3.8	89	7	94	3

The main activity undertaken by more than 91% of the households was crop farming. About five percent of the respondents were employed by UTT while nearly four percent were businesspersons. For most farmers, rain fed maize was the main food crop grown by all respondents; it was also one of the major cash crops.

4.2 Household Resources

4.2.1 Land ownership, users, decision making and other characteristics

It was noted that land ownership ranged between 0.5 acres per household (Kibao and Ihomasa) to 40 acres per household (Ludilo) with an overall average of 3.8 acres per household among all sampled households. The least mean acreage was obtained in Ihomasa (2.3 acres) while the highest mean acreage (6.8 acres) was in Ludilo. Other villages with land problem (mean <3.0 acres) include Mninga, Lufuna and Mtwango whereas better acreages (mean > 4.0 acres) were recorded for Ifwagi, Kidete and Sawala in addition to Ludilo. The rest seven villages had mean acreage of about 3 acres per household.

Despite the large variation, majority of households own small areas of land in all the surveyed villages. Over 50% of all respondents indicated land ownership to be a constraint, the cry most heard in Itulituli (70% of respondent in the village) while Mkonge had least proportion (33%) of respondents who thought it was a problem. Interestingly, even in Ludilo land was seen to be a constraint by most respondents (64%). Options listed for coping with land constraint were borrowing farm land (71%), buying extra food (17%) and buying additional land (10%). Information collected from village leaders indicated that almost in all villages, majority of households would be ready to plant trees of at least a quarter an acre if given the opportunity. Such households probably considered the possibility of borrowing land from people with large areas.

4.2.2 Livestock

Almost all respondents (92%) in the household survey had at least one kind of livestock kept either for food, for sale or for both. A few respondents with no livestock were recorded in Kibao (5), Mpanga (4), Lufuna (3), Itulituli (1), Mninga (1) and Ifupira (1) who had either just sold them or had not kept them for some time. It was obvious that livestock formed an important component of people's livelihood next to agricultural production in the study villages. Estimates made by the interviewed leaders of the study villages indicate that with the exception of Ihomasa and Ikwega villages which had least populations of livestock, over most of house holds in the study villages had chicken and pigs and a good number kept guinea pigs. Average numbers per household ranged between 5 and 10 for chicken, 1 and 2 for pigs while that of guinea pigs ranged between 5 and 20.Other livestock kept by only a few households include cattle, goats, sheep ducks and rabbits. Details on livestock as source of income are given under 4.3.2 below.

4.2.3 Labour

In all the surveyed villages, labour was mostly provided by the family (average 2 adults and 3 children per household). Since most of children attend school most of the time it is more likely that production activities are carried out by adults (mostly husband and wife since there are very few widows and divorcees). It was noted that even those who go for casual labour in tea estates have to participate in the household agricultural activities.

4.3 Household production and income

4.3.1 Farming - crops grown, average production, sales and prices

Findings showed that crop production was considered a highest contributor of household income in almost all villages. It was only in Lufuna and Mtwango where employment was ranked first and in Itulituli where local brewing was thought to be superior to crop production. In interviews with village leaders (Chairmen and executive officers) when asked to rank the village's most important economic activities, agriculture was number one in all villages except in Itulituli and Kibao where local brewing took the lead and in Ifwagi where small business (kiosk) was important. It means that for any consideration over people's livelihood improvement in the area, crop production should lead in focus.

Most of the crops in the study area are common to all villages. These include those found in all 15 villages (maize, beans, wheat, peas, Irish and sweet potatoes), those found in most villages (tea, cabbages and finger millet and those in few villages such as fruits (9 villages), vegetables (8), pyrethrum (5), sunflower (4), "atemisia" (4) and tomatoes (3). Similar findings are reported by Ngaga (2007) in a study on socio-economic baseline data for selected areas of the Great Ruaha River Catchment Area. It is pleasing to note that some villages (6) include trees in their list of crops. Bananas and pigeon peas were only reported in Ihomasa village as some of the crops.

Table 3 gives the impression over the order of importance of the most grown crops both in terms of food and in terms of cash based on PRA results. While only 9 crops were found in most villages other less frequently listed crops ranked higher as sources of food and cash in some villages. Hence the large ranking numbers in some cases. For example vegetables, fruits and trees were considered to be more cash earners than tea and sweet potatoes in Mninga village. In Itulituli village, crops such as tomatoes, onions, vegetables, fruits and sunflower, which are not very much grown elsewhere were regarded as more important than finger millet as source of food and more important than peas, sweet potatoes and finger millet as source of cash. Trees were ranked at number 2 as cash source only after tea in Mkonge village. In villages where fruit production is high, fruits ranked quite high as cash crops e.g. 4^{th} among 12 crops in Mpanga, among 10 crops in Mkonge or 5 among 14 items in Kibao, among 12 items in Lufuna and 6^{th} among 10 items in Mtwango.

Table 3. Perception of villagers on the position of various agricultural crops in contribution to household food and income

Name of village	Ranking* as a source of food									Ranking* as a source of income								
	Maize	Beans	Wheat	Peas	Irish potatoes	Sweet potatoes	Tea	Cabbages	Finger millet	Maize	Beans	Wheat	Peas	Irish potatoes	Sweet potatoes	Tea	Cabbages	Finger millet
Mpanga	1	4	2	5	3	6	-	9	8	1	6	2	9	5	11	3	8	7
Itulituli	1	2	3	5	4	6	-	8	13	1	3	6	11	2	13	-	4	10
Lufuna	1	3	2	7	4	6	-	5	8	2	12	1	9	4	8	11	5	7
Kibao	1	3	2	4	5	6	-	7	11	3	8	2	9	1	13	7	4	10
Mninga	1	4	2	6	3	-	-	5	-	1	4	2	9	3	11	10	5	-
Ikwega	1	4	2	6	3	5	-	-	-	1	5	2	9	3	7	6	4	8
Ihomasa	1	2	4	5	3	6	-	9	7	4	5	6	9	3	-	1	2	7
Ifupira	1	6	2	7	3	5	-	8	4	-	8	4	9	1	10	2	-	3
Mkonge	1	2	8	5	4	3	-	-	-	-	5	7	6	3	-	1	-	-
Mkalala	1	5	2	6	3	4	-	7	8	1	4	2	8	3	-	6	5	-
Sawala	1	5	2	6	3	4	-	8	9	1	-	2	-	3	-	6	4	-
Mtwango	1	6	2	8	3	4	-	7	9	5	4	1	10	2	9	7	3	8
Ifwagi	1	2	3	6	4	-	-	8	5	2	1	3	-	4	11	9	7	5
Ludilo	1	3	2	7	5	6	-	8	4	1	2	3	8	-	5	-	6	4
Kidete	1	2	7	6	3	5	-	-	8	1	3	7	6	4	10	8	-	2

*Ranking was done such that 1 ranks highest, followed by 2 and so on.

In all the study villages, maize is the main source of food, mostly followed by wheat, Irish potatoes and beans. It can also be noted that, in over 50% of the villages, maize is also considered highly important as cash crop. Similar findings are reported by Ngaga (2007) in a study on socio-economic baseline data for selected areas of the Great Ruaha River Catchment Area. The dominance of one crop (maize as major food and cash crop may partly explain why most of the people are poor taking into consideration acreages cultivated and land productivity. Also important as cash crops are Irish potatoes (Kibao and Ifupira villages), wheat (Lufuna and Mtwango villages) and tea (Ihomasa and Mkonge villages). Ifwagi village had beans as the most important cash crop though crop farming was not their main economic activity.

In support of what was obtained from the PRA, almost all (98.7%) respondents in the household survey indicated to be maize producers. Over 50% of respondents produced beans (70%), Irish potatoes (61%) and wheat (57.3%). Figure 2 gives the summary of household mean quantities of important crops produced.

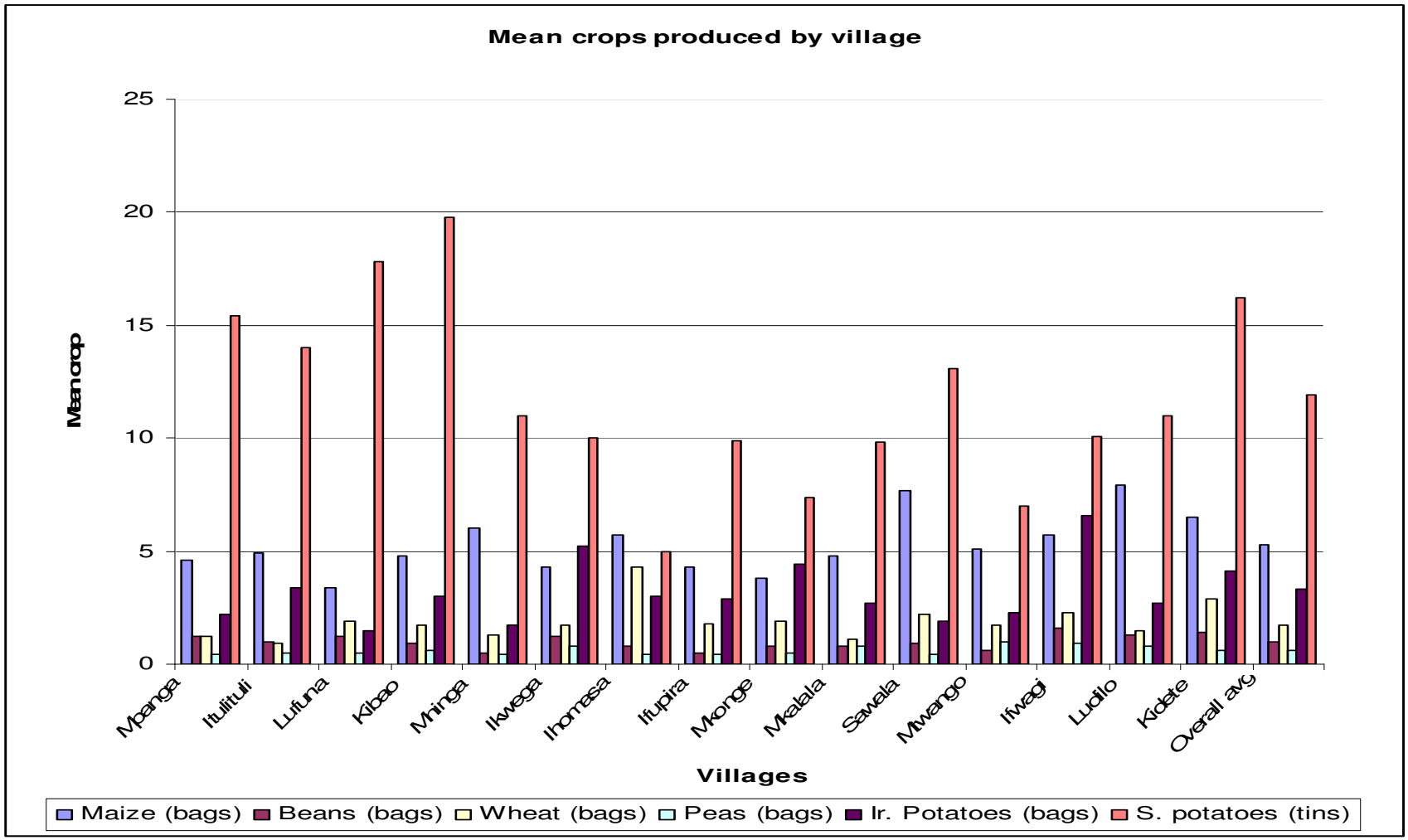

Figure 2. Mean annual quantities of crops produced per village in the study area

The average rain fed productivity per acre for most households is 5 bags (100 kg/bag) of maize, 1 bag of beans, 1.7 bags of wheat, 3 bags of Irish potatoes and 12 bags of sweet potatoes. Field losses due to vermin (mainly by small black monkey (*Ngedere*)) were estimated at 1 bag of maize per acre in most villages. However, for most of the crops, quite a number of respondents that revealed quantities produced in the household did not indicate amounts sold. This may be interpreted as either the crop in question was wholly consumed in the household or the respondents could not mention the quantities sold due to some reason. Most farmers either forget what they sell since sales are normally in small bits or they don't reveal what they sell in fear of exposing their incomes. The fact that agriculture was ranked high as an economic activity contributing most of the income to most of the villages; it is very likely that figures regarding sales of crops are not consistent with reality. On the question of minimum and maximum prices of individual crops, the responses were so variable for the different crops between villages as well as within villages. However, the average minimum and maximum prices were Tsh. 9,000 and 30,000 per bag (100 kg) respectively. Taking the example of maize crop, ranges of price per bag obtained from the PRA were 9,000/= (Ludilo) to 17500/= (Mkonge and Mtwango) during harvesting season and 15,000/= (Mpanga) to 30,000/= (Itulituli, Lufuna, Kibao and Ifupira) during scarcity.

4.3.2 Livestock type, number and prices

As earlier pointed out (4.2.2) livestock is an important resource in Mufindi. The household survey study indicated that over 53% of respondents kept chicken but many respondents were silent about possession of guinea pigs (Tables 4). Information from village leadership revealed that most of households keep guinea pigs though ownership would not necessarily be restricted to household heads. According to Table 5, animals mainly kept for cash income were pigs followed by chicken. Other livestock kept by few households either for food or for cash include goats, sheep, ducks, rabbits and cattle.

In Mkonge, Ludilo, Ifwagi (Ikonongo) and Kidete, livestock are considered very important as main source of household income next to agricultural crops. Livestock also ranked third in five villages (Ihomasa, Ikwega, Lufuna, Mpanga and Sawala) following agricultural crops and employment (Table 5).

As source of food, ranking high were chicken and guinea pigs (Table 5). Based on the above two tables, survey data supports the PRA findings that chicken and pigs are most preferred livestock in the studied villages. The large proportion of respondents that indicated possession of livestock mainly kept either or both chicken and pigs. Other types of livestock are scarcely kept. It was found out that chicken comparatively contribute most of household income from livestock. As would be expected, least sales were noted for cattle since these are not kept by many households in the area. It is of interest to note that although guinea pigs were considered important as source of food during PRA discussions, the sampled households in the survey hardly indicated presence of these animals in the area. This is probably due to the possibility of ownership not being of heads of households but other members such as children.

Table 4. Number of respondents indicating possession of various livestock in the study villages

	Number of respondents keeping livestock							
	Cattle	Goats	Sheep	Chicken	Ducks	Rabbits	Pigs	G' pigs
Mpanga	1	3	-	4	-	-	10	-
Itulituli	-	1	-	11	-	1	8	-
Lufuna	1	-	-	6	-	1	11	-
Kibao	5	-	-	6	-	-	12	-
Mninga	3	-	-	9	-	-	12	-
Ikwega	2	-	-	11	-	-	12	1
Ihomasa	1	-	-	9	-	1	9	1
Ifupira	1	-	-	16	1	-	14	1
Mkonge	1	-	-	17	-	-	12	-
Mkalala	-	1	1	11	-	-	15	-
Sawala	1	1	1	10	-	-	14	1
Mtwango	1	-	-	10	1	-	14	1
Ifwagi	-	1	-	16	-	-	15	1
Ludilo	-	-	1	15	1	-	16	1
Kidete	1	-	1	13	-	-	14	1
Total	19	8	4	161	3	3	188	8
	6.3%	2.7%	1.3%	53.7%	1%	1%	62.7%	2.7%

Table 5. Villagers' perceptions on the position of various types of livestock in contribution to household food and cash

Name of village	Ranking as a source of food								Ranking as a source of cash							
	Cattle	Goats	Sheep	Chicken	Ducks	Rabbits	Pigs	Guinea pigs	Cattle	Goats	Sheep	Chicken	Ducks	Rabbits	Pigs	Guinea pigs
Mpanga	5	6	-	1	-	3	4	2	6	5	-	2	-	4	1	3
Itulituli	-	5	-	1	4	3	-	2	3	4	5	2	6	8	1	7
Lufuna	8	5	7	1	4	3	6	2	8	4	7	2	6	5	1	3
Kibao	3	5	8	1	6	7	4	2	7	3	8	1	5	6	2	4
Mninga	-	-	-	1	3	4	-	2	2	4	5	3	-	-	1	-
Ikwega	-	-	-	1	3	4	-	2	4	3	5	2	7	8	1	6
Ihomasa	-	5	6	1	4	3	-	2	2	4	7	3	8	6	1	5
Ifupira	-	-	-	1	3	4	-	2	3	4	-	1	7	5	2	6
Mkonge	5	6	-	1	4	-	3	2	3	5	-	2	6	-	1	4
Mkalala	-	-	-	1	-	3	-	2	5	3	6	2	-	7	1	4
Sawala	9	-	-	1	3	4	-	2	-	3	4	2	-	-	1	-
Mtwango	-	-	-	1	-	4	2	3	3	4	-	2	-	6	1	5
Ifwagi	-	-	-	1	3	-	-	2	5	4	6	2	-	-	1	3
Ludilo	7	4	5	1	3	-	6	2	5	3	4	2	7	-	1	6
Kidete	6	7	-	1	4	5	2	3	4	7	-	1	5	6	2	3

4.4 Forest Products and Services from UTT forests

4.4.1 Product types, quantities, uses and prices

Firewood

When listing benefits from forests during the PRA exercises, firewood was either ranked first of all the listed benefits/products (Itulituli, Mninga, Ikwega, Ihomasa and Mtwango), second after water (Mpanga, Lufuna, Kibao, Ifupira, Mkalala and Kidete) or third after water and rain (Mkonge, Ifwagi and Ludilo). In any case, it was clear that most of the importance of forests was placed on firewood. It was pleasing to note that some villages were aware of the fact that forests are important as water sources and have a bearing on conserving the environment.

Quite a number of tree species were listed by the villagers as sources of fuel wood (Table 6). The species that were mentioned most include *Macaranga kilimandscharica* (Mpongolo) which was mentioned by 83 respondents (28%) and indicated by 10 villages, followed by *Myrica salicifolia* (Mkufwa) mentioned by 80 respondents (26%) and indicated by 11 villages, and *Bridelia bridelliodes* (Mhapi) (10% of respondents and mentioned in 8 villages). This suggests that these species are the most used indigenous species for firewood and building poles. The results are supported by other findings reported by Barber (2006) which showed that similar trees species were amongst the most populous species for firewood and building poles. Other species reported by respondents include Pines (12% respondents, mentioned in 11 villages), and Acacia *mearnsii (*Black wattle) (10% respondents, mentioned in 11 villages). Others were *Dodonea viscose (*Muhai) (6% respondents and mentioned in 7 villages) *Eucalyptus* spp (Milingoti) (6% respondents), *Eucalyptus* (5% and mentioned in 12 villages) and *Nuxia congesta* (Mngogwi). As can be viewed from Table 6, some tree species used for firewood were sort of specific to some villages while others were common to most villages. The least mentioned and seemingly more specific to some villages were *Myrica plilolifera* (Mkuywa) (Mpanga), *Cupresus lustanica (*Msonobari) (Itulituli), *Strichnos spinosa* (Litonga) (Ikwega), *Prunus Africana* (Mwiluti) (Mkalala), *Syzygium masukuensis* (Mlalambi), *Casporea gumufera var verticimata* (Mbalamba) and *Dicliptera laxata* (Nyamtitu) (Lufuna), *Parinari excelsa* (Mkazaule) (Mkonge), *Katschya curviflora (*Mwelesi) (Ifupira) and *Alphloid rheiformis (*Mheyelwa) (Kidete). The more universally used as seen from the number of villages that listed them were *Eucalyptus* (12 villages), *Myrica salicifolia* (Mkufwa) and Acacia *mearnsii (*Black wattle*)* (11 villages) *Macaranga kilimandscharica* (Mpongolo) (10 villages) and *Nuxia congesta* (Mngogwi) (9 villages). However, these lists can not be taken conclusively since villagers were not asked to exhaust their listings.

Table 6. Tree species used for firewood in the study villages

Species	Total number of hh listing the species in the survey study	Where mentioned most in the hh survey study (rate of mention in brackets)	Villages listing the species during PRAs
Macaranga kilimandscharica (Mpongolo)	83	Mkonge (12)	Ihomasa, Ikwega, Mkalala, Lufuna, Mpanga, Mkonge, Mtwango, Ifupira, Ludilo and Kidete
Myrica salicifolia (Mkufwa)	80	Mkonge (14)	Ihomasa, Ikwega, Mkalala, Lufuna, Mpanga, Mtwango, Sawala, Mkonge, Ifupira, Ludilo and Kidete
Pinus spp (Msindano)	35	Mpanga & Sawala (6)	Mninga, Itulituli, Kibao, Mpanga, Mtwango, Sawala, Mkonge, Ifupira, Ludilo, Ifwagi* and Kidete*.
Ocotea usambaransis (Mhapi)	31	Ikwega, Ifupira & Ludilo (4 hh)	Ihomasa, Mkalala, Mpanga, Sawala, Mkonge, Ifupira, Ludilo and Kidete.
Acacia mearnsii (Black wattle)	30	Itulituli (8)	Mninga, Itulituli, Kibao, Lufuna, Mpanga, Mtwango, Sawala, Mkonge, Ifupira, Ludilo and Kidete*
Dodonea viscose (Mhai)	18	Ifupira (4)	Mkalala, Lufuna, Sawala, Ifupira, Ludilo and Kidete.
Eucalyptus	16	Mkalala (3)	Mninga, Itulituli, Kibao, Lufuna, Mpanga, Mtwango, Sawala, Mkonge, Ifupira, Ludilo, Ifwagi* and Kidete*.
Blackwood	12	Mpanga (3)	
Allophylus Africana (Mtunumbi)	11	Ihomasa (2)	Ihomasa, Mkalala, Lufuna, Mtwango, Sawala and Ludilo.
Myrica plilolifera (Mkuywa)	8	Mpanga (5 hh)	
Cupresus lustanica (Msonobari)	4	Itulituli (3)	
Rapanea laucadandron (Mhanzuti)	4	Mkonge (2)	Mkonge
Kigelia Africana (Liguluka)	4	Lufuna (2)	
Pittosporum viridiflorum (Lipetwa)	3	-	Ihomasa, Mkonge,
Aphloia theiformis (Lihehelo)	3	-	Mkonge, Ludilo,
Strichnos spinosa (Mtongo/Mtonga)	3	-	
Rhus nataliensis (Muhehefu/muhefuhefu)	2	-	
Nuxia congesta (Mngogwi)	1	-	Ihomasa, Ikwega, Mkalala, Lufuna, Mpanga, Mtwango, Sawala, Ludilo and Kidete.
Syzygium spp (Mvengi)	-	-	Ikwega, Mkalala, Lufuna, Mtwango, Ifupira, Ludilo and

			Kidete
Buddleia salvifolia (Mhahasa)	-	-	Ihomasa, Mkalala, Lufuna, Sawala,
*Acacia polyacantha (*Mkunguhu)	-	-	Mkalala, Ludilo and Kidete
Hekia saligna (Mihekya)	-	-	Mtwango, Ludilo and Kidete.
Strichnos spinosa (Litonga/Mtonga)	-	-	Ikwega, Mkonge, Ludilo
Prunus Africana (Mwiluti)	-	-	Mkalala
Syzygium masukuensis (Mlalambi)	-	-	Lufuna
Casporea gumufera var varticimata (Mbalamba)	-	-	Lufuna
Dicliptera laxata (Nyamtitu)	-	-	Lufuna
Parinari excelsa (Mkazaule)	-	-	Mkonge
Katschya curviflora (Mwelesi)	-	-	Ifupira
Alphloid rheiformis (Mheyelwa)	-	-	Kidete

*From PRA discussions, it was reported that almost all households in Ifwagi and about 90% households in Kidete used fuelwood from privately established forests of Pine, *Acacia* mearnsii (Black wattle) and *Eucalyptus* spp. It was however not established how much acreage was on tree establishment per household. Very limited collections were from natural forests and UTT established forests.

From the survey results, firewood used by households in the study villages were estimated and also included in Table 7 and Figure 3. The lowest household annual consumption was 3,898 kg estimated for Itulituli village while the highest annual consumption was estimated as 6,087 kg in Ikwega village. The results are within reasonable estimates when compared with other studies. For example, a study by MNRT (2001) reported the low income household annual fuel wood consumption of 5,834 kg in the Mbeya Municipality. Other results reported in the same study (MNRT 2001) include 6,230 kg for low income households in Mwanza, 13,964 kg in Arusha, 4,488 kg in Dodoma and 3,451 kg in Dar es Salaam. For most of the studied villages, the largest source of firewood was UTT (both natural as well as established forests but mostly the established ones). The interviewed village leaders admitted that all or majority of villagers had to rely on forests for fuel wood. Exceptions were Mninga, Ikwega, Sawala, Ifwagi and Kidete where the leaders thought that dependency on forests was by very few villagers, implying that people in those villages had their own plots of established trees.

Table 7. Estimated annual firewood consumption (kg) from sources other than natural forests (NFs) related to that collected from natural forests

Village	Considering household mean consumptions (kg)			Considering village consumptions (kg)		
	Overall	Outside NFs	Difference	Overall	Outside NFs	Difference
Mpanga	5,062.0	3,106.7	1,955.3	2,009,614.0	1,233,346.7	776,267.3
Itulituli	3,897.7	3,600.0	297.7	1,870,892.3	1,728,000.0	142,892.3
Lufuna	4,748.6	2,046.7	2,701.9	1,657,251.4	714,286.7	942,964.8
Kibao	4,958.0	2,843.3	2,114.7	4,214,300.0	2,416,833.3	1,797,466.7
Mninga	4,153.3	3,545.6	607.7	664,533.0	567,300.0	97,233.3
Ikwega	6,086.7	3,260.6	2,826.0	3,883,293.3	2,080,278.8	1,803,014.6
Ihomasa	4,680.0	4,546.0	135.0	3,032,640.0	2,945,160.0	87,480.0
Ifupira	4,682.5	3,777.3	905.2	1,924,507.5	1,552,459.1	372,048.4
Mkonge	5,364.0	4,388.8	975.2	4,023,000.0	3,291,617.6	731,382.4
Mkalala	4,436.7	4,326.9	109.7	1,996,500.0	1,947,115.4	49,384.6
Sawala	5,637.3	3,306.7	2,330.6	4,143,395.5	2,430,400.0	1,712,995.5
Mtwango	5,084.0	4,582.1	501.9	3,528,296.0	3,179,981.1	348,314.9
Ifwagi	5,460.0	5,460.0	0	2,866,500.0	2,866,500.0	0
Ludilo	4,524.0	3,612.5	911.5	1,375,296.0	1,098,200.0	277,096.0
Kidete	5,799.0	2,835.0	2,964.0	2,609,550.0	1,275,750.0	1,333,800.0
Total/ Mean	4971.6	3682.5	1289.1	39,799,569.0	29,327,229.0	10,472,341.0

Note: The information was given in “head loads” whose weights ranged from 12 to 45 kg with the mean 30 kg. The mean of 30 kg per head load was used in computing the weights of consumed firewood.

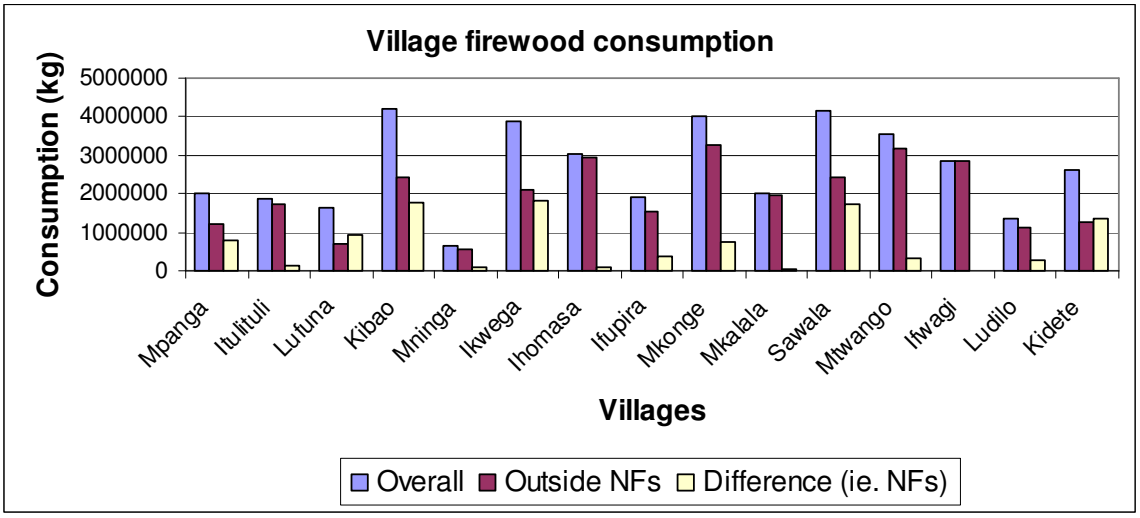

Figure 3. Annual firewood consumption per village (total, outside natural forests and within natural forests)

Though leaders in Kibao village felt that half of the villagers depended on forests for firewood, the village appears to be leading in the quantities of firewood consumed per year (14.2 million kg) probably due to a large number of households in the village (see Table 2), followed by Sawala, Mkonge, Ikwega and Mtwango. Ikwega village had the highest mean household annual consumption of firewood. Interestingly, the village with the least number of households (Mninga) was also least but one regarding mean annual consumption of firewood, next to Itulituli. For both mean and total annual consumption of firewood, Mtwango was consistently at the 5th position of the 14 villages (leaving out Ifwagi whose consumptions were not recorded because the village collected nothing at all or very little from natural forests).

Notice that if we were to consider villages' household mean annual firewood consumptions, the first five villages would include Kidete on the 2nd position after Ikwega and would excluded Kibao. While Kibao takes the 7th position in the order of annual mean consumptions, the position is taken by Kidete when total annual consumptions are taken into consideration. Itulituli, Mninga and Ludilo villages maintained low values compared with the rest, whether based on mean or total annual firewood consumptions. This serves as initial clue on which villages are potential for high pressure to the forests.

Regarding the amounts of firewood collected from sources other than natural forests it was established from the survey study that Ifwagi village was leading by far, followed by Mtwango, Ihomasa, Mkonge and Mkalala when mean household annual consumptions are considered (Table 7 and Figure 3). Figure 3 relates the amounts of firewood collected from sources other than natural forests to overall consumption where the differences is taken to mean collections from natural forests. Lowest quantities were obtained for Lufuna village. When total village annual estimates (from outside NF) are considered Mkonge takes the lead followed by Mtwango, Ihomasa, Ifwagi, Sawala, Kibao and Ikwega with the lowest values recorded for Mninga.

Whether considering household mean or overall village annual firewood consumption from natural forests, we have seven villages at the top of the list when villages are arranged in descending order of consumption. The order considering household mean annual consumption has Kidete as highest, followed by Ikwega, Lufuna, Sawala, Kibao, Mpanga and Mkonge whereas when considering village total annual consumption, the highest village is Ikwega, followed by Kibao, Sawala, Kidete, Lufuna, Mpanga and Mkonge.

Following Mpanga and Mkonge villages maintaining the same position in the orders referred to above we have the same villages in the first 5 positions, the two considerations only differing in the order of the villages due to differences in the number of households. Values for 3 villages, namely Ikwega, Kibao and Sawala were appreciably larger than those of the rest in terms of village total annual consumption from natural forests.

From the above discussion, other factors aside, likely candidates for the five villages of most pressure to natural forests could include Ikwega, Kibao, Sawala, Kidete, and Lufuna. However, since some responses could have been received from villages that collect most of their firewood from UTT established forests that are a potential pressure to

natural forests information on other aspects will have to be included in reaching a final verdict. Additionally, pressure on natural forests can not be only due to one factor, i.e. quantities of firewood collected.

Dependence of UTT employees living in the company premises on firewood and other wood materials

The company provides employment for over 6,000 people. About 5,000 employees are housed within the company premises. A preliminary research was done to cover employees living within the company premises during the study period. Dependence on natural forests for firewood was found out to be about 35% while on fuel-wood plantations or other exotic trees was 65%. Most households depend on firewood from harvested fuel wood plantation or other exotic trees. They collect the firewood from the plantations during thinning and unsuitable firewood for factory use. The company has 1,405 ha of fuel wood plantations with harvesting cycle of eighty years; and 281ha of pine for timber to cover factory pallets and other uses. An average of three head loads (equivalent to 90 kg) are used for firewood per week. Therefore each household use about 4,680 kg (8.4 m^3) per year out of which 3,042 kg (5.5 m^3) comes from company plantations and the remaining 1,638 kg (2.9 m^3) from natural forests. Thus, assuming that the 5,000 employees also represents households, then the total firewood consumption by all employees living within the company premises was estimated to be about 23.4 million kg (42,100 m^3) per year, 35% (14,700 m^3) being from natural forests. In terms of natural forests, collection of firewood involves fallen dried/ dead trees.

No use of poles or timber from natural forests reported from the collected data/information. UTT is also considering establishment of firewood plots in future for employee whose settlements are far from fuel wood plantations and piloting energy efficient stoves.

Poles

Very few respondents (6%) indicated that they use poles. For the household which used poles the average consumption was estimated at 24 poles per year. Therefore the total annual consumption for all villages (6% of 7841 households in 15 villages) was estimated at 11,280 poles. Only two respondents in Lufuna and one each in Itulituli, Kibao, Ikwega, Ihomasa, Mkalala and Mtwango indicated to have used 15 poles in the preceding year, while one respondent each in Mpanga, Lufuna and Ikwega had used 30 poles in that year. One respondent in Kibao spent the highest number of poles (120) in the year and twenty six poles were spent in Mpanga, Mtwango and Kidete (one respondent each). The least number of poles (12) was mentioned in Mpanga, Ihomasa and Ludilo (one respondent each).

No responses were recorded in Mninga, Ifupira, Mkonge, Sawala and Ifwagi concerning the use of poles. It was found that species preferred for use as poles include, *Casporea gumufera var* varticimata (*Mbalamba)*, *Eucalyptus* spp, *Macaranga kilimandscharica (Mpongolo)*, *Allophylus Africana (Mtunumbi)*, *Strichnos spinosa (Mtonga)*, *Piper ingens (Mdaha)*, *Acacia* melanoxylon (Blackwood), and *Bridelia bridelliodes* (*Mhapi)*, most of which are same as those preferred for firewood. The use of these poles were just in construction of own houses and livestock sheds. One respondent in Lufuna and one in Kibao gave the price of poles as 500/= per pole.

It can generally be speculated that destruction of forests in the study area is not very much due to felling trees for use as poles. This could be mainly due to the fact that construction is not a regular activity and use of bricks for wall construction.

Withies

As in the case of poles, very few responses (5.3%) indicated the use of withies in the study area. For a household which used withies the average consumption was estimated at 19 headloads per year. Therefore the total annual consumption for all villages (5.3% of 7841 households in 15 villages) was estimated at 7,896 headloads. A study by MNRT (2001) has indicated that one headload has about 20 pieces of withies. Therefore 7,896 headloads is equivalent to 157,920 pieces. Generally there exists low use of the product or the sampled respondents declined to produce the information. Annual collections of withies were either 3 head loads (2 respondents in Mpanga, 1 respondent each in Ikwega, Ifupira and Mkalala), 4 head loads (2 respondents each in Kibao, Ikwega and Ludilo, 1 each in Lufuna and Ihomasa). One respondent in Mpanga indicated use of 200 withies in the year. There were no recorded responses in Itulituli, Mninga, Mkonge, Sawala Mtwango and Ifwagi regarding use of withies. As such, this item does not provide much information for comparing villages about pressure on natural forests.

The few responses obtained about withies indicated own use in construction of house roofs as the only function of these products. Species providing withies include, *Bridelia bridelliodes (Mhapi)*, *Casporea gumufera var* varticimata (*Mbalamba)*, *Dodonea* viscose (*Mhai)*, *Buddleia salvifolia (Mhahasa)*, *Eucalyptus* spp, *Macaranga kilimandscharika* (*Mpongolo)*, *Piper ingens (Mdaha)*, *Acacia* melanoxylon (Blackwood) and *Allophylus Africana (Mtunumbi)* the highest score being for *Dodonea* viscose (*Mhai)*, followed by *Macaranga kilimandscharika* (*Mpongolo)* and *Bridelia bridelliodes (Mhapi)*.

Timber

It was interesting to note that during PRA trees were included in the lists of main agricultural crops for some villages (Mkalala, Mninga, Lufuna, Sawala Mkonge and Ludilo. However, though timber was included in the list of main sources of income it never ranked high except in Ikwega (Table 8). In Kibao village, possession of a tree plantation was considered in grading one's wealth status. One has to be of a middle class to possess such a plantation.

Based on the results in Table 8 one could deduce that though many people admit the importance of trees as source of timber and hence source of income only a small proportion of the local population engage itself in timber business. Probably most of those who grow trees, mainly sell them rather than producing timber. On interviewing village government leaders, two of the villages (Itulituli and Ikwega) indicated that all villagers depended on natural forests for their timber needs, three villages (Lufuna, Ifupira and Mkonge) indicated that majority of the villagers did, one village (Mpanga) indicated that few villagers did whereas the rest of the study villages indicated that none of the villagers depended on natural forests for timber. Wherever dependence was not natural forests, own established trees as well as established plantations of trees owned by tea companies were mentioned as sources of timber.

Table 8. Position of timber as source of income in the study villages

Village	Timber listed/Not listed in main sources of income	Number of items listed as main sources of income	Timber's ranking as source of income	Remarks
Mpanga	Listed	10	8	Listed as "timber/tree sales"
Itulituli	Listed	11	5	Listed as "timber/tree sales"
Lufuna	Not listed	11	-	It was included in the list of 9 benefits of forests where it ranked 9th.
Kibao	Listed	10	10	Listed as "timber/tree sales"
Mninga	Not listed	8	-	It was included in the list of 6 benefits of forests where it ranked 6th.
Ikwega	Listed	11	4	Listed as "timber and tree sales"
Ihomasa	Listed	8	5	-
Ifupira	Not listed	9	-	It was included in the list of 7 benefits of forests where it ranked 5th.
Mkonge	Listed	11	9	It was also included in the list of 11 benefits of forests where it ranked 6th.
Mkalala	Listed	11	7	It was also included in the list of 12 benefits of forests where it ranked 4th.
Sawala	Not listed	9	-	It was included in the list of 9 benefits of forests where it ranked 5th.
Mtwango	Not listed	12	-	It was included in the list of 10 benefits of forests where it ranked 3rd.
Ifwagi	Not listed	10	-	Trees sales were listed ranking 5th but timber was listed in the 11 items of benefits of forests ranking 6th.
Ludilo	Listed	9	5	It was also included in the list of 12 benefits of forests where it ranked 7th.
Kidete	Listed	13	5	Trees sales were listed separately ranking 4th but timber was also listed in the 11 items of benefits of forests ranking 6th.

In Ludilo village where it was estimated that about 38 individuals were engaged in timber business, timber was considered by the village leaders to be most important economic activity next to agriculture. They however confidently stated that all timber was not from natural forests but from own grown trees. The same applies to Ifwagi where timber was second to kiosk operations regarding important economic activities and leaders estimated 35 individuals to be engaged in timber business. In Kidete, the second position regarding order of important economic activities was taken by "business" where business referred to running of shops and carrying out timber business. About 100 individuals were estimated to be engaged in timber trade in Kidete village.

Probably due to missing timber dealers in samples taken for household surveys, results of the survey study gave little information about timber. Timber was only mentioned by

one respondent in Mninga and 4 in Ihomasa to be one of the products that are collected from sources other than natural forests. It can generally be inferred that there is no serious involvement of timber business in the destruction of natural forests requiring much attention than say firewood.

Charcoal

During interviews with village government leaders, only Lufuna village indicated dependency on government natural forests for charcoal to be by the majority. In other villages the indications were of few (Ihomasa, Mkalala and Sawala), very few (Mpanga, Itulituli, Ikwega, Ifupira, Mkonge and Ludilo) or nil (Kibao, Mninga, Mtwango, Ifwagi and Kidete). This kind of trend could be attributed to the possibility that majority of people in these villages, mostly use firewood than charcoal for energy. Studies have shown that charcoal is more used in urban areas while fuelwood is more used in rural areas (MNRT 2001, Mwandosya and Luhanga 1993, Beleko 2000, Sawe 1997, Sechambo 1986, Kaale and Sawe 2000). Of the few who use charcoal, some depend on natural forests, some on UTT established forests and some on own grown trees. In cases where village leaders indicated presence of people involved in charcoal business, they would insist that charcoal sold is not from natural forests. This was also apparent from PRA when the issue of main sources of income was considered. In many villages (Ifupira, Mkonge, Mkalala, Sawala, Ifwagi, Ludilo and Kidete) charcoal was not listed as one of income sources at all while where it was listed was accorded a very low ranking e.g. last rank out of ten listed sources in Mpanga, last out of eleven listed sources in Ikwega and last but one out of eight listed sources in Mninga and Ihomasa villages.

From the household survey only a few respondents (1 in Ihomasa, 3 in Mkonge, 4 each in Mpanga, Itulituli, Mtwango and Kidete; 5 each in Ifupira, Mkalala and Ludilo; 6 each in Kibao, Mninga, Ikwega and Sawala; and 7 in Lufuna) indicated use of charcoal in their households. One respondent in Mpanga and another in Kibao indicated involvement in charcoal trade while a few others said were using as well as selling the product (1 in Itulituli and 2 each in Ludilo and Kidete). Out of 136 respondents who indicated their sources of charcoal, 61 (45%) obtained their charcoal from natural forests, 30 (22%) from established forests, 27 (20%) from around their settlements while 18 (13%) obtained it from households' own woodlots. Villages with majority of respondents indicating natural forests as source of charcoal were Kibao (7 out of 8 respondents), Lufuna (9 out of 11 respondents), Ludilo (6 out of 9 respondents) and Ifupira (5 out of 8 respondents). In Sawala, almost equal proportions of respondents had natural forests (8 out of 15) or established forests (7 out of 15) as their source of charcoal. Natural forests were not listed as source of charcoal in Mkonge and Ifwagi.

While *Acacia* mearnsii (Black wattle) was the only species mentioned during PRA for charcoal making, it was learnt from the household survey study that in addition to *Acacia* mearnsii (Black wattle) (71%) other species like Black wood (25.7%) and *Myrica salicifolia (Mkufwa)* (18.9%).

Wild Fruits

Very few responses were received regarding use of indigenous fruits and nuts. Fifty six (18.7%) mostly from Ludilo (12 respondents) and least from Itulituli (1 respondent) expressed quantities used in the household during the previous year. These quantities

varied from the average of 1.5 tins per household in Ikwega to 9 tins per household in Ludilo and Kidete. Out of 58 respondents regarding use of fruits and nuts from natural forests, 52 (89.7%) were consuming them at home while the rest 6 (10.3%) consumed some and sold some to get income.

As per household survey and PRA, species of fruits collected from natural forests include *vitex ferruginanii* (mfudu), *Vitex mombassae* (msasati), *uacapa* kirkiana (mguhu/mkusu), *Parinari curatellifolia* (msaula), *Ficus sycomorus* (Msombe) and *Syzygium spp (mivengi)*.

Traditional Medicine

Figure 4 shows average quantities of medicines collected per household according to the survey.

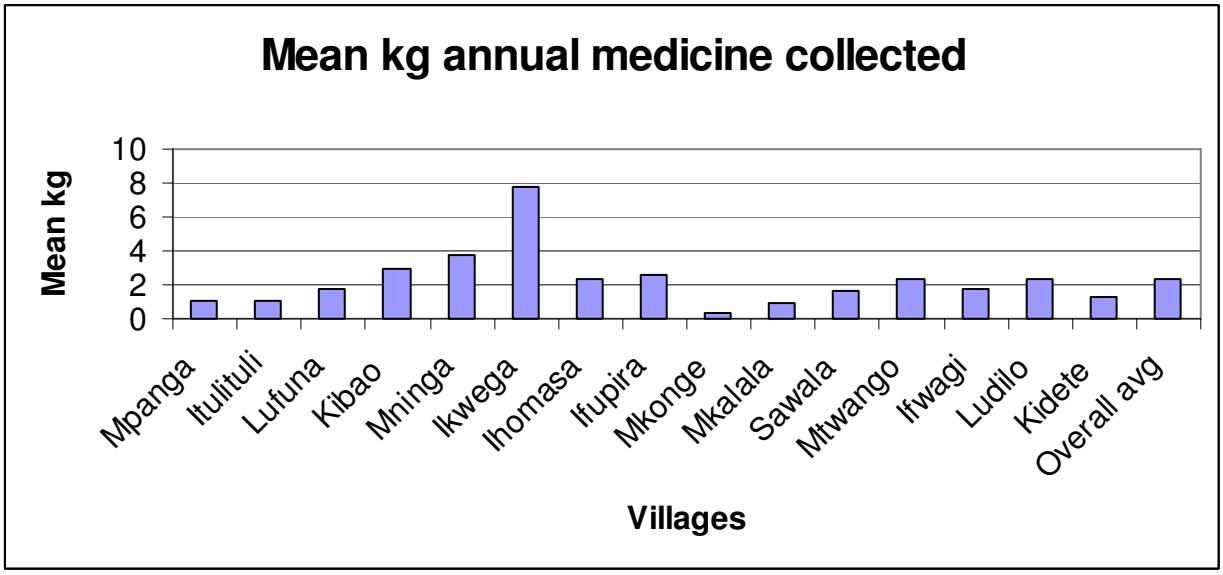

Figure 4. Mean annual quantities of medicines collected from natural forests per village

In most cases minimum quantities were a quarter of a kilogramme but maximum quantities went up to as high as 30 kg in Ikwega, most likely a figure given by a traditional healer. Other high values were in Sawala (10 kg), Mtwango (12 kg), Ifupila and Ludilo (15 kg). In Mkonge a mean from 8 respondents imply low use of medicines in that village. However, the mean quantity collected per household was about 2.4 kg per year. A study conducted in Morogoro, Tanga, Kilimanjaro and Arusha found an average consumption of 1.5 kg, 0.65 kg, 2.1 kg and 3.5 kg per household per year respectively (FBD 2003). Another study by CIROF (2004) in Kimani village of Mbarali district estimated annual houseld collection of 1.1 kg per household. About 37% of the households interviewed collected medicinal plants from natural forests. Therefore the total annual collection of medicinal plants for all villages (37% of 7841 households in 15 villages) was estimated at 6,963 kg.

Table 9. Forest tree species used for traditional medicine as listed during PRA and Household survey

Species name	Part of tree used	Village where mentioned
Rubus irinyaensis (Ntona/utono)	Leaves and roots	Mpanga
Bequestidendron megalismontana (Mnyalabati)	Roots	Mpanga
Prunus africana (Mwiluti)	Barks	Ikwega, Mpanga, Itulituli
Allophylus spp (Mtunumbi)	Leaves and roots	Mpanga
Faurea saligna (Mhanyi)	Leaves and roots	Mpanga, Mkalala, Mtwango, Kidete, Ludilo
Dracaena afromontana (Lidetema/Ndetema)	Leaves	Mpanga, Mtwango, Kidete
Eucalyptus spp	Leaves	Itulituli, Ifupira, Sawala
Acacia mearnsii (Blackwattle)	Leaves	Itulituli
Claisena anisata (Linung'anunga)		Itulituli, Kidete
Rumex abyssinica (Mnyunyu)	Leaves, roots and barks	Mkalala
Dodonea viscose (Mhai)	Leaves and roots	Mkalala, Mtwango, Kidete, Ludilo
Diaspyros whyeteana (Lidakwe)	Leaves and roots	Lidakwe, Mkalala
Teclea nobilis (Litona)	Roots	Ikwega, Mkalala, Sawala, Mtwango, Ifwagi, Kidete, Ludilo
Myrica salicifolia (Mkufwa)	Leaves and roots	Ikwega, Mkalala, Sawala, Mtwango, Ifwagi, Kidete, Ludilo
Zanthoxylem chalybeum (Mlungulungu)	Leaves and roots	Ikwega, Mkalala
Cassipourea mallosana (Libalamba)	Leaves	Ikwega
Piper ingens (Mdaha)	Sticks	Sawala
Bridelia bridelliodes (Mhapi)	Leaves and barks	Mtwango
Aloe nutii (Litembwetembwe)	Leaves and roots	Mtwango
Landolphia longifolia (Mvungavunga)	Leaves and roots	Mtwango

Maesa lanceolata (Mkodzi)	Roots	Kidete
Bombax rhodognaphalon (Msufi)	Barks and roots	Kidete, Ludilo
Opuntia spp (Likamanda)	Barks and roots	Kidete
Croton megalocarpus (Liwulugu)	Barks	Kidete
Strichnos spinosa (Litonga)	Barks	Kidete
Bauhinia petersiana (Msegese)	Leaves	Kidete
Entandophragma spp (Mkalikali)	Leaves	Kidete
Makaranga kilimandischarica (Mkaranga)	Barks	Kidete
Buddleia flonibondis (Lihulutsa)	Leaves and barks	Kidete, Ludilo
Physallis peruviana (Masongwe)	Leaves	Kidete
Beisenia abysinnica (Lipeme)	Roots	Kidete
Osyris lanceolata (Ndunula)	Leaves	Ludilo

The medicinal tree species mentioned during the survey are shown Table 10. The numbers indicate the number of respondents who listed the species in the particular village.

Table 10. Medicinal species used by various respondents during the survey

	Faurea saligna	Myrica pliolifera	*Rumex abyssinica*	*Teclea* nobilis	*Maesa lanceolate*	*Strichnos spinosa*	wild onion	*Myrica salicifolia*	*Dracaena afromontana*
Mpanga	3	1	1	2	1	1	0	0	0
Itulituli	0	0	0	3	0	1	1	0	0
Lufuna	0	1	3	3	0	0	0	0	0
Kibao	0	2	2	3	0	0	0	0	0
Mninga	0	0	1	1	0	0	0	2	0
Ikwega	1	0	1	4	0	1	0	5	2
Ihomasa	1	0	4	2	0	0	0	4	3
Ifupira	2	0	2	3	0	1	0	1	2
Mkonge	0	2	4	2	0	0	0	2	1
Mkalala	0	0	3	4	0	2	0	2	2

Sawala	0	0	6	4	0	2	0	5	3
Mtwango	1	0	2	2	0	0	0	3	1
Ifwagi	0	0	0	5	0	0	0	5	2
Ludilo	0	0	4	6	1	1	0	0	2
Kidete	2	1	0	3	0	0	1	5	3
Total	10	7	33	47	2	9	2	34	21

Apart from firewood, use of traditional medicine from natural forests seems to have significant importance to the communities in the study area. Though the quantities collected annually are in most cases very small (Figure 4) the fact that about 37% of respondents indicated use of medicine continued dependence on forests is definitely likely to cause destruction especially considering tree species where roots and barks are harvested (Table 9). The results support the findings reported by Kitaluka (2006) and observations in Barber's report (2006).

From the two tables above (Table 9 and Table 10) it can be noted that most important medicinal species that might call for in-depth understanding are *Teclea* nobilis (*Litona)*, *Myrica salicifolia (Mkufwa)*, *Faurea saligna* (*Mhanyi)*, *Dodonea* viscose (*Mhai)*, *Rumex abyssinica* (*Linyunyu), Prunus Africana (Mwiluti*) and *Dracaena afromontana* (*Mdetema)*. Species like *Maesa lanceolate* (Mkodzi) and *Kitunguupori* (wild onion) seem to be least important perhaps due to infrequent application.

It was also noted from the survey that quite a number of respondents (34%) singled out acute child malaria (*degedege*) as a disease cured by traditional medicines. Other diseases were always dumped together as "human diseases".

Traditional medicines were only mentioned in Ihomasa village to be one of sources of income but even there it was ranked last out of 8 items. This can be interpreted that traditional medicines are not generally sold for cash except for a few traditional medicine men and women whose services are to be paid for.

Mushrooms

During the household survey, of the 76 respondents (25%) who indicated use of natural mushrooms, 73 (96%) said they use it at home one said collected it for sale and two said they both consume it at home as well as selling some. The mean collection by a single household was estimated at 6 kg per year. A study by FBD (2003) in Morogoro estimated annual household collection of 3.6 kg while a study by CIFOR (2004) in Kimani village put estimates at 3 kg. A study by Msemwa (2007) in Kilosa district, Morogoro region estimated a mean household mushroom collection of 7.5 kg per year. Mufindi and Iringa rural districts are known for the abundance of a variety of mushrooms and higher consumption (Ngaga and Munyanziza 2006, Munyanziza and Ngaga 2006). Therefore the total annual collection of wild mushrooms for all villages (25% of 7841 households in 15 villages) was estimated at 11,762 kg.

With the exception of Itulituli, use of mushrooms was distributed throughout all villages with at least 2 respondents (in Mkalala) and up to 10 respondents (Mkonge). Though many respondents did not bother to indicate their sales of mushrooms for most of villages, prices of the same were indicated. The price of mushroom was lowest in Mkonge (200/= to 900/=) and highest in Kibao (1000/= to 1400/=)

Bush Meat

Twelve respondents from Kidete (3), Kibao (2), Ikwega (2), Ihomasa (2), Mpanga, Ifupira and Mkata (1 each) indicated to have been using bush meat from natural forests. One respondent in Mpanga and another in Itulituli were even involved in selling the meat. Species mostly hunted from natural forests were guinea pigs, wild pigs, and dikdik (*digidigi*). Others were wild rats and rabbits, small black monkey (Ngedere), francolins and pigeons. Though majority of those who responded to the question of bush meat were mainly hunting for household own food, some sold the meat fetching the price of 1,000/= to 3,000/= depending on the type of the meat.

Ropes

A total of 31 (about 10%) respondents indicated their use of ropes from natural forests. It was not easy for the respondents to estimate the quantities of ropes they collect but the majority of them estimated use of 6 metres of ropes per year. Quite variable responses were noted regarding the extent of materials collected as ropes. The species used as ropes include *Brachystegia spiciformis* (*Mkwee)*, *Brachystegia bussei (Mtelela)* and *Katschya curviflora (Mlyesi)* only used for tying up loads of firewood and withes. There were no responses recorded in Ikwega, Ludilo and Ifwagi villages regarding the use of ropes.

Other products from forests

Other products collected from forests in small quantities include bamboo wine, wild vegetables (especially *Solanum ethiopicum* (*mnafu)* and *Corchorus olirotus* (*mlenda)*, fodder for livestock, thatching grass and honey. Although this survey did not record much in terms of honey from natural forests, an earlier study by Kitaluka (2006) indicated that there were at least five beekeepers in each village.

4.4.2 Present condition of natural forests

Villagers were asked to give their opinion on which part of the forest – whether periphery, a bit inside the boundary, interior or just anywhere – which was most affected by human activities. Forty nine percent of respondents indicated that the effect was more evident a bit inside the boundary. About 35% said the tendency was to go anywhere interior of the forests. This indicates that there could be very little effect or damage on the periphery or boundary of the natural forests because people knew that it was illegal to enter the forests thus they tended to hide themselves from patrolling guards and/or forests owners. That observation notwithstanding, natural forests that are near to human settlement are disturbed more compared to forests that are far.

Furthermore, although there were human activities inside natural forests the condition of the forests was considered as just good by nearly 57% of the respondents while 36% indicated that it was good. Only seven percent said the condition of the forests was not good. Considering that these were responses of communities who normally enter the forests illegally, these could be hesitation to reveal the actual situation. Physical assessment of the forests disturbances could reveal the reality.

Furthermore, in all the villages surveyed at least one incidence of fire occurred in each village last year (2006). Based on the number of responses, it seems the problem of fire is more felt in Mpanga, Ludilo, Kidete and Ifwagi. The main causes of fire as reported by respondents include farm clearing, honey harvesting, hunting and charcoal making. An earlier study by Kitaluka (2006) reported the problem of fire incidences to be more in Kibao and Mpanga villages and the main cause being land preparation for cultivation.

Some of the possible mitigating measures as suggested by communities include prohibiting land preparation using fire (53%), education awareness (14%), prohibit hunting in natural forests, improving security (9%) and enforcement of by-laws (9%).

4.4.3 Distance from homesteads to natural forests

According to village respondents, the average distance to natural forests was estimated as 2 km (Table 11).

Table 11. Responses on mean distances from home to natural forests

S/N	Village name	Mean distance (km)
1	Mpanga	1.0
2	Itulituli	4.5
3	Lufuna	0.8
4	Kibao	1.3
5	Mninga	2.5
6	Ikwega	2.1
7	Ihomasa	3.0
8	Ifupira	1.4
9	Mkonge	1.9
10	Mkalala	2.8
11	Sawala	2.4
12	Mtwango	1.8
13	Ifwagi	4.0
14	Ludilo	1.1
15	kidete	1.8
Mean		2.2

According to the villages, Itulituli and Ifwagi were relatively far (about 4 km) from natural forests followed by Ihomasa village (3 km). According to the estimates made by villages, Lufuna was relatively more close (0.8 km) to natural forests than other villages.

Villages close to natural forests pose more threat to the resource in the absence of alternations for forest products in need by households. It should also be noted that generally people tended to collect firewood and other forest products from forests which are close to them regardless of whether that forest belong to UTT, MTC or government. And that the mean time which women used for firewood collection was 1.2 hours.

4.5 Water Resource use and service functions

Most of the households (93%) interviewed in the 15 villages believed that natural forests are sources of water and that they should be conserved. Communities in some villages believed that some of the rivers/stream are either originating from or stabilized by the natural forests. Some of the rivers/streams mentioned in each village are indicated in Table 12.

Table 12. List of some of the rivers/streams in each of the villages surveyed

S/N	Name of village	Name of some rivers/ streams
1	Mpanga	Lufyagile, Nyakinungá Makalao and Mpanga
2	Itulituli	Kibata and Lunguya
3	Lufuna	Magadu, Ngongósa, and Itufilo rivers
4	Kibao	Kibata and Itufilo rivers, Wangama, Lungundi Kwanyato and Kilimani streams
5	Mninga	5 steams within the village but far and 26 streams within Unilever land
6	Ikwega	Mvanga and Ifaghi and 2 small rivers
7	Ihomasa	Fagi and Kitendega
8	Ifupira	Msiwasi (runs from Sawala) and Kidope
9	Mkonge	Nyamongolo, Mmilandope and Kehomangambapo
10	Mkalala	Luganga and Kigogo
11	Sawala	23 water sources (some are springs) – dries up during dry season;
12	Mtwango	Nyamgongo, Mchagalike, Magadu, Ngesi, Timbwi and Lingasisuka
13	Ifwagi	Kidope (Msingisi, Nyangawe), Mawogwe, Mwenga, Isimike and Nyawifu
14	Ludilo	Idutwi, Mafindasa, Makinda, Ilogolo, Kinyaminyo and Isimike
15	Kidete	Msiwasi Ilogolo, Mafindasa and Kibavala

For the majority, use of water according to respondents (96%) in all villages was for domestic while a small percent (3%) identified irrigation use and one percent for livestock. Irrigation farming was not significant in the villages especially because most of them are in relatively higher altitudes. Irrigation was common in the lowland areas of the Mufindi district.

Valley bottom cultivation is common in the 15 villages relying mainly on soil moisture and limited irrigation. The major source of water for domestic use was water springs, rivers and wells for most villages. Small towns like Kibao, Lufuna, Sawala and Mtwango had piped water for some households. Many respondents felt that there were many water sources and springs within the natural forests of UTT.

Communities agreed that water levels of most rivers/streams has decreased, and the trend in most rivers or streams has been to dry up earlier in the year than in the past. The main contributing factors were mentioned as increased population causing expanded agriculture and environmental degradation due to human activities.

4.6 Forest resource use conflicts

Resource use conflict was evident in many villages especially on forests. Most of the villages are close to natural forests belonging either to UTT, MTC, Central and/or local government. There is also pressure from the surrounding communities to extract products illegally from the forest reserves while owners would wish to see that these forests are conserved. Therefore conflicts on access to these natural forests are common. The extent of extraction of firewood was discussed in detail in section 4.4.1 and shown in Table 7 and Figure 3.

The desire to get firewood and other forest products from natural or plantation forests of UTT was very high especially because of limited alternative sources from community perspectives, and the growing population and increased human activities in most villages. Occasionally illegal entrance to the forests has caused some conflict between forest owners and villagers because of punishments to culprits. In some cases the Company do allow the bordering communities to enter and collect some firewood left after the Company has collected its own firewood. However, some villagers do enter the forests and collect the firewood prepared by the Company before it is picked causing some problems.

4.7 Future demand for forest products

The demand for forest products is expected to increase as reported by 77% of the respondents interviewed. About 16% were of the opinion that demand will decrease while 7% indicated that demand will remain constant. The main reason for increase in demand was population growth as reported by 96% of the respondents. Other factors for increased demand for forest products especially firewood and charcoal include the high prices of alternative energy sources such as electricity and kerosene and its availability in rural areas. About 73% and 64% of the respondents indicated that kerosene and electricity were scarce respectively. However 36% said electricity was abundant but they could not afford the costs. There is no evidence that household income is increasing which could have influenced people to switch to better alternative energy sources (e.g. electricity). A recent study by Ngaga (2007) in the Great Ruaha River Catchment Area (which includes Mufindi) shows that nearly 46% of the households are poor and living on slightly less than a dollar (0.8 USD) per day.

Alternative energy sources to woodfuel in the 15 villages are limited and/or unaffordable. The basic concept of alternative energy sources relates to issues of sustainability, renewability, availability, affordability and pollution reduction. In reality, alternative energy means any thing other than deriving energy via fossil fuel (coal, natural gas and crude oil) combustion. Basic barrier to all forms of alternative energy lies in initial costs. It seems evident that in the villages studied, biomass energy (especially firewood and charcoal) will continue to be the main source of energy to the majority of community members, in the foreseeable future due to poverty and lack of affordable alternative energy sources.

4.8 Alternative energy sources and efficient technologies

The villages surveyed are essentially rural and the major source of energy was fuelwood-firewood and charcoal; fuelwood being the dominant energy source. Other types of

energy used were kerosene as indicated by 93% of respondents while 7% respondents indicated to use electricity. However, the number of people who have access to electricity is a mere 10% for the entire population in Tanzania (Mrindoko 1997). Rural electrifications are poor and related to weak infrastructure**.** Villages with electricity were Lufuna, Kibao, Mninga, Sawala, Mtwango and Ifwagi. Other alternative energy sources such as gas, solar, wind and coal were not used by the households interviewed. All these are indigenous energy sources that are found in Tanzania. These results are similar to those reported in various places that biomass energy resource (mainly fuelwood and charcoal) from natural and plantation forests is the most preferred fuel which account for 88% - 93% of the country's final energy consumption (Hosier, Luhanga and Mwandosya 1993, Mrindoko 1997, FBD 2001; Ngaga *et al.,*2004). Despite the revealed significant importance of woodfuel, its utilisation is characterised by application of energy inefficient technologies especially three stone stoves whose efficiency is about 7-12% resulting to massive wastage of resources.

Petroleum is the principal energy resource in Tanzania providing 88% of commercial energy. The supply of the product to rural areas is difficult due to distance and poor infrastructure. The prices of the products are relatively high for rural people.

Coal is one of the major energy resources of Tanzania. However, coal potential is not yet widely used, and its availability to majority of the poor Tanzanians including the study villages of Mufindi district is not foreseen in the near future. The contribution of coal in the current energy balance in Tanzania is considered to be negligible. The challenge with regard to coal exploitation includes:

- Lack of investment for coal exploitation from both industries and government;
- Inadequate utilization of coal;
- Higher cost implication for the application of cleaner coal technologies;
- Lack of infrastructure for coal distribution; and
- Environmental impact of coal utilization

The natural gas is now readily available to Dar es Salaam city under SONGAS company management, and the government is promoting its use as alternative energy source to biomass energy for forest conservation. However, for rural areas like the villages studied in Mufindi district this becomes a limited option.

Solar energy is another form of source of energy in Tanzania. Solar heating is the use of the sun in its primal form, without interference of any technology. However very little attempt has been made to utilise this source of energy, which could be available alternative source option to reduce use of wood and oil for heating and lighting purposes. The main limitation with solar is that the efficiency is low (5-15%), high initial costs; lack of adequate storage materials (batteries); and high cost to the consumer which makes it a difficult alternative to the villages bordering the UTT forests. This is true for photovoltaic i.e. converting solar energy into electricity. This form of alternative energy source could assist minimize forest destruction in the near future. However, solar energy use has so far been limited to thermal applications (heating water, crop drying, and salt drying) and photovoltaic (PV) applications in the households, health centres, and transport and communication sectors in remote areas.

Tanzania tends to have average wind speeds ranging between 2 to 5 metres per second. With such wind regimes it could be utilized both for water pumping and power generation. Advantages of wind energy include its technological feasibility on large scale when compared to solar; supplemental power in windy areas; best alternative for individual homeowner. Disadvantages of wind energy source includes: Highly variable source; relatively low efficiency (30%); more power than is needed is produced when the wind blows; efficient energy storage is thus required for wind to be viable alternative energy source to biomass. This makes it a difficult option for the villages surrounding UTT forests.

4.8.1 Energy conservation option

It is clear that a more viable energy option in the villages studied is biomass energy, which mainly comes from wood materials. One among the available strategic options for proper energy conservation is conservation of wood fuels through introduction of improved and efficient conversion and utilisation technologies. A study which was conducted by FBD (2001) in five regions of Tanzania indicated very low utilization of improved and efficient stoves. For example in a study carried out by the Forestry and Beekiping Division in 2001 only eight percent of the households surveyed in Mbeya Municipality used improved wood stoves (FBD 2001). Another observation from charcoal users was that 56% of the households surveyed were still using traditional and inefficient metal stoves (FBD 2001). These cooking devices, the three stone stove and the traditional metal stoves are inefficient. The traditional charcoal stoves heat transfer efficiency is 15 to 18 per cent only and the three stone stove has about 7-10% efficiency (Ishengoma and Nagoda 1991; Sawe 1997).

Therefore, improving use of energy efficiency stoves potentially offers a cost-effective alternative for easing the burden of buying fuel or encroaching forest reserves by households. For example improved charcoal stoves (Figure 5) and firewood devices have an energy efficiency of up to 50% (range is 20 – 50%); and this implies that charcoal and firewood consumption can be further reduced. During household survey it was found out that use of improved firewood efficient stoves (mud-made stoves) (Figure 6) were common in some of the villages for example Lufuna, Mkonge and Kibao. This type of stoves could be promoted in other villages. Also, there are other types of firewood efficient stoves and smoke free which UTT is piloting with other staleholders in some of the villages.

Figure 5. Types of improved charcoal stoves manufactured and marketed in Tanzania by different organizations/Institutions. The top two are named (i) Double liners and (ii) Bell bottom while the bottom ones are (iii) Straight wall and (iv) Triple stand.

Figure 6. An example of mud-made firewood efficient stoves found in some villages surrounding UTT

According to the responses indicated in Table 13, use of firewood efficient stoves reduces consumption of firewood by 50%. Similar results are also reported in Shinyanga, Tanzania (Bakengesa 1997). This implies that average annual household consumption of firewood in the study villages can fall from 9 m^3 to 4.5 m^3. Based on villages which have

significantly advanced in using firewood efficient stoves (Lufuna and Mkonge), more than 75% of households can adopt the stoves if appropriare interventions are made. Basing on this assumption, total annual firewood consumption from natural forests for the 15 villages and UTT employees can fall from 33,576 m^3 to 22,384 m^3 and about 11,192 m^3 can be saved annually if 75% or all households adopt energy efficient stoves. This saving is equivalent to about 132 ha of natural forests considering a high stock of miombo forests (which has estimated growing stock of about 70 – 100 m^3 ha^{-1}). Also about 62 hours annually used for firewood collection will be saved and could be used for other activities.

Several Government and NGOs and other agencies are involved in several places in Tanzania in the implementation of this strategic option for energy conservation. In some places the initiated efforts have shown positive achievements. However in many other places the efforts have had no significant impact. The use of improved and efficient stoves in the villages studied is very low as indicated in Table 13. The main reasons responsible for set back of large scale utilization of improved technologies include, among others (not in order of priority):

- Inadequate public awareness of improved technologies and their potential benefits. The efforts to educate the public has been site specific mainly driven by development partners. There is no clear and long term national wide stratergy for public awareness on use of energy efficient devices. The main methods used have been through seminars and workshops which are normally attended by a few. Public awareness is important because of low literacy level, socio-taboos and the fact that people are used to the traditional local stoves.

- Lack of access to necessary information.
  Information on different types of technologies available and benefits associated with each is not easily available and known to many people. Most of this information is available in certain centres e.g. "*Taasisi ya Kuendeleza Nishati Endelevu na Mazingira* (TaTEDO)" and the Ministry responsible for energy; places which are not easily reached by many people especially those in villages.

- Inadequate trained and skilled manpower.
  Trained and skilled nampower is also available in certain centres but very few are available at regional and district levels. Extension personel with sufficient knowledge are also very few and not available in rural areas where consumption of firewood is high. In addition, regional and district offices donot have resources e.g. transport to reach the villages to provide skills on moulding the stoves and their maintenance as well as to raise public awareness for the people to adopt them

- Lack of appropriate financing mechanisms.
  There is no reliable/established financing by the Ministry responsible for energy or TaTEDO and other stakeholders for dissemination of energy efficient devices. Even where dissemination is done, there is no regular followup to encourage people and solve problems they encounter. The new technologies usually embrace a change in cooking habits which is difficult to achieve unless people are visisted regularly, educated and encouraged. Where metal materials are used for some type of stoves, many people cannot afford the prices. Moreover, many stove

producers lack sufficient capital to purchase the appropriate materials and end up buying materials of lower quality and produce low quality stoves.

- Abundant availability of firewood in some villages.
  Abundant availability of firewood does not give someone incentives to use energy efficient stoves especially if firewood is easily available and collected freely. This includes location of the village in relation to firewood sources and accessibility. It is only through knowledge over the importance of environment conservation that one may consider efficient use of firewood in a place where it doesn't seem to be a constraint.

- Inadequate and ineffective institutional framework.
  There is no single organization/Institution responsible for promotion, development and dissemination of energy efficient devices. Different sectors dealing with natural resources e.g. forestry, energy and environenment may design different activities to promote use of certain efficient technologies in specific areas. Most of planning and implementation is done at sectoral and/or ministerial levels.These activities are not coordinated and its impact cannot be easily evaluated. There is no coordination of sources of information about stoves design, materials used, training and marketing of the technologies.

Therefore, the success of any initiative in promoting large-scale use of improved technology in the villages will depend on how effective the above barriers are addressed. For example how women are empowered – they are not usually the heads of households and therefore often unable to obtain money for purchase such items. The women are the ones who most benefit as it will save them much time from firewood collection.

Table 13. Reponses on use of improved fuelwood and charcoal stoves in the villages surveyed

S/N	Name of village	Responses on use of improved fuelwood and charcoal stoves
1	Mpanga	Very low use of improved wood and charcoal stoves
2	Itulituli	Very low use of improved wood and charcoal stoves
3	Lufuna	About 75% are using firewood efficient stoves (Fig. 6) which has reduced consumption by 50% (a headload is used for 4 days instead of 2 days) and 15% are using charcoal efficient stoves which has reduced consumption by about 50%. However charcoal is mainly used for warming the house. Brick-made firewood efficient stoves are used and were introduced by Student partnership worldwide (SPW).
4	Kibao	Brick-made firewood efficient stoves were introduced by Student Partnership Worldwide (SPW). There have also been some efforts from Mafinga Lutheran college to introduce various forms of cookers to help households cook several items at ago and reduce the quantity of firewood. About 17% of households use them to date. The adoption rate is low due to their being less efficient in supplying the heat for the

		family in the home, the cost of construction and need for a special handle to hold the pot during cooking (for some food items). In addition, efficient earthen charcoal stoves have been introduced in the town though only about 29% (250 households) of households use them to date
5	Mninga	Very few use improved wood and charcoal stoves
6	Ikwega	Very low use of improved wood and charcoal stoves
7	Ihomasa	Very low use of improved wood and charcoal stoves
8	Ifupira	3-stone traditional arrangement Brick-made firewood efficient stoves are used by 24% of the households. Not many households use them because the technology is not yet widespread. There is still need for educating the community about these stoves. Efficient earthen charcoal stoves. About 50 households (12%) use them to date. The main constraints being high price (They sell at 3,500/= to 4000/= each)
9	Mkonge	3-stone traditional arrangement Brick-made firewood efficient stoves (similar to Fig. 6) are used by 97% of the households. This is because some women were trained on how to make them and made sure that they visit each house to train other women. Efficient earthen charcoal stoves. About 10 households only (about 1%) use them to date. The main constraints being availability, awareness including the fact that use of firewood is seen by many as not a problem.
10	Mkalala	Only 5% and 4% of the households uses improved wood and charcoal stoves
11	Sawala	Use of improved wood stoves • Very few have this type of stoves (about 9.5% - 70 households). They have not been widely adopted mainly due to awareness and cost Use of efficient charcoal stoves • Mainly used for heating the room/house especially during cold weather • Currently used by about 14% (100 households)
12	Mtwango	Use of improved wood stoves • Very few have this type of stoves (50 households). They have not been widely adopted mainly due to awareness and cost. However villagers acknowledged that uses lesser firewood: one headload can go up to 5 days instead of 1 – 2 days, and that one can cook 3 or 3 items at a go. Use of efficient charcoal stoves • Mainly used for heating the room/house especially during cold weather • Priced at 3000/= per stove • Currently used by about 500 households
13	Ifwagi	About 15% are using fuelwood efficient stoves and a few households are using charcoal efficient stoves made of clay mainly used for warming the house.
14	Ludilo	Use of improved wood stoves

		• Very few have this type of stoves (30 households i.e. 10%). They have not been widely adopted mainly due to awareness and cost Use of efficient charcoal stoves: none of the households • Mainly because of awareness, ease of availability (transport) and price of stoves. • Priced at 3000/= per stove
15	Kidete	About 22% are using fuel wood efficient stoves and 11% households are using charcoal efficient stoves made of clay mainly used for warming the house. The adoption is low because most people feel that fuel wood is still available (about 1-2 km distance), charcoal is expensive for most people.

4.9 Perceptions of communities regarding various interventions

Many villagers interviewed were of the opinion that efforts made by the Company (UTT) to protecting natural forests have enabled these forests to survive to date. They further acknowledged that it has not been possible to completely prevent people entering the forest because the area is big with a long boundary coupled with demand for forest products by surrounding communities. The relationship between the Company (UTT) and surrounding communities was described by many villages as generally good. Some of the services from the Company mentioned by communities include limited access to medical services, use of some roads, getting limited quantity of fuelwood and traditional medicine, and employment. Some of the concerns raised included restricted access to fuelwood in some of the villages and damage to crops caused by vermines (wild pigs, small black monkey (Ngedere), monkey etc) from the natural forests. Many households estimated an average loss of up to half an acre or one bag of maize per acre due to vermines. However, all vermines cannot be attributed to UTT natural forests alone as there are other forests (private and those owned by other Institutions).

5. SELECTION OF FIVE VILLAGES OF MOST PRESSURE ON NATURAL FORESTS

5.1 Introduction

In any selection exercise, there must be a criterion on which to base for taking or dropping members of the pool in question. This could be a single item existing in varying levels or they could be several parameters combined in an agreeable formula for accomplishing the exercise. Obviously the set criteria must be carefully designed so that the eventually selected units fit for the purpose of selection.

The purpose of this exercise was to come up with villages that exert most pressure on the surrounding company's natural forests. The pressure on forests includes harvesting of plants and animals as well as carrying out activities that can impair the natural state of the forests. With this in mind, a number of factors need to be addressed when setting the criterion. Once all important factors have been put into consideration, then a formula to address all factors in combination will have to be drawn. Below are factors considered for inclusion in the criterions and the drawn criterion is described thereafter. Lastly the selected villages and justification for their selection are given. Factors for consideration were prepared by the experts, presented and discussed in a workshop which involved village and ward leaders of the 15 villages, UTT senior staff and officials from the Mufindi District Natural Resources Office. Two additional factors were proposed by one of the participants group; size of the natural forest near the village and extent of current destruction on the natural forests. However, during plenary discussion it was agreed that those factors are somehow taken care by some other factors discussed below (chapter 5.2).

5.2 Factors for consideration

5.2.1 The issue of proximity to natural forests

In most cases, somebody closer to a particular resource exploits it more than the one who is far away from it. Resources like water, grass, firewood and construction materials are sometimes obtained distant places from people's dwellings. In such cases people spend the collected items in more economic ways than if they were obtained within easy reach. This is to try to reduce frequencies of going for the same, thereby saving time for other activities. The reduced frequency of collecting the same resource from some place is likely to minimize chances of its destruction or extinction. On the other hand, resources within one's vicinity often succumb to misuse as he or she frequently go for its collection without much pain felt.

From the above, it has been reasoned to have distance from household to natural forests as one of the factors included in the criterion for selection of villages of high destruction potential. During household survey, each respondent was required to estimate the distance from his/her home to the nearest natural forest. As described below, the closer one is to the natural forest the more scores for being selected.

5.2.2 Dependency on natural forests, UTT and other established forests

Dependence on natural or established forests for various products is likely to vary according to availability of alternative sources and/or resources. For example in a place where there is electricity (of course when it is affordable by many) forest resources will be spent less than in a place where there is none.
In the studied villages, dependency on natural forests for firewood, charcoal or building materials would depend on whether people have own grown trees or not. Information gathered from PRA and survey studies has been used to include aspects of dependency either on natural forests or on UTT/MTC/Sao Hill established forests (man-made forests) in the selection criterion.

5.2.3 Volumes of products collected from natural forests

In addition to proximity and degree of dependency on natural forests, it would be of help if one could establish the quantities of collected products. Large quantities collected from the forests are associated with the extent of forest destruction. It requires use of advanced techniques for one to collect large quantities of products from forests without causing destruction.

Although many forest products were collected from natural forests, firewood was isolated as the most significant product. Through computations earlier explained in the previous chapter, it was possible to come up with estimated quantity of firewood collected from natural forests by individual villages. This aspect has been incorporated in the criterion as described below.

5.2.4 Education and income levels

Though not in all circumstances, levels of education and wealth status of the community may be used to predict dependency on natural resources. Campaigns on conservation of environment factors can be easily picked or adopted by educated members of the community while environmentally friendly technologies are more likely to be afforded by middle and higher income classes.

The time taken for the present study was not sufficient to ascertain whether the studied area is an exception to the above arguments. The issue of education has not been included in the criterion while income levels have been considered.

5.2.4 Land availability per household

Just like the question of income, land acreage or availability of land per household does not necessarily reflect impact to the forests. However since land is an important household asset in day to day activities including farming, livestock raising and tree planting it goes without saying that the more scarce land is the more likely one will not have own trees and has to resolve into invading natural forests for survival. The issue has

been considered in the criterion but an attempt is also made to see what happens if excluded.

5.3 The selection criterion

For easy ranking of the villages, weighting of the items to be included in the selection index gives a lowest value to the level which is considered to be most destructive so that the extreme opposite level goes with the village that needs not be selected. For example taking the case of distance between households and natural forest, the village with shortest distance takes 1 as the village's value for that item whereas the farthest village takes 15 as its value for the item. In case there are villages with the same distances then they carry the same value and thus the last village will have a value less than 15. When you take the example of quantities collected from natural forests, a village collecting the largest quantity will have the value of 1 and that with the least quantity will score 15 as a corresponding value in the hierarchy when sorted in the ascending order. Basing on this order and data from household surveys, PRA and interviews with village leaders, villages are ranked based on the following criteria:

(a) Distance from natural forests
(b) Quantities of firewood consumed from natural forests
(c) Proportion of poor households
A village with highest proportion of poor takes the value of 1 while that with least proportion of poor takes the corresponding position in the hierarchy, the highest possible being 15.

(d) Average household monthly income
A village with lowest mean household income takes the value of 1 while that with highest household income takes the corresponding position in the hierarchy, the highest possible being 15.

(e) Degree of dependence of villagers to natural forests
Of the four categories given, "all villagers" takes the value of 1, "majority" takes 2, "half" takes 3, "few" (<½) takes 4 and 'very few" takes 5 (Data from interviews with village leaders)

(f) Dependency on UTT for firewood
A village with highest count of respondents listing their dependence on UTT forests for obtaining firewood takes the value of 1 while the one with least count takes the highest position in the hierarchy. (Survey data)

(g) Household land acreage
A village with least mean household acreage takes the value of 1 while the one with highest mean household acreage takes the value of 15 or lower depending on whether there are tallying villages or not. (Survey data)

(h) Is land a constraint?
In the survey, one was required to indicate by YES or NO if land was considered a constraint. Yes answers are accorded a zero mark and No answers a 1 mark. Hence for each village the number of No's makes the villages value. The higher the no's the more it is pushed to the bottom of the order.

All villages are listed against the entries of the criterion. The criterion is that when all values are summed up, then the lower the value the more is the village likely to cause more pressure to the natural forests relative to the rest. Then ranking options based on inclusion or exclusion of factors in the criterion are given in Table 14.

Table 14. Selection of five most pressure villages using various considerations

	Distance	Firewood from NF	Prop of poor	Monthly inc	Depend on NF	Dependence on UTT	Land size	Response to land as constraint	Total score
Mpanga	2	6	11	5	1	1	5	8	39
Itulituli	15	11	8	2	1	6	6	5	54
Lufuna	1	5	13	2	1	2	3	9	36
Kibao	4	2	5	6	3	2	9	7	38
Mninga	11	12	3	2	5	4	2	7	46
Ikwega	9	1	2	2	5	7	11	8	45
Ihomasa	13	13	7	6	2	7	1	8	57
Ifupira	5	8	6	4	2	6	7	7	45
Mkonge	8	7	12	4	2	3	10	8	54
Mkalala	12	14	5	4	2	8	8	7	60
Sawala	10	3	4	3	4	2	12	6	44
Mtwango	6	9	9	4	1	2	4	6	41
Ifwagi	14	15	10	4	6	5	14	6	74
Ludilo	3	10	1	1	2	4	15	5	41
Kidete	7	4	3	2	5	5	13	6	45

Different ranking options

Rank1	Rank2	Rank3	Rank4	Rank5	Rank6	Rank7	Rank8
Lufuna	Lufuna	Ludilo	Kibao	Lufuna	Lufuna	Lufuna	Lufuna
Kibao	Mpanga	Kibao	Mpanga	Mpanga	Mpanga	Mpanga	Mpanga
Mpanga	Kibao	Lufuna	Lufuna	Mtwango	Kibao	Kibao	Kibao
Mtwango	Mtwango	Mpanga	Mtwango	Kibao	Mtwango	Mtwango	Ik\wega
Ludilo	Ludilo	Ikwega	Ludilo	Ifupira	Ifupira	Sawala	Ifupira
Sawala	Ikwega	Sawala	Ifupira	Sawala	Sawala	Ludilo	Ludilo
Ikwega	Ifupira	Kidete	Sawala	Ludilo	Mkonge	Mkonge	Mtwango
Ifupira	Sawala	Ifupira	Ikwega	Mkonge	Ludilo	Ifupira	Kidete
Kidete	Mninga	Mtwango	Kidete	Kidete	Kidete	Kidete	Mkonge
Mninga	Kidete	Mkonge	Mninga	Mninga	Mninga	Ikwega	Sawala
Itulituli	Mkonge	Mninga	Mkonge	Ikwega	Ikwega	Mninga	Itulituli
Mkonge	Itulituli	Itulituli	Ihomasa	Itulituli	Itulituli	Itulituli	Mninga
Ihomasa	Ihomasa	Mkalala	Itulituli	Ihomasa	Ihomasa	Ihomasa	Ihomasa
Mkalala	Mkalala	Ihomasa	Mkalala	Mkalala	Mkalala	Mkalala	Mkalala
Ifwagi	Ifwagi	Ifwagi	Ifwagi	Ifwagi	Ifwagi	Ifwagi	Ifwagi

Rank1 = Sorts villages in ascending order when all items are included
Rank2 = Sorts villages in ascending order when land constraint is excluded
Rank3 = Sorts villages in ascending order when land size and land as constraint are excluded
Rank4 = Sorts villages in ascending order when monthly income is excluded
Rank5 = Sorts villages in ascending order when only proportion of poor is excluded
Rank6 = Sorts villages in ascending order when both, proportion of poor and monthly income are excluded
Rank7 = Sorts villages in ascending order when proportion of poor, monthly income, land size and land as constraint are excluded
Rank8 = Sorts villages in ascending order when only distance from natural forest, firewood from natural forests and dependency on natural forests are included.

5.4 Proposed selected five villages

Whatever ranking option is used, i.e. whether inclusion of all factors or exclusion of some, 3 villages namely Lufuna, Kibao and Mpanga are within the first 5 villages. Note that the second option that only excludes the question of land as constraint has the same arrangement of the first five villages. Mtwango village appears among the five villages in 5 out 8 options. This means that this is the best candidate for joining the 3 to make four. The fifth is proposed to be Ludilo which, appears 4 times.

Hence five villages namely Lufuna, Kibao, Mpanga, Mtwango and Ludilo are proposed for the pilot intervention. Another village, Ifupira may be considered as the next village to the five ones. It has the highest freguency of inclusion in the first five when poverty and income are excluded as criteria. It was also noted during field visits that the village's community was using relatively more poles and firewood from natural forests which are fairly close. The natural forests close to Ifupira are also considered to be relatively rich in near endemic animal species. It was also recommended during the workshop that some interventions for example awareness education and training could go beyond the five villages in order to have a significant impact to environment and natural forest conservation. Table 15 summarises information on the used items in the selection criterion for the selected villages.

Note that dependence on UTT planted trees for firewood was included in the criterion. This considers the fact that should UTT restrict entry into their tree plantations for firewood, people will resort to natural forests. However, exclusion of dependence on UTT the criterion retains the same villages except that Ikwega replaces Mtwango and takes in the 5th position with Ifupira taking the 6th one.

Table 15. Information on the selected villages

Village name	Distance from NF (km)	Firewood from NF (kg)	Proportion of poor (%)	Monthly income (000' Shs)	Dependence on NF	Dependence on UTT (No of respondents)	Land size	Proportion mentioning land as constraint (%)
Lufuna	0.86	942,964.8	2	30	All	11	2.76	47
Kibao	1.33	1,797,467	30	90	Fifty percent	11	3.38	59
Mpanga	1.07	776,267.3	4.5	60.8	All	13	3.05	58
Mtwango	1.78	348,314.9	7.5	60	All	11	2.81	54
Ludilo	1.12	277,096	65	24	Majority	5	6.75	64
Ifupira	1.38	372,048.4	24.5	60	Majority	3	3.15	46

6.0 Proposed mitigation measures to reduce degradation of natural forests

According to the findings of this study the main factors contributing to degradation of natural forests are associated with population growth and level of poverty in the villages bordering UTT forests. Population growth has increased human activities such as expansion of agriculture and increased demand of forest products. Poverty level has limited options for the communities to find alternatives. Basing on these factors, mitigation measures must take this into consideration and look for measures which are within reach by communities and could take the lead in implementation of the measures. Therefore basing on the knowledge and discussion with communities during field visits the following mitigating measures listed in order of priority and presented in concetric rings (Figure 7) are considered:

(i) Effective tree planting
(ii) Effective use of improved and energy efficient fuelwood and charcoal stoves
(iii) Awareness education to the communities on environmental conservation
(iv) Involvement of communities in forest management (Participatory Forest Management)
(v) Agriculture and Agro-forestry Development
(vi) Institutional Development and Capacity Building at all levels
(vii) Other measures include promotion for use of bricks and tiles for house construction, government interventions to reduce cost of electricity.

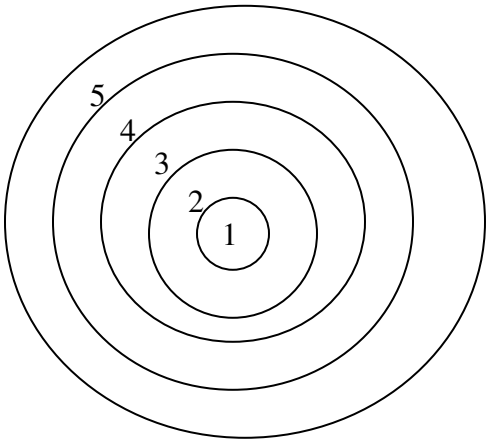

Figure 7: **Mitigating measures arranged in order of priority**

Key: 1-Energy efficient stoves, 2-Tree planting and agroforestry, 3- Awareness education programmes, 4-Institutional and capacity building, 5-Participatory Forest Management.

6.1 Effective tree planting

Planting of trees for different uses can be done around the farms and other plots. In some of the villages such as Mkalala, Sawala, Mkonge, Ludilo and Ifupira communities were willing to contribute in kind in raising seedlings and estimated that many households could take 500 or more seedlings. UTT could establish its own tree seedlings nursery

because of the experience they have in nursery establishment and later distribute to communities and/or support villages willing to raise own tree seedlings. Alternatively, UTT could work in partnership with other NGOs for example Tanzania Forest Conservation Group (TFCG) which is working in some of the villages in Mufindi district in conservation of natural forests. The main limitation could be availability of land for some of the households and the reluctance expressed by other village members for fear of vermin which are likely to increase because of trees and hence increase crop damage as discussed in chapter 4.3.1.

6.2 Effective use improved and energy efficient fuelwood and charcoal stoves

As pointed out in section 4.7 already some few villages such as Mkonge and Lufuna have made significant steps in using fuelwood efficient stoves and acknowledged significant reduction in fuelwood consumption. However, there is little use of fuelwood efficient stoves in other villages and uses of charcoal efficient stoves are almost insignificant in all villages. Because of the growing demand and impact of the woodfuel problems in the natural forests of UTT and others the urgency for intervention is called for. Therefore, deliberate efforts should be made to scale up use of improved firewood and charcoal stoves particularly the fact that most people cannot afford to cook and heat their homes using other sources of energy. The already proven economic viability, social acceptability and environmental benefits of improved energy efficient devices further justify the need for continuing support by all stakeholders. Bearing in mind the difficulties encountered with promotion of stoves in East Africa, options will first be evaluated on a pilot basis. This is a general comment for all of these potential solutions. The Student Partnership Worldwide (SPW), an NGO based in Iringa region which worked in the area before and contributed to the high adoption rate of efficient devices in Mkonge and Lufuna villages could help the project. Some women in Mkonge and Lufuna could also be engaged with the project to make the brick made wood efficient stoves and train women in other villages.

6.3 Awareness education to the communities on environmental conservation

Various programmes could be designed to create awareness among communities on the importance of natural forests and environment in general, including use and management of fire. The programme may involve training of Village and Ward leaders and members of Village Natural Resource Management Committees. This can be done in form of seminars, study tours, exchange visits, production and distribution of leaflets, and radio programmes using the FM station at Mafinga town.

6.4 Involvement of communities in forest management (Participatory Forest Management)

6.4.1 Joint Forest Management (JFM)

The national forest policy of 1998 has created a new framework for Participatory Forest Management (PFM) in Tanzania through its emphasis on "Joint Forest Management" (JFM) and "Community Based Forest Management" (CBFM). The overall goal for the forest sector was defined as "*to enhance the contribution of the forest sector to the sustainable development of Tanzania, and the conservation and management of her natural resources for the benefit of present and future generations*".

JFM is defined as

> "*involvement of local communities or non-governmental organizations in the management and conservation of forests and forestlands with appropriate user rights as incentives*".

It should be noted that there is an important distinction between JFM, which encompasses a range of management options with varying degrees of community involvement, and "community-based forest management" which lies at one end of this JFM spectrum and essentially implies a hand-over of management authority to local communities. Also notable about the New Forest Policy opportunities provide avenues which are used to involve local communities in the management of the forest reserve. Involvement of communities in forest management is already practised in many places and Mufindi District Council is currently involving communities in the management of some of the natural forests through JFM. The practicability of this to UTT natural forests and/or other forests will depend on location of the forests, willingness and commitment of the bordering villages to participate, potential benefits to UTT and communities. There are many examples now in Tanzania where JFM is being practised. Village leaders could visit Iringa rural district which is fairly close to Mufindi to see how JFM is being practised and also learn the processes involved in its establishment.

6.4.2 Conservation of other forests through Community Based Forest Management (CBFM)

Currently, communities also collect firewood, charcoal and other forest based products from open woodland and other than natural forest causing degradation of the forest patches outside the reserves of UTT. It was however, noted that other areas are already degraded and could offer alternative to wood scarcity but are left without proper management structures at village level because of the existing land tenure system. It was further noted that there is inadequate financing of the District Catchment Forest Office from the government to enable the office undertake all conservation activities and extend the forest cover beyond the reserve boundaries under different land tenure system. Therefore, one of mitigating measures is to support conservation of these villagedegraded areas as a long term strategy to reduce pressure in the forest reserve of UTT by undertaking the following activities:

- Establishment of CBFM in the surrounding villages through user group approach.
- Promote enrichment tree planting and in-situ conservation of the degraded hill/areas.

It is assumed that CBFM arrangements will be expressed through village level agreements and that during the project lifetime such agreements will be developed. It is suggested that the two processes should go together in order to achieve conservation objectives and at the same time sustainable management of the established village reserves. In the user group approach, the local community will be facilitated to do enrichment in places where there are gaps and in areas where the vegetation is not very degraded they would be encouraged to do in-situ conservation. The whole process will be in a participatory manner, local community being the main implementers and the project assuming the role of facilitation. In this way local communities are expected to develop a sense of ownership that would guarantee the sustainability of the project.

The findings discussed have clearly indicated a significant dependence of UTT forests for firewood which is collected illegally, and the threat of fire to the tea estates caused by surrounding communities. This could be seen as challenge or an opportunity to involve communities through PFM mechanism so that collection of firewood (especially wood not needed by UTT for tea drying) is legalised and villagers also become responsible in forest and tea estates management.

6.5 Agriculture and Agro-forestry Development

This is an important intervention because of the land scarcity issue (see chater 4.2.1) in relation to low productivity of agricultural crops (see chapter 4.3.1) in the 15 villages surveyed. Among the suggestions made by Barber (2006) is the need to address the issues of land scarcity and low productivity of farmer's land without distorting their choice of crop preferences. The aim of this intervention is therefore to enhance the capacity of farmers in agricultural practices and land use management through agro forestry technologies. The main economic activity of communities surrounding UTT is crop farming through shifting cultivation and to a small extent livestock keeping which graze most commonly in the open areas. Agro-forestry and farm forestry interventions are mainly thought to reduce the dependence of local people on forest resources from forest reserve. The project should also focus on skills and incentives to improve the management of farms through promotion of agro-forestry techniques. It is assumed that these interventions will enhance the livelihood security of local households both directly as a result of the specific interventions, and indirectly by supporting conservation of the forest resource on which they remain significantly dependent (e.g water, non timber forest products, forest products and grazing areas).

The target population for the agriculture and agro-forestry component will be the entire population of the projects target area. Priority will be given to villages adjacent to the natural forest reserves and those exerting more to the forests with expansion to cover other areas depending on progress review and an assessment of potential conservation impact. Furthermore, assuming that it is poor households that are more dependent on forest resources, agricultural and agro-forestry interventions will be selected that are

appropriate for poor households. Likewise attention may be given to extension methodologies to ensure that poor households are effectively reached. To maximise the conservation value of these agriculture and agro-forestry interventions, an analysis of key hypotheses and assumptions relating to C-D linkages should be made and used to develop a plan for ongoing monitoring of these linkages.

Alongside standard extension methodologies (demonstration plots, leader farmers, cross visits etc) the intervention could promote alternative extension methodologies based on farmer experimentation and farmer to farmer extension. Experience in many areas indicates that these approaches are superior both in terms of increased and more sustainable impact and in terms of reducing the dependence of the agricultural development process on external extension service (Franks 2001).

6.6 Institutional Development and Capacity Building at all levels

There is need to enhance the capacity of partners in planning and management of land use changes and environment. Before the capacity is enhanced studies will be needed on the existing institutional mechanisms for the management of natural resources in the surrounding mountains, hills and open areas. This will encompass both the institutions of local government and the NGO's, CBO's, and informal social networks that are collectively described by the term "civil society".
Capacity and training needs assessments should be conducted for specific institutions that are identified as having the potential to contribute to the goals of the overall conservation and development of forests. In making these assessments, it may be useful looking for opportunities to exploit to the full the potential of civil society institutions working alongside government agencies. The local government and NGO institutions involved in natural resource management within the surrounding communities could be strengthened, including establishment of Village Natural Resource/Environmental Management Committees where they don't exist. This should cover both technical skill (e.g environmental planning and monitoring, agriculture and agro-forestry) and management skills (e.g planning, M&E, team building, and human resource development). Where relevant, CBO's will also receive assistance, in particular with respect to group organisation, management and registration.

Expected outputs/results to be realised and activities proposed by Consultants in collabotation with village communities, indicators and Actors are presented in Annex 6 of this report. Other detailed activities proposed by village communities in each of the five villages visited are presented as Annex 7.

7.0 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions

From the study, the following concluding remarks could be made:

- The studied villages are not unique from other rural areas of Tanzania in that, majority of people have only primary education (Class seven), depend on agriculture for their livelihood but productivity is very low due to poor practices of production. They also depend on natural resources for most of their survival activities. Labour is only provided by the household members.
- Medium household size noted in the study area (ranged 4 – 7 persons per household, with a mean = 5) but quite variable acreage per household (ranged 0.5 – 40 acres per household, with a mean = 3.8)
- Maize, which is the main country's staple, provides most of the food in the area but also ranks high as source of income. Other important crops are beans, wheat, potatoes and peas.
- Of the forest products most collected is firewood, the most preferred species being, *Myrica salicifolia (Mkufwa)*, *mpongolo*, *mngogwi*, *Bridelia bridelliodes*, *mvengi*, *Dodonea* viscose (*Mhai)* and *mtunumbi*.
- Most of the study villages draw most of their firewood requirements from natural forests and company's man-made forests. About 26% of the firewood requirement comes from natural forests belonging to UTT, MTC, local and national government depending on which forest is nearby. Other forests – UTT plantations, individual plantations and forests of other companies such as Sao Hill and Mufindi Tea Company support the remaining 74%. Majority of people feel that demand of forest products, especially fuel wood will increase with time due to increases in population and high prices of alternative energy items.
- Though harvested in small quantities, traditional medicines pose potential forest destructions especially for species whose roots and barks are used.
- It was pleasing to note that in all the surveyed areas, most people were aware of issues of environment conservation and some were even aware of what could be done to safeguard the forests including planting of trees. It is therefore timely for appropriate interventions.
- Based on some criterion, the five villages selected for interventions were Lufuna, Kibao, Mpanga, Mtwango and Ludilo.

7.2 Recommendations

While much concentration of the project could be put in the 5 selected most pressure villages, we feel that some steps could involve most villages without much hassle. As the visited villages showed eagerness for improved development, increased awareness initiatives with little assistance in some conservational measures can bring about significant changes. In summary the following mitigations are recommended:

- Effective tree planting
- Effective use of improved and energy efficient fuelwood and charcoal stoves
- Awareness education to the communities on environmental conservation
- Involvement of communities in forest management (Participatory Forest Management)
- Agriculture and Agro-forestry Development
- Institutional Development and Capacity Building at all levels

As pointed out earlier, natural forests managed by MTC, local and national government are also facing human pressure. Therefore, for long term sustaibility of biodiversity in these natural forests a coordinated joint effort of all owners/managers of the natural forests in Mufindi is needed.

Finally, the consequences of reduced access to natural or plantation forests of the Company require strategic interventions which must be integrated in into Company long term plans if pressures on natural forests are to be reduced while maintaining the livelihood of local communities.

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7.0 ANNEXES

Annex 1: Terms of Reference
Mufindi Community Project

The project aims to analyse human pressures on the natural forests of Unilever Tea Tanzania Limited (UTT), research impacts from villages in and around UTT's forests and other adjacent forests and build capacity of the local people to sustain these forests for future generations. Five of the 15 villages having the greatest impact on the forests will be identified and mitigation projects will be developed and implemented.

Background

The estate (UTT) has a long-term lease of 20,000ha, owned by the Government of Tanzania in the Mufindi area of the Southern Highlands of Tanzania, the Udzungwas, forming part of the Eastern Arc Mountains. Key facts important for the proposed project area are as follows:

- 15% of the land is used for tea production, 20% represents land converted to other uses including timber for construction on the estate, fuel wood, residential and other infrastructures and facilities.
- The remaining 65% of the Mufindi estate is covered by relatively undisturbed forests, wetlands and grasslands, which are part of the Udzungwa biodiversity 'hot spot', one of 24 in the Eastern Arc Mountains of Kenya and Tanzania. 'Hot spots' are the biologically richest and most threatened areas.
- Studies recently completed on endemic plants for the whole of the Eastern Arc Mountains show that 191 plant taxa (over 80% of the total) are endangered, and a further 986 plant taxa are potentially threatened. Many of the endemic plants (both endangered and threatened) occur on the Mufindi Estate. In addition, rare birds, amphibians, reptiles and butterflies with restricted ranges are known also to occur.
- Six main habitats can be identified, from east to west including:
    1. Escarpment forests
    2. Plateau forests
    3. Plateau grasslands
    4. Plateau forest patches
    5. Plateau woodlands
    6. Plateau wetlands.

  Also important for biodiversity are converted habitats such as areas used for tea, fuel wood and timber.
- A range of endemic plant and threatened animal and bird species are found in the different habitats including the globally threatened flycatcher, the Iringa Akalat (*Sheppardia lowei*); also very rare shrubs include members of bamboo, 'myrtle' and 'witchhazel' families – respectively *Hickelia africana*, *Eugenia mufindiensis* and *Trichocladus goeztei*. In addition, a rich terrestrial and orchid flora including *Disa sp*. *Satyrium sp*. and *Habenaria sp*. which are under threat from high volume trade for food are found here. A small spiny succulent *Euphorbia caloderma* occurshere has not been found in any other location.

UTT has benefited, for many years, from the field and academic research of many visiting and local biologists and naturalists at Mufindi. It has worked to determine the extent of species endemism, rarity and degree of threat to the biological diversity on its estate. These efforts made it possible to initiate the UTT Biodiversity Action Plan in 2000. In addition, work on the estates by academics from the University of York, UK, resulted in the development of protocols designed to monitor the spatial structure of natural habitat, habitat quality and human disturbance, within the estate. Work continues on identifying which of the endemic plant taxa in the Eastern Arc Mountains 'hot spot' are found in Mufindi and what their status is. Completing the list of plants and animals known from the Mufindi area is an ongoing task. UTT continues to welcome the many specialists visiting and working on the estates, who assist with this task.

Current Situation and Rationale for the Project

There are 15 villages within the 6 legislative districts of Mufindi with total human population of 100,000; the villages are located within 10 km of the estate's boundaries. The forest is experiencing increased pressure from these communities; its products are in demand mainly for fuel wood, building materials and medicinal

plants. Thirteen primary and two secondary schools with a total of 8,000 students are also located within 10 km of the company. Approximately 7,000 people are employed by UTT; the majority living within the estate's boundary.

From previous studies, it is known that the villages have an impact on the forest and this project is to ascertain the extent of this impact and seek solutions to address this issue. Research is required on the following:

- the volume of materials gathered;
- locations affected;
- the needs of the local communities and;
- the extent to which households are dependent on these natural resources, either for cash income or subsistence.

It is within this context that UTT wishes to undertake the proposed project.

Study area

UTT is located at: *Latitude: 8.35S, Longitude 35.22E*
Altitude: 1,800 to 2,000 metres (6,000 to 6,500ft)

The company sits along a 50-km escarpment of the Southern Udzungwa Mountains, which is, situated 600 m above the plain. The UTT estate is 64 km across from southwest to northeast and 10-15 km in depth. To the southwest, the government owned Kigogo forest (2,500 ha) separates two halves of one of the UTT estates. The villages in the scope of the project are: Ihomasa, Ikwega, Mkalala, Mninga, Itulituli, Kibao, Lufuna, Mpanga, Mtwango, Sawala, Ifupira, Kidete, Ikonongo, Ludilo and Mkonge.

Project Aims and Objectives

Aim: To secure long-term protection for important animal and plant species in the Mufindi forest 'hot spot' through empowerment of the local communities

Objectives

- To appraise all 15 villages and identify the 5 villages having the most significant impact on the natural forest and biological diversity.
- To develop activities with these 5 communities to mitigate impacts of human activity on the natural forests, such as:
  - Identify alternative energy sources to wood;
  - Plan sustainable forest management schemes which yield wood for fuel, building materials, and medicinal plants; and
  - Pilot the use of fuel-efficient stoves to reduce demand.
- To promote an understanding by all communities and stakeholders of their dependence on the forest (resources and ecosystem), and institutionalise sustainable community management of the forest.
- To build on work already undertaken; such as expanding the analysis of human impact on the natural forest.

Communities and stakeholders include UTT employees, the Mufindi Tea Company and the National Forest Service.

Project Description

This is a year-long project which will be conducted in two parts: *Analysis* and *Mitigation*.

Part 1: Analysis

Part 1 aims to identify the extent of use of the forest by surrounding villages. It will analyse the main pressures on the natural forest and biological diversity and identify those communities creating the most pressure. An unknown number of people depend on forest products for both subsistence and market trading, particularly for fuel wood, building materials and medicines. An analysis of forest use will build on research previously undertaken by UTT and the Divisional Forest Office and include an evaluation of the following:

a. The species collected from the forest and how they are used.

b. The volume of each timber species and medicinal plant collected on a daily and/or weekly basis.

c. An analysis of collection levels (subsistence household or market trading, or a combination of the two).

d. Extent of agricultural encroachment on the forest.

e. Identify 5 of the 15 villages creating the most pressure.

f. Identify how communities and individual households select preferred collection sites.

Part 2: Mitigation

In conjunction with the targeted communities, Part 2 aims to identify solutions and develop action plans that tackle the root causes of forest use identified in Part 1. These plans will provide practical mitigation strategies to minimise the impact of human use on the forest. In consultation with the selected 5 villages and based on the results of Part 1, the following topics will be discussed:

a. Sustainable management and use of the natural forest for needed products (including fuel wood, building materials and medicinal plants), perhaps through Participatory Forest Management.

b. The potential for developing and using non-wood and other sustainable energy sources.

c. The selection of tree species for agro-forestry and other purposes and their potential impact on village water sources should be carefully considered.

d. Potential resource ownership issues for user-communities.

e. Potential gender issues in relation to the pattern of collection and use of forest products, relating to roles within households etc.

f. Potential integration of the well-established village committee system in the improved management of forest and in managing pilot projects for non-wood energy sources.

Through this community consultation process, appropriate activities will be developed and planned.

Expected Outcomes

1. Reduction of impacts by the communities on the most biodiverse natural forest areas, without negative cultural or economic consequences for the livelihoods of local people.

2. Dissemination of the project results to all 15 villages and UTT employees to encourage everyone to reduce pressure on the biodiversity 'hot spot' areas of the estate and to co-operate on the sustainable management of wood and herbaceous plant resources.

3. Institutionalisation of sustainable community management of the forest.

4. Improvements to the quality of life and livelihoods of the people through empowerment of the targeted communities.

Project Deliverables

Survey and report on forest use with all 15 villages
Development of detailed action plans for mitigation projects with 5 selected villages
A minimum of 15 village meetings and PRAs carried out
Two workshops accommodating the relevant stakeholders

Key Project Indicators

Evaluation of success against remit (part of Critical Ecosystem Partnership Fund (CEPF) requirement for funding) should be done through use of Key Project Indicators. The details of these indicators are to be developed by the Project Team but are to cover the following areas:

a. Degree of community involvement/learning progress and effectiveness.

b. Identify appropriate technology for energy sources and its potential to reduce fuel wood requirements.

c. Capacity and learning of the Project Team

d. External ongoing communication of the results by the Project Team.

e. Benchmarks for reducing loss of forest and pressure on individual keystone species (later with help of natural scientists).

A key to the project success is the creation of sustainable relationships between the stakeholders and the ProjectTeam. This will ensure success of action plan implementation and facilitate further research and institutionalise the sustainable management of the forest.

Funding and Partners

The project is jointly supported by the CEPF, which is a joint initiative of Conservation International, the Global Environmental Facility, the Government of Japan, the MacArthur Foundation and the World Bank. The partnership aims to dramatically advance conservation of the Earth's biodiversity 'hot spots'. A fundamental goal is to ensure civil society such as community groups, non-governmental organizations and private sector partners are engaged in biodiversity conservation. UTT is working with the Mufindi Local Government (Forest Division), other tea producers and the Unilever Sustainable Agriculture Team based in the UK. Many local and external conservationists and development specialists are committed to supporting this project.

Project Requirements

Project Team

The Project Team will consist of:

- Sylvia Rutatina as Project Coordinator: To manage the project until the appointment of the Project Manager. Once the project manager is in place to coordinate the project manager on a weekly or fortnightly basis (to be agreed).
- Project Manager: To oversee day-to-day management of the project. To coordinate Tanzanian Tea sub staff with the approval of the Project Coordinator. To write and submit reports as required.
- Unilever Sustainable Agriculture Team: Provide guidance and advice on project management and progress. They are also available for advice on biodiversity issues, community appraisals, and options for alternative energy sources including non-wood energy based on preliminary results by the Project Team. The team members allocated to this project are: Helen Bentley-Fox, Janet Barber and Christof Walter. The team will be available to offer advice to both the Project Coordinator and the Project Manager.
- Other team members: Mufindi Tea Company (MTC) sub staff and others as required.

UTT, in collaboration with the above team, will coordinate the project.

The Project Team is required to:

1. Survey the 15 villages and identify 5 villages that are creating the most pressure on the forests by collecting information on the following:
    - Identify which wood and herbaceous species are most used and how widespread are these plants. (UTT will provide biodiversity transect data that highlights important 'structure' trees (ie the most important (or keystone) tree species for the forest ecosystem and other plants).
    - Record any indication of the degree of threat or rarity of collected species.

- Type and frequency of collection of medicinal plants.
- Distance and time spent for collecting fuel wood.
- Identify direct and indirect impacts which collection has on target and non-target species within the natural forest.
- The volume of timber used for fuel wood or building materials on a daily or weekly basis by households.
- The extent to which households are dependent on these natural resources either for cash income or subsistence.
- The factors which influence the choice of area from which to collect.
- The possibility of linking conservation measures and economic incentives for communities.
- Indigenous knowledge and practice in managing and protecting forests.

2. As research progresses potential mitigation measures will become apparent. These could include the following, it is not an exhaustive list:
   - Selection of species for planting (both natural and exotic) to integrate with existing farming practices, available land and watershed protection.
   - Develop project with an understanding of the village social and culture norms, as well as peoples' priorities for land use i.e. mainly food in preference to wood lots.
   - Determine the availability of community land that can be accessible for tree planting.
   - Utilise knowledge on culture and economic conditions that could guide on alternative energies including other sustainable sources for the user communities.
   - Determine the number of natural and exotic trees that will suit each of the 5 villages as well as households expected to be involved in the mitigation phase.
   - Identify the possibility of sustainable management and use of the forest to meet various needs through Participatory Forest Management.
   - Incorporate gender issues in all mitigation measures, for example, pattern of collection and use of forest products, relating to roles within households etc.
   - Investigate technology options that have been developed in the past including limitations.
   - Clarify the role in which village committees and leaders can play in improved management of forests and pilot projects for non-wood energy sources.

The Project Team are required to consider implications of all international, national and local by-laws and policies that are relevant in this project. These will include, but not necessarily be limited to:

- *Tanzania National Forest Policy and Legislation*
- Tanzania 2002 Forest Act
- Tanzania National Biodiversity Action Plan
- Local by-laws

Required Skill Set

The Project Team shall consist of persons with the following expertise:

Sociological research skills;

Knowledge on forestry and agro-forestry;

Detailed understanding of the Natural Resource Laws and policies of Tanzania;

Database and analytical skills;

Literature reviews;

Report writing skills;

Knowledge of non-wood energy sources and technologies;

Appreciation of the biological importance of the study area; and

Ability to communicate in English and Swahili.

Reporting

The Project Team will report to UTT and the report will be shared with CEPF, other interested parties and Unilever Global.

The report will be written in English and should be as concise as possible focusing on findings, conclusions and recommended actions. A draft of the report will be sent to UTT. Appendices should be used to present detailed study findings or related information. The outline of a report format will be provided to the Project Team.

The Project Team has to submit six hard copies of the report together with an electronic version in Microsoft Word on CD.

Annex 2: Structured questionnaire used to collect household information from the study villages

A. Identification variables

Date _____

Item	Name/Number
1. Name of interviewer	
2. Date of interview	
3. Distance to NF border	
4. Questionnaire number	
5. Village name	
6. Ward	
7. Division	

B. Household Characteristics

10. Total size of the household (total number of people)…….
11. Number of children .....
12. Number of Adults……..
13. Provide the following information for the respondent

Respondent characteristics	Gender	Age	Marital status	Education level	Main occupation
Head of household					
Spouse					

Code: Gender 1=Male, 2 =Female
Marital status 1= Married, 2 = Single, 3 = Widowed , 4= Divorced
Main occupation 1 = Farmer, 2 =Others (specify)
Education level 1= Primary, 2=Secondary, 3= College, 4= other (specify)

C. Land Ownership

14. Total acreage owned. … … … …
Total acreage rented in…….
15. Is land a constraint in terms of acreages? 1= yes, 2= no
If yes; what options are there for more land?
……..
16. Do you keep livestock? YES/NO. If YES how much grazing area do you use?…….
17. What is the property right regime and size of this grazing area?

Property right regime	Size (in hectares)
Private (own farm)	
Communal land	
Open grassland	
Natural Forest	
Others: Specify	

Note: If it is zero grazing indicate source of fodder
……

D. Household Production and Income

18. Total agricultural production (husband and wives and children) **LAST YEAR**.

NOTE: Interviewer must remind respondent that all seasons should be included, and help aggregate from two seasons is necessary. Also note that this is product on agricultural land (not forests etc)

Type of crop	Total production (in bags, tin)	Amount sold in Unit (Bags, tin etc)	Unit Price (Tsh.)	
			MIN	MAX
Maize				
Sweet potatoes				
Irish potatoes				
Beans				
Beans				
Bananas				
Tea				
.....				

19. Indicate income from Livestock products LAST YEAR

Type of livestock product	Number of livestock owned	Number sold	Unit Price (Tsh.)	
			Min.	Max.
Cattle				
Goat				
Sheep				
Chicken				
Duck				
Donkey				
Pig				
Milk				
Others				

20. Give the amount of income obtained LAST YEAR from other sources

Item	Amount sold (unit)	Price per unit (Tsh.)	Total income (Tsh.)
Local brew			
Casual labour			
Formal employment			
Remittances			
Business e.g teahouse, restaurant, cooking cakes, shop, a milling machine, buying and selling various products			
Others			

21. Which amounts did you use LAST YEAR of the following forest goods from NF?
First go through list and check which products are used, then fill in the actual amounts, prices etc.

Product	Actual use last year (amount per year) INDICATE UNIT	How much did your household collect from NF (own use and sold) last year NOTE: ONLY FROM NATURAL FOREST		Mention species collected and rank them	Mention product uses	Price per unit (average or maximum-minimum) Seasonal differences (TSh.)
		Own use	Sold			
Indigenous fruits and nuts						
Mushrooms						
Medicine from the forest						
Wild vegetables /leaves?						
Honey						
Other food						
Stimulants						
Fodder						
Timber						
Firewood						
Charcoal						
Poles						
Withies						
Ropes for climbers						
Material for curving						
Bush meat (Rock Hyrax, bush pigs etc)						
Thatching material						

22. Apart from natural forests, are there any other sources you collect forest products (e.g. plantations, farms, household/community woodlots) ?

Source	Product(s)	Amount (indicate units)

23. Which part of the forest (periphery, a bit inside the boundary, interior or just anywhere) you think is most affected due to human activities? e.g. fire, collection of forest products, encroachment for agriculture etc

……

- In case of fire:
  How many incidences occurred last year……
  Estimate of size of area affected……..
  What do you think are causes of fire outbreaks?……
  What could be done to stop fire outbreaks?……

24. How do you select the most preferred sites for collection of forest products?

25. Given your experience and knowledge of the villages surrounding the natural forests, which villages do you think use natural forests most or do activities which cause more pressure on the forests e.g. fire and/or encroachment?

F. Water use

26. Is the NF a source of water? YES/NO

27. For what purpose do you use water coming from the natural forest?

……
How much do your household use per day for different purposes? And what is the price per unit?

Use	How much per day (units)	Price per unit (Tsh.)
Water for domestic use		
Water for livestock drinking		
Irrigation: if they cannot give litres, ask how much area is irrigated and which period		
Other uses, like brewing, brick making etc.		

G. Future demand for forest products

28. Will your household's demand for forest products from natural forests be decreasing, increasing or the same?
1= Increasing
2= Decreasing
3= The same

29. Give reasons why demand is increasing or decreasing

30. Which products do you think the demand is likely to increase most?.....

31. How do you find the condition of the natural forest?
Good/ Just good/ Not good (tick)

32. Would your household be willing to pay something to maintain the natural forest in good condition? 1= Yes, 2= No
33. If YES:

How much would your household be willing to pay per year in order to maintain the natural forest in good condition?
Tsh: _____per year

34. IF NO:
Why is your household not willing to pay anything in order to maintain the forest in good condition?

35. Suggest possible mitigation measures to reduce degradation of natural forests

S/n	Possible mitigating measures	Limitations
1		
2		

36. Is it possible to manage these natural forests sustainably through involvement of communities? NO/YES

37 If NO Why

38. If Yes why

H. **Use of alternative energy sources and efficient technologies**

39. How much woodfuel does the householder collect and how much is purchased say per week?

	Fuelwood	Charcoal
Collect/produce	…….	…….
Purchase	……..	…….

40. What is the price for woodfuel?

	Fuelwood	Charcoal
Price paid (kg/bundle/tin/bag/m^3)	…….	…….

41. Source of woodfuel?

	Fuelwood	Charcoal
Where obtained	…….	…….
Distance in m/km.	…….	…….

42. How long does it take to collect the woodfuel?

	Fuelwood	Charcoal
Time taken (hours/min)	…….	…….

43. Availability of woodfuel:

	Fuelwood	Charcoal
Abundant	…….	…….
Scarce	…….	…….
Very scarce	…….	…….

44. a) Which tree species does the household use?

	Fuelwood	Charcoal	Why?
Tree species	…….	…….	……
	…….	…….	……

b) Which tree species does the household prefer?

	Fuelwood	Charcoal	Why?
Tree species	…….	…….	……
	…….	……	…….

c) Other types of fuels used

45. Other types of fuels and purposes for their uses

Paraffin Electricity Gas Diesel Other (Specify)

46. What is the cost of these fuels /week/month?

	Paraffin	Electricity	Gas	Solar	Other
Amounts used	……..	……	…….	…….	……
47. Cost of fuels: Shs/litre/KW	…….	……..	……	……	……

48 How available are the fuels?

	Paraffin	Electricity	Gas	Solar	Other
Abundant	……..	……	…….	…….	……
Scarce	……..	……	…….	…….	……
Very Scarce	……..	……	…….	…….	……

I: Other information

49. What measures do you think should be taken to conserve energy requirements?
……

50. In consuming woodfuel, what are the main problems you face?
……

51. What is your perception of the quality of woodfuel available now? (Do you feel that you get good value of woodfuel for the price that you pay?

Fuelwood: ……
Charcoal: ……

52. What type of stoves are you using
For fuelwood: Three stones …….
Improved wood stoves…….
Other (specify) ……..

For Charcoal: traditional metal stove …….
Improved charcoal stove ……
Other (Specify) ……

53. Are there any other sources for developing and using non-wood and other sustainable energy sources?

J. USE OF FOREST PRODUCTS FOR CONSTRUCTION

Materials used for construction

Structure/Building	Materials used			
	Walls	Roof	Doors	Windows
Main living house				
Kitchen				
Toilet				
Other (e.g. livestock shed)				

54. Frequency of repair/reconstruction

Part	Frequency of repair (tick)				
	Every year	Once per 2 yrs	Once per 3 yrs	Once per 4 yrs	Once per 5 or more yrs
Main house walls					
roof					
doors					
windows					
Kitchen walls					
roof					
doors					
windows					
Toilet walls					
roof					
doors					
windows					
Other (.....) walls					
roof					
doors					
windows					
Structure/Building	Frequency of fresh construction (tick)				
	Every year	Once per 2 yrs	Once per 3 yrs	Once per 4 yrs	Once per 5 or more yrs
Main living house					
Kitchen					
Toilet					
Other (e.g. livestock shed)					

K. ISSUES ON NATURAL FORESTS (NF) OF UTT

55. What is your perceptions regarding future interventions to improve conditions of the forests?

56. List major problems/obstacles in relation to your access to NFs.

57. What is your relationship (services, markets, information exchange power etc) with other stakeholders

58. Indicate any conflicts in management, access to goods and services and interests with the above stakeholders.

60. Do you have any other comments or questions?

Annex 3. Structured questionnaire used to collect information from the village governments

1. Name of interviewee…….
2. Name of village…….
3. Position in leadership……
4. Number of households in the village…….
5. Total land area (acres/hectares)……..
6. Land availability for agriculture……livestock……Other uses……..
7. Number of people by hamlet:

Hamlet name	Number of people	
	Males	Females

8. Main economic activities in the village:

…….

9. What do you estimate to be the average household income?.....

10. Livestock kept in the village

Type of livestock kept	Number of households	Average kept per household	Main reason for keeping

11. Main system used in raising the animals:

Type of livestock kept	Indoor rearing	Extensive grazing	Free scavenging

12. In case of extensive grazing, do animals be allowed into forests? YES/NO

13. In case of indoor feeding what are sources of feeds used by most keepers?

14. Do you think domestic livestock are a possible cause for forest destruction? YES/NO
Explain briefly

16. From your experience and to the best of your knowledge, how many people depend on forests in the village? Tick appropriate window

	All villagers	Majority	Half	Less than half	Very few
For firewood					
For charcoal					
For timber					
For medicines					
For livestock feeding					
For other (specify)					

17. Number of individuals known to be deal with forest product business

Product	Number (roughly)	
	Locally	Outside the ward
Fire wood		
Charcoal		
Timber		
Medicines		
Other (specify)		

18. In case there are people that are not dependent on forests, what alternative means do they have for (not to be answered if The ticks are on "all villagers" in number 5 above

i) Fuel (firewood/charcoal)…….
ii) Construction material:……..
iii) Medicines……..

19. In your opinion, what constraints are faced by the village in terms of

i) Fuel for cooking……
ii) Construction materials……..
iii) Agricultural land……
iv) Availability of water……

20. Are there farmers that are forced to clear forests for agricultural activities? YES/NO

If YES, what proportion? Majority/ half / Less than half / Negligible number (tick)

21. Are people in your village aware of the importance of environment conservation issues? YES/NO

- If Yes to what extent? Majority are aware/ Many are aware/ Fifty fifty/ Only a few are aware

- If No, what do you think is a problem?

22. Considering the importance of the whole issue of environmental conservation for the present and future generations, if you were to be asked to suggest means of conservations what would you advise in terms of

i) Fuel energy……
ii) Construction materials……..
iii) Medicinal plant uses……

23. From your experience, do you think if one supplied tree seeds, would the villagers be ready to plant them? YES/NO

What makes you give such an answer?……..

In case the answer is YES is land for tree planting available in your village? YES/NO

- What percentage of household would have problems with land for tree planting?.....
- On the average, how much land can be available for tree planting per household?

24. Suppose the villagers were to be asked to contribute a bit in achieving environmental conservation, do you think they can be ready to contribute money or in kind towards that? YES/NO

What criterion have you used to answer so?……

Annex 4. Checklist for interviews with Mufindi District Land and Natural Resources officers and Community Based organizations

A: IDENTIFICATION VARIABLES

ITEM	NAME/NUMBER
1. Sheet No.	
2. Name of Interviewer	
3. Date of Interview	
4. Name of respondent(s), position and Address	
5. Village name	
6. Ward	
7. Division	
8. District	
9. Region	

B: OTHER VARIABLES

1. Who are the main stakeholders and their interests
2. What is your role and mandate (power, existence, legitimacy and effectiveness of laws and agreements) in the management of UTT natural forests, also indicate capacity.
3. What are the key institutions (regularised patterns of behaviour) involved in the management of UTT natural forests
4. What is your perceptions regarding future interventions to improve conditions of the forests?
5. List of goods and services stakeholders get from the UTT natural forests
6. How do they access the goods and services (who, where and what are the conflicts).
7. List major problems/obstacles in relation to Q2, Q5 & 6. Identify and quantify any illegal activities
8. What is your relationship (services, legal/contractual, markets, information exchange power etc) with the following stakeholders

    i. Communities
    ii. Local government
    iii. NGOs (local and international)
    iv. Private sector (sawmillers, plywood, charcoal dealers, poles/firewood sellers, carvings, carpentry, tourist companies etc)
    v. Community Based Organisations (CBOs) concerning with irrigation in the Usangu catchment areas.
    vi. Others

9. Indicate any conflicts in management, goods vs services and interests with the above stakeholders listed in Q8.
10. PFM – How it is functioning, monitoring and problems experienced.
11. (a) List the villages, sub-villages and population in each village and sub-village around the UTT natural forests and indicate which sub-villages are close to the UTT natural forests .
    (b) Indicate villages and sub-villages where there are other sources of forest products
12. What production activities take place in and/or around UTT natural forests (Specify legal and illegal activities).

Production activity	Legal(L) Or Illegal (IL)	Area/quantity (ha,m^3,litres, kg)	Price (Tsh.) Indicate units
Farming (encroachment in CFR)			
Pitsawing			
Firewood			
Charcoal making			
Poles			
Withies			
Material for carving			
Thatching material			
Fodder collection			
Grazing in CFR			
Wild food: (plants, fruits, vegetables, mushrooms)			
Wild medicine collection			
Hunting (bush meat)			
Honey collection			
Edible ants and grasshoppers			
Others			

14. Explain the extent of trade in forest products and /or services from the UTT natural forests by specifying quantity and price for each product and/or service (including installations if any).

Product/service traded	Quantity	Price (Tsh.)

15. Give average yields per ha in UTT natural forests.
16. Give sustainable levels of harvesting in UTT natural forests (Allowable cut).
17. Give potential area and volume for selective harvesting in UTT natural forests (zoning concept).
18. Give actual area in hectares of UTT natural forests
19. Give potential area in hectares for agriculture within UTT natural forests.
20. How much does the UTT natural forests contribute to the economy of the household, village and district?

Annex 5: List of persons met during Data collection

IHOMASA 15/3/2007

S/N	Name	Title
1.	Daniel Mkoma	Village Chairman
2.	Damiani Kalinga	VEO
3.	Thomas Mbedule	Treasurer
4.	Jamesi Msige	Chairmn sub-village
5.	Jikonda Ngoda	Ssecretary Oosy
6.	Maimuna Kindole	Chairmn sub-village
7.	Jema Makombe	Member
8.	Mastadi Sanga	Environmental committee member
9.	Yona Nyipeta	Chairmn sub-village
10.	Berina Sanga	Environmental committee member
11.	Amina Kibiki	Member/social services
12.	Osmund Mlelwa	Member/social services
13.	Elly Makombe	M/Usawa Group
14.	Furaha Mhumba	Member Usawa Group
15.	Neema Mhumba	Member OOSY
16.	Saida Kibiki	Environmental committee member
17.	Monica Mpiluka	Member H/Kijiji
18.	Anjelista Mahimbi	Environmental committee member
19.	Braisony Kafuka	Environmental committee member
20.	Edimund Mhumba	Chairmn sub-village
21.	John Mhumba	Chairmn sub-village
22.	Stiphini Kibiki	Member/social services
23.	Jermana Mkonge	Member/social services
24.	Yonika M. Ngaga	Researcher
25.	Elisante N. Tesha	M/M Ihomasa
26.	Elenatus Chaula	Village elder
27.	Paul Mtavangu	Village elder
28.	Medico Makombe	Village elder
29.	Mhamedi Kivembele	Chairmn sub-village
30.	Andreasy Mbedule	Village elder
31.	Tedi Chaula	Primary school teacher
32.	Alex Mbilinyi	Member UTT
33.	Jack P. Nganilwi	Member UTT
34.	Sylvia Rutatina	UTT
35.	Ruben Haule	Member UTT
36.	Emmanuel Mvile	UTT

IKWEGA 16/03/2007

S/N	Name	Title
1.	A. Galagunga	Village Chairman
2.	Natalis C. Ngwila	VEO
3.	France Mahenge	Member
4.	Charles Mtavangu	Treasurer
5.	Julius Kafuka	Member
6.	Jermias Kibiki	Member
7.	Damas Kyando	Member
8.	Mazaleth Lubara	Chairmn sub-village
9.	Juliana Kilale	Member
10.	Andreas Msakwa	Member
11.	Francis Mtawangu	Member

12.	Farida Gudule	Member
13.	Yahanis Chaula	Committee chairman
14.	Matrida Kilale	Member
15.	Sodomu Kilale	Expert (MSO)
16.	Nyasia Lubava	Member
17.	Raida Swalo	Member
18.	Sevelin B. Mhapa	CCM Chairman
19.	Mankus Gudule	Chairmn sub-village
20.	Jackibed Mhema	Member
21.	Bruno Mhapa	Member
22.	Donato Lunyungu	Member
23.	Clalence Makombe	Chairmn sub-village
24.	Alfred Singaile	Chairmn sub-village
25.	Imakulata Lubava	Member
26.	Daudi E. Makombe	Member
27.	Gervas Lubava	Member
28.	Fikiri Mtavangu	Member
29.	George Mtavangu	Chairmn sub-village
30.	Inochenzia Mgamba	Member
31.	Costantina Lusangami	Member
32.	Anjelista Mwigune	Member
33.	Chesko Mtavangu	Member
34.	Jack P. Nyaganilwa	Member UTT
35.	Alex Mbilinyi	Member UTT
36.	Ruben Haule	Member UTT
37.	Emmanuel Mulle	Member UTT

MNINGA 17/03/2007

S/N	Name	Title
1.	Mwinga	VEO
2.	T.P. Msisi	Chairman
3.	Batista Sanga	Member
4.	Mathiasi Nyingo	Member
5.	Agustino Kibiki	Member
6.	Abakuki Nganunlia	Member
7.	Joseph Tefu	Member
8.	Michelina Ndanzi	Member
9.	Edina Mbinda	Member
10.	Ibrahimu Mwenda	Member
11.	Josephat Ndanzi	Member
12.	Michael Mgina	Member
13.	Lidia Kibiki	Member
14.	Johakimu Tossy	Member
15.	Samweli Nundu	Member
16.	Emeli Manga	Member
17.	Laurence Moyo	Member
18.	Yusuph Chengulla	Member
19.	Medelina Sanga	Member
20.	Joyce Sanga	Member
21.	Aloyce Mtengela	Member
22.	Lustika Sanga	Member
23.	Pius Mlanzi	Member
24.	Birnadina Ndanzi	Member
25.	Alex Mbilinyi	Member
26.	Ruben Haule	Member

27.	Jackson P. Nyaganilwa	Member
28.	Emmanuel Mvilla	Member
29.	Luy Moyo	Member
30.	John Chelesi	Member
31.	Kastori Kafulu	Member
32.	Fedelika Miho	Member
33.	Ismail Mhapa	Member
34.	Helena Mahenge	Member
35.	Priska Mauya	Member
36.	Azarath Kipangula	Member
37.	Lucy Moyo	Member
38.	Franziska Makombe	Member
39.	Sabina Makombe	Member
40.	Bernad Swalo	Member
41.	Godfrey Sikira	Member
42.	Kibosho	Member
43	Sistusi Toss	Member
44.	Florida Lunyungu	Member
45.	John Mgina	Member
46.	Sylvester Mbedule	Member
47.	Agnes Sanga	Member
48.	Henry Mdemu	Member
49.	Enesia Maliua	Member

ITULITULI18/03/2007

S/N	Name	Title
1	Ernest Kibiki	Member
2	Rogath Mtavangu	Member
3	Titus P. Makombe	Member
4	Juma Popo	Member
5	Yusto Mtavangu	Member
6	William Kinanda	Member
7	Jema Mtavangu	Member
8	Sinod Mohele	Member
9	Scola Miho	Member
10	W. Ngongi	Member
11	Rehemu Lugusi	Member
12	Athanasio Mihali	Member
13	Richard Mohele	Member
14	H.D. Cheles	Member
15	Semeni Kipangula	Member
16	Krifed Mbata	Member
17	Shukuru Lubava	Member
18	Mikidad Msokele	Member
19	Yustina Maliva	Member
20	Zawadi Msekefu	Member
21	Mama Popo	Member
22	Therezia Lugusi	Member
23	Onoladi Mwenda	Member
24	Esther Nziku	Member
25	Thobias Lumwesa	Member
26	Eveni Maliva	Member
27	Sodomu Mohele	Member
28	Alidi Mtweve	Member
29	Japhet Msokele	Member

30	Olaji Mohele	Member
31	Agatha Chumi	Member
32	Maria Sanga	Member
33	Sumbuko Lumwesa	Member
34	Fidelis Msokele	Member
35	Akilimali Msokele	Member
36	Esther Nziku	Member
37	Matokeo Lumwesa	Member
38	Zainabu Kilasi	Member
39	Eda Nziku	Member
40	Paulo Kihongole	Member
41	Ferdinand Kibiki	Member
42		

KIBAO 19/03/2007

S/N	**Name**	**Title**
1	D.J. Ngelime	Member
2	Mary Ndulute	Member
3	M. Kiduge	Member
4	S. Sanga	Member
5	E. Ngailo	Member
6	E. Kyando	Member
7	Tulambona Kyando	Member
8	John Ngunyale	Member
9	Musa Enock	Member
10	Ally Mlonga	Member
11	M. Mbata	Member
12	Zavery Nyalusi	Member
13	Asha Fungo	Member
14	Adelia Dunda	Member
15	R. Mpiluka	Member
16	L. Lukuvi	Member
17	R. Kabelege	Member
18	Lustika Vaginga	Member
19	Atilia Fivao	Member
20	Beher Sanga	Member
21	Midico Nyaluke	Member
22	Asangye Kyando	Member
23	Matilda Sanga	Member
24	J.T. Mengo	Member
25	Stanley Chatila	Member
26	J. Kitindi	Member
27	Jacob	Member
28	E. Lawrent	Member
29	Z. Sanga	Member
30	Sandey Juma	Member
31	P Cesco Muyinga	Member
32	Y.P. Nyangwa	Member
33	Edna Chaula	Member
34	Florida Mahenge	Member
35	Esther Kiswaga	Member

LUFUNA 20/03/2007

S/N	Name	Title
1	James Mlowe	Member
2	Jeremana Sanga	Member
3	Kilipu Sanga	Member
4	Rehema Kitinye	Member
5	Joisy Magala	Member
6	Agustino Mahenge	Member
7	Keaz Chenda	Member
8	Fedinandi Kitindi	Member
9	Ferista Mtewele	Member
10	Rosina Mkimbo	Member
11	Onesmo Mhami	Member
12	Jailo Ngailo	Member
13	Besti Mahenge	Member
14	Elias Mlongway	Member
15	Telesia Mwemba	Member
16	Teso Mvemba	Member
17	Mariamu Mholo	Member
18	Alfonce Kihela	Member
19	Gelvas Kihenzeva	Member
20	Malipa Sanla	Member
21	Razalo Chengula	Member
22	Otavina Longo	Member
23	Angojey Kahama	Member
24	Benjamini Mwipulilwa	Member
25	Romana Kihimbo	Member
26	Tulasiva Sanga	Member
27	George Mpiluka	Member
28	Abasi Lugusi	Member
29	Rehema Mbena	Member
30	Kizota Ngailo	Member
31	Fidelisi Mpumilwa	Member
32	Kazinga Lupembe	Member
33	Ngina Nyakunga	Member
34	Aruna Mangula	Member
35	Philipo Ngwema	Member
36	Mteseni Tweve	Member
37	Dani Mlumbusi	Member

MPANGA 21/03/2007

S/N	Name	Title
1.	E. Ngenzi	Chairman
2.	C.M. Lutego	VEO
3.	Makalyvi	Member
4.	J. Kibangali	Teacher
5.	J. Lukuzera	Member
6.	J. Mtunge	Member
7.	G. Mhema	Member
8.	B. Mzena	Member
9.	B. Tungu	Member
10.	A. Lukinga	Member
11.	Pius Sanga	Member
12.	A. Mhema	Member

13.	J. Nyenza	Member
14.	C. Mhema	Member
15.	J. Nguiso	Member
16.	T. Tweve	Member
17.	L. Sanga	Member
18.	S. Mdemu	Member
19.	A. Chaula	Member
20.	Y. Sanga	Member
21.	A.A. Ndelwa	Member
22.	Betisaila Chando	Member
23.	A. Luvena	Member
24.	Cleopa Kahuga	Member
25.	J. Keluwule	Member
26.	B.A. Ndelwa	Member
27.	Otto Mzina	Member
28.	Yege	Member
29.	Victor Luvena	Member
30.	J. Ndelwa	Member
31.	Agnetha Ngwiso	Member
32.	M. Mhema	Member
33.	Agusta Kihinele	Member
34.	Faresi Tweve	Member
35.	James Msole	Member
36.	K. Ndelwa	Member
37.	Felix Mhapa	Member
38.	B. Luvena	Member

MTWANGO 22/03/2007

S/N	Name	Title
1.	Pius Nyakunga	Village Chairman
2.	Dominikus Mandike	VEO
3.	Anastasia Filipatali	Treasurer
4.	Nestory Sanga	Member
5.	Damson Ludago	Member
6.	Marko Mahenge	Member
7.	Charles Sanga	Member
8.	Jelemana Fyumagwa	Member
9.	Getrude Ulikaye	Member
10.	Lidia Mbagule	Member
11.	Neema Mlwa	Member
12.	Veronica Mponzi	Member
13.	Yusta Mtilela	Member
14.	Anna Lunyungu	Member
15.	Neema Mpangwa	Member
16.	Getrude J. Chumi	Member
17.	Pina Kaduma	Member
18.	Nobu Lugusi	Member
19.	Subira Chussu	Member
20.	Ledas Kihongos	Member
21.	Angrus Nyenza	Member
22.	Paul K. Mbilinyi	Member
23.	Josephat L. Mgaya	Member
24.	Mariamu Msemwa	Member
25.	Izack L.M. Kilatu	Member

26.	Amoni Ndambo	Member
27.	Lukas Luvanda	Member
28.	Hosina Saneni	Member - KKKT
29.	Aidun Kayege	Member
30.	Hatina Mbwilo	Member
31.	Jackson Chussu	Member
32.	Anita Mfilinge	Member
33.	Mariana Chawe	Member
34.	Aldo A. Kipangula	Member

SAWALA - 23/3/2007

S/N	**Name**	**Tittle/From**
1.	Israel G. Kitimsa	Chairman
2.	Erasto P. Mbuggi	Secretary
3.	Melina G. Kisonga	Member
4.	Faraja G. Kavafi	Member
5.	Alamu Chaulla	Pastor
6.	Jaradi Mhagama	Pastor
7.	Aleni Mbilinyi	Member
8.	John Mangula	Member
9.	Karistus Mvemba	Member
10.	Issoru Chaula	Member
11.	Godlove Kikala	Member
12.	Leonola Mvemba	Member
13.	Ester Mwakalinga	Member
14.	Mustafa	Member
15.	Aguster Mjema	Member
16.	Bestina Mbuna	Member
17.	Felista Kyafu	Member
18.	Ezekia Mhapa	Member
19.	Mwakitopa Deeule	Member
20.	Odina Kitinusa	Member
21.	Sosthen Sigala	Member
22.	Enna Sanga	Member
23.	Huruma Mlonganile	Member
24.	Nicodemus K. Mwaipungu	Member
25.	Philemon Sanga	Member
26.	Japhet Maginga	Member
27.	Ajua Y. Nyaluke	Member
28.	Kigaile Ezekiel	Member
29.	Mnyulla P. Msi	Member
30.	Lusabiko Mbuna	Member
31.	Anjela Kalinga	Member
32.	Charles Kaveva	Member
33.	Maulolyo Kapuma	Member
34.	Musa Masilu	Member
35.	Musa Eliya	Member
36.	Imani Ngimbusi	Member
37.	E. Ngoloke	Member
38.	J. Kiduko	Member

IFUPIRA 25/03/2007

S/N	Name	Title
1	Charles Kaguo	Chairman
2	Lukelo Mwinuka	VEO
3	Erasto Chendite	Member
4	Fojas Chumi	Member
5	Juma Kigodi	Member
6	Inazid Chumi	Member
7	Waziri Kayuki	Member
8	Yudith Ng'umbi	Member
9	Leonide Kibabage	Member
10	Fausta Msumbwa	Member
11	Rejina Kanyika	Member
12	Rehema Kadege	Member
13	Regina Mponzi	Member
14	Dominica Kalinga	Member
15	Juliana Kadege	Member
17	Sevelina Mwagala	Member
17	Paulina Kayuki	Member
18	Otaviana Chengula	Member
19	Fausta Kitinusa	Member
20	Auleliana Mgaya	Member
21	Valenge Mwagalla	Member
22	Marco Mdota	Member
23	Anjelista Mponzi	Member
24	Onica Kalinga	Member
25	Asia Sanga	Member
26	Anna Kibabage	Member
27	Helena Yacobo	Member
28	Daina Kalinga	Member
29	Helena Ndolla	Member
30	Erenestina Mkiwa	Member
31	Venanzia Mwinuka	Member
32	Rukia Luwumba	Member
33	Jojina Kitinusa	Member
34	Tresia Mbalinga	Member
35	Yudith Sanga	Member
36	Anatalia Kilasi	Member
37	Pamela Kawage	Member
38	Debora Kimgunza	Member
39	Raymondi A. Kitinusa	Member
40	Julio Mponzi	Member
41	John Dunia	Member
42	B.A. Kingunza	Member
43	Johns Kalinga	Member
44	Metodi Mwalala	Member
45	Andu Hassan	Member
46	Emilyo Kitinusa	Member
47	Victory Kidoko	Member
48	Expedito Kisapu	Member
49	Josephat J. Mponzi	Member
50	Evarist Mwanuke	Member
51	Jema Lyuvale	Member
52	Patrick Kaguo	Member
53	Sebio E. Msakwa	Member

54	Arid D. Dugange	Member
55	Thobiasi Mminza	Member
56	Majulisho Kisari	Member
57	Adelina Mponzi	Member
58	Aluwa Nzogu	Member
59	Costantin Ndolla	Member
60	Biatus Kayuki	Member
61	Samson Sanga	Member
62	Hassan Timoth	Member
63	Hamisi Lusungu	Member
64	Zaraph Mtengela	Member
65	Ibrahim Nyitala	Member
66	Veronica Chengula	Member
67	Eva Lalika	Member
68	Baski Chumi	Member
69	Thomas Mahumbi	Member
70	Evaristo Mgimba	Member
71	Pastor R. Mgaya	Member
72	Chesco Mwenzegule	Member
73	Shadrack P. Deule	Member
74	Alex J. Mhuna	Member
75	Jackson Sanga	Member
76	Edgar Ng'umbi	Member
77	Joachim Mlisayo	Member

LUDILO – 26/03/2007

S/N	Name	Title
1.	Benthio Mhumba	Chairman
2	Stephan Kanyika	V E O
3	Carlo A. Mahimbi	Treasurer
4	Valentino Luwungo	Member
5	Expeditho G. Lutambi	Member
6	Vitaluma Chunga	Member
7	Patrick Mdemu	Member
8	Beatus Mdemu	Member
9	Furaha Mdalingwa	Member
10	Asia Ndanzi	Member
11	Anatalia Kabonge	Member
12	Alexanda Makilika	Member
13	Philipo Mduvike	Member
14	Ephrem Kitalika	Member
15	Rosima Kalinga	Member
16	Waseme Luwumba	Member
17	Julius Kalinga	Member
18	Yusuph Mwagala	Member
19	Michael Makilika	Member
20	Ponziano Kabonge	Member
21	Consolata Mgonzo	Member
22	Sara Kihongole	Member
23	Richard B. Kisonga	Member
24	Richard A. Kitalika	Member
25	Thobias ,Waga;A	Member
26	Elnestina Chunga	Member
27	Moses H. Kubonge	Member
28	Batwel H. Kaguo	Member

29	Donald H. Kabonge	Member
30	Luchana Nyalupak	Member
31	Alex Kalinga	Member
32	Charles Kiduko	Member
33	Ibrahim Nyongole	Member
34	Elijusy Nyongole	Member
35	Saphina Mdalingwa	Member
36	Sikujua Mdemu	Member

IFWAGI – 27/03/2007

S/N	Name	Title
1	Mathew Mahimbi	V E O
2	Greison Sanga	Member
3	Rozi Lwimbo	Member
4	Vick Lwimbo	Member
5	Suzana Ngoko	Member
6	Veronika Mkolefu	Member
7	Monica Mligo	Member
8	Blastusy Mwanuke	Member
9	Faraja Mahanga	Member
10	Charles Sanga	Member
11	Expedito Lwimbo	Member
12	Imakulata Mdalingwa	Member
13	Almoni Mhapa	Member
14	Fredrick Tossy	Member
15	Costandono Lwimbo	Member
16	Rejina Mahenge	Member

KIDETE 28/3/2007

S/N	Name	Title
1	Gabriel Kangalawe	Chairman
2	Adinani Kavenuke	VEO
3	Marcelina Kalinga	Member
4	Redenta Kiwale	Member
5	Evelina Ngalali	Member
6	Joyce S. Kalinga	Member
7	Baraka Ngalali	Member
8	Maricle Kangalawe	Member
9	Laurent Kiwale	Member
10	Malta Filipatali	Member
11	Denis Kigulu	Member
12	Bulasitus Kalinga	Member
13	Albert Ngimba	Member
14	Gasper Kalinga	Member
15	Raimunda Mwagala	Member
16	Theresa Kangalawe	Member
17	Tresina Kigulu	Member
18	Elize Mwagala	Member
19	Emelda Masonda	Member
20	Gervas Kalinga	Member
21	Gody Chuni	Member
22	Justina Kihongole	Member
23	Paulina Mdemu	Member

24	Makutata Kaganga	Member
25	Joseph Ngella	Member
26	Viktorinus Kigulu	Member
27	Polkarp Ndokole	Member
28	Ponziano Masonda	Member
29	Estelina Kaguo	Member
30	Musa Kangalawe	Member
31	Elemeasi Kalinga	Member
32	Imelda Mponzi	Member
33	Emilyo Filipatali	Member
34	Fortinata Masonda	Member
35	Biltista Kangalawe	Member
36	Siwema Kigulu	Member

MKALALA 29/3/2007

S/N	Name	Tiitle
1.	Anton Mtasiwa	Chairman
2.	Richard Chelesi	VEO
3.	Baraka Mbilinyi	Member
4.	Mathiasi Vahaye	Member
5.	Maret Mbogele	Member
6.	Kabaka M. Kibibi	Member
7.	Sadiki Mbaule	Member
8.	Paskalina Ndanzi	Member
9.	Yohani Mahenge	Member
10.	Marko Mlowe	Member
11.	Rozina Tweve	Member
12.	Tengema Kyando	Member
13.	Benitho Pila	Member
14.	Ebelina Tweve	Member
15.	Kenedy E. Mtweve	Member
16.	Batweli Sanga	Member
17.	Damson Kamache	Member
18.	Joeli Mbwilo	Member
19.	Klementina Mpiluka	Member
20.	Subira Sanga	Member
21.	Anko Mahenge	Member
22.	Evina Mgao	Member
23.	Angela Sanga	Member
24.	Ilifongi Myinga	Member
25.	Jimm Church	Member
26.	Audax Mgeni	Member

Annex 6: PROJECT INTERVETION LOGFRAME

IMMEDIATE OBJECTIVE: TO REDUCE DEGRADATION OF NATURAL FORESTS OF UTT

SN	Results/Outputs	Activities	Indicators	Means of verification	Actors
1	Awareness education to communities on environmental education improved	1.1 To training of village leaders, village environmental committees, Ten-cell leaders, and other relevant Institutions in the village • Seminar/workshops • Study tours • Exchange visits • Short courses • Village assembly meetings	At least one training provided by June 2008	Training report	Village communities and UTT
		1.2 To produce and distribute leaflets and fliers	At least one leaflet/flier produced by June 2008	Leaflets/Fliers produced	UTT
		1.3 To prepare appropriate environmental education programmes	At 2 education programmes prepared by December 2008	Quarterly/ semi/annual reports	UTT
		1.4 To establish strategies for dissemination of the education programmes through mass media e.g. Radio, TV, Cinema and Drama groups	At least 2 programmes disseminated using mass media or drama groups by December 2008	Quarterly/ semi/annual reports	UTT

SN	Results/Outputs	Activities	Indicators	Means of verification	Actors
		1.5 To establish a joint environmental committee which draw members for the village government and UTT Staff	A joint committee in place by December 2008	Quarterly/ semi/annual reports	UTT
2	Tree planting in the villages promoted	2.1 To facilitate choice of tree species preferred	Choice of tree species done by August 2007	Consultant's report	Villagers, Consultants, UTT
		2.2 To establish planting area available in each village	Area available in each village established by August 2007	Consultant's report	Villagers, Consultants, UTT
		2.3 To facilitate establishment of village tree seedlings nursery		Quarterly /Semi-annual reports	Villager Leaders (VL), Village Environmental Committee (VEC) and UTT
		2.4 To facilitate availability of seeds of the chosen species		Quarterly /Semi-annual reports	UTT

SN	Results/Outputs	Activities	Indicators	Means of verification	Actors
		2.5 To identify and train some of the village youths on tree nursery techniques	Village youths trained	Quarterly project intervetion logframe/ Semi-annual reports	VL and UTT
3	Use of improved energy efficient fuel wood and charcoal stoves promoted	3.1 To facilitate identification and choice of energy efficient stoves	Appropriate energy efficient stoves identified by August 2007		Villagers, Consultants and UTT
		3.2 To establish requirements (materials) for the stoves	Requirements for the stoves established by August 2007		Villagers, VL, VEC, Consultants and UTT
		3.3 To establish appropriate training required to communities	Training needs required established by August 2007		Villagers, VL, VEC, Consultants and UTT
		3.4 To identify experts to provide the required training	Experts to provide training identified by September 2007		Villagers, VL, VEC, Consultants and UTT
		3.5 To facilitate availability of equipment/materials for the stoves			Villagers, VL, VEC and UTT
4	Agriculture and Agro-forestry Development improved	4.1 To identify appropriate agroforestry technologies	At least 2 appropriate technologies identified by August 2007		Villagers, VL, VEC Consultants and UTT

SN	Results/Outputs	Activities	Indicators	Means of verification	Actors
		4.2 To identify appropriate tree species	Appropriate tree species identified by August 2007		Villagers, VL, VEC Consultants and UTT
		4.3 To identify other technologies/techniques for improvement of agricultural productivity	At least 2 technologies identified by August 2007	•	Villagers, VL, VEC Consultants and UTT
		4.4 To identify training needs and establish training programmes	• Training needs identified by August 2007 • Training programme in place by • At least one training provided by	•	Villagers, VL, VEC and UTT
		4.5 To facilitate training of some village members to become trainers	• At least one training provided by	•	Villagers, VL, VEC and UTT
		4.6 To facilitate availability of appropriate tree seedlings	• Seedlings available by • At least 20% of farmers practising agroforestry technologies by December 2008.	•	Villagers, VL, VEC and UTT
5	Involvement of communities in	**Joint Forest Management (JFM)**			

SN	Results/Outputs	Activities	Indicators	Means of verification	Actors
	forest management (Participatory Forest Management) promoted	5.1 To identify forests close to villages with potential for JFM			Villagers, Consultants and UTT
		5.2 To facilitate village community t and forest owner(s) to meet and express willingness for JFM			VL, District Council and UTT
		5.3 To facilitate initiation of dialogue/negotiations			VL, District Council and UTT
		5.4 To prepare Memorandum of Agreement between the village community and forest owner(s)			VL, VEC District Council and UTT
		Community Based Forest Management (CBFM)			
		5.5 To support conservation of village degraded forests/land			Villagers, District Council, UTT
		5.6 To facilitate establishment of village forest reserve			Villagers, District Council, UTT
		5.7 To promote enrichment planting in degraded areas			Villagers, District Council, UTT

SN	Results/Outputs	Activities	Indicators	Means of verification	Actors
6	Institutional Development and Capacity Building at all levels strengthened	6.1 To conduct capacity and training needs assessment to identify weaknesses/gaps of village Institutions that have the potential for environmental conservation			UTT
		6.2 To provide training to village Institutions e.g. on leadership, planning and management of land use and other activities			Experts, UTT

Annex 7: DISCUSSIONS ON PROPOSED MITIGATION MEASURES WITH THE SIX SELECTED VILLAGES

A brief introduction was given by the consultants especially by giving feedback on the study carried out in March 2007. The day's task was explained.
Generally a number of issues were raised on availability of land at household level, sort of collaboration expected, future expansion of tea estates in relation to conservation of natural forests and consideration for buffer zones; which were responded.

KIBAO, 31ST JULY 2007

A. Awareness Education

a) This can be achieved through open air meetings – Inviting experts of environmental issues to talk to people at the meetings. The project implementers from UTT attend the meetings
b) Use of banners and posters
c) Form groups specifically to deal with environmental education
d) Use environmental committees that can even educate individuals. These committees can then collaborate with existing forest guards from UTT forests. The existing committees need to be educated on what they should exactly do as they are not certain of their roles and responsibilities.
e) Ensure that harmlet and ten cell leaders are equipped with environmental conservation issues so that they may continuously educate other people under their leaderships.
f) Let a few representatives from the village go for intensive short courses on environmental conservation so as to use the obtained knowledge in educating the rest of the village members.

Awareness education should target all members of the community including children, school teachers and students/pupils

B. Effective Tree Planting

a) Research should be carried out to look for the possibility of raising natural/local trees so as to revive the lost beauty of Kibao of the past.
   Proposed tree species: *Syzygium spp (Mvengi/Mzambarau mwitu*) known for its capacity to conserve water sources – about 2,000 seedlings needed.
   Also to be raised are Eucalyptus (the fast growing type), pine, *Acacia* mearnsii (Black wattle) and Gravelia
b) There is need for supply of tree seedling. The group known as "Jitegemee group" may be facilitated to raise the seedlings since it already has experience in doing the same. Each household has a capability of planting trees to at least a quarter of an acre and there are about 15 acres of land owned by the village and can be used for planting trees. The village can then jointly plant pine, eucalyptus and *Acacia* mearnsii (black wattle)

C. Promotion of Energy efficient stoves

a) Introduce stoves that utilize saw dusts and wood shavings since there are a number of saw millings and there is no where to dispose the dust.
b) Introduce efficient firewood stove as they can be constructed at a low cost and yet save a lot on firewood consumption. One stove can be constructed at a cost of 5,000/=
c) Carry out a seminar on construction of stoves and conduct a on-household training so that all households may construct these stoves. It is wished that this is accomplished as soon as possible. The best way is to use the existing skills but improve them.

D. Enhancing agriculture and agro-forestry practices

a) Add "marejea" (*Crotoralia oclereuca*) in the crop farms to boost up soil fertility
b) Use guinea pig dung to fertilize the land since it has a very good fertilizing capacity. Dung from 20 guinea pigs can fertilize one acre of land annually. Hence the need to promote keeping of guinea pigs, locally known as "*Simbilisi*" and educate people on the importance of their dung regarding soil fertility. If possible while assisting with acquisition of tree seedlings; also assist with acquisition of guinea pigs.
c) Assist with creation of a road to the cropping fields as they are very far. Carrying the inputs to the fields becomes very difficult due to absence of the road. It is thought that even the issue of tree planting will be addressed by putting the road in place since seedlings and manure will be easily transported.

E. Involvement of Communities in Forest Management

a) It would be better to hold a meeting with the forest owner so as to plan the collaboration.
b) Let the village continue receiving the service of being allowed to obtain firewood.
c) Let the village be part and parcel in providing security guarding of the forests but be paid something to ensure its conservation. Then each villager will be a watcher to fellow villagers
d) Knowledge over conservation principles need to be imparted to all villagers so that to participate in proper conservation.
e) One of the envisaged benefits is honey keeping for honey production
f) Since the government owned forest of Mnyoli is currently poorly managed, look for the possibility of participating in conserving it.

F. Institutional Development and Capacity building

a) Seminars be conducted with the involved so that one may know his/her roles and responsibilities for effective and sustainable progress.

b) It felt that the issue of capacity building is very important for achieving the other activities

LUFUNA, 1ST AUGUST 2007

No questions were advanced after the briefing. The meeting wanted to hear the proposed mitigations so as to weigh them and contribute their ideas accordingly.

A. Awareness Education

a) This can be achieved through brochures and leaflets
b) Set up a class room for whoever is interested to get in for education
c) Use open-air meetings
d) Equip a few representatives of the hamlets with education and let them impart the acquired knowledge be imparted to the rest of the community.

The target audience for awareness education: Whole community including school children

B. Promotion of Tree Planting

a) Train few individuals in raising tree nurseries who will open up tree nurseries for producing tree seedlings. It is estimated that at least one acre average per household can be available for tree planting.
b) Let trees be also grown around the village boundaries as well as around the forest borders. Tree species have to include pine, eucalyptus, *Acacia* mearnsii (black wattle) and natural trees such as mivengi (for the 7 water sources requiring about 1,000 seedlings), *Bridelia bridelliodes* and milungulungu (for provision of local medicines).

C. Promotion of Energy Efficient Stoves

a) Education about construction of efficient stoves including the right positioning of the same in the kitchen.
b) Fortunately, about 75% of households already have these stoves, what is needed is to strive to have all villagers constructing the stoves.

D. Improved Agriculture and Agro-forestry

a) Education on agro-forestry technologies
b) Supply of right species for agro-forestry, e.g. Grevalia
c) Use of “marejea”
d) Education on better husbandry of guinea pigs, whose excreta has shown good performance in fertilizing the soil. Nine tins of guinea pig excreta are sufficient to

fertilize one acre annually. Thirty guinea pigs can produce 2 tins of the excreta per month. The problem guinea pigs succumb to cat attacks and the young ones are attacked by rats. It has been observed that if the cat is brought into the household when still young, grows with the guinea pigs thereby getting used to them. In addition to not attacking them, guards them against rat attacks.

e) Assistance in constructing the road to the crop fields, at least by placing curvets at difficults spots to ease transportation of inputs and produce
f) Strengthen extension services for more efficient production since we are currently producing by poor agricultural principles.

E. Involvement of Communities in Forestry Management

a) Request for ownership of the neighbouring natural forest owned by the government and request UTT to help us with the evaluation and other logistics
b) Request UTT to involve us in the management of their forests that are surrounding us.
c) The government forest is currently under our guard but it is not clear what should be our benefits. We would like to have agreements on what should be our benefits as we continue to provide its security.

F. Institutional Development and Capacity Building

a) Institute an environmental conservation committee and educate them on what they should do
b) Roles and responsibilities should be clear for all existing institutions – training
c) Introduce sustainable development programmes such as fruit production units.

MPANGA, 2ND AUGUST 2007

No questions were advanced after the briefing. One member started by proposing renovation of the worn out patches of the natural forest bordering the village by enriching it with trees. In principle, the members unanimously accepted the project

A. Awareness Education

a) Use of open air meetings where people will be explained over these issues. The village leaders could take up the issues and go hamlet by hamlet holding meetings to explain to others
b) Introduce educative groups that can spread the knowledge through choirs, ngomas, acting etc. This can go hand in hand with open air meetings
c) Use of video shows.

All members of the community – Adults and children should be targeted.

B. Promotion of Tree Planting

a) Avail seeds and seedlings: Average of one acre for tree planting. Species to include, pine (80%), eucalyptus (20%), *Acacia* mearnsii (black wattle), Grevellia (100 seedlings) *mivengi* (600 seedlings to cover the available 15 water sources at 40 per water source).
b) Preparation of seedbeds to be taught in schools.

C. Promotion of Energy Efficient Stoves

a) There has been noted that as such stoves are constructed, small black ants build up causing sinking of the stove. This may be due to the type of soil used.
b) Possible solution would be to for the community to use another type of stoves and/or soil.
c) Education on using saw dust/wood shavings/rice husks as an alternative to earthen stoves.

D. Improved Agriculture and Agro-forestry

- The idea of agro forestry not known yet in the village

E. Involvement of Communities in Forestry Management

- A problem was noted: The neighbouring natural forest owned by the government is currently unguarded, especially against fire. After every 3 years uncontrollable big fire outbreaks are experienced.

F. Institutional Development and Capacity Building

a) Introduce electricity into the village
b) Regular seminars to the institutions regarding the issue of environment conservation
c) Facilitation to the groups to accomplish their activities
d) Introduce an independent committee on environment – This has then to be educated on their roles and responsibilities.

MTWANGO, 3RD AUGUST 2007

1. The first person to speak indicated acceptance of the project into the village. What was required was to point out the activities to be carried out.
2. It was also pointed out that when one talks of institutions, the various groups such as women or youth groups were inclusive.
3. The proposed mitigation items were all accepted.

A. Awareness Education

a) Educate the old members of the community about the importance of environment conservation so that they may assist in spreading the education through open meetings
b) Let this education start right from schools
c) Let the institutions such as NGOs and churches take some sessions of educating the masses gradually. The institutions to acquire the knowledge through seminars.

B. Promotion of Tree Planting

(a) Nurseries existed in the village. What was needed was the supply of seeds. The nurseries were being raised by various groups (Mnyang'ala group, *Hifadhi Mazingira Mtwango*)

(b) Form more groups within hamlets to raise seedlings seedlings for the whole community

- About 50% of households can be prepared to grow trees (½ acre per household)
- The tree plots can have 50% planted with eucalyptus for commercial and firewood purposes. -- The rest 50% can be planted with pine for commercial purposes.
- The 15 available water sources require 100 *mivengi*'s each.
- About 10 acres can be available for tree planting around the schools while 3 acres can be available for *Acacia* mearnsii (black wattle) at schools and other areas of the village.

C. Promotion of Energy Efficient Stoves

(a) Knowledge over the use of such stoves – though some people are already using them, there was still need for spreading the technology.
(b) There was a problem of black ants
(c) Another problem was about use as heat source by the family. They were thought to be inadequate in supplying heat.
(d) The right way of construction was also not known
(e) The saw dust type was thought unsuitable as it produced a lot of smoke.

D. Improvement of Agriculture and Agro forestry

(a) Education about agro forestry was essential
(b) Use of Guinea pig dung. Few people kept these animals as little husbandry knowledge was known other than letting them breed around kitchen places.
(c) Suitable trees for agro forestry were to be known (Grevillea)

E. Involvement of Communities in Forestry Management

(a) Involve the village in guarding the forest
(b) Let the villagers set up bee keeping for benefiting from honey

F. Institutional Development and Capacity Building

(a) Provide education over environment conservation
(b) Equip the groups with necessary gear for carrying out activities
(c) The existing committee on environment need to be more educated over what are their roles and responsibilities.

LUDILO, 4TH AUGUST 2007

1. Unanimously accepted the project
2. Pointed out the correction that the village's average maize production was 5 bags per acre per household.

A. Awareness Education

(a) Educate the masses through posters, leaflets, pamphlets (vitini), brochures and fliers.
(b) Provide education to institutions such as environment committees, village executives as well as a
committee on land disputes.
(c) Go by hamlets following a particular programme
(d) The existing economic groups should also be educated. These include, Ludilo Tea nursery group,
Ludilo B hima hima group, Vijana group, Jamii group, Jiungeni group, Natural Resources
Committee and Kwihanga group.
(e) Include environment education in school syllabi.

B. Promotion of Tree Planting

(a) Educate all nurseries raising groups
(b) Provide support to the groups in terms of gear to raise seedlings
(c) Support in supplying seeds especially for the natural trees but also for eucalyptus, *Acacia* mearnsii (black wattle), pine and grivellia

C. Promotion of Energy Efficient Stoves

(a) Spread the technology.
(b) Provide education over the construction of the stoves
- The problem of black ants also existed in the village

D. Improvement of Agriculture and Agro forestry

(a) Promote use of dung (cattle, pigs, chicken and guinea pigs)
(b) Raise improved Guinea pig breeds
(c) Educate people on good husbandry for guinea pigs
- The problem of means for transporting manure to the crop fields mentioned

E. Involvement of Communities in Forestry Management

It seemed that the community was already involved in some ways. It was also noted that the village owns a natural forest which is managed by the village itself. No body is allowed to fell trees from the forest, for any purpose.

F. Institutional Development and Capacity Building

(a) Provide some gear e.g. gum boots, transport (bicycles) to the committee on environment and to all economic groups
(b) Provide education about how to maintain the raised seedbeds
(c) Provide technical support regarding collection of natural tree seeds.

IFUPIRA 16TH AUGUST 2007

The villagers were ready to engage with the project with two hands.

1. Tree planting

(a) Tree planting: 0.5acre per household
Types of tree =75% pine
25% eucalyptus
(b) School area for tree planting = 10 acres (6 acres pine, 2 acres blackwattle & 2 acres eucalyptus)

2. Energy efficiency cooking stoves- Need knowledge and education on better technology of building the stoves.

3. **Agro-forestry and agriculture promotion.** Good practice for keeping simbilis and good breeds. For gravellier (each house hold 50 trees).

4. Comments in the rest of points were almost same with the ones obtained in the previous villages.