UDZUNGWA MOUNTAINS NATIONAL PARK (UMNP)

AN ASSESSMENT OF ECOLOGICAL AND SOCIAL - ECONOMIC IMPACTS CAUSED BY COLLECTION OF DEADWOOD, MEDICINAL PLANTS AND CUTTING OF GRASS FOR THATCHING IN UDZUNGWA MOUNTAINS NATIONAL PARK

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ARI	Acute Respiratory Infection
COBET	Complementary Basic Education in Tanzania
DB	Dung beetle
ELCT	Evangelical Lutheran Church in Tanzania
FGD	Focus Group Discussion
HEP	Hydro-electric Power
HH	Household
HIV	Human Immune deficiency Virus
HP	Heifer Project
HQ	Headquarter
MMMT	Mang'ula Mechanical and Machine Tools
SACCOS	Savings and Credit Co-operative Societies
SME	Small and Medium Enterprise
STI	Sexually Transmitted Infection
TANAPA	Tanzania National Parks Authority
TANESCO	Tanzania Electricity Supply Company
TAZARA	Tanzania Zambia Railways
TBA	Traditional Birth Attendants
U-5	Under five years of age
UDSM	University of Dar es Salaam
UMNP	Udzungwa Mountains National Park
VEO	Village Executive Officer
WEC	Ward Education Coordinator
WEO	Ward Executive Officer
WWF	Worldwide Fund for Nature Conservation
WWF-TPO	Worldwide Fund for Nature Conservation- Tanzania Programme Office
TB	Tuberculosis

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EXECUTIVE SUMMARY

Between April and October 2005 an ecological and socio-economic survey was carried out in the Udzungwa Mountains National Park and neighbouring villages and towns. The objective of the study was to assess the impact of three human activities (deadwood collection, cutting grass for house thatching, and collection of medicinal plants) to the biodiversity of the National Park, and to study socio-economic ramifications of the activities. In addition, recommendations were to be made to the Park authorities on whether or not to continue allowing the three activities in the Park.

Ecological studies using dung beetles as indicator group clearly revealed a negative trend in the ecological diversity in areas where deadwood collection was most intense. Moving from primary forest to moderately exploited areas, the ecological diversity first increases, and then it decreases towards intensely exploited areas neighbouring the two main population centres near the Park (Mkamba town in the north and Mwaya/Mang'ula towns near the Park Headquarters). This pattern is as predicted by the intermediate disturbance hypothesis, and although at present the situation has not yet reached a critical stage, if allowed to continue a stage will be reached when local species extinction will take place. This should be avoided.

Socio-economic studies revealed a high dependency of local communities on deadwood from the Park as their main source of energy for cooking and heating. There was also trading of

deadwood from the Park, especially for use in the local brew industry. Several alternative sources of energy are already in use in the area, but they account for a low percentage of the total energy use. Previous efforts to encourage local population to plant trees have not been very successful, mainly due to land shortage, but also in part due to complacency because of the free source of deadwood from the park. Poverty is another drawback, where many people could not afford the price of alternative energy sources. The other two activities (removal of grass for thatching and medicinal plants) don't seem to cause similar disturbance to the ecosystem.

The majority among respondents to questionnaires (95%) had positive views about conservation. They agreed that the situation where people are allowed to access resources from the park couldn't be continued in its present form. However there was a vocal minority (5% of respondents) who were totally opposed to the idea of the three activities being stopped. These had a view that the national park had taken land that was theirs.

The study recommends a gradual phase out over a period of up to five years. The period should be used to carry out an educational and public relations campaign, help village authorities to formulate land use management plans which designates a larger proportion of land for tree planting than is currently assigned, to help to find alternative sources of energy and increasing acceptance and use of alternative sources of energy already in place, and to help in identifying more feasible income generating schemes, so that the people around the park can afford other energy sources.

SECTION 1
INTRODUCTION

1.1 UDZUNGWA MOUNTAINS NATIONAL PARK SURROUNDING HUMAN POPULATED AREAS

1.1.1 Introduction

This Report is based on an ecological and social survey which was conducted on the Udzungwa Mountains National Park (hereinafter called the "UMNP") to assess the ecological impact of the collection of dead wood, grass for thatching and medicinal plants on the integrity of the park and surrounding areas. It is the intention of this report to highlight the social implications of the activities enumerated above and thereafter provide policy recommendations aimed at mitigating the harmful effects of the said activities.

1.1.2 Historical background

UMNP is part of the Eastern Arc Mountains. The park covers 1,990 km^2 of which 80 percent is in Kilolo district in Iringa Region and the rest is in Kilombero district, Morogoro Region. The area is known for its extraordinarily rich and unique biodiversity, characterized by high endemism. Furthermore, UMNP is the only park in Tanzania in which indigenous people are allowed to practice traditional worshiping and collect dead wood, medicinal plants and grass for thatching.

In accordance with the National Park Ordinance (Cap 412) of 1959, the UMNP was gazetted in 1992 from the existing Forest Reserves of Mwanihana, Iwonde and parts of Matundu and the West Kilombero Scarp Forest Reserves. UMNP, the twelfth in the National Park system, was specifically created with the intention of safeguarding the mountain water catchments and biological values of the locality.

1.1.3 Location

UMNP has its headquaters at 36˚41'E and 7˚48'S in the southern- central parts of Tanzania. The Selous Game Reserve is found in the east, beyond the Kilombero Valley, and Mikumi National Park to the northeast. The Great Ruaha River borders the north of the park and the Ruipa and Msosa Rivers borders the west of the same. The fertile Southern Highlands lie to the south of the UMNP. The UMNP spans for an altitude from 200m to 2,576m. above sea level (Figure 1).

1.1.4 Physical features

UMNP is dominated by strong physical features such as the 2,579m mast peak of Mwanihana, the escarpments that mark the park's western boundary, and the Ruaha River in the north. There are also numerous rivers, waterfalls and streams carving the forest in narrow gullies and canyons.

1.1.5 Climate

UMNP receives the bulk of its annual rainfall from November to May, and the longer rain period of March to May. There is an overlap of the short October to December rains. The dry season reaches its peak in September and October. The mean annual rainfall in the southeast of the park, which is often covered by mist, is around 2000mm a year. In the northwest, only 600 mm of rain falls per year.

Figure 1: Location of the Udzungwa Mountains National Park in relation to other National Parks in Tanzania (Adapted from www.africaguide.com).

1.1.6 Vegetation

The UMNP is covered primarily by dense mountain forest which was once part of a rich belt that extended southward from the Congo. Within the park, there are thick stands of bamboo, as well as open moorland at higher altitudes. In the north and west of the park, the forest descends into miombo woodland, with riverine forest along the Ruaha. There are at least 50 plants found in the UMNP that are endemic to the Eastern Arc Mountains, including many species of climbers, shrubs, flowers and herbs. Over 150 of these species are considered to have medicinal value and are used by local communities.

1.1.7 Land use pattern

The favourable combination of good soils, reasonable climate and abundant rainfall has made it possible for Kidatu and Mang'ula divisions and Kilombero district at large to make notable development in agricultural production, which largely depends on small holder farms. The main agricultural activity is general mixed farming. The majority of the population engages in paddy, maize and sesame crops farming while some well-to-do people engage in sugar cane growing. Individual farmers own a total of 5,204 hectares of sugarcane under a sugarcane out-growers programme from which the harvest is sold to ILOVO Kilombero

Sugar Company. Some of this land comes from conversion of paddy farms into sugarcane farms.

On the other hand there has been a constant land conflict between peasants and pastoralists. Due to the good climate of the area, the latter is suitable for both agriculture and pastures for cattle grazing. Kidatu and Mang'ula divisions have limited area for both farming and grazing. Expansion for such activities is impossible because the two wards are surrounded by various protected areas and plantations. In the south, Mang'ula and Kidatu divisions border the Selous Game Reserve. The Kilombero Sugar Company is found in the north-east, while the north-west and the west is bounded by the UMNP and several forest reserves. The Kilombero Teak Company has also taken a lot of land in Kilombero valley.

1.1.8 Population and demographic characteristics

According to the 2002 population and housing census and other sources (Table 1) the Kidatu and Mang'ula areas have a total population of 109,866. The number of males is 56,061 (51%) and the female population is 53,805 (49%). The total number of household is 26,057 with the household average size of 4.2 individuals. The fertile soils of Kilombero Valley have attracted commercial growing of rice and sugarcane and booming trade opportunities which have attracted a large number of economic immigrants.

Table 1: Distribution of residents in Divisions and Wards, type of Wards, gender and size of households

S/N	DIVISION	WARD	TYPE	NUMBER OF HH MEMBERS			NUMBER OF HH	AVERAGE HH SIZE
				MALE	FEMALE	TOTAL		
1	KIDATU	KIDATU	MIXED	18,272	17,022	35,294	8,374	4.2
		SANJE	RURAL	4,981	4,754	9,735	2,397	4.1
2	MANG'ULA	MKULA	RURAL	4,185	4,232	8,417	2,017	4.1
		MANG'ULA	MIXED	14,444	14,442	28,886	6,948	4.2
		KISAWASAWA	RURAL	4,590	4,409	8999	2,285	4.0
		KIBEREGE	RURAL	9,589	8,946	18,535	4,036	4.6
	TOTAL			56,061	53,805	109,866	26,057	4.2

Source: Field Data/URT 2002, Population Census

1.2. COLLECTION OF DEAD WOOD, GRASS AND MEDICINAL PLANTS

As a result of a verbal agreement between Tanzania National Parks Authority (hereinafter called "TANAPA") and Kilombero District Council, human activities such as collection of dead wood, cutting of grass for thatching and the use of medicinal plants were permitted inside the UMNP since it was gazetted in 1992. Initially, the agreement was for ten years, but after the 10 year period it proved difficult to stop the activities. This was partly due to humanitarian grounds, especially with the absence of data on the impact of these activities on the integrity of the UMNP and on its biodiversity. The agreement was informal possibly due to of the fact that the UMNP was still in the inception stage, and that the goodwill of surrounding communities was crucial in the gazetting of the UMNP. For example, there was an agreement to swap land between villages and the new park in order to make the boundaries of the park more rational and practical.

1.3 SOCIAL IMPLICATIONS

Over the years since 1992, there have been major socio-economic changes in Tanzania generally, and in the Kilombero Valley specifically. These include a liberalization of the economy, which lead to the privatization of most state-owned and parastatal economic activities, a process which has entailed much upheaval in the life-styles of many former workers and their families. In this context, the privatization of the Sugar industry in the KilomberoValley, the Mang'ula Mechanical Manufacturing Tools and others have affected the population adjacent to the UMNP directly.

Privatization had a direct effect on the environment of the area. For example, privatization of the sugar cane industry attracted expansion of sugarcane farming and increase in the buying of sugarcane from small farmers. This practice resulted in replacement of paddy with sugarcane, thus jeopardizing the food security of the affected communities. It may also partly account for the relative failure of the tree planting campaign since sugarcane farming and agro-forestry are not compatible. The increase of acreage under sugarcane and other crops has the effect of reducing wildlife corridors between UMNP, Selous Game Reserve and Mikumi National Park. The same effect can also result from the Teak Plantations found in the area.

There have also been demographic changes (including population increase mentioned above) around the UMNP, with the associated increase in the demand for resources from the UMNP.

1.4 AIM

The aim of this survey was to determine the ecological impact of the three activities (collection of dead wood, grass for thatching, and medicinal plants) in the UMNP, identify the resulting social implications, and recommend policy interventions (see Terms of Reference, Annex A).

1.4.1 Objectives

The following were the specific objectives of the ecological and social survey on the impact of dead wood collection in the UMNP:

(1) to determine the average quantity of dead wood removed from the forest, sections of the community involved in the activity, and its social and economic aspects (e.g. dead wood collection for commercial purposes, impact on tourism);
(2) to assess the quantity of medicinal plants collected over a specific time period;
(3) to assess the social factors and consequences of stopping collection of dead wood, thatching grass and medicinal plants;
(4) to determine the impact of these human activities on the biodiversity of the UMNP
(5) to propose a course of action based on the above findings; and
(6) to prepare a policy paper that will help to advise TANAPA on the necessary policy interventions. Such a paper will also be useful in encouraging village, district and regional authorities to set aside land for tree planting as a source of fuel wood for the communities.

1.5 JUSTIFICATION

As detailed above, the informal agreement concerning the three allowed activities in UMNP expired in 2002. In view of the above, and since the magnitude of the problem has not been analyzed scientifically, the WWF Tanzania Programme Office (hereinafter called "WWF") commissioned the consultants to carry out an assessment of ecological and social impact caused by dead wood collection in UMNP. This report gives details of the findings of the study and suggestions about the way forward. WWF has been involved in conservation in the UMNP before and after of its establishment as a National Park. For example, in 1991, WWF started supporting projects to establish tree seedling nurseries in the area as part of an agro-forestry project. It was hoped that with time, this project will help to reduce the dependence of the local communities on the park for their fuel wood and other forest products. There have also been projects focusing on fuel-efficient stoves and income-generation projects (e.g. the heifer project). All the projects have met with only partial success. The present study analyses the reasons for these relative failures in order to suggest improvements.

SECTION 2
ECOLOGICAL IMPACT

2.0 INTRODUCTION

Dead wood (whether standing, dead or dying trees, fallen logs and branches) is an important component of ecosystems. It provides food and shelter to a wide range of animal and fungal species, as well as act as an indicator of the naturalness of the forest (WWF, 2004). There is reliable evidence that dead wood directly correlates with invertebrate diversity, and that the removal of dead wood can reduce species diversity (Masser *et al.*, 1979; Niemela, 1996;

Oakland *et al.*, 1996). When the dead wood decomposes, its nutrients become available to other plants, thus being an important part of nutrient recycling. Finally, removal of dead wood can deprive the soil of its protective cover, leading to soil erosion.

The main objective of the ecological survey was to determine whether or not the three permitted human activities had a negative impact on the biodiversity of the UMNP. Given the short time within which to conduct the survey, a cross-section of levels of disturbance was compared at three levels of disturbance. According to the intermediate theory hypothesis (Connell, 1978), if there is ecological disturbance, diversity should increase first from the least disturbed to the moderately disturbed areas, before falling at the most disturbed sites. This was the hypothesis to be tested. In conducting the survey, dung beetles were used as indicators of the overall change in the quality of the environment. Dung beetles are easily sampled in a quantitative manner, easily identified, are not directly dependent on plants (being decomposers) and they therefore show long term effects. Dung beetles have been used in other parts of Tanzania (Usambara mts, see Nyundo *et al*., 2003) and the world (Davis, 2000) to ascertain the ecological disturbance.

The criterion for measuring the disturbance was the number of people living adjacent to the UMNP in a particular locality. It was assumed that this was proportional to the amount of dead wood removed from that area. This was supported by the results of on-site observations and estimates by the socio-economic team. Level One (L1) sites were located in the primary forest area where there was no dead wood removal (sites near Kidatu Hydro-Power plant and Lumemo Rangers' Post). Level Two (L2) sites had low levels of dead wood removal (low-population areas centered on Sanje village). Level Three (L3) sites were located near highly populated urban centers (Mkamba/Kilombero and Mwaya/Mang'ula areas) and were highly exploited in terms of dead wood collection.

2.1 METHODS

2.1.1 The study sites

The selection of sampling sites and setting of transects took place in late April, starting from 24th April 2005. A total of nine transects were established on the eastern-facing slopes of the Udzungwa mountains inside the UMNP. Three of these transects were near highly populated areas where utilization of dead wood by nearby communities was high (these were designated Disturbed Sites, D1, D2 and D3). Three sites were in low-population areas where utilization was low (Medium disturbance sites M1, M2 and M3). The remaining three sites were in areas where utilization by local communities was nil (Primary forest sites, P1, P2 and P3). Detailed locations and descriptions of the study sites are provided in Table 2. In conducting the survey, the choice of disturbed sites was determined by the location of areas affected by dead wood collection such as areas adjacent to population centres from Mkamba to Kiberege, while the primary forest sites were chosen from areas where dead wood collection was prohibited.

2.1.2 Sampling

The ecological survey work involved dry season and rainy season sampling of dung beetles (indicator group) and the sampling of two groups, namely butterflies and wood-dependent invertebrates, that are directly affected by the three permitted activities mentioned above. Rainy season sampling lasted for two weeks starting from 25th April 2005. Dry season

sampling lasted for two weeks from 21st July 2005. Sampling utilized locally trained field helpers under the supervision of the ecologists from the University of Dar es Salaam and UMNP Headquarters, Mang'ula.

Table 2: Study sites for the ecological survey

Ser. No.	SITE	LEVEL OF DISTURBANCE	LOCATION (GPS Points)	DESCRIPTION
1	P1	L1	271738 9154749	Primary forest near Kidatu HEP project.
2	P2	L1	274085 9153161	Intact primary forest near Kidatu HEP project.
3	P3	L1	243198 9114309	Intact woodland/forest near Lumemo Post
4	M1	L2	272511 9146700	Moderately used forest near a teak plantation
5	M2	L2	268909 9138948	Moderately used forest near Sanje Post
6	M3	L2	268909 9136366	Moderately used forest near Mwanihana trail
7	D1	L3	275300 9150205	Highly disturbed forest near Mkamba Village
8	D2	L3	266350 9132356	Disturbed forest near TANAPA Mang'ula HQ
9	D3	L3	2666609 9131744	Highly disturbed forest/woodland adjacent Mwaya Town

The sorting out of the samples and the identifying of dung beetles, butterflies and other invertebrates was carried out at the laboratories of the University of Dr es Salaam, Department of Zoology & Wildlife Conservation. Identification was carried out to family level. For the purpose of computing species richness, some samples of dung beetles and all butterflies were also identified to species level.

Three aspects of sampling were studied at each site: firstly, sampling resulting from dung beetles collection using pitfall traps; secondly, sampling resulting from butterfly collection using butterfly nets and baited butterfly traps; and thirdly, sampling resulting from ad hoc observation and collection of wood dependent invertebrates found under lying logs, under barks of dead wood and in rotting wood.

2.1.3 Dung beetles

Dung-burying beetles (Scarabaeoidea) were used as indicators of the overall health (or lack of) of the Ecosystem. They were sampled using pitfall traps baited with fresh cow-dung. At each transect, 20 pitfall traps were set at distances of 0m, 40m, 100m and 250m from the forest edge. There were five pitfall traps at each distance, and the distance between traps was 40m. The traps were made of two (2) one-litre plastic cups per trap, one cup inside the other. The traps were set in the morning and emptied after 24 hours. The cups were half-filled with water and a few drops of a detergent were added to break the surface tension. Fresh cow dung was tied onto a piece of light clothing material and placed at the top of the pitfall trap to act as bait. Collected dung beetles were sieved from the traps and immediately transferred

into specimen bottles containing 80% alcohol, ready for transportation to Dar es Salaam, where identification was carried out.

Plate 1. An oblique view of a pitfall trap in place with the dung bait on top

Plate 2: The ecologist demonstrating to the others how to empty pitfall traps

2.1.4 Butterflies

Due to the abundance and diversity of butterflies (Order Lepidoptera) butterflies were used to assess the impact of human activities on the vegetation of the UMNP. (This is because butterflies are totally dependent on more or less specific plant species for their survival at the larval stage. As such, any change in plant composition and abundance should, therefore, be reflected in a corresponding change in the diversity and abundance of butterflies).

In collecting the butterflies, butterfly nets were used to catch butterflies at each transect. There was an attempt to use banana traps in collecting butterflies but due to the resulting low collection, the use of banana traps was discontinued . The collected butterflies were killed, preserved in envelopes, and transported to Dar es Salaam for identification and data analysis. Sampling for butterflies was not systematic (i.e. unequal effort was expended at different sites).

Plate 3: The above banana trap design was tried in the UMNP for sampling butterflies. Its use was stopped due to low yield.

2.1.5 Wood-dependent invertebrates

The direct impact of the removal of dead wood from the forest was assessed through studying the abundance and diversity of wood-dependent (xylophylous) invertebrates at the three levels of disturbance. Collection methods involved searching under logs, under barks of dead wood, and inside rotting wood. Collected specimens were immediately transferred into specimen bottles containing a mixture of 80% ethanol, ethyl acetate and white vinegar (90:5:5 parts respectively). The specimen was transported to Dar es Salaam for sorting, identification and statistical analysis. Collection of wood-dependent invertebrates was on an ad hoc basis.

2.1.6 Statistical analysis of ecological data

Statistical methods were used to assess whether or not poor species diversity and the abundance of dung beetles corresponded to the high disturbance caused by human activities. The data did not satisfy assumptions of parametric tests, therefore non-parametric tests were used, namely the Kruskal-Wallis and Mann-Whitney tests for abundance, the Shannon-Weaver index (and special t-test) for diversity, and the χ^2 test for the number of species.

2.2 RESULTS

2.2.1 Ecological impact of dead wood collection in UMNP

During the rainy season, a total of 277 samples of dung beetles were obtained and analyzed from the 324 pitfall traps which were set at the nine sites (three sites for each level of disturbance pressure). Samples from 54 traps were not included in the analysis for various reasons: some traps were vandalized by animals, other samples were damaged due to prevalent evaporation or leakage of the preservative (ethyl alcohol) from the plastic bags that were used to store the specimens, others had illegible labels or the labels had been damaged during transportation and storage of the samples.

The remaining 270 usable samples produced a total of 10,243 dung beetles. The average abundance (arithmetic mean) of dung beetles per trap was 37.43, with a standard deviation of 43.64. The minimum and maximum numbers of dung beetles in the traps were 0 and 299 respectively. The data obtained had a high variance to mean ratio, therefore non-parametric tests were used throughout for data analysis.

Dry season samples were sorted to family level (dung beetles) and species level (butterflies). Abundance patterns were similar to wet season samples, so, in this analysis, only the latter are given in detail.

2.2.1.1 Effect of human activities on abundance of dung beetles

Overall, the abundance of dung beetles decreased from primary forest where there is no human use of dead wood to moderately used forest (level two), before climbing again at the most disturbed forest (level three), which had the maximum abundance of dung beetles (Figure 2). This difference was statistically significant (Kruskal-Wallis H=78.535, p=0.000). Similarly, comparison showed a statistical difference between all three possible pairs.

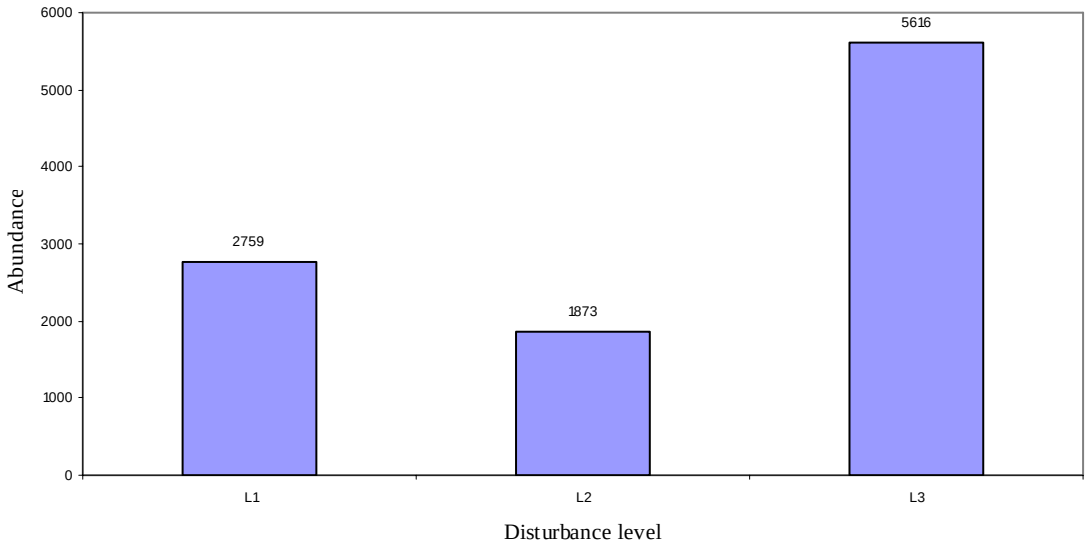

Figure 2. Abundance (the number) of dung beetles at the three levels of human pressure (L1: Primary forest (with no dead wood collection), L2: Moderately utilized areas, L3: Highly utilized areas)

At each level of disturbance, one site had significantly lower abundance of dung beetles compared to the other two. For the primary forest sites there was an obvious overall significant difference in the abundance of dung beetles (Kruskal-Wallis H=20.701, p=0.000). This difference was caused by the Lumemo site (P3), which was significantly different from the two Kidatu sites, P1 and P2 (Mann-Whitney U=723, p=0.000 and U=643, p=0.000 respectively). Sites P1 and P2 showed no significant difference (Mann-Whitney U=501, p=0.593).

Within the intermediate level of disturbance there was an overall difference in the abundance of dung beetles (Kruskal-Wallis H=14.640, p=0.001). This was contributed by the significant difference of site M2 from the other 2 sites, site M1 and site M3 (Mann-Whitney U=701.0, p=0.009 and U=273.5, p=0.000 respectively). Sites M1 and M3 showed no significant difference (Mann-Whitney U=428, p=0.498).

Within the highest level of disturbance, there was an overall difference in the abundance of dung beetles (Kruskal-Wallis H=23.341, p=0.000). This was contributed by site M2, which differed significantly from the other two sites, M1 and M3 (Mann-Whitney U=701.0, p=0.009 and U=273.5, p=0.000 respectively). Sites M1 and M3 showed no significant difference (Mann-Whitney U=428, p=0.498).

2.2.1.2 Effect of human activities on the species richness and diversity of dung beetles and their distribution

A total of 37 species of dung beetles were collected from the nine study sites. This evident species richness is higher than has been observed in other eastern mountain forests, such as East Usambara Mountains which have 23 species and Sokhulu Forest Reserve, South Africa which have between 18 and 23 species (Davis, 2001). The high number of species in the UMNP is a probable reflection of a higher diversity of habitat types (miombo woodland, mountain forest and some patches of grassland). The high number of species may also be a result of patchiness of the habitat resulting from disturbance, which serves to create more niches for animal species.

The most abundant species was Dung Beetle Species 1, which consisted of 1239 dung beetles, accounting for 27.39% of the total. The other species and their percentages are shown in Appendix 1b.

The six most abundant species accounted for 73.92% of the total abundance. These were predominantly found in the most disturbed site (66%) (Figure 3). Fourteen species were rare species, having less than 10 representatives overall. Of the rare species, two were represented by a single specimen each (singletons) while three were represented by two specimens each (doubletons). Some species were predominantly found at the disturbed sites while others were found mainly from the primary forest sites.

DB1, Sisy1, DB3, ScaptSegr, DB2 and DB5

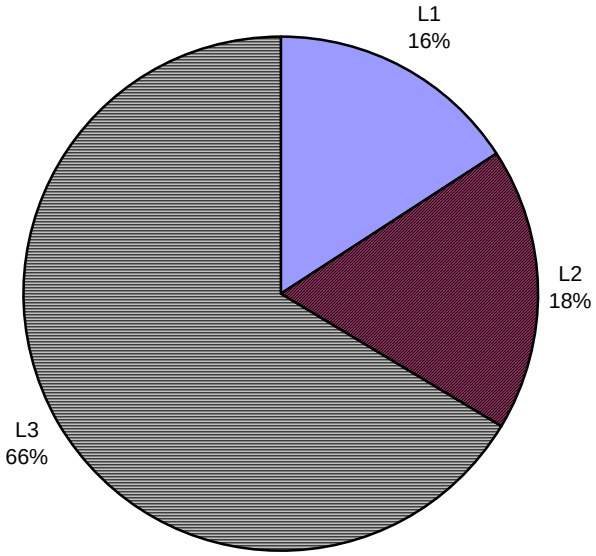

Figure 3: Distribution of the six most abundant species at the three levels of disturbance.

Species richness increased from the least disturbed sites (level one, L1) which had 27 species in total to the intermediate and most disturbed sites, which had a total of 28 species each. This difference, however, was not statistically significant (χ^2=0.024, p<0.01).

Diversity indices (Shannon-Wiener H') at the three levels of disturbance were 1.05 at L1, 1.16 at L2 and 0.95 at L3. Special t-test showed high statistical significance between all three sets. This pattern of increasing then decreasing diversity conforms to the predicted intermediate disturbance hypothesis (Figure 4). It shows the significant effects of human activities on the biological diversity of the areas concerned. NOTE: Biological diversity is a compound index that includes two components, namely species richness (*S*) and species evenness (so-called equitability) (Magurran, 1988). The highly disturbed sites, although they possess slightly higher species richness than the primary forest sites, they have very low species evenness (low equitability). In other words, the number of species relative to the abundance of the species is low at level three sites compared to level one sites, hence the low diversity at the former sites.

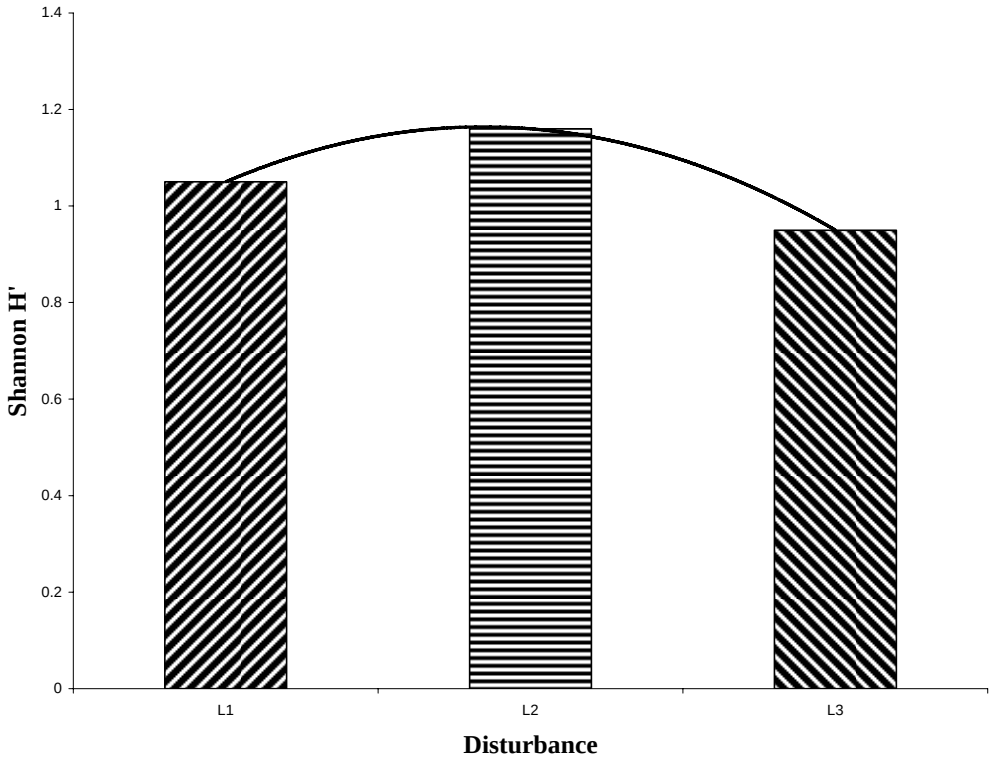

Figure 4: Diversity (Shannon-Wiener index *H'*) at the three levels of disturbance (with a trendline).

2.2.1.3 Edge effect on distribution of dung beetles

The distance from the forest edge affected the abundance of the various species of dung beetles. The highest number of species was found at the forest edge (33 species, it being 31% of the total). This number of species decreased towards 100m from the forest edge before rising again at 250m from the said forest edge (Figure 5). Similarly, the abundance of dung beetles decreased from 1510 dung beetles at the edge of the forest to 775 dung beetles at 100m, then rose again to 1434 dung beetles at 250m (Annex 6.2).

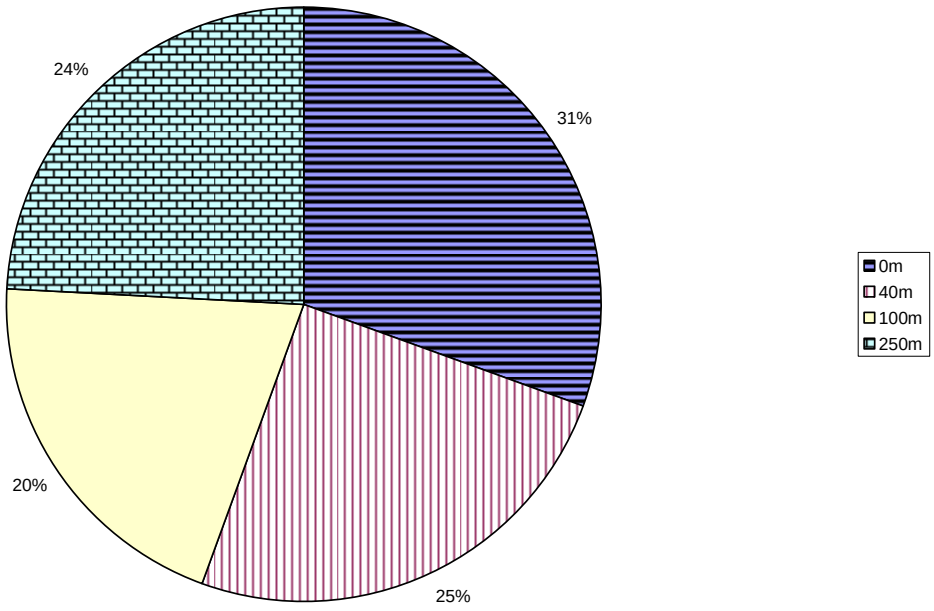

Figure 5: The number of species (%) at the four distances from the forest edge

Nine out of twelve of the most abundant species were found predominantly in the forest interior, with the exception of DB3, *Scaptocnemis segregis*, and *Anachalcos procerus* which were predominantly edge species. These nine species, together with two rare species (DB7 and *Onthophagus miscellus*), are classified as forest-dependent species (Figure 6a).

The rare species, on the other hand, were predominantly found at the forest edge, with the exception of DB7 and *Onthophagus miscellus*. Compared to the primary forest (L1), the rare species are disproportionately represented in the most disturbed areas (L3 and L2). This may be an indication that many of these species are invasive species, meaning that they are transit species from the adjacent savanna, lowland forest and woodland habitats (Figure 6b).

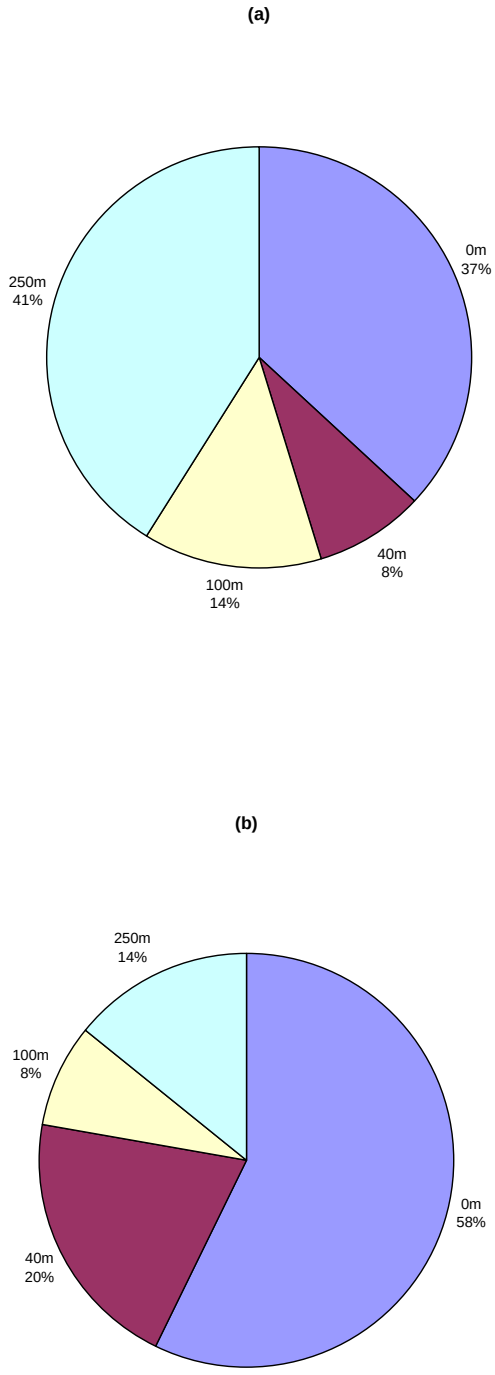

Figure 6: Abundance of the common species with the exception of DB3, *Scaptocnemis segregis*, and *Anachalcos procerus* (a) and rare species with the exception of DB7 and *Onthophagus miscellus* (b) with distance from the forest edge.

2.2.1.4 Effect of human activities on butterflies

Subjective observation and non-quantitative collection of butterflies indicated a significantly higher abundance and species richness of butterflies at the non-utilized sites (primary forest, L) as compared to the same in disturbed sites. In attempting to establish the status of abundance of butterflies and species richness, a total of 74 specimens were collected. These comprised of 27 species from eight families of butterflies. The majority, 41 butterflies in total were collected from primary forest sites. Only 12 and 21 specimens were collected from the moderate and highly disturbed sites (L2 and L3) respectively. The number of species proved to be higher at L1 sites (22 species) as compared to the other two levels (7 and 11 species respectively at L2 and L3 sites). A checklist is given in Annex 6.2.3.

2.2.1.5 Effect of human activities on wood-dependent invertebrates

To assess the impact of human activities on wood dependent invertebrates, invertebrates were collected from under fallen trees and logs lying on the ground, under the bark of fallen trees and logs, and from rotting wood. These covered the whole range in terms of taxonomy, but arthropods were predominant. The invertebrates collected included beetles (Order Coleoptera), earwigs (Order Dermaptera), scorpions (Arachnida), centipedes and millipedes (Class Chilopoda and Diplododa respectively), ants and solitary bees (Order Hymenoptera), cockroaches (Order Blattodea), larvae and pupae of butterflies and moths (Order Lepidoptera) and spinners (Araneae). In addition, many species of fungi were also observed growing on fallen logs and rotting wood. Vertebrate species were also found to utilize fallen wood as hunting areas (lizards), for perching (birds) or for shelter (rodents, lizards, snakes and toads).

2.3 CONCLUSION

2.3.1 Impact of human activity on biodiversity

The survey of dung beetles (indicator group), butterflies and wood-dependent invertebrates has revealed a wide range of organisms that are affected by the three human activities of dead wood collection, of cutting grass for thatching and of harvesting medicinal plants. Results of the survey revealed a statistically significant impact on the abundance of species, species richness and species composition, all of which are reflected in the change in the biological diversity of the dung beetles which are the indicator group that was used. Dung beetles are saprophytic (scavengers) in their ecological position on the trophic pyramids, feeding on materials indirectly derived from animals and plants. As a result, they are not immediately affected by the loss of animal and plant species. The fact that the ecological impact can be detected to a significant level in this group of indicators means that considerable damage has already been done to the ecosystem. As a result, groups that are directly affected by the loss of plant species such as butterflies (primary consumers) show a considerable degree of difference between the unaffected areas (the three primary forest sites) and the affected areas.

Similarly, an analysis of edge effect revealed the impact of human activities on the ecosystem. Some dung beetle species that are normally found at the forest edge were observed deep into the forest at sites where human activity is allowed.

Affected groups of animals include some that have particular ecological significance. The first is the group of forest-dependent animal species. Of the butterflies collected during this study, several species are forest dependent. These forest dependent butterflies include the *Graphium polistratus*, the *Papilio dardanus*, *Euphaedra neophron* and others. Among the dung beetles, the *Sisyphus* species is forest-dependent. Given the inadequate knowledge of the biology of the animal species of the area, and the fact that the majority of these species have not been catalogued and many are likely to be new to science (undescribed species), there is an urgent need to conserve the area (Figure 7).

Figure 7: *Euphaedra neophron* shown on the left is a forest-dependent species found in Eastern Arc Mountains. *Graphium polistratus* (right) is another forest-dependent species.

Another group causing concern is the endemic, rare and locally distributed species. The present study, though limited in scope, revealed two butterfly species and a number of beetle species that are both endemic to Tanzania and confined to the Udzungwa Mountains. The butterfly species referred to are the *Bicyclus danckelmani* and the *Physcaeneura robertsi* (Figure 8). Several ground beetle species (Family Carabidae) which were identified in the area are new to science. These include the *Pseudomasoreus*

sp.nov., the *Pseudomegalonychus* sp.nov., the *Thyreopterus* sp.nov. and the *Euplines* sp.nov. (Nyundo, 2002).

Figure 8: The species on the left is *Physcaeneura robertsi*, an endemic species in Tanzania. On the right is *Bicyclus* danckelmani, another Tanzania endemic species.

Finally, it can be concluded that many animal species and groups of species are directly dependent on dead wood in various ways. These include many beetle species, earwigs, myriapods, and many others (see Figure 9 for examples).

Figure 9: A passalid beetle (Coleoptera, Passalidae) is shown on the left. Both adults and larvae are found in rotting wood, feeding on larvae of other insects. On the right is *Thyreopterus* sp.nov., a wood dependent carabid beetle that has not been described (endemic to Udzungwa Mts).

2.3.2 Conservation issues in the UMNP

The preceding section raises the issue of conservation of the UMNP. It is clear that the three human activities affect the biological diversity of the area negatively. In addition to

the removal of dead wood, grass and medicinal plants there is also a problem of habitat alteration. Human beings tend to create tracks and footpaths, a process that changes the micro-environment by increasing openness of the forest, thus increasing the amount of sunlight reaching the forest floor. Affected also are other parameters such as temperature and humidity. Soil erosion is increased by soil compaction, removal of vegetation cover and obstacles such as dead wood, which contributes further to habitat alteration. The combined effect is to allow invasive plant species to grow in the area in question, which in turn leads to the displacement of native animal species by new ones from surrounding areas. In the final analysis, local species become extinct. Although there is no evidence that local species extinction has already taken place there is clear indication that the process has already commenced, as indicated by the initial increase of diversity at moderately disturbed sites followed by a fall in diversity at highly disturbed sites, in line with predictions of the intermediate disturbance hypothesis. In addition, although butterflies were not collected quantitatively, it was clear that the disturbed sites had fewer species of these insects compared to primary forest. There is a need, therefore to take urgent steps to reverse the trend, and to carry out long term monitoring to assess progress in the recovery of the ecosystem.

The legal aspect of permitting people to enter the UMNP since it was gazetted (see Section 4.9.2 of the present report) has served to fuel the problem of poaching in the UMNP. The said problem of poaching has been exacerbated in several ways. Firstly, on days when people are allowed into the park, it is difficult to police against poachers because they blend into the general population. Secondly, the poachers use the opportunity to conduct legal activities in order to carry out scouting for subsequent illegal activities. The familiarity with the geography of the park makes the job of the poacher easier and the work of the people protecting the park much harder. Stopping the three allowed activities of collecting dead wood, gathering grass and gathering medical plants would have an added benefit, therefore, of reducing illegal activities in addition to conserving the environment. Although the policy of TANAPA is to balance conservation with the need to meet local needs, conservation is their primary function. However, TANAPA should play part in helping the local communities to find alternative sources of forest products, or other solutions for their problems, including the primary problem of energy sources.

2.3.3 Long term monitoring

Should the permitted human activities be curtailed or stopped, there would be a pressing need to monitor the recovery of the ecosystem. The first reason for monitoring the recovery is that forest regeneration takes a considerable length of time. Since there is little knowledge of the extent of the habitat destruction, there is need to monitor the speed of recovery. The monitoring would have an added advantage of providing evidence to justify the measures instituted in a case where monitoring indicates that stopping human activities have resulted into positive trends in the biodiversity of the protected areas. Secondly, in addition to the legal (allowed) activities by the surrounding communities, there are other threats to the biodiversity of the park. These other threats include natural and anthropogenic disasters such as forest fires and landslides, both of which are

common in the UMNP. Other threats include poaching, unrestrained tourist activities, and sometimes even activities of scientific researchers, all of which, if not properly planned and monitored, can result in habitat alteration. It is thus imperative that a monitoring programme specifically tailored to monitor the impact of dead wood collection, cutting of thatching grass and collection of medicinal plants should be put in place. The programme can use a simple protocol similar to the one used in the present study, with some modifications.

SECTION 3
SOCIAL- ECONOMIC STUDY

3.1 INTRODUCTION

This section identifies and explains the social economic impact of the three allowed human activities, namely the collection of dead wood, the gathering of grass for thatching and collecting medicinal plants in the Udzungwa Mountains National Park (hereinafter called "UMNP") and their relationship to the integrity of the park. The study assesses earlier initiatives by Tanzania National Parks Authority (hereinafter called "TANAPA"), World Wildlife Fund Tanzania Programme Office (hereinafter called "WWF") and other stakeholders in environmental conservation and their outcomes. Lastly, based on the findings of the study, the consequences of stopping human activities in the UMNP are outlined.

The UMNP is facing a number of critical problems. Among the problems is a high influx of people who have migrated into the areas for both agricultural and commercial purposes. This influx has resulted in a daily increase in the number of people depending on the same resources. The survey has revealed a high consumption of dead wood and its negative impact on forests and the environment as a whole with not enough attention being paid to the resulting problems and the necessity for mechanisms to control and balance the equilibrium.

Different human activities in areas surrounding and within the UMNP threaten the conservation of resources. These human activities inside and outside the park threaten important ecological corridor and animal habitats. While demand for land for cultivation is increasing, the resulting deforestation in the areas sharing the park's ecosystem is alarming.

According to the analysis, suddenly restricting people from entering the park would have adverse effects for the people and the park itself. Some of the possible negative impacts of restricting people from entering the park are a decline of income from tourists and paying visitors, destabilizing household budget by denying people their source of income, an energy crisis from a lack of fuel wood, a lack of traditional health services, destruction of the local environment, hostile relationship with the Park management and accelerated poaching.

The report recommends a gradual process of revitalizing the initiatives commenced by WWF and TANAPA in controlling the use of fuel wood, encouraging tree planting, promoting the use of improved firewood stoves and other biomass, and encouraging community involvement and education in the protection of wildlife and other resources by using stern by laws and gender consideration in resources management.

The population located in the study area is comprised of several ethnic groups, which are both indigenous and non-indigenous. The indigenous people are mainly the Wapogoro, the Wandendwe, and the Wandambwa. However, the current trend is that migrants with

relatively more economic power are outnumbering the indigenous people, who are relatively poor. The population consists of a mixture of Christian and Islamic religions as well as traditionalist cultures.

3.2 METHODOLOGY

The study was conducted from May to October 2005. The main purpose of the study was to identify the extent of use of resources in the different seasons of the year.

The methodology of the study considered both qualitative and quantitative approaches as per the Terms of Reference. The methods used in collecting the data for this study are structured questionnaires, in-depth interviews, focused group discussions (hereinafter called "FGD"), observations and documentation. The study area was a narrow strip of populated villages along the north-eastern border of the UMNP, from Mkamba to Kiberege. This area has limited land, high population and life sustaining activities that depend on the resources from the UMNP.

Since the community in the study area is not homogeneous, purposeful and random sampling procedures were adopted in order to include groups of people with different economic status, power in decision-making, educational backgrounds, attitudes, perceptions, experiences and other social attributes. Through this method, samples of 4 district officers, 6 Ward Executive Officers, 8 Village Executive Officers, 148 households, 8 primary schools, 20 individuals in a local brew business and brick making and 7 key informants were obtained.

The same procedures were applied to obtain samples from 8 focus groups. The said 8 focus groups included two (2) groups of people who collect and use medicines and other traditional practices in the park, two (2) groups of people involve in local brewing and brick making, two (2) groups of women and youth economic groups and two (2) groups of ordinary household members, key opinion leaders and other people who are involved in the exploitation and use of resources from UMNP.

At household level, the 148 households which were sampled came from a total of 22061 households, i.e., 0.67% of all households. The majority of the selected households had an average of 4- 6 members comprised of a husband, a wife and children, some households had grand children or a single mother and children. In some cases, grand parents were left to take care of grandchildren in cases where parents were away in urban areas.

3.2.1 Data Collection Methods

3.2.1.1 Structured questionnaires

148 structured questionnaires were administered to the households, 6 wards, 8 village leaders, 8 primary schools and Kilombero Sugar Company. The questionnaires sought information on household size, income generating activities, household expenditure, housing, source and expenditure on energy, type of stove used, land use etc. **(Table 4).**

3.2.1.2 Focused Group Discussions (FGDs)

Data collection through FGDs was used on household members, key opinion leaders and other beneficiaries of the resources from the UMNP. Focused discussions were conducted with 8 groups. (See the sample) In conducting the FGDs, groups were arranged differently based on socio-economic activities, age and location (nearby and far from the UMNP).

3.2.1.3 Informal Discussions

Formal discussions were conducted with wards and village officials from all the 6 wards and 20 villages. Informal discussions were conducted with the UMNP officers. This further involved other key informants in the study area such as district officials, village and wards leaders, representatives of Kilombero Sugar Company, religious leaders, traditional healers and extension workers.

3.2.1.4 Observation

Observation on economic activities, social and cultural issues, energy use and availability, collection of dead wood and other related activities, infrastructure and social provisions were done through transect walks and ad hoc questions.

3.2.1.5 Stakeholders workshop

A one-day normal stakeholders' workshop was conducted to harmonize and moderate findings from FGDs, discussions and observed phenomena in the whole area. At ward levels, the workshop included Ward Executive Officers, Extension Officers, Village Executive Officers and Village chairperson. At the village levels, the workshop included representatives from UMNP and the Forest division.

3.2.1.6 Review of documented information

Review of relevant literature was conducted in the WWF Tanzania Office, the UMNP, the District Council and other relevant sources elsewhere. The review provided detailed information on the historical background, population and demographic characteristics, social services provision like status and performance, the education sector, health and medical services. The review revealed various projects, commitments and initiatives by TANAPA, WWF, community and other development agencies in the area. Also reviewed was data related to Park management and conservation (policy and planning) and data related to the involvement of the community in resources protection.

3.2.2 Data analysis

The data analysis employed both qualitative and quantitative methods. The questionnaires were coded and analyzed by using a Statistical Package for Social Science (SPSS) from which percentages, cross tabulations, graphs and charts were developed. Other collected information was analyzed by using qualitative methods

3.3 RESULTS AND DISCUSSION

3.3.1 QUANTITY OF DEAD WOOD AND MEDICINAL PLANTS COLLECTED

As is the case in other rural areas, dead wood is the number one source of energy in the study area (Figure 10). Our estimate shows that dead wood accounts for more than 73 percent of cooking and heating energy requirements for domestic and commercial purposes. Charcoal use accounts for 20 percent of the energy requirements in the surveyed households.

Table 3: Main source of cooking and heating energy in selected households

Type of energy	Number of households	Percentages (%)
Fuel-wood	108	73
Charcoal	29	20
Kerosene	8	5
Electricity	0	0
Others; eg sawdust	3	2
Total	148	100

Source Field Data 2005

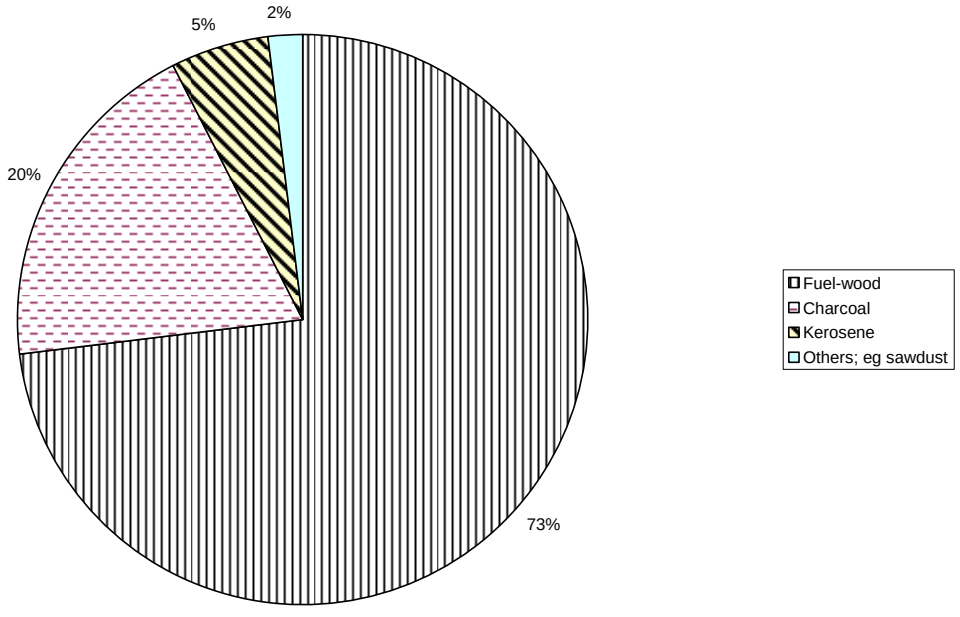

Figure 10: Main source of cooking and heating energy in selected households expressed as a percentage

Combined together, dead wood and charcoal (wood products) contribute more than 90 percent of energy requirements in the surveyed households in the whole area. UMNP provides the bulk of used dead wood (Table 3). This includes dead wood obtained from vendors.

Plate 4: A villager with a bundle of dead wood from the UMNP

While the wood products account for more than 90 percent of the energy requirement within the households, UMNP is the main sources of the wood, accounting for **66** percent of the total (Table 4). Only 6 percent of the dead wood is bought from vendors, but many of the vendors also collect the dead wood from UMNP**.**

The increased consumption of dead wood and its consequences on forests and the environment of UMNP have been attributed to population growth and socio-economic hardships. This section assesses the effects of dead wood collection as a major source of energy and level of supply from UMNP by estimating the amount of dead wood use and the requirements within each household. This estimate should be taken as indicative only and not an absolute volume, due to the absence of data on per capita dead wood

consumption, the irregularity of dead wood sticks/twigs in terms of linear and circular measures, the varieties of trees and twigs used in cooking etc.

An empirical method was used in calculating the volume of dead wood. Firstly, the length and circumference of sticks and twigs were obtained using a tape measure. Secondly, the diameters of the sticks and average of length were calculated. The volume was calculated using the following formula**:**

$$V = \frac{\pi d^2 l - k}{4}$$

where V = Volume of dead wood stick
d = diameter of dead wood stick
l = length of stick
k = stick irregularity factor
= $\frac{1/5\,\pi d^2 l}{4}$

During interviews with households, 4 dead wood sticks in each bundle obtained in the households were randomly picked and measured. The measured sticks were grouped into 5 groups according to their circumferences. Thus, the average of diameters, lengths and volumes were as follow.

Group 1. d = cm 13. 89, l = cm 43.66, volume m^3 0.0053
2. d = cm 11 l = cm 28.35, volume m^3 0.0022
3. d = cm 11.87, l = cm 37.2 , volume m^3 0. 0329
4. d = cm 7, l = cm 200, volume m^3 0.0062
5. d = cm 10.71, l = cm 310, volume m^3 0.0022.

The average volume of a stick is m^3 = 0.0096 then; the average volume of a bundle, which is 20 sticks, is m^3 0.192.

The majority of households spend one bundle of sticks for domestic use (i.e. cooking and heating), therefore making the average volume of dead wood per capita m^3 0.192 ÷ Average household size = m^3 0.192 ÷ 6.6 = 0.029 m^3 per week.

The annual consumption of dead wood per household is 0.192 m^3 x 52 weeks =9. 984m^3. The analysis revealed that almost 75 per cent of the households get dead wood from UMNP, which means that more than 1643,782 m^3 of deadwood is collected annually from the Park. (Kiberege ward is excluded because they don't get dead wood from UMNP).

With the current low rate of tree planting, the rate of utilization of firewood is higher than the replacement of trees. If the situation is not regulated, over-dependence and over-exploitation of dead wood from the UMNP will cause increasing destruction of the biodiversity of the area.

3.3.2 POPULATION TRENDS

Population movement can be tracked throughout the different seasons. Fertile areas of Kilombero Valleys attract a high influx of people into the areas for agricultural purposes. Besides agriculture, booming trade opportunities are also attracting a high number of economic immigrants. Anecdotal evidence reveals that more than 70,000 people are living in the eastern part of the reserve between Kidatu and Kiberege.

Seasonal movement of people to the UMNP is high during planting and harvest seasons. People living outside the area in places such as Dar es Salaam, Morogoro and other rural areas have acquired large farming lands in the UMNP area. Movements of people are high during the beginning of farming season (January to March). The number of people coming into the area doubles during the harvest season. During this time, a number of businessmen from urban areas entering the UMNR to buy paddy and rice is quite high.

It is also noted that lately, there has been a lot of movement of pastoralists coming into the area from Lake and Central regions of Mwanza, Shinyanga and Tabora with large heards of cattle. This is considered to be a serious problem due to a shortage of grazing land, the spread of animal diseases and increased pressure on resources.

A rapidly increasing population from both natural means and from migration into the area surrounding the park has a direct correlation with the exploitation of resources from the UMNP. The presence of UMNP, TAZARA railway station, sawmills, Mang'ula Mechanical Industry, Kilombero Sugar Company and primary schools have attracted a substantial number of employees from other areas. A large number of people has migrated into the area, and is engaged in formal employment in small and relatively big business and in agriculture. The boom in sugar cane cultivation has encouraged expansion of local owned plantations and small sugar cane farms. Areas where trees were previously planted have been cleared for farming. Sugar cane cultivated areas expanded from 3,482 acres in 2000 to 11,826 acres in 2005. Indigenous people around the park are selling their land to migrants and are becoming poor and landless with limited resources to support their lives. Discussions with focus groups noted that migrants own the majority of small and big investments in the areas.

The number of people depending on the same resources has been increasing daily. Increased poaching, trespassing, illegal lumbering, animal trapping and other illegal human activities are some of the results of the high pressure on resources from as ever increasing population and prevalent poverty. While emigration to the UMNP area is high, rural to urban migration has also affected this area as a good number of the strong youth have moved to Morogoro, Dar es Salaam and other urban areas in search of better fortunes.

3.3.3 DOMESTIC VERSUS COMMERCIAL USE OF DEAD WOOD AND MEDICINAL PLANTS

3.3.3.1 Firewood

Dead wood was a major source of energy used for domestic purposes such as cooking and heating by more than 95 percent of the population. Besides domestic use, dead wood is consumed in local brew making and brick making. It is estimated that more than 70 percent of dead wood used for domestic and local brewing purposes is from the UMNP.

A significant number of the youth and women earn part of their income by collecting dead wood mainly from the UMNP and other sources and selling the said wood at a price of between TSh. 500/= and 1000/= per bundle.

Table 4: Source of fuel-wood in the selected households

Source of dead wood	Number of households	Percentage (%)
UMNP	98	66.2
Own farm/forest	22	14.9
Planted trees around the house	12	8.1
Buy from vendors	9	6.1
Others	7	4.7
Total	148	100

Source: Field Data 2005

3.3.3.2 Dead wood for local brewing

The common local brew found in the area is known as “Kangara” or “Tekawima” which is made from maize and other cereals. Deadwood consumption in the making of other illegal local brew like “Gongo” is virtually unknown as the brew making is highly secretive.

Brewing of kangara demands a large quantity of fuel wood. Estimates for fuel wood consumption in local brew making follow the same formula as in estimated consumption of fuel wood for household use. Estimates show that one production of local brew (mkorogo), which is about 170 liters, requires 2 bundles of dead wood (0.384) whereas one bundle of 20 sticks has a volume of 0.192 m^3. In an estimate of 15 productions of brew per week per village, which amounts to 5.76 m3 of dead wood, it is estimated that 14 villages which depend on the dead wood from the UMNP consume about 80.64 m3 per week. The area uses 322.48 m3 of dead wood for local brew making in one month and 1935.36 m3 for the whole post harvest season, which is popular for local brew making.

Table 5: Source of fuel wood among the brewers (in percentage)

Source	Percentages (%)
UMNP	79
Own farm/forest	2
Planted trees around the house	1
Buy from vendors	7
Others	1
Total	100

Source Field Data 2005

Our estimates show that the current consumption of dead wood for local brewing is 5.76 m^3 for one round of brewing (mkorogo). This is equivalent to ten (10) trees with 35 cm diameters and length of six meters. According to collected data, about 80 percent of the dead wood used in brewing is obtained directly from the UMNP **(**Table 5). This massive demand of energy implies that over exploitation of dead wood may be taking place, resulting in the possible cutting of living trees (poaching).

The rough estimates show that a household with an average of 4 to 6 members uses 10 m^3 of dead wood annually for domestic purposes. Thus, 14 villages with 22061 households will need 477,511 trees of medium size with 40 cm circumference and height of 6 meters in one year. In other words, each household would use 22 trees of the same volume annually.

3.3.3.3 Brick burning

Brick burning uses dead wood, rice husk and saw dusts. However, there is a belief that bricks which are burnt using dead and fresh wood are harder than those burnt with rice husks and saw dust. Therefore, bricks burnt with wood are sold at a higher price. As a result, brick dealers prefer to use wood to burn bricks rather than husks.

3.3.4 QUANITIES OF DEADWOOD USED, TIME SPENT AND GENDER IN COLLECTION OF DEAD WOOD

3.3.4.1 Energy requirements, use, type and sources

Fuel wood is the main source of energy and it accounts for approximately 95 percent of all energy requirements. Over 98 percent of the total population depends on fuelwood mainly for domestic use. Other notable sources of energy are charcoal, electricity, husk and sawdust, kerosene, diesel and other petroleum based fuels (Table 6). Diesel and other petroleum based fuels are more commonly used in industries and in the transportation sector. The use of electricity for domestic purposes is substantially low, mostly for lighting purposes.

Table 6: Energy requirement and type of function among households

ACTIVITY	TYPE OF ENERGY AND PERCENTAGE							Total
	Dead wood	Charcoal	Kerosene	Electricity	Gas	Solar	Sunrays	
Cooking and heating	78.5	13	5.5	3.0	0	0	0	100
Local Brewing	100	0	0	0	0	0	0	100
Lighting	1	0	93	6	0	0	0	100
Drying crops	0	0	0	0	0	0	100	100
Others	10	82	0	8	0	0	0	100

Source: Field data 2005**.**

Charcoal is the second main source of energy used for cooking and heating. Charcoal is used more in the mixed (urban and rural) areas of Kidatu and Mang'ula along the trunk road than it is used in the rural areas. Only 18 percent of the households (particularly those with regular salaries) used charcoal. Due to it being expensive, charcoal is used more in restaurants and food vending businesses than it is used for domestic purposes. One bag of charcoal costs about TSh 3400/= in the market and when sold in small units it costs TSh 100/= and 200/=. While demand for charcoal is increasing, species preferred for charcoal making have already been exhausted in other areas. The only species remaining are in the reserve areas. Environmental effects of charcoal making and negative implications on the plant and animal biodiversity are significant.

Kerosene is extensively used for lighting and, on rare occasions, for heating and boiling. Almost all villagers use kerosene for lighting in both domestic and in commercial transactions. The average consumption of kerosene per household ranges between TSh 30,000 and TSh 40,000 annually, which is expensive when compared to average household incomes. The cost is even high for households which use kerosene for heating or boiling.

Very few people use electricity. The eastern part o UMNP and the Kilombero Company premises are relatively well supplied with electricity. In some areas, power lines are within people's vicinity but most of the people have not installed electricity due to the high initial cost of installation and the unavoidable bureaucracy. Electricity is also used in small and medium sized industries, workshops and offices in the area. The price of electricity is also high and has been rising frequently.

Diesel, petrol and other petroleum-based fuel are normally used in the industrial and in transportation. The price of diesel has also been augmenting.

The use of alternative forms of energy highlights the extent of energy the crisis as well as the social economic conditions of the communities in the area. Use of biomass based fuels such as sawdust and rice husks go hand in hand with the rising cost or shortage of other sources. Rice husks are used more in brick burning than they are used in domestic

cooking. The reason for this is the belief that the use of husks in cooking causes chest pain and Tuberculosis (TB).

Annual household expenditures range between TSh. 200,000/= and TSh. 1,900,000/= per household. In estimating the household annual income and expenditures in detail, 75 percent of the interviewed households have an income of approximately 70,000 a month (see detailed breakdown in Table 7). Energy accounts for only 9% of the average household expenditure (Figure 11). This is an underestimation of the true value of used energy since most of the energy used is in the form of dead wood which is obtained from UMNP and not quantified in terms of its monetary value. However, in estimating the actual value of fuel wood in monetary terms, it is evident that one household uses between TSh 52,000/= and 100,000/= for fuel-wood annually at an estimate of one to two bundles of fuel wood per week.

Table 7: Annual expenditure on basic needs in selected households in (TSh) in 2004/5

Item	Food	Personal care and others	Health	Energy	Total
Expenditure	40,187,870	11,856,000	3,710,000	5,703,460	61,457,330

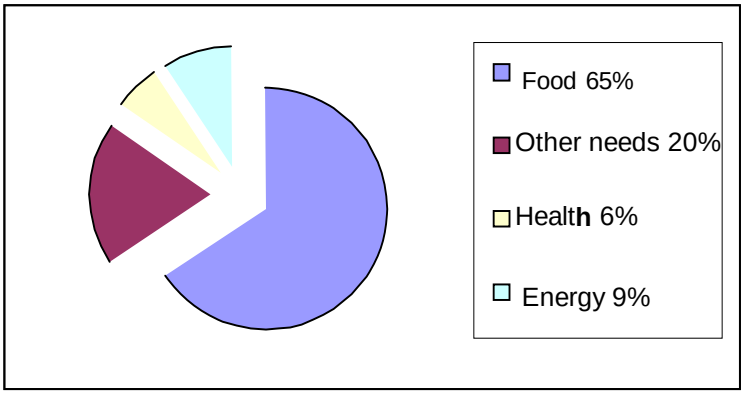

Figure 11: Annual expenditure on basic needs in selected households in 2004/5 (expressed as percentage of the total)

3.3.4.2 Gender specific issues

Gender relationships were analyzed to determine the importance of both men and women in the present socio-economic set-up and activities in the area. This would help to design appropriate approaches that can increase the impact of intervention intended for environment protection and social economical development.

With respect to access to and utilization of production resources, the study observed that both genders are involved in petty trade. However, the selling of fuel wood has remained an activity which is carried out by more men and fewer women

Land is the major resource in which gender issues are important in relation to resources ownership and use. As noted earlier, women carry the heaviest share of the burden in economic and reproductive activities in rural households. Moreover, women implement these activities in difficult conditions. For example, in energy and dead wood collection, women are more responsible than men.

Gender dimension in decision-making and participation in community development activities was another focal point. As is the case with most villages in Tanzania, planning and decision-making on most of the development activities is effected through the village council. In recent years, the villagers, both men and women, have participated in politics, planning and implementation of several community development activities on self-help.

Although men and women are equally represented in the village decision-making bodies' men influence the making of the majority of decisions that affect the family and the household in general. On environmental issues, while women are busy with domestic chores, men have a chance to attend different sensitization and knowledge-dissemination meetings. Men own most of the family's resources, including land and trees. Decisions on land use, tree planting and harvesting are mainly made by men. Women are the ones who utilize firewood for domestic purposes such as cooking and are thus hard hit by energy crises. The women, although affected by the energy crisis, are not involved in finding solutions for energy related issues.

For purposes of environmental protection, the activities should focus on and be practiced by all members of the household equally. While men mostly effect decision on tree planting and construction at home, women and children are managers of most of the decisions and projects that are carried out at the household.

3.3.4.3 Time spent in collecting dead wood and medicinal plants

Women are more directly involved in energy and dead wood collection. Out of 148 households interviewed, 115 (78%) of the households showed that wood collection is done by women compared to 33(22%) households where it was done by men. However, the number of men engaged in wood collection is said to be rising. This is explained by the rising business in dead wood. Interviewed households revealed that about 70 percent of men collect fuel wood in the UMNP for business purposes, and only 30 percent collect dead wood for household domestic use.

According to those interviewed, firewood was previously obtainable from close proximity. The increasing demand and mode of collection have depleted the dead wood at nearby sites. As the demand and consumption increases the distance covered and time taken in firewood collection increase daily (Table 8). The majority of people, especially women, take an average of seven hours to complete dead wood collection trips.

This includes three to four hours used to walk to the sites and back, plus 3 hours used for actual collection of the dead wood.

Table 8: Gender and time taken in collection of fuel-wood in UMNP

Hours	**Sex**		**Total number and percentage of respondents**
	Male	**Female**	
<2	4	9	13 (9%)
3	6	21	27 (18%)
4	8	23	31 (21%)
5	5	19	24 (16%)
6	4	17	21 (14%)
7	3	16	19 (13%)
More than 8	3	10	13 (9%)
Total	33(22%)	115(78%)	148 (100%)

Source Field Data 2005

3.3.5 POSITIVE AND NEGATIVE EFFECTS OF DEAD WOOD COLLECTION

3.3.5.1 Positive impacts

3.3.5.1.1 Social economic and cultural importance

The UMNP area has health, cultural and religious importance to the local people and the entire population of the country. For many years, people in the eastern side of Udzungwa Mountains have been using sacred areas in UMNP for religious and other faith-based purposes. They believe that their god, called “Bokela”, to whom they sacrifice in time of diseases, famine and drought, is in the UMNP area. They also believe that gods are pleased that the areas are protected from human activities.

In the Western side of the UMNP, the Mwanaluvele cave that is found near the former village of Mbatwa is an important historical and sacred site. The cave is believed to be a refuge during famine and tribe wars and could accommodate more than 200 people during calamities. The place has salt deposit, which it is believed has medicinal value.

Mwanihana Peak and Nyumbanitu are also known to have high cultural values. The areas are believed to be the homestead of traditional gods. As such, the same are used for offering sacrifices to the traditional gods in times of joy, in times of difficulties and during different ceremonies. The specific areas inhabited by the gods are respected and unexploited due to the fear of repercussions from annoying the said gods.

3.3.5.1.2 Collection of medicinal plants

The UMNP has over 160 medical plant species, which are known and are used for traditional and other sacred purposes. The parts of the plants that are used include the roots, the barks, the leaves, and the seeds/fruits. Similarly, while some species of plants are used for worshiping and other faith related purposes, other species are the hosts/

home of the gods and are thus regarded as sacred and respected. Much of the population from the area and outside depends on the park for traditional health care for known and unknown health problems and for other faith related problems.

It is estimated that more than 100 traditional practitioners ranging from medicine sellers, divine tellers, faith healers and others visit the UMNP for collection of medicines and other related activities. The traditional practitioners are of two types: residents of the area and non-residents. Some of these traditional practitioners practice from all over the country and depend on the park for a supply of medicinal materials. Some resident traditional healers have practicing licenses and permission to practice traditional health care from the cultural department of the council and are registered within their village councils.

Practitioners wishing to collect medicines from the UMNP are required to obtain permission from the UMNP. The process starts with obtaining special clearance from their respective villages and wards and then proceeds to the Reserve Administration. Permission lasts for three months and individuals are required to re-apply after the expiry date. Collection of medicine is done at the individual's time during the daytime. According to the Reserve Administration, one healer may collect about 5 kg of medicinal plants per one visit, and they can visit twice per term (a term being 3 months). The residents usually don't collect medicinal plants in large quantities because the collection area is nearby and accessible. For non-residents and those with clinics in areas which are far from UMNP, collection is done in larger quantities to minimize traveling costs and time spent. The resident traditional healers believe that it is this group of non-resident traditional healers that overexploit and damage medicinal plant species.

Basing on those estimates, more than one ton of medicinal plants is collected from the UMNP annually. In some cases, extraction of medicinal plants is destructive to the plant. The damage prevents regeneration and leads to the death of the plants. Since there is no replacement, it is likely that some of the plant species may become locally extinct.

3.3.5.1.3 Economic gain medicinal and cultural values

Although traditional healers regard themselves as service providers, the services are mainly provided for economic gain. Among the traditional healers, there are traditional birth attendants (hereinafter called "TBAs") who are officially recognized by the District Council. TBAs attend to most of the community's maternal and children's well being. Recognizing their role in the community, TBAs have undergone different formal training courses under the District Councils and other Non Governmental Organisations, which deal with community health such as the Axios and Plan. Other TBA traditional attendants are trained on important health issues such as HIV/AIDS. However, not one of them could estimate or reveal the amount of income they receive from the activity.

According to the TBAs, genuine and seriously true practitioners inherit the work from their ancestors, parents or close relatives. Others are directed by super natural powers through dreams, through being sick or through miraculous ways for purposes of serving the community. In that case, a genuine and true practitioner does not move from his/her

original ancestral area. They remain in their respective areas and have no specific charges for the services. However, a person pays for the TBA services according to what she/she has, is willing to pay or can afford to pay after healing. They believe that there is a group of opportunists, mainly young men, pretending to be traditional healers, coning people and charging high prices for their services.

Traditional healers believe that the gazetting of the UMNP has protected medicinal species and the sacred areas. While they face no problems in obtaining permits, it is difficult for them to domesticate some of the plant species. Some medicines need to be obtained secretly to preserve the secrecy of their profession. Other plants are said to be identified through dreams while some plants are said to be protected by the gods and cannot be transplanted.

Some traditional healers are rich and living lavish lifestyles, punctuated by expensive four-wheel drive cars. They also believe that they play an important role as watchdogs and informants to the UMNP for the poaching and other illegal activities within the reserved area.

3.3.5.1.4 Thatching grass and raffia

One of the main objectives of this study was to assess exploitation by the local people of thatching grass from the UMNP. Collected information revealed that, at present, the effects of cutting grass for thatching or other construction purposes from the Reserve is not significantly conspicuous. The study noted that the need for grass for thatching has declined significantly due to a number of factors. One of the factors is the increased construction of modern houses roofed by more modern roofing materials like iron sheets, roofing tiles and other exotic roofing materials. From mere observation, very few houses are built by or thatched by grass. Cutting of grass is also hampered by the bureaucratic procedures in obtaining permission from the UMNP. For the few houses that are thatched by grass, in particularly, toilet facilities, people look for alternative place to obtain grass, such as in their personal fields.

3.3.5.1.5 Other direct benefits

More benefits in terms of services have been greatly enjoyed by the people and villages living adjacent to the UMNP headquarters. There have been a number of projects at the UMNP which have funded development activities. These range from the rehabilitation of schools, improvement of health, development of infrastructure, roads, improved water provisions and many others. By the end of the 2004/05 financial year, UMNP had spent about TSh. 290,532,361.00 (98.7%) of its income in development projects and activities (solely sponsored or implemented by the UMNP or jointly carried with the communities) in the districts of Kilombero Kilosa and Kilolo (Appendix II).

Furthermore, the communities have also gained free tree seedlings from tree nurseries established by the UMNP in 1991. Until the year 2000, about 1,129,000 tree seedlings were distributed to the wards and villages surrounding the UMNP (Table 25).

3.3.5.2 Negative impacts

3.3.5.2.1 Agriculture

Different human activities in areas surrounding and within the UMNP threaten the conservation of resources. Human activities further threaten important ecological corridor and animal habitats. While demand for land for cultivation is increasing, deforestation in the areas around the park is alarming.

Agriculture is a major economic activity of the people in the UMNP area. About 80 percent of the residents are engaged in agricultural activities. Even for the households with other sources of income such as small businesses and salaried income, agriculture has remained a major activity, especially the farming of sugar cane and paddy. Animal husbandry is also being practiced by some households, which supplement the households' income.

Privatization and expansion of Kilombero Sugar Company (ILLOVO) has greatly encouraged sugar cane farming. In the two districts of Kilombero and Kilosa, sugar cane growing has expanded from 3482.0 acres in 2000 to 11,826 acres in 2004. The harvested tonnage increased from 133,743 tonnes in 2000 to 588,051 tonnes in 2004. Sugar cane farming has been the most profitable of the crops farmed over suitable land. Trees planted ten years ago have either been cleared or converted into sugar cane plantations by the local people (Table 9).

Table 9: Estimated sugar cane cultivation in Kilosa and Kilombero Districts from 2000/04

Year	Cultivated area (acres)	Harvests (tons)
2000	3,482.0	133,743
2001	3,951.0	192,980
2002	5,865.2	258,785
2003	7,886.0	429,632
2004	11,826.0	588,051
Total	33,010.2	1,603,191

Source; Field data/ILLOVO 2005.

Sugar cane farming has affected food production and tree planting in the UMNP area. The expansion of sugar cane farming and other crops have reduced number of trees tree planted areas.

3.3.5.2.2 Dead wood collection

The increased demand for dead wood for use as fuel is intensifying exploitation of the resources and increasing human activities within the the UMNP area. As noted, more than 85 percent of the people living around the UMNP depend on dead wood from the

Park. The implication of other sources of energy becoming expensive is more negative to the Park and its diversity. Dead wood collection within the UMNP and overexploitation of wood resources has a direct effect on biodiversity on the local community, on the park's environment and on tourism within the UMNP.

3.3.5.2.3 Poaching

Like other conservation authorities in Tanzania and others countries in Africa, illegally obtaining and utilizing resources in the protected areas "poaching" is a main challenge for the UMNP. The problem is escalating due to the rapid population increase and the high level of poverty among the communities living adjacent to protected areas.

The main poaching activities in the UMNP are timber lumbering, followed by firewood collection, illegal entry, cannabis cultivating, animal hunting (using guns, snares/traps, poisoning) mainly for subsistence and small scale commercial purposes, charcoal burning and mining. Lumbering, which is recorded as the highest poaching activity, is done mostly in the catchment forests (Plate 5).

Plate 5: Lumbering is recorded as the highest poaching activity in the catchments forests

Figure 12 below shows the incidence of poaching offences during a period of ten years. The offence which is more commonly committed is timber lumbering (48%). The main reasons for this are:

- Timber is in high demand for building and furniture making
- Proximity of the park with the neighboring communities as well as the absence of buffer zones especially on the eastern side, and
- The presence of major roads makes it easy to transport timber to nearby towns.

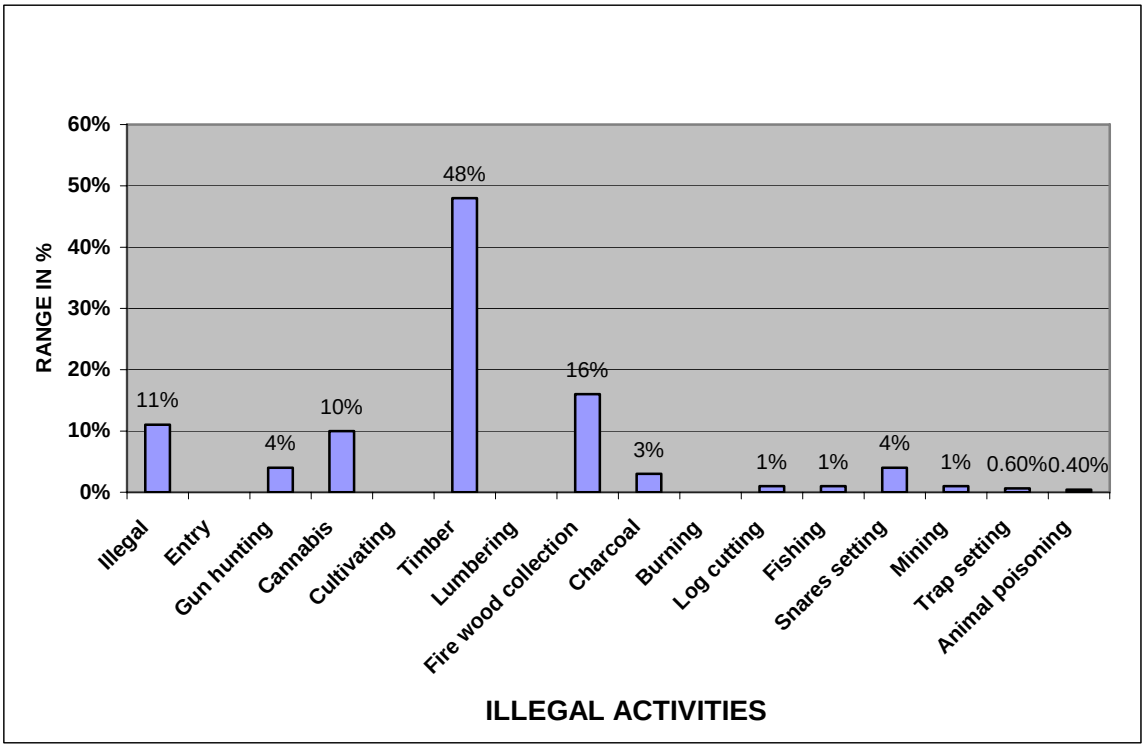

Figure 12. Number of poaching offences committed for ten years (from 1995/96 - 2004/05)

Table 10: Seasonal distribution of the poachers arrested from 1999-2005

MONTHS	YEAR AND NUMBER OF ARRESTED INDIVIDUALS						TOTAL
	99/00	00/01	01/02	02/03	03/04	04/05	
JULY	30	2	2	12	0	10	46
AUGUST	4	3	12	5	6	14	44
SEPTEMBER	16	5	2	7	8	1	39
OCTOBER	6	7	27	9	0	12	61

NOVEMBER	1	2	5	4	1	6	19
DECEMBER	0	0	4	10	22	6	32
JANUARY	6	1	2	7	3	4	23
FEBRUARY	2	4	8	5	14	27	60
MARCH	4	14	17	15	10	9	59
APRIL	2	10	12	5	9	7	45
MAY	9	4	1	14	2	14	44
JUNE	3	8	14	3	5	14	48
Total	83	60	104	76	80	124	520

Source; Field data/UMNP 2005

Most people were arrested between the months of January to March and April to June (Table 10). The reasons for the arrests being that during October to December, most of the villagers have enough food after harvesting their crops, unlike the period from January to June which is cultivating season and people have food shortage, thus increasing the rate of poaching.

An analysis of the days with more poaching activities indicate that Mondays (17%), Wednesdays (16%) and Saturdays (16%) are the days of the week when most poachers are arrested. This is due to the fact that people are allowed to collect firewood on Fridays and Sundays, and they use the time to set snares and traps, and to scout for areas to carry out their poaching on the following days. As a result, most poachers are caught on Mondays and Saturdays when they go to observe their snares and traps set on previous days.

3.3.5.2.4 Prevalence of bush fire

Anecdotal evidence suggests that the prevalence of uncontrolled bush or wild fires is relatively low in the UMNP compared to other areas of Morogoro region. However, the extent of fire is always extensive and destructive. The problem of fire in the UMNP is acute in the northern and western parts of the park. Available information shows that incidences of fire have decreased in the area since its gazzetting. Sources show that from 2000 to 2005, there have been more than seven bush or wild fires (Plate 6).

Plate 6: Forest fires burning inside the UMNP. Usually they occur most frequently during the dry season.

Bush fires are associated with illegal human activities in the reserved areas. Local people believe that major causes of such fires are timber lumbering at night, animal hunting, clearance of cultivating land which is close to the reserve, honey harvesting, TANESCO clearing areas around the transmitting poles, and natural forces such as thunderstorms, and crashing of rolling stones.

They also believe that some of their local hunting communities like Wavidunda are more likely to cause fires because they are not integrated enough into the resources conservation programmes.

The actual cost and loss resulting from wild fires are not well assessed or documented. Such fires devastate forest flora and fauna in the park and destabilize the ecosystem and tourism system. The last fire which erupted in Msolwa in early October, 2005. It is estimated that the fire destroyed more than 500 hectares of the reserved area.

3.3.5.2.5 Disturbances to tourists and littering

Further assessments of the impact of human activities in the UMNP noted that tourists are reluctant, uncomfortable or scared when they meet people in the midst of the reserve. Furthermore, some dead wood collectors carry plastic bags, plastic water containers and sisal fabric ropes which are eventually left in the reserve to litter the environment. Sometimes, dead wood collectors visit the UMNP with the intention to poach. Setting

snares, honey gathering, timber lumbering and other poaching activities disturb animal ecology and are sometimes the source of wildfires.

Evidence shows that allowed activities inside the UMNP have adverse implications to the biodiversity of the UMNP area. Habitat destruction and alteration as a result of collection of firewood, medicinal plants, poaching, setting of wildfires, and disturbing the wildlife have negative impact on animal diversity at the most commonly used areas. This may, in the long run, lead to ecological problems and local species extinction.

3.3.6 EFFECTS OF PROHIBITING PEOPLE FROM ACCESSING PARK RESOURCES

3.3.6.1 Economic effects

3.3.6.1.1 Decline of income

Micro and small-scale enterprises (hereinafter called "SMEs") are important sources of income within the entire area as they employ a substantial number of young men and women. Some of these SMEs, for example, small restaurants, petty trades, local brewing, fuel wood selling and medicines are directly linked with the exploitation of resources in the UMNP. Since survival of the local people and their means of income depends on the UMNP, many people will be negatively affected if they are stopped from entering the park.

Besides the sale of fuel wood, raw materials that are used in small-scale carpentry workshops in producing furniture, doors and windows come from UMNP. Most of the timbers used by the carpenters are mainly obtained within the villages or illegally obtained from UMNP (although not publicly disclosed).

Local brewing is a popular source of income especially for women. It is estimated that 20 percent of all households in the UMNP area depend on local brew making and selling for their livelihood. It is estimated that in one village, for example, individuals who are involved in local brew earn about TSh. 382,500 per week. Thus, it is estimated that in all 19 villages in the study area, about TSh. 7,267,500 is realized from local brew per week.

Brick making is one of the income generating activities in the area. Bricks are made from clay soils and hardened by hot temperature. The price of bricks differs according to the source of the fire which is used to make the bricks. Generally, one brick costs about TSh. 35/= whereas bricks treated by fire wood cost TSh. 5-20. This price is different from that of bricks which are treated by fire made from saw dust and husks.

Closing of the Park would affect the collection of medicinal plants and other related activities. More than 100 medicine practitioners who depend on the UMNP as the source of their medicines will lose their undisclosed income.

3.3.6.1.2 Destabilising household budget

The demand of dead wood for energy has escalated at an alarming rate. According to respondents, the price was previously lower when firewood was collected from a short distance within the UMNP. Scarcity has turned dead wood into a commodity. Some of the youth and women are earning income by collecting wood from UMNP and selling it at a cost of Tsh. 1000 per bundle. If the UMNP is closed, costs of fuel wood and other energy sources would stretch household budget by diverting other resources and expenditures into energy. Rising costs means more economic burden, which households would not be able to afford.

3.3.6.2 Social effects

3.3.6.2.1 Energy crisis

The sudden closure of the UMNP would bring an immediate energy crisis to the community. People are worried about the increasing distance which they have to travel in order to obtain fuel-wood and medicinal plants**.** It is possible for people to have food but still die of starvation due to a lack of cooking energy. Currently, energy for cooking and heating is already in short supply and it is expensive.

3.3.6.2.2 Lack of health services

As an alternative to modern medical service, people reported an increased preference for of traditional health care. This health care system is opted as an alternative due to a shortage of health services, a lack of money for other health care services and cultural belief caused by lack of knowledge on health. Traditional healers attend to a variety of sicknesses in both infants and adults from simple fever, minor operations to complicated social psychological matters. Traditional health care is very useful and caters for the different needs of a large section of the village population. Most of the medicines and rituals are done within the park areas. Closing the park would deny people medicines and important health care rituals.

3.3.6.2.3 Destruction of the local environment

A majority (95%) of the people in the area depend on the fuel-wood for cooking and heating purposes. More than 80 percent of the fuel wood comes from the UMNP. If the access to UMNP is imediately stopped the only altenative to fuel wood would be within the people's souroundings. Since the demand is high, then the likelihood of overexploitation and destroying present young trees or any available trees are considerably high.

3.3.6.3 Cultural effects

Restricting cultural rituals and ceremonies, which play a vital part in people's social economic life, would have a negative impact to the local people and their relationship with UMNP. The area has both a cultural and religious importance to the people. The UMNP is regarded as sacred for religious and other faith-based purposes. Religious sacrifices and offerings in times of diseases, famine and drought are conducted in the UMNP area.

3.3.6.4 Effects on management of the park

The relationship between UMNP and the local people is mostly cemented by the services that they get from the Park. A major basis of the cemented relationship is the availability of fuel-wood. While it is of vital importance to preserve the Park it is also significant to note that current relationships with the park's management will not be sustained when people will be stopped from entering the UMNP areas. These restrictions will inevitably lead to negative attitude of local people towards UMNP and the nature resources turning to hostility.

Some people believe that stopping or banishing the local people from entering the UMNP for dead wood collection will encourage poaching and related illegal activities because the people will be forced to enter into the reserve illegally. The people believe that immediately stopping access to UMNP will lead into legal problems as quoted as follows "*Wakifunga huo msitu wapanue na magereza*" which means that "if they decide to ban dead wood collection in the reserve, then they should also expand the prisons".

3.3.7 VIEWS OF COMMUNITY MEMBERS ON CONSERVATION AND ASSISTANCE NEEDED

3.3.7.1 Community involvement in protection of wildlife and other resources

To ensure maximum security for the wildlife, the local people have been trained in scouting and other methods of wildlife protection.

Community conservation seeks to protect the integrity of national parks by reducing conflicts between the wildlife and surrounding communities by improving relations with those communities and by helping to solve problems of mutual concerns so that they become part of the conservation efforts.

The joints efforts have shown positive results by arresting a number of poachers, reducing fire incidences and increasing awareness on the roles of the community in protecting their resources.

Ranger posts constructed outside the park facilitate communications between the community and the park staff, especially rangers. People now seem to be sensitized with conservation knowledge through the outreach programme and hence they are willing to report on poachers and poaching events to the park rangers/staff leading to the arrests of the poachers and the confiscation of trophies and weapons. Most of the arrests (66%) are through information gathering from intelligence and from the communities.

Table 11: Types of patrols and number of poachers arrested from 1995/96 – 2004/05

1. Joint Patrols With Village Game Scouts	398 (51%)
2. Park Rangers Only	315 (41%)
3. Community Arrest	60 (8%)
TOTAL	**773 (100%)**

Source Field data/UMNP 2005

The majority of the poachers arrested (51%) were arrested through joint patrols with village game scouts and other law enforcement units as explained in Table 11. This is possible due to the fact that most of the suspects and criminals live among the communities and are well known by community members. Therefore, communities living adjacent to conservation areas can support law enforcement agencies through campaigns and giving out intelligence information, or by their own village game scouting assisting in the protection of resources by doing patrols.

Table 12: Source of information on poachers arrested

OPERATION TYPE	**No. of arrestees**
Normal patrols	262 (34%)
Information gathering (Intelligence)	511 (66%)
TOTAL	**773 (100%)**

Source: Field data/UMNP 2005

Table 12 above indicates that the highest number of poachers arrested (66%) were arrested through information gathering (intelligence). Arresting through information gathering makes the patrols become more effective and less time-consuming as compared to arrests conducted through normal patrols (34%). The effective patrols, equipment and good cooperation with conservation organizations, stakeholders and neighbouring communities are the secret behind the achieved success.

However, incidences of poaching and wild fires still persist. Moreover, littering and disturbance to tourists are also noted. According to the local communities, the reasons for continued poaching, wild fires, littering and disturbance to tourists include poverty, poor education on conservation issues, a growing mistrust between the park management and segments of local communities, and the free and easy access to the park (especially during dead wood collecting days). The following solutions to the above problems are recommended:

- Communities should be educated more on the importance of participation and involvement in protection of natural resources and the importance of the UMNP to the entire area and to the country as a whole.

- Councils, villages and wards should play a leading role in educating the community. UMNP should be involved as a stakeholder or a partner in environmental programmes led by the Councils.

- UMNP should investigate on the allegations and rumours that some of their workers are sabotaging the park by allowing or having a direct involvement in poaching.

- The issue of accessing the UMNP for different reasons should be revisited. Visits to the UMNP have a negative impact on the existence of the UMNP and its natural resources.

3.3.7.2 The need to reassess the mode of development assistance to the area

Since 1991, the communities around UMNP have enjoyed direct benefits from the UMNP through various projects under partnership bases and other services. The benefits range from projects such as the construction of primary and secondary schools, health centers, fishponds, roads, bridges, water pipes to income generating activities and others**.** By the end of the 2004/05 financial year, UMNP had spent approximately TSh. 290,532,361.00 in development projects and activities (solely sponsored or implemented by the UMNP or jointly carried out with the communities) in the districts of Kilombero, Kilosa and Kilolo (Annex 6.3**).**

The development efforts were mostly directed towards infrastructure and long-term social- economic investments and services in the areas such as schools, roads, health care and water provision. Kilolo and Kilombero councils have benefited most from the UMNP support. In the segregation of direct assistances from the UMNP into selected sectors, large portions went into education which received approximately Tshs 68,272,315.00(23%) and rehabilitation of roads to which Tshs 135,000,000 or 46% was allocated. Water provision, health, IGA and others shared the remaining 31% of the allocated funds.

Tsh. 3.8 million (1.3% of the total assistance) went into IGAs. Of these, Tshs. 1,200,000 was used for constructing Sanje Women Curio Shop in 2001/2, Tshs 1,959,886 for constructing a tea room and toilets for the Kisawasawa Women Group in 1993/4 and TSh. 710,000 for constructing the Kisawasawa Primary School fish pond in 2004/5.

Assessing the impact of the assistance given to the communities and its effect on natural resources, protection has not been easy since most of the funds are only indirectly linked to natural resources (for example, infrastructure assistance). The assistance is a long term investment. However, accessibility to the social services has improved the availability of such services. Rehabilitated roads, bridges and pathways are now passable, thus improved accessibility to the markets. In the education sector, there has been a remarkable increase in the number of classrooms, teachers' houses, laboratories and other schooling facilities. The learning, teaching and general environment of schools have impacted positively and, as a result, the enrolment and performance of pupils have increased. The provision of health and related services such as water have also been considered to have positive contribution to the livelihoods of local people.

The impact of the assistance to resources protection and community participation towards environmental conservation, though positive, cannot be felt immediately. The impact that may be directly associated with the improvement in natural resources conservation is the improved relationship between the UMNP and surrounding communities. However, the problem is that the respect and relationship could be based on a mixture of fear and appreciation for the assistance that the community receives from the UMNP. Presently, UMNP has taken a lead in direct involvement and funding of developmental activities. This kind of relationship has grown into a one way traffic development approach. This being the case, it is important for the three parts in the equation, i.e. the Councils, UMNP and the communities to review the assistance strategies and their present relationship.

3.3.7.3 The need to revitalise previous initiatives by WWF and TANAPA

In recognition of the potential and mutual roles and benefits which exist between the UMNP and the local people, the TANAPA initiated and encouraged a relationship through community conservation. Community conservation seeks to protect the integrity of national parks by reducing conflicts between the wildlife and surrounding communities by improving relations with those communities and by helping to solve problems of mutual concerns so that they become part of the conservation efforts. Through community development programmes, the TANAPA and WWF, in collaborating with the community, has donated materials, cash, skills and other incentives for the ensured success of the initiatives **(Annex II).** One of the initiated conservation and development project was a tree-planting project in 1991.

3.3.7.3.1 Tree planting

The tree-planting project, apart from being an investment on tree resources, was aimed at piloting and assisting people in environmental conservation and the establishment of alternative fuel-wood sources. By the year 2000, the project had distributed more than 1,120,000 tree seedlings.

Positive results of the project are significantly visible in some institutions within the area of study. Primary schools have tried to utilize the meagre pieces of land that they posses by planting different species of trees and shrubs (Table 13 and 14). Besides schools, Kilombero Sugar Company has shown positive development in tree planting. On the other hand, villages have reluctantly supported the tree-planting project. Very few trees have been planted for the whole ten year period.

Table 13: Trees planting in the schools and area covered (in acres and percentage)

School	Built area	Playing grounds	Tree planted area	Others	Total
NYANDEO	1.8 (60%)	0.6 (20%)	0.6 (20%)	-	3.0 (100%)
JUHUDI	1.7 (85%)	0	0.3 (15%)	-	2.0 (100%)
MKAMBA	1.5 (50%)	0.5 (33%)	1.0 (33%)	-	3.0 (100%)
MKULA	8.0 (32%)	1.5 (6%)	6.0 (24%)	9.5 (38%)	25 (100%)
MSOLWA UJAMAA	3.0 (15%)	3.0 (15%)	6.0 (30%)	-	12 (100%)
MLIMANI	2.16 (16%)	1.08 (8%)	7.29 (54%)	2.97 (22%)	13.5 (100%)
ICHONDE	1.5 (40%)	1.5 (40%)	0.75 (20%)		3.75 (100%)
KISAWASAWA	3.0 (60%)	1.0 (20%)	1.0 (20%)		5.0 (100%)

Source: Field Data, 2005.

Table 14: Type and number of trees planted by schools

School	Year started tree planting	Year started tree nursery	Fruits trees	Other trees	Total number of trees
NYANDEO	1980	1995	84	431	515
JUHUDI	*1987*	*None*	21	85	106
MKAMBA	1971	1999	25	175	200
MKULA	*1973*	*1993*	906	1139	2045
MSOLWA UJAMAA	1992	1992	40	260	300
MLIMANI	1998	2001	84	24,416	25,000
ICHONDE	1995	1998	43	1180	1223
KISAWASAWA	1998	2001	960	720	1680

Source: Field Data, 2005.

Along with the expansion of cultivating land, Kilombero Sugar Company has tree-planting programmes within the company and in the adjacent areas. The company has a tree nursery, which produces more than 200,000 seedlings per year. It is estimated that the company plants more than 50,000 trees each year, and in the period of 5 years, has planted more than 234,180 trees in the company's vicinity (Table 15)**.**

The availability of locally produced electricity and good income has reduced fuel wood consumption among the company's workers. The company's workers use 30 percent fuel wood, 20 percent charcoal and 50 percent electricity for cooking and heating. The company uses its own electricity which is produced from its industrial processes (thermal

electricity from burning of sugarcane remains). The factories use 60 percent of this electricity and the workers use 60 percent of the remaining 40 percent.

Table 15: Number of trees planted by The Kilombero Sugar Company 2000-2004

S/n	Year	Number of trees planted
1	**2000**	**30,500**
2	**2001**	**8,220**
3	**2002**	**10,309**
4	**2003**	**113,443**
5	**2004**	**71,711**
	Total	**234,183**

Source: Field data and ILOVO 2005

Pressure on tree planting was high in early 1990 which was the beginning of the tree planting campaign. The tree-planting project was initially enthusiastically received. However, even in the initial phase of the project, the number of planted trees was lower than the seedlings which were distributed by the project.

As time went on, tree nurseries did not receive proper attention. Some nurseries were handed over to schools while others were privatized. Currently, only three villages have tree nurseries which are managed privately, and the seedlings are sold at a high price. According to owners of the nurseries, the villagers do not buy tree seedlings and their main customers come from Morogoro and Dar es Salaam. Reports show good statistics of the planted trees in the wards during tree planting and environment days but in actual fact, most planted trees were not cared for and were left to die. The initial efforts did not fare well due to the following reasons: -

- People, especially at household level, were not educated enough on the importance of tree planting in the light of the future energy crisis.

- People did not take it as a serious issue since the forest (UMNP) still exists and they are allowed to get dead wood twice a week from it.

- The male-dominated land ownership means that women do not own land and cannot make decisions concerning land use. Ironically, more men attend tree-planting campaigns and seminars than women, yet they are reluctant to provide a piece of their land for wood lots.

- Some peoples suffer acute shortage of land while others hire out their plots to others for cultivation. When tree seedlings were distributed, some of these people put theirs at the corner of the yard to dry up.

- Many villages have no plans for proper land use. Some of the areas which were planted with trees are in conflict between individuals, social groups and other interested parties over land use.

- The increase of sugar cane and paddy growing is incompatible with the growth of trees. Many areas have been cleared to allow for sugar cane cultivation.

- Both people and leaders were not committed to make follow up on the project implementation.

- The mechanisms used to ensure that planted trees receive proper attention were not there. There was no monitoring of the distribution of seedlings, no follow up to ensure trees are planted and no care for the trees.

- Tree planting was taken for granted by trusting people and voluntarism. There were no by laws to enforce, monitor tree planting or care for the trees.

Community involvement in tree planting focused on resources protection and sustainable use by raising the level of conservation awareness, promoting alternative resources, and reducing over dependence on the resources in the UMNP. Since the project is important and designated for alternative source of fuel wood and environmental protection, following up should be done to revive the tree planting project in the wards.

- Councils should allocate funds, technical and materials support for tree planting in the wards and villages surrounding the UMNP.

- Councils in all surrounding districts should enact by laws to enforce tree planting and care from the district down to the village and household levels.

- Under the by laws, villages and hamlets should be forced to have wood lots and tree nurseries with proper supervision and management by Environmental Conservation Committees (hereinafter called “ECCs”) from district down to wards levels. The ECCs should have legal power to monitor tree planting and use within the respected areas. The ECCs should be answerable to high level ECCs and government administration.

- The by laws should direct every household to plant a certain number of trees in their area as should be targeted in the projected plans. Failure to accomplish the target should be subjected to punitive measures.

- For the villages with no land use planning, the responsible councils should create resources to carry out the planning. The UMNP can see how to assist according to its resources allocation and budget. Within the planning, wards and villages should allocate lands for trees planting.

- District councils should revive tree planting competition and awards within and between wards, schools, villages and households.

- Councils, districts administration and leaders should be held to show their commitment and responsibilities in trees planting

- People should be educated more on tree planting, the by laws and restrictions on the use of UMNP resources.

- Councils, wards, villages and individuals should be encouraged to search for partners, sponsorship and other assistance from interested parties in tree planting and environment conservation.

3.3.7.3.2 Improved firewood stoves and other biomass

Various measures were taken to promote sustainable energy use in an efforts to reduce the amount of dead wood used for cooking and heating. More than 70 percent of the population was taught on how to and was assisted in making low fuel-wood consuming stoves (Plate 7). According to households, improved firewood stoves have managed to reduce fuel wood consumption and improve cooking conditions.

Three-quarters of the respondents reported that reduced fuel wood consumption with an ability to accommodate more cooking pots depend on the design. The use of these stoves has led to a reduction in the number of trips and amount of dead wood collected from the UMNP. However, designing and construction of the stoves was not sustainable and in many households they did not last.

Initiatives in searching for alternative energy sources also concentrated on biomass and organic energy. Use of rice husks and sawdust in homes and in brick burning has been given an upper hand.

Plate 7: An improved stove in operation in the study area

Although the technology is cheap and uses locally available materials, since the project ended the knowledge on and the use of the stoves declined. Some of the noted reasons for the partial failure of the stoves project are:-

- Like the tree-planting programme, improved stoves did not get enough attention and mechanism for monitoring and ensuring the adoption of the technology was not there.

- The project lacked political and pioneer back-ups from the leaders and the whole responsibility was left to UMNP and WWF. Majority took it as an imposition from the UMNP. They did not feel any obligation, ownership or responsibility in adopting the technology.

- Use of early adapters to foster the innovation process at the onset of the project was not given enough consideration.

- Even after the technology had been introduced, communities still enjoyed easy access to the UMNP for wood collection. Adoption of a new technology was not given much weight.

- In many households, stoves were not constructed in well-built and permanent kitchen buildings. Instead, most of the kitchen buildings were of poor quality, temporary and unplanned. Some stoves were built outdoors.

- Men were not well involved and the issue of fuel wood and kitchen building remained the responsibility of women.

While people agree on the usefulness of the new stoves, the adoption and the use of the technology have not been widespread. To save the initial purpose of the stoves, that is, to reduce fuel wood consumption and environment conservation, the following must be done:

- The use of low consumption fuel wood cooking stoves must be revived.

- In reviving the project, a leading role must be taken by the councils and their administration at all levels, and the people must be involved. The UMNP should be involved as a stakeholder but it should not be given the leading responsibility.

- Under the environmental by-laws, the use of low fuel wood consuming stoves should be emphasized. The by-laws should provide for the construction and use of improved stoves for those household using fuel wood. Leaders and ECCs should encourage and oversee the use of the stoves by showing practical examples in their own households.

- The ECCs should have legal power to monitor the construction of stoves and use within the respected areas.

- The by-laws should direct every household to build and use low fuel wood consuming stoves. Failure to do that should be subjected to punitive measures.

- Councils should sponsor the expansion of technology in making and using low cost, locally available alternative cooking energy sources, materials such as grass, solar and other bio mass from local institution like Tanzania.

- It is of vital importance that any education and knowledge on the use of energy, fuel wood and resource conservation incorporates all household members to facilitate decision making and household resources use.

SECTION 4
CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

Ecological studies have produced concrete evidence that the three allowed activities inside the UMNP have adverse effects to the biodiversity of the area. Habitat destruction and alteration associated with the collection of firewood, medicinal plants and cutting of grass for thatching have resulted in the fall of animal diversity at the most intensely used areas. This may, in the long run, lead to local species extinction. Given that the study area harbours many unique, rare, and endemic species, or species with special needs (e.g. forest-dependent species), it is imperative that an alternative source of energy and other resources should be found so that neighbouring communities would stop activities inside the UMNP.

The majority of the population from the area, which comprises the two divisions of Kidatu and Mang'ula, still depend on the fuel wood for cooking and heating at large. Furthermore, even after the ten years of a tree planting programme agreement, the degree of dependence on dead wood from the UMNP is still high. Per capita fuel-wood consumption appears to be rising instead of declining as planned. Low income, poor knowledge and a shortage of land for tree planting affect the use of alternative sources of domestic energy.

While the population is growing fast, the need for agricultural land is increasing. With the increased population, there is escalating pressure on the fuel-wood and charcoal consumption. The economic viability of firewood related business is adding pressure to the exploitation of the resources. The estimated calculations show that the amount of trees planted in the period of ten years is low compared to the growing demands while other energy sources are limited.

Current wood energy resource conservation and regeneration falls far short of efforts needed to replenish the annual loss of trees, let alone the need to increase woodlands and the demands such as construction poles, timbers and others.

The efforts to reduce mounted pressure on wood resources in the UMNP by planting trees, introducing low fuel-wood consumption cooking stoves and use of other bio mass have not gained enough acceptance. The progammes have encountered problems such as a lack of enough land, land ownership systems, lack of proper seedlings and lack of enough political and administrative support. Initial efforts of tree planting and introduction of low dead wood consumption stoves were well planned and with good intentions but the supportive network needed to ensure continuity and sustainability was not well arranged.

Pressure on dead wood collection is complicated by the existing poverty. The low income of the villagers and the high cost of energy affect household accessibility to alternative

sources of energy. While the initial cost of installation and the daily use of electricity is unaffordable. Charcoal and kerosene are also beyond reach. Other means of energy such as biogas are unknown and unavailable within the areas.

People are aware of the current verbal agreement on the access and utilization of dead wood from the UMNP but they lack seriousness in tree planting and maintaining low dead wood consumption stoves. Other villages do not have small tree nurseries while some individuals have never planted a single tree. The supportive network for encouraging, assisting and monitoring proper and reduced fuel wood uses and tree planting is not functioning properly. This lack of seriousness is attributed to the poor political, administrative or legal support and enforcement by the responsible leaders in the implementation and monitoring of planned activities. Proximity and free and easy access to the UMNP have also been explained as one of the reasons for peoples' lack of seriousness.

Entering the UMNP for wood and medicinal plants collection is turning out to be more of a "right" phenomenon than just a "privilege". Thus, people and the administration are inactive in planting or taking care of trees even in the little available spaces that they have because they know that they will go to UMNP on Fridays and Sundays for collection.

The report concluded that efforts and initiatives mainly from the UMNP to alleviate environmental problems specifically within the Park and in the areas were proper and timely. Promoting social services, assisting in income generating activities, introducing alternative forms of cooking energy uses and involving people in conservation were important and required. However, the efforts are not well linked between the people, the UMNP, the district councils and other stakeholders in environment management. Roles, responsibilities and obligations of different players are not clearly stipulated. Currently, the issue has been left to the UMNP under the umbrella of WWF and TANAPA with little help from other stakeholders. Furthermore, the initiatives were based on just "human trust" and lacked back up mechanisms to enforce the implementation.

4.2 RECOMMENDATIONS

The report recommends the following to be considered or included in the policy formulating process. The recommendations are based on the already and ongoing initiatives. The main point is that the ongoing plans and initiatives are proper and useful but they lack back up enforcement and the actors are disjointed.

The main recommendation is that the three allowed activities inside the UMNP should be phased out as soon as possible in order to arrest and, hopefully, reverse the negative trend in the habitat and biodiversity of the area. The phase out should be carried out in phases and procedures agreed to between the UMNP, the Districts Councils and the people.

Due to the high dependency of the local communities on dead wood from the Park and other services, this phase out should be carried out over a period of at least three years and be accompanied by several measures. The first phase should include reduction of the

number of the days allowed for dead wood collection from the present two days to one day per week. The second phase may include introducing special permits by which, as is the current practice in collection of medicinal plants, a person wishing to visit the UMNP for wood collection would be required to applying first. The next phase may introduce the payment of a token amount of money for visiting the UMNP regardless of activities unless it is for special cases. This would discourage unnecessary visits to the UMNP and hence a gradual termination of human activities within the Park.

TANAPA, UMNP authorities, local communities and the Districts Councils surrounding the park should clearly outline roles, obligations and rights of each of the parties involved in protecting the UMNP. This should entail signing a legally binding memorandum of understanding to replace the current verbal agreement.

The memorandum should be enforced by the by-laws enacted by the district councils surrounding the UMNP. The by laws should be able to enforce planning, implementation, protection and responsibilities for the programmes related to natural resources use and the UMNP from the district level down to the villages, the households and individuals.

Income-generating activities should be encouraged and supported. These would reduce the communities' over dependence on natural resources. Increased income would also facilitate or enhance access to, and the use of alternative sources of energy for cooking and heating. District councils should assist the people in reviving cooperatives that help them in securing better markets for their agricultural products, minimize crop loss, encourage saving and developing entrepreneur skills.

Traditional knowledge about resource management and conservation should be revived and modern knowledge disseminated. That should be assisted with a proper supportive network and mechanisms between the local communities and the Park.

In order to avoid land use conflicts and promote proper land use, the Districts Councils, Kilombero in particular, should set aside funds to assist villages in formulating their land use plans, for those villages without such plans. Well-planned land use ensures proper land use and avoids conflicts between interested groups such as pastoralists and farmers and enables tree planting in appropriate spaces.

There should be collaboration with local communities and traditional practitioners who obtain medicine from the Park so as to ensure sustainable and proper collection of medicine. Such collaboration will ensure respect, maintenance and protection of cultural and historical sites.

Research into the use and acceptance of alternative energy sources should be commissioned. Biogas, solar, wind regime and electricity would have been ideal sources but they are expensive to install and maintain. The district councils should take the leading roles while TANAPA and UMNP play a facilitating role in conducting strategic energy planning in order to identify possible energy sources that is affordable to all people, such as grass and reeds. Sources like grass and reeds could be used to alleviate

pressure on the Park's wood-based resources, which is now experienced on matters regarding fuel-wood for cooking, brew making and brick making.

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6.0 ANNEXES

6.1 TERMS OF REFERENCE

TERMS OF REFERENCE FOR THE ASSESSMENT OF ECOLOGICAL AND SOCIAL IMPACTS CAUSED BY THREE ALLOWED HUMAN ACTIVITIES (COLLECTION OF DEAD WOOD, CUTTING GRASS FOR THATCHING, AND COLLECTION OF MEDICINAL PLANTS) IN UDZUNGWA MOUNTAINS NATIONAL PARK (UMNP).

1.0 Background information

Udzungwa Mountains National Park (UMNP) is located in south central Tanzania, lying within the Kilombero district in Morogoro region and Kilolo district in Iringa region. UMNP forms part of the great Selous ecosystem that encompasses some of Tanzania's most important grassland, woodland and forest with wildlife species found nowhere else in the world.

UMNP covers an area of 1990sq.km. The park together with the surrounding areas represent one of the parts of the Eastern Arc mountains range which has dense rainforest cover remaining from low to high altitude (approximately 250-2500m.a.s.l). It also provides one of the essential catchment areas for major rivers of southern Tanzania, including those which serve as important sources of hydroelectricity to the nation.

Although the Udzungwa Mountains rainforests were originally designated as forest reserves, unsuitable extraction of animals and plants by surrounding human populations posed a threat to their integrity, especially their rich biodiversity and important watershed value. The government of Tanzania recognized this threat and, in 1992, upgraded the status of Udzungwa forests to that of National Park.

National Park designation denies local people the right to exploit any resources in the park and that there are always costs associated with this prohibition. However before UMNP gazetting, verbal agreement was made between Tanzania National Parks (TANAPA) and Kilombero District Council where people adjacent to the park from Mkamba to Kiberege villages are allowed to access the park to collect dead wood twice a week on Friday and Sunday, and are given special permits to collect medicinal plants, thatching grass and for worshiping purposes. This arrangement was based on the following scenarios: first, communities have been living with the resource base over a long time and have been using and protecting it through various traditional organizations and institutional management systems. Secondly, local people are no longer seen as adversaries but partners in conservation and management of natural resources.

The Kilombero valley has fertile soils that have high potential for agriculture. This has attracted many people to migrate into this area for cultivation. With this rapid increase in population in the Kilombero valley, the pressure on land and other natural resources also has increased, including dead wood demand from UMNP.

Over the last 14 years, WWF and TANAPA have been working with communities to support them with alternative sources of energy through planting trees, use o frice husks in backing bricks and energy saving stoves, but the population increase continues to exert mounting pressure on the resources.

In view of this and since the magnitude of the problem has not been scientifically analyzed, there is a need to undertake a study that will assess the ecological impacts brought by dead wood collection in UMNP, so as to come up with information that will provide data for conservation and management of the park as well as to influence policy review.

2.0 Overall objective

The overall objective of the proposed study is to identify the impacts of the three allowed human activities (collection of dead wood, cutting of grass for thatching, and collection of medicinal plants) on the overall integrity of the park, on the biodiversity of the UMNP, and the social consequences of stopping this informal agreement.

3.0 Specific objectives

A study should be focused that essentially will compare similar plots from which firewood and other materials are collected with plots from which they are not collected. Specifically the study intend to:

a. Assess the quantities of dead wood collected over a specific time. The aim here is to determine if the rate of extraction is increasing or decreasing over time (seasonally/annually).
b. Assess the quantities of medicinal plants collected over a specific time period. Aim is to determine if the rate of extraction is increasing or decreasing over time (seasonally/annually).
c. Assess the changes in population and distribution patterns of life forms that depend on dead woods, such as vertebrates- small mammals, rodents, invertebrates –specifically any insect group and plants. Assess the levels of ecosystem disturbance resulting from the extraction of dead wood and medicinal plants.
d. Identify which segments of the communities are sourcing dead wood and medicinal plants.
e. Assess the time spent by dead wood collectors (opportunity cost).
f. Assess if dead wood collection is used for economic gains (economic opportunity).
g. Assess the impact of dead wood collection on tourists, both positive and negative.
h. Assess the trends/impacts of human presence/activities on the conservation status/integrity of the park e.g. setting of forest fires, illegal felling of trees.

i. Assess effects/impact of denying access to communities for the collection of dead wood/medicinal plants on the lives of the populations. What are the alternative sources/implications?
j. Integrate the findings from ecological impacts and socio-economic impacts studies and come up with conclusions as to whether dead wood collection is sustainable or not within the UMNP.
k. Produce a comprehensive report that provides recommendations, based on findings, of how the dead wood/medicinal plant access issue should be managed by UMNP.
l. Prepare a draft policy paper that will help to advice TANAPA and the Ministry of Natural Resources and Tourism on policy review.

4.0 Scope of the study

The ecological impact assessment will take place inside the UMNP adjacent the villages involved in the collection of dead wood while socio-economic impact assessment will cover some villages along the eastern side of the UMNP from Mkamba to Kiberege, and park areas adjacent to these villages. The social and ecological parts of the study will take place concurrently but it is envisages that the socio-economic component will have a fairly shorter period. The study will take place during rainy (March/April) and the dry season (August 2005).

Input from the neighbouring communities, TANAPA authorities and the ecologists will be used to draw up a policy proposal for the action to be takes. The team member from the TANAPA Planning Unit will be involved in all matters concerning policy and National Park regulations and laws.

5.0 METHODOLOGY

Both scientific and social analysis tools should be employed depending on the aspects assessed. Basically, the study involves setting up plots in the park and consultations with neighbouring communities, TANAPA authorities and the park ecologists both to generate the necessary primary and secondary data and also facilitate sysnthesis and drawing up final report and policy brief for informed decision making based on the lessons learned and future park's management. While carrying out this study, the consultants are also advised to search some baseline information from previous studies that were conducted in Udzungwa by different researchers.

5.1 ECOLOGICAL ASPECTS

The aim is to assess the impact of dead wood collection and other allowed human activities on the species diversity and abundance of invertebrates of UMNP as key species indicator. Nine transects will be selected to include the following:
(i) Areas with the lowest level of disturbance (three transects)
(ii) Areas with intermediate levels of disturbance (three transects)
(iii) Areas with the maximum level of disturbance (three transects)

Each transect will be 80 by 250 m, starting at the edge of the forest. Along each transect the following will be conducted:

5.1.1 Dung beetles

Dung-burying beetles (Scarabaeoidea) will be used as indicators of the overall health (or otherwise) of the Ecosystem. They will be sampled using pitfall traps baited with cow-dung. At each transect 20 pitfall traps will be set at distance 0m, 40m, 100m and 250m from the forest edge (the assumption the deeper you move into the park the less disturbance there will be). There will be five pitfall traps at each distance, and the distance between traps will be 40m. The traps will be made of one-litre plastic cups (two per trap, one inside the other). Traps will be set in the morning and emptied after 24 hours. They will be half-filled with water and a few drops of detergent added to break the surface tension. Fresh cow dung will be tied into a piece of light clothing material and placed at the top of the pitfall trap to act as bait. Collected dung beetles will be pinned in the field onto cardboard discs which will then be dried up and stacked in plastic buckets ready for transportation to Dar es Salaam, where identification will be carried out.

5.1.2 Butterflies

The abundance and diversity of Butterflies (Order Lepidoptera) will be used to assess the impact of human activities on the vegetation of the UMNP. (Butterflies are totally dependence on more or less specific plant species for their survival at larval stage. Any change in plant composition and abundance should, therefore, be reflected in a corresponding change in the diversity and abundance of Butterflies).
Butterfly nets will be used to catch butterflies at each transect. A banana trap will also be operated at each site. The collected butterflies will be killed, preserved in envelopes, and transported to Dar es Salaam for identification and data analysis.

5.1.3 Wood-dependent Invertebrates

The direct impact of the removal of dead wood from the forest will be assessed through studying the abundance and diversity of wood-dependent (xylophylous) Invertebrates at the three levels of disturbance. Collection methods will involve searching under logs, under barks of dead wood, and inside rotting wood. Collected specimens will be immediately transferred into specimen bottles containing a mixture of ethanol, ethyl acetate and white vinegar (90:5:5 parts). This solution acts both as a killing agent and a preservative. They will be transported to Dar es Salaam for sorting, identification and statistical analysis.

5.1.4 Statistical analysis

Statistical methods should be used to assess whether or not poor species diversity and abundance correspond to high disturbance due to human activities. The actual statistical test to be used will have to be decided depending on whether or not the data satisfy assumptions of parametric tests. Tests should include Kruskal-Wallis or ANOVA for abundance, Shannon-Wiener index (and special t-test) for diversity, and others.

5.1.5 Collectors

Data collection in the field to be carried out by the UMNP Ecologist with the help of his assistants and three field helpers. The ecologist from the University of dare s Salaam should supervise selection of study sites and initial setting of transects and traps. Sorting, identification of specimens and data analysis should take place at the University of Dar es Salaam, Department of Zoology & Marine Biology.

5.2 SOCIO-ECONOMIC ASPECTS

The methodology to be considered is qualitative and quantitative data collection and analysis whereby structured questionnaires, in-depth interviews, focused group discussion, observation and documentation will be adopted.

5.2.1 Qualitative (participatory) approach

To be achieved through the following:

- Focused group discussion (FGD). Different groups from household members with different socio-economic activities will discuss about collection and use of dead wood at household and village levels, medicinal herbs (plants) and grass for thatching etc.
- Buzz/dialogue. Talking in pairs when one sex feels shy or underprivileged to express their views, feelings, and perception about the subject matter.
- Plenary discussion/workshop. Some members from FGDs (who were vocal than others) will discuss in a one-day workshop. The discussion will harmonize and moderate the findings from FDGs in the whole area.
- In-depth interview: This will consist key informants in the study area i.e. district officials, village government leaders, representatives from agro-industries like ILLOVO and TEAK, religious leaders, traditional healers, politicians, extension workers etc. Each informant will be interviewed separately to give his/her views and experience independently without any interference from outside.
- Observation: Consultants to observe economic activities in the study area and housing etc. Observation will be done through transect walks and ad hoc questions should be posed to get answers clearly.

5.2.2 Quantitative approach

- Structured questionnaires: The household survey will seek information about household size, income generating activities, household expenditure, housing, source of energy, type of stove used etc.
- Documentation: Review of relevant literature will have to be conducted in WWF Tanzania Office, UMNP and other related sources elsewhere.

5.2.3 Methods/techniques

In order to get reliable data for the study, the following the following techniques will be adopted.

- In FDGs separate groups of men and women should discuss separately and then join together for making consensus on the subject matter.
    - During discussions, problem ranking should be done as key to session discussions.

- In-depth interviews with key informants, each informant should be interviewed separately; that each informant should give his/her views, experience, attitude independently without any interference from outside.
- Observation will be done through transect walks and ad hoc questions to be posed to get answers clearly.

5.2.4 Extent of coverage

The proposed area of coverage by the study will be as follows:

- Assess the quantities of dead wood and medicinal plants collected over a specific time
    - The amount (volume) of dead wood used daily, weekly, monthly or annually per household
    - The volume of medicinal plants extracted/used by herbalists in the area.
- Assess the population trend in the area.
    - Examine the periods when the population increases rapidly or gradually.
    - Factors causing influx of people in the area.
- Assess in terms of volume the use of wood and medicinal plants.
    - For domestic and
    - For commercial purposes.
- Assess the time spent as follows:
    - Examine time spent in collecting dead wood and medicinal plants per gender group.
    - Examine division of labour in the area.
- Assess the positive and negative effects of collection of dead wood.
    - Effects on the tourists/tourism.
    - Effects on the biodiversity.
- Assess the effects if people will be prohibited to access the park resources.
    - Social effects.
    - Economic effects.
    - Cultural effects.
    - Management of the park.
- Assess their recommendations, options or survival strategies if they are prevented from using park resources and.
    - What internal and external assistance would they need to survive if they are prohibited to go in the park?

5.2.5 Sampling procedure

Since the communities in the study area are not homogenous the purposeful sampling should be adopted. The rationale of using this method is to get the fair representation of women and men as well as people from different social groups that use the park resources.

Moreover, different people have different economic status, power in decision-making, education background, attitude, perception, experience etc., so the method is very relevant.

Thus the following categories of members will be involved.

(i) Villagers
(ii) Village Chairman (VC)
(iii) Village Conservation Committees
(iv) Village Executive Officers (VEOs)
(v) Ward Executive officers (WEOs)
(vi) Local brewers
(vii) Traditional leaders
(viii) Extension officers
(ix) District officials.

5.2.6 DATA ANALYSIS AND PRESENTATION

Analysis of data should involve frequency analysis, association tests/contingency analysis and content analysis.

The SPSS programme has to be used from which percentage and cross tabulations can be presented. Information from in-depth interviews, FGDs and observations should be summarized and integrated with the information from structured questionnaires thus the presentation will be analytical and descriptive by nature. The results from this social analytical part should be incorporated into the ecology report so as to produce a final report.

5.3 POLICY FRAMEWORK DRAFT

The draft policy paper with input and guidance from TANAPA personnel should be developed concurrently with report production.

5.4 TIME SCHEDULE

March to October 2005.

TEAM COMPOSITION

The team will be composed of 10 people as listed below:

1. Dr. B. Nyundo, Ecologist- Team leader: will be responsible in designing ecology methods, identifying plots/sites, data analysis and report writing.
2. Mr. H. Kissaka, socio-economic consultant: will be responsible in designing socio-economic methods/instruments, data analysis and report writing.
3. Mr. Christopher David Timbuka- Chief Park Warden, will provide TANAPA's input on policy analysis.
4. Mr. Abel Mtui- supervisor of ecology data collection.
5. Mr. Hamisi Ngelima and Mr. Samuel Mtoka- Ecology data collection.
6. Field assistants to ecologist- Assist in ecology data collection.
7. Assistant to sociologist- Supervision and collection of socio-economic data.
8. Field assistant to sociologist- Assist in socio-economic data collection.
9. Park Ranger- Provide security support while doing field work inside the park.

In terms of administration, team will be supervised by Zakiya M. Aloyce, Programme Officer and Amos Mugisha, Ag. Finance and Administration Manager.

6.2 CHECKLISTS

6.2.1 Species of dung beetles collected from the three levels of disturbance during the rainy season, 2005. (DB1, 2 etc. means Dung Beetle species 1, 2 etc.)

Ser. No.	Species	L1	L2	L3	TOTAL	%
1	DB1	138	176	925	1239	27.39
2	*Sisyphus* species 1	147	100	384	631	13.95
3	DB3	131	97	305	533	11.78
4	*Scaptocnemis segregis*	43	60	308	411	9.08
5	DB2	38	89	220	347	7.67
6	DB5	33	68	82	183	4.05
7	DB9	4	139	35	178	3.93
8	*Onthophagus lacustris*	9	83	72	164	3.63
9	*Sisyphus* species 3	22	85	48	155	3.43
10	DB6	45	57	32	134	2.96
11	*Anachalcos procerus*	11	21	93	125	2.76
12	*Sisyphus* species 2	33	26	36	95	2.10
13	DB23	0	0	53	53	1.17
14	DB8	4	16	18	38	0.84
15	*Onthophagus areolatus*	21	3	6	30	0.66
16	*Copris* species	4	10	15	29	0.64
17	DB7	2	17	9	28	0.62
18	DB10	3	23	2	28	0.62
19	*Onthophagus puginatus*	5	1	10	16	0.35
20	*Diastellopalpus thomsoni*	1	1	12	14	0.31
21	*Onthophagus miscellus*	0	13	0	13	0.29
22	DB24	0	8	5	13	0.29
23	DB12	0	7	4	11	0.24
24	*Catharsius* species 2	2	1	5	8	0.18
25	*Onthophagus* species 9	8	0	0	8	0.18
26	*Copris gilleti*	6	0	0	6	0.13
27	*Copris* species 1	2	2	2	6	0.13
28	*Garetta azureus*	0	0	5	5	0.11
29	*Catharsius* species	0	2	2	4	0.09
30	DB11	4	0	0	4	0.09
31	DB17	0	4	0	4	0.09

32	DB19	0	0	3	3	0.07
33	DB20	1	1	0	2	0.04
34	DB21	0	2	0	2	0.04
35	DB22	2	0	0	2	0.04
36	DB15	0	0	1	1	0.02
37	DB25	1	0	0	1	0.02
	Total	**720**	**1112**	**2692**	**4524**	**100.00**
	No. Species	**27**	**28**	**28**	**37**	

6.2.2: Distribution of dung beetle species at various distances from the forest edge

Ser. No.	**Species**	**0m**	**40m**	**100m**	**250m**	**Total**
1	DB1	295	252	257	435	1239
2	*Sisyphus* species 1	176	40	161	254	631
3	DB3	276	91	60	106	533
4	*Scaptocnemis segregis*	309	36	27	39	411
5	DB2	71	81	71	124	347
6	DB5	59	17	32	75	183
7	DB9	26	30	24	98	178
8	*Onthophagus lacustris*	11	54	34	65	164
9	*Sisyphus* species 3	24	8	27	96	155
10	DB6	32	36	32	34	134
11	*Anachalcos procerus*	28	80	10	7	125
12	*Sisyphus* species 2	35	8	13	39	95
13	DB23	53	0	0	0	53
14	DB8	25	2	4	7	38
15	*Onthophagus areolatus*	21	2	0	7	30
16	*Copris* species	4	17	6	2	29
17	DB7	2	10	0	16	28
18	DB10	10	3	1	14	28
19	*Onthophagus puginatus*	12	0	2	2	16
20	*Diastellopalpus thomsoni*	8	3	1	2	14
21	*Onthophagus miscellus*	1	3	4	5	13
22	DB24	0	13	0	0	13
23	DB12	4	6	1	0	11
24	*Catharsius* species 2	3	4	0	1	8
25	*Onthophagus* species 9	8	0	0	0	8
26	*Copris gilleti*	1	0	5	0	6

27	*Copris* species 1	1	2	2	1	6
28	*Garetta azureus*	5	0	0	0	5
29	*Catharsius* species	1	1	1	1	4
30	DB11	2	1	0	1	4
31	DB17	0	4	0	0	4
32	DB19	3	0	0	0	3
33	DB20	0	0	0	2	2
34	DB21	1	1	0	0	2
35	DB22	2	0	0	0	2
36	DB15	1	0	0	0	1
37	DB25	0	0	0	1	1
	Total	1510	805	775	1434	4524
	No. of Species	33	27	22	26	37

6.2.3: A checklist of butterflies collected from the UMNP

Ser. No.	**SPECIES \LEVEL OF DISTURBANCE**	**L1**	**L2**	**L3**	**TOTAL**
	Family Acraeidae				
1	*Acraea asema* Hewiston	2			**2**
2	*Acraea eponina* Cramer	1	2		**3**
3	*Bematistes aganice*Hewiston	1			**1**
	Family Danaidae				
4	*Danaus chrysippus* Linnaeus			1	**1**
	Family Hesperidae				
5	*Spialia*sp.			1	**1**
	Family Lycaenidae				
6	*Anthene hobleyi* Neave	3			**3**
	Family Nymphalidae				
7	*Aterica galene* ssp. *theophanes* Hopffer		2		**2**
8	*Catacroptera cloanthe* Stoll	1			**1**
9	*Euphaedra neophron* ssp *littoralis* Talbot	1	1		**2**
10	*Euryphura sp.*	4			**4**
11	*Hamanumida daedalus* Fabricius	1			**1**
12	*Neptis penningtoni* van Son			1	**1**
13	*Neptis saclava* Boisduval	4			**4**

14	*Precis hierta* Fabricius	1			**1**
15	*Precis terea elgiva* Hewitson	4	1	2	**7**
16	*Pseudacraea deludens* Neave	2		1	**3**
17	*Pseudacraea lucretia Cramer*	1			**1**
	Family Papilionidae				
18	*Graphium polistratus* Grose-Smith	1			**1**
19	*Papilio dardanus* Brown			4	**4**
	Family Pieridae				
20	*Belenois thysa* Hopffer	1		2	**3**
21	*Catopsilia florella*Fabricius	2			**2**
22	*Eurema desjardinsi* ssp. *marshalli* Butler			1	**1**
23	*Eurema hecabe* Linnaeus	1		4	**5**
	Leptosia alcesta Stoll			2	**2**
	Family Satyridae				
24	*Bicyclus danckelmani* Rogenhoefer	3	2		**5**
25	*Gnophodes betsimena* ssp. *diversa* Butler	1	3		**4**
26	*Physcaeneura robertsi* Kielland	3			**3**
27	*Ypthima asterope* Klug	3	1	2	**6**
	TOTAL	**41**	**12**	**21**	**74**
	No. of Species	**22**	**7**	**11**	**27**

6.3: COMMUNITY DEVELOPMENT PROJECTS SPONSORED BY THE UMNP IN THE AREA

(MIRADI YA MAENDELEO TULIYOSHIRIKIANA NA WANANCHI /VIJIJI VINAVYOZUNGUKA HIFADHI YA MILIMA YA UDZUNGWA KUANZIA 1994 / 1995 - 2002 / 2003 – 20004 / 2005)

NA	AINA YA MIRADI (SCIP)	MWAKA YEAR	WILAYA DISTRICT	KIASI CHA FEDHA (TSHS.) AMOUNT
1.	Ujenzi wa Kituo cha Afya Msolwa	1996/1998	Kilombero	10,770,752/-
2	Ujenzi wa darasa na Ofisi ya walimu shule ya Msingi Mlimani	1995/1997	Kilombero	4,817,670/-
3	Ujenzi wa Maabara shule ya Sekondary Mang'ula	1994/1995	Kilombero	6,424,539/-
4	Kuchangia Ujenzi wa shule ya msingi Kiberege Prison	1996/1997	Kilombero	885,000/-
5	Ujenzi wa nyumba ya Mwalimu Msosa	1998/1999	Kilolo	1,958,500/-
6	Ujenzi wa nyumba ya Mwalimu Ikula	2001/2003	Kilolo	6,000,000/-
7	Ujenzi wa Darasa na Ofisi shule ya Msingi Udekwa	1998/1999	Kilolo	5,942,250/-
8	Kuchangia Ujenzi wa Zahanati Kiberege	WWF Fundi 1995/1996	Kilombero	2,060,000/-
9	Mradi wa Mgahawa na choo kikundi cha akina mama Kisawasawa	WWF Fundi 1993/1994	Kilombero	1,959,886/-
10	Ukarabati wa Kituo cha Afya Mang'ula		Kilombero	2,323,388/-
11	Utengenzaji madawati shule ya Msingi Mlimani	1995/1996	Kilombero	127,900/-
12	Ujenzi wa dika (Curio shop) Sanje akinamama	2001/2002	KilomberoWWF	1,200,000/-
13	Ujenzi wa Madarasa shule ya Msingi Msimba	2001/2002	Kilosa	6,636,502/-
14	Ujenzi wa choo S/M Sanje	2001/2002	Kilombero	2,019,017/-
15	Uwekaji umeme shule ya Sekondari Mang'ula	2000/2001	Kilombero	4,500,000/-
16	Kufidia jingo la CCM Mkula	2001	Kilombero	1,500,000/-
17	Ujenzi wa maaabara sekondari Lukosi	2003/2004	Kilolo	23,960,737/-

18	Ukarabati wa Barabara – Ilula Udekora	2002/2003	Kilolo	135,000,000/-
19	Ujenzi wa darasa S/M Juhudi	2004/2005	Kilombero	5,000,000/-
20	Ujenzi wa Bwawa la samaki S/S Kisawasawa	2004/2005	Kilombero	710,000/-
21	Ujenzi wa kituo cha Askari Udekwa	WWF 2002/20003	Kilolo	42,122,960/-
22	Mradi wa bomba la maji Udekwa	WWF 2002/20003	Kilolo	26,793,060/-

6.4. DATA COLLECTION INSTRUMENTS (QUESTIONNAIRES)

HOJAJI No.1
UTAFITI WA AWALI KATIKA KAYA
VIJIJI KANDO KANDO YA HIFADHI YA WANYAMA YA UDZUNGWA.

Jina la Mkuu wa Kaya _____
Jina la Mhojiwa _____
Jina la Kitongoji _____ kijiji_____
Jina la Kata _____
Jina la Mhojaji _____
Tarehe _____
Muda kuanza saa _____
Muda kumaliza saa _____

ORODHA YA WANAKAYA

No	1. Majina ya wenye kaya anza na mkuu wa kaya	2. Uhusiano na mkuu wa kaya	3. Jinsi	4.Umri	5.Hali ya ndoa	6. Kiwango cha juu cha elimu	7. Shughuli kuu/kazi wanazofanya wanakaya (jaza zote)
		Mkuu wa kaya ….,,,01 Mke/Mme…….02 Mtoto wa Kiume …03 Mtoto wa kike ……04 Mtoto wa kufikia ….05 Wajukuu …06 Mzazi wa mkuu wa kaya ….07 Mtumishi wa nyumbani …08 Wengine …09	Mme 1 Mke 2	Chini ya mwaka mmoja andika 00 Zaidi ya 88 andika 88	Hajaoa/Hajaole wa 1 Ameoa/Ameole wa 2 Ameachika/ame tengana 3 Mjane/Kizuna 4	Shule ya awali 00 Darasa la 1…….01 2…….02 3…….03 4…….04 5…….05 6…….06 7…….07 8…….08 Mafunzo ya ufundi, upishi n.k 09 Kidato cha 1……10 2……11 3……12 4……13 Mafunzo baada ya Elimu ya Secondari Kidato cha 5…….14 6……..15 Elimu ya juu ….. 16	Mwajiriwa …..01 Ajira binafsi ……02 Shughuli zisizo za ajira …..03 Mwanafunzi…04 Hajiwezi…..05 Hahusiki……06

S/N	1.MAJINA	2.UHUSIANO	3.JINSI	4.UMRI	5.NDOA	6.ELIMU	7.SHUGHULI

SEHEMU B

SHUGHULU ZA KUONGEZA KIPATO

SHUGHULI	NDIYO	KIASI Tshs	MWEZI	MSIMU	MWAKA
1. Uzalishaji wa mazao					
-Mpunga					
-Mahindi					
-Mihigo /Viazi					
-Miwa					
-Ndizi					
Mengineyo					
2. Mifugo					
3. Uvuvi					
4. Ufugaji					
5. Ajira serikalini					
6. Ajira shambani (kibarua)					
7. Ajira katika shirika-umma/kampuni					
8. Akiba benki					
9. Pensheni					
10. Ufundi					
11. Biashara					
12. Kutumiwa Fedha na jamaa/watoto n.k					
13. Upangishaji nyumba					
14. Tiba za asili kienyeji					
15. Nyinginezo					

SEHEMU C

MATUMIZI KWA JUMA NA MWEZI

VITU	NDIYO	KWA WIKI	KWA MWEZI
1. Simu			
2. Sabuni, nyembe, mafuta ya kujipaka, Dawa ya meno n.k			
3. Vyakula vinavyoliwa hotelini/gengeni n.k			
4. Usafiri			
5. Bili ya maji			
NAFAKA			
1. Mahindi/ Unga			
2. Mchele			
3. Mtama			
4. Ngano			
5. Nafaka zingine			
MIZIZI NA VIAZI			
1. Mhogo			
2. Viazi vitamu			
3. Mbatata			
4. Miziz na viazi vingine			
JAMII YA KUNDE			
1. Maharage			
2. Kunde/ Njegere/ Choroko			
3. Karanga /Nazi/ Ufuta			
MBOGAMBOGA			
1. Mchicha, Karoti, Spinachi, Kisamvu, n.k			
MATUNDA			
1. Machungwa, Mapapai, Mananasi, Ndizi Mbivu n.k			
NYAMA,MAZIWA, SAMAKI			
1. Maziwa			
2.Nyama ya kuku			
3. Nyama ya ng'ombe			
4. Mayai			
5. Nyama ya kondoo / Mbuzi			
6. Nyama zingine			
7. Samaki / Dagaa			
MATUMIZI MENGINE			
(a) Mafuta ya taa - Kuni, Mkaa, Umeme,			
2. Mafuta ya kupikia			

3. Pombe za kienyeji, bia n.k			
4. Sigara			
5. Matibabu			
6. Mengineyo (taja)			

_____ _____

SEHEMU D

RASILIMALI ZA KAYA

Vitu /Rasilimali	Nduyo	**Id**adi	Vya biashara 1siyo vya biashara 2	Kama ni vya biashara kuingiza Tshs.
1. Radio/Kaseti				
2. Simu ya kawaida				
3. Simu ya mkononi				
4. Jokofu/Friji				
5. Cherehani				
6. Televisheni				
7. Video				
8. Viti/ Stuli				
9. Makochi				
10. Meza				
11. Saa				
12. Vitanda				
13. Kabati				
14. Kabati za nguo				
15. Vyungu/sufuria za kupikia				
16. Chandarua				
17. Pasi				
18. Jiko la umeme				
19. Majiko mengine				
20. Vitabu (visinyo vya shule)				
21. Magari				
22. Pikipiki				
23. Baiskeli				
24. Mkokoteni/guta				
25. Toroli				
26. Mifugo ya wanyama				
27. Mifugo jamii ya ndege				
28. Punda				
29. Ardhi na mashamba				
30. Nyumba				
31. Antena /Dishi				
32. Majembe				
33. Mashine ya kunyunyuzia dawa				
34. Pampu ya maji				

35. Mashine ya kukamulia matunda				
36. Trekta				
37. Tele la trekta				
38. Plau				
39. Haro				
40. Mashine ya kusaga na kukoboa nafaka				
41. Mashine ya kutotolea vifaranga				
42. Visima				
43. Mizinga ya nyuki				
44. Nyingine (taja)				

SEHEMU E

HUDUMA ZA JAMII

SEHEMU	UMBALI	MUDA	NAMNA YA USAFIRI (CHOMBO KINACHOTUMIKA)
1. Kupata maji ya kunywa wakati wa kiangazi			
2. Kupata kuni/Mkaa			
3. Sokoni /Gulio			
4. Genge			
5. Zahanati/kituo cha afya			
6. Hospitali iliyo karibu			
7. Shule ya msingi			
8. Sekondari			
9. Posta/Benki			
10. Kituo cha polisi			
11. Kanisa /Msikiti			
12. Shamba la kaya			
13. Kituo cha usafiri/basi			
14. Mashine ya kusaga			
15. Chama cha ushirika			
16. Mahakama ya mwanzo			
17. Mgahawa			
18. Duka			

SEHEMU F

CHANZO CHA NISHATI

(b) Milo mingapi hupikwa katika kaya yako kwa siku? _____

(c) Nishati ipi hutumika zaidi kwa kupikia katika kaya yako

(a)Kuni_____% (b)Mkaa_____% (c)Mafuta ya taa_____%

(d) Umeme _____% (e) Gasi _____%

(f)Nyingine (taja) _____%

3. Kama kaya yako hupika pombe za kienyeji nishati ipi hitumika zaidi kwa shuguli hiyo?

(d) Kuni_____% (b) Mkaa_____% (c)Mafuta ya taa_____%

(d) Umeme_____% (e)Gesi _____% (f)Nyingine (taja)_____%

(e) Nishati itumikayo kwa kupikia chakula/pombe unaipata wapi ?

(f) Hifadhi ya dzungwa_____%
b) Miti tiliyootesha_____%
c) Kwa wauza kuni _____%
d) Kwa wauza mkaa _____% e)Kingine (taja) _____%
(g) Kuna umbali gani toka nyumbani hadi unakopata nishati ya kupikia (kuni)
(1)M _____ (2) Km_____
(h) Unatumia muda gani kwenda na kurudi kwa kuchukua nishati hii
(i) Saa_____ 2) Siku_____
(j) Unatumia mizigo mingapi ya kuni kwa kupikia kwa kipindi cha wiki moja?
Mizigo _____

JAZA JEDWALI HILI

Urefu wa kuni	Mzigo wake
1.	
2.	
3.	
4.	

8. Je unatumia mizigo mingapi kwa kupikia pombe?
Mizigo _____

JAZA JEDWALI HILI

Urefu wa kuni	Mzigo wake
1.	
2.	
3.	
4.	

(k) Je kwa kipindi cha miaka kumi iliyopita hali ya upatikanaji wa kuni hapa kijijini ilikuwaje?
a) Nafuu_____
b) Ngumu_____
(l) Katika kipindi cha miaka kumi iliyopiatamatumizi ya kuni katika kaya yako yameongezeka au yamepungua ?_____
(m)Kama yameongezeka ni mizigo mingapi ya kuni imeongezeka ?
Mizigo _____
(n) Kwanini matumizi yameongezeka ?
Toa sababu
_____
_____
(o) Hapa kijijini mzigo wa kuni unauzwa shilingi ngapi?
(p) Wakati wa mvua Tshs _____

(q) Wakati wa kiangazi Tshs _____
(r) Miti inafaida yeyote kwako?
(s) Ndiyo _____ b) Hapana_____
(t) Kama jibu ni ndiyo umewahi kushiriki kwenye kampeni za upandaji miti?
(u) Ndiyo_____ b) Hapana_____
(v) Kama jibu ni ndiyo kwa kipindi cha miaka kumi iliyopita umepanda miti
mara ngapi? Mara _____
Wastani wa miti uliyopanda ilikuwa kiasi cha miti _____
(w) Je unafahamu kuwa sheria zinazo wakataza kuokota /kukata kuni kwenye
hifadhi ya Udzungwa
(x) Ndiyo _____ 2) Hapana_____
(y) Je sheria hiyo inamanufaa kwako ?
(z) Ndiyo _____ 2) Hapana_____
(aa) Kama jibu ndiyo ni manufaa gani ?
Elezea
_____

(bb) Kama jibu ni hapana. Kwa sababu
_____
(cc) Kama kaya yako ikikatazwa kuokota kuni kwenye hifadhi, utapata wapi kuni za kupikia _____, Utapikia nini
_____
(dd) Nishati hiyo/ kuni zitatoka wapi?
_____, _____
(ee) Faida gani unazipata kwa kuishi kando ya hifadhi ya dzungwa?
(ff) _____ 2) _____
3) _____4)_____
(gg) Ni hasara zipi unazozipata kwa kuishi kando ya hifadhi ya dzungwa?
1)_____
2)_____
3) _____4)
_____
(hh) Kati ya mambo haya yafuatayo ni yapi yenye matatizo kwako kwa kipaumbele
(ii) Uhaba wa kuni _____%
2) Uhaba wa ardhi_____%
3) Wanyama waharibifu wa mazao _____%
4) Uhaba wa kitoweo _____%
5) Ukosefu wa kipato _____%

…….AHSANTE KWA USHIRIKIANO……

HOJAJI NO: 2

TAARIFA ZA KIJIJI

(jj) Kijiji cha …….. kata……
(kk) Idadi ya watu me _____ ke_____
Jumla_____
(ll) Idadi ya kaya _____
(mm) Idadi ya watu huongezeka zaidi kipindi gani cha mwaka /msimu gani katika kijiji chako_____
(nn) Kwasababu gani kunakuwa nakilo ongezeko la watu ?
_____

(oo) Katika kijiji chako kaya nyingi hutumia nishati gani kupikia
(pp) kuni _____% b)Mkaa_____%
(qq) Mafuta ya taa_____% d) Umeme _____%
e) Nyingine _____%
7. Kwa wastani kaya ngapi katika kijiji chako hupika pombe za kienyeji?
_____
(rr) Upikaji wa pombe hutumia kuni kiasi gani ?
Mizigo _____(kila mzigo unakuni _____ zenye urefu _____na mzigo _____).

(ss) Nyasi za kuekezea nyumba hapa kijijini zinapatikana wapi
(tt) Kwenye hifadhi _____%
2) Nje ya hifadhi _____%
(uu) Kulingana na mgawanyiko wa kazi katika kaya hapa kijijini jinsia gani huhusika zaidina uokotaji kuni kwenye hifadhi
me _____ ke _____
(vv) Watu hutumia muda gani kwenda kwenye hifadhi kuokota kuni
(ww) Saa_____ 2) Usiku _____
(xx) Kijiji chako kimeshiriki kwenye kampeni za kupanda miti
(yy) Ndiyo 2) Hapana
(zz) .Kama jibu ndiyo mmepanda wastani wa miti mingapi kwa kipindi chote_____
(aaa) Kama jibu ni hapana kwanini hamjapanda miti?
Toa sababu
_____

(bbb) Katika matatizo haya yafuatayo ni yapi yanaathiri kijiji chako zaidi?
(ccc) Uhaba wa ardhi_____%
(ddd) Ukosefu wa kuni _____%
(eee) Wanyama waharibifu wa mazao _____%
(fff)Uhaba wa nyasi za kuezeka_____%

e) Ukosefu wa kipato _____%
f) Vinginevyo (taja) _____%

16. Kwa maoni yako wananchi wakikatazwa kuokota kuni na kukata nyasi kutoka kwenye hifadhi wanaweza kupata kuni na nyasi hizo wapi?

_____

(ggg) Mbali na kampeni za kupanda miti kuna kampeni gani zingine zilizofanywa hapo kijijini ili kupata nishati mbadala kwa ajili ya kupikia , kuchomea matofali na kupikia pombe?

_____,
_____
_____,
_____

(hhh) Kwa maoni yako mwitikio wa watu kuhusu kukubali nishati mbadalani
kiasi gani?
(iii) Zaidi ya nusu ya wakazi wote
2) Robo ya wakazi wote
3) Chini ya robo ya wakazi wote

(jjj) Kama ni 2 au 3 hapo juu Taja sababu zinazosababisha mwamko mdogo wa kampeni
hizo._____
_____
_____
_____

(kkk) Kwa maoni yako unafikiri mambo gani yafanyike ili wakazi wa kijiji chako wasiokote kuni kavu ,kuchimba dawa na kukata nyasi toka kwenye hifadhi

_____

……Ahsanteni kwa ushirikiani wenu…….

HOJAJI NAMBA 3
DODOSO KWA SHULE ZA MSINGI

Jina la shule ……..…….
.kijiji ……Kata …….idadi ya wanafunzi ……. …… me ……. ……..ke…….Jumla…….

- Shule imeanzishwa mwaka ……
- Shule ina eneo la ekari / hekta ……
- Eneo la majengo ni ……...% ya eneo lote
- Eneo lililopandwa miti ……% ya eneo lote
- Eneo la viwanja vya michezo ……...% ya eneo lote
- Shule ilianza kuotesha miti mwaka ……
- Hivi sasa shule ina jumla ya miti …… Miti ya mtunda ni …… miti mingine ……..
- Shule iliwahi kuwa /ina bustani ya miche ndiyo/ hapana
- Kama jibu ni ndiyo kuanzia mwaka…….mpaka …….
- Shule imeshauza miti mingapi kwa miaka mitano (5) iliyopita.

Mwaka	2001	2002	2003	2004	2005
Idadi ya miti					

- Kwa kipindi chote hicho shule ilipata jumla ya Tshs ngapi……
- Kuacha miti ya matunda, miti mingine iliyopo hapa shuleni ina mzingo wa urefu kiasi gani?……..
- (a) Mti mkubwa mzingo …….. urefu ……...
- (b) Miti ya kati mzingo …… Urefu ……..
- © Miti midogo mzingo ……..urefu ……..

N.B Kadiria urefu katika meta.

- Hapa shuleni mnapikia nishati gani ? …….
- Nishati hiyo mnaipata wapi? ……..
- Je shule inauza miche ya miti kwa wanakijiji ?…….

Je mnapata msaada wa mbegu na utaalamu tok

(lll) aa) Serikalini (b) Halmashauri (c) Hifadhi ya Udzungwa (d) Kwingineko taja

- Je mnataraji kuotesha miti mingine? Ndiyo ☐ hapana ☐
- Kama jibu ni ndiyo eneo hilo lina ukubwa kiasi gani ? ekari / Hektari ☐
- Je shule iliwahi kuwapa watoto miti ya kuotesha nyumbani?

  Ndiyo ☐ Hapana ☐

- Je kwenye kata yenu likuwahi uwa ma mashindano ya kupanda miti?

  Ndiyo ☐ Hapana ☐

Mlishika nafasi ya ngapi? …….

Ahsante kwa ushirikiano.

HOJAJI NAMBA 4

(mmm) **DODOSO LA KIWANDA CHA SUKARI KILOMBERO**. Kiwanda kina idadi ya watu wangapi) K1 …… K2…… Jumla ……2. Kiwanda kina hekta ngapi za miwa? ……..

(i) Sehemu ya wilaya ya Kilombero ……

(nnn) Sehemu ya wilaya ya Kilosa ……3. Kiwanda hununua tani ngapi za miwa kutoka kwa wakulima binafsi

(ooo) ……. ……4. Kwa kipindi cha miaka 5 iliyopita kiwanda kimefadhili watu wangapi kulima miwa kwa upande wa (a) Kilombero (b) Kilosa

MIAKA	IDADI YA WATU	EKARI ZILIZOLIMWA	TANI WALIZOVUNA / WALIZOUZA	FEDHA WALIZOPATA @ TANI
2000				
2001				
2002				
2003				

(ppp) 5. Kwa kipindi cha miaka 5 iliyopita kiwanda kilinunua miwa kiasi gani toka kwa watu binafsi ambao hawakufadhiliwa na kiwanda

MIAKA	IDADI YA WATU	EKARI WALIZOVUNA	TANI	FEDHA ZILIZO\LIPWA
2000				
2001				
2002				
2003				

(qqq) 6. Wafanyakazi wa kiwanda hiki hutumia nishati gani kwa kupikia kwa asilimia kati ya hizi zifuatazo:

(a) Kuni ……%

(b) Mkaa ……%

(c) Mafuta ya taa ……..%

(d) Umeme ……%

(rrr) Nyingine (taja) ……7. Kwa utunzaji wa mazingira na kupata kuni kwa karibu kiwanda chako kimeotesha miti kiasi gani katika kipindi cha miaka 5 iliyopita ?

Miaka	**Idadi ya miti**
2000	……..
2001	…….
2002	…….
2003	…….

(sss) ……8. umeme unaozalishwa na kiwanda heko kutokana na masalia ya miwa hutumikaje hapa? ……

(a) Huanzia TANESCO……%

(b) Hutumika kiwandani ……%

(c) Hutumika katika nyumba za wafanyakazi ……%

(d) Kwingineko (taja) ……%

(ttt)9. Je kiwanda kina mpango wowote sasa hivi wa uoteshaji wamiti ili kuzuia mmomonyoko wa kuhifadhi mazingira kwa jumla? Toa maelezo

……

……

……

…….0. Kwa wakulima binafsi kiwanda hutoa motisha gani ili

(uuu) Walime miwa baora zaidi

……

(vvv) Kupanda miti kwa ajili ya kuni na kuzuia mmomonyoko

……

……

(www) ……

……

…….1. Kwa maoni yako unafikiri kiwanda kifanye nini ili kujaza wafanyakazi zisitegemee hifadi ya wanyama ya UZIZUNGWA kwa kuni za kupikia, dawa na miti ya ujenzi Toa maelezo……

……..

……..

……

……

Ahsante kwa ushirikiano.

HOJAJI NAMBA 5

DODOSO KWA WAGANGA WA JADI.

JINA ……..……..

Kitongoji ……kijiji……..

Kata ……..Umri…….jinsi…….

Kiwango cha elimu ……

Hali ya ndoa (a) umeoa/umeolewa (b) Sijaoa/ sijaolewa (c) Mjane/kizuka

(xxx) Hali ya familia (a) watu wazima

……b) Watoto

……

Idadi ya watoto wanaosoma ……

(a) Shule ya msingi ……

(b) Shule ya sekondari ……

(c) Vyuo vya juu ……..

Umepata kibali cha tiba? Ndiyo ☐ hapana ☐

Umelipa Tshs. Ngapi kwa hicho kibali Tshs ……

(yyy) Kwa wastani huwa unatibu wagonjwa wangapi kwa (a)

siku……b) Wiki ……..……..(c)

mwezi …… (d) Msimu

……(e) Mwaka ……..

Kwa wastani wagonjwa unaotibu hukulipa kati ya shilingi ……..

Hadi …….. mpaka apone .

Kwa wastani huwa unakwenda msituni mara ngapi ili kupata dawa?

Wiki mara ……

Mwezi mara ……

Msimu mara ……

Mwaka mara ……..

Kwa kukadiria unavuna dawa kiasi gani ila unapokwenda kwenye hifadhi?

(i) Mizizi kiasi cha magunia/ mfuko ……

(ii) Magome / maganda ……

(iii) Matawi ……

(iv) Majani ……

(zzz) Kipato chako kwa mwaka ni kiasi gania) kIlimo Tshs ……..kwa mwaka/msimb)

Uganga Tshs ……kwa mwaka /msimu

(c) Biashara Tshs ……Kwa mwaka / msimu

Je ukikatazwa kuchimba/ kuokota, kuvuna dawa toka katika hifadhi ya Udizungwa utapata hasara gani? Toa maelezo ……

……

……

Kama ukuzuiliwa kuingia katika hifadhi utatumia njia zipi ili kupata dawa na kuendeleza uganga ? ……

……

Je unajua kuchukua kwako dawa toka kwenye hifadhi kunasababisha madhara kwa wadudu na wanyama?

Kama ndiyo unafikiri ni madhara gani? ……..

……

……..

Je umewahi kuotesha baadhi ya miti uitumiayo kwa dawa katika eneo lako ?

……

Hali ya upatikanaji wa dawa hivi sasa ni miaka 5 iliyopita ipi ilikuwa ni nzuri zaidi?

Kwa nini? Toa sababu ……..

Hivi sasa unatumia muda gani kuwenda kutafuta dawa? Saa ……..

Hapo awali miaka 5 iliyopita ilikuwa saa ……

Kwa maoni yako unadhani hifadhi ya mlima Udizungwa ifanye nini ili wewe uendelee kupata dawa ? Toa maoni ……..

…….

…….

Ahsante kwa ushirikiano.

HOJAJI NO 6

KWA WATU MASHUHURI NA VIKUNDI (KEY INFORMANTS AND FGDs)

1. Kwa kipindi kirefu sasa wanachi wa eneo hili wamekuwa wakishirikiana na hifadhi ya wanyama ya udzungwe ni faida zipi tunazipata kutikana na hifadhi hii ?
2. Hasara zake nazo ni zipi?
3. Je unafahamu kuna sheria inayozuia watu kuingiakatika hifadhi kwa minajili ya kuokota kuni , kuchimba dawa na kukata nyasi.?
4. Je muda uliotolewa wa miaka kumi wa kuwatayarisha wanachi wasiendelee kuokota kuni kwenye hifadhi unatosha?
5. Je watu waliitikia wito huo kwa kujitayarisha au wameshindwa?
6. Kwanini wameshindwa?
7. Unafikiri kitu gani kifanyike ili kuboresha hizo kampeni?
8. Je watu gani /mashirika/ makampuni gani yangesaidia ili watu wasiingie kwenye hifadhi kwa lengo la kuokota kuni,kuchimba dawa na kukata nyasi?
9. Kwa hivi sasa watu wakikatazwakukatakuni kwenye hifadhi wanaweza kupata hiyo nishati tuka wapi?

00

……..Ahsante kwa ushirikiano wako……

6.5 LIST OF PARTICIPANTS IN FOCUSSED GROUP DISCUSSIONS

A GROUP 1 – WARD SANJE:

1.	Mwanaisha Mohamedi	Sex	F	age	65	
2.	Fadarace Kiwelu		F		33	
3.	Hamadi Mombosasa			M		63
4.	Raphaeli Chawala			M		56
5.	Foibe Raphaeli		F		51	
6.	Selemani Kihimbo			M		55
7.	Habibu Simba Mkuti			M		42
8.	Laurencia Zingi		F		39	
9.	Magdalena Michaeli			F		33

B. GROUP II WARD MKULA

1.	Lazaro Sanga	Sex	M	Age	47
2.	Tulepoma Mbwile		F		42
	Ladislaus Chalamila		M		29
3.	Edga Chitititira	M		66	
4.	Tabu Saidi Yahaya		F		20
5.	Wedesta Daniel	F		25	
6.	Habiba Rashidi	F		18	
7.	Sofia Tungupau	F		51	
8.	Wendeslaus Kabida		M		23

C. GROUP III MANG'ILA

1.	Prisila John	Sex	F	Age	47
2.	Shamiti Limbuga	F		48	
3.	Sabina Msegala	F		55	
4.	Joyce Ngunga		F		21
5.	Rashidi Kuluka	M		54	
6.	Mashaka Mayanjo		M		32
7.	Hilda Kalinga		F		46
8.	Aisha Nasoro		F		51
9.	Sedi kibwebgo	M		37	
10.	Joseph Mapunda	M		61	

D. GROUP IV WARD KISAWASAWA.

1.	Amin Abdala	Sex	M	Age	68
2.	Christina Vicent	F		42	
3.	Mwanaisha Seleman		F		70
4.	Lucia Madawa		F		68
5.	Zainabu Ali Mponda		F		48
6.	Salehe Saidi		M		30
7.	Mohamedi Matyai		M		32
8.	Twaibu Ukungu	M		33	

E. GROUP V LOCAL BREWERS DEAD WOOD DEALERS.

1.	Sauda Salemani	Sex	F	Age	42	
2.	Frorenciana nyoni			F		36
3.	Juma Ndugula			M		27
4.	Sospeter Mlekano			M		34
5.	Alphonse Bernard			M		40

6.	Radhia Mloka		F		42
7.	Mwanahamisi Kondo		F		32

F. GROUP VI WOMEN ECONOMIC GROUPS (WEGS)

1.	Congester J. Mlakana	Sex	F	Age	37
2.	Silvia Mwakalile	F		29	
3.	Florence A. Mchapi		F		47
4.	Fatuma Abdala Ali		F		32
5.	Zubeda Adbulhakim		F		42

G. GROUP VII TRADITIONAL HEALERS

1.	Halima Sitti (mama Kuta) F. Village	Sex	F	Age	Mwaya
2.	Iddi Maulule		M		Mgudani
3.	Amina Mweda		F		Mmwaya
4.	Lucy John		F		Mwaya B
5.	Shante Kionjo		M		Mang'ula B
6.	Ainidi Mbee Faume		M		Mangule B
7.	Rashidi Mamba		M		Mwaya A.

H. GROUP VIII TRADITIONAL HEALTHERS.

1.	Ali Ngozi Ruluambo		M	Msuriri
2.	Rehema Ali Barge		F	Maolwa Ujamaa
3.	Zungujou Kabeyo (mbwa mweusi)	M		Mhamba
4.	Juma Ali Mlopelolo		M	Sanje
5.	Adriano Hipofite	M		Sanje
6.	Mariamu Resembili		F	Msufini

I **GROUP IX WORKSHOP PARTICIPANTS**

	NAME	DESIGNATION	WARD /VILLAGE
1.	Alli K. Mbelemba	M/k Kijiji cha Sole	Mkale/Sole
2.	Abdu Likulika	Mtendaji	Kisawasawa/Kaulo
3.	Asajile Mwasubi	Mk/ serikali za mtaa	Kidatu/Mkamba
4.	Pidam Mbigi	Kaimu Katibu Tarafa	Kidatu/kidatu
5.	benedict Nella	Mtendaji Kijiji	Kidatu Mkatula
6.	Nongeza Mwasisoja	WEO KIDATU (Agt)	Kidatu
7.	Laurencia Zigi	Nazigiri (Katibu)	Msolwa Ujamaa(Saje)
8.	Heuzide Mxiku	M/Kt. Saukali	Msolwa/ Msolway
9.	Magreth Nyange	Agt. Afisa Mtendaji kata	Misawasawa
10.			
11.	Thomas Majembe	Mjumbe Mazingira	Msilwa
12.	Kaitan Mtokela	WEO Sanje	Sanje
13.	Mohamed Kikana	M/Kt Kijihi Komelo	K.S.C / Kaulo
14.	Adinani kindade	M/Kt. Kijihi Muya	Mampula/Mwang
15.	Mohamed Maudika	M/Kt. Kijihi MaMapula A	Manjula/
16.	Degration Makinda	M/Kt. Kijiji Ichonde	Kisawepasa
17.	Adamu ndamba	VEO – Ichonde	Ichonde/Kisa.
18.	Charles Katuala	VEO – Msolwa Ujamaa	Saje/
19.	Adam dimhela	M/Kt. Kijiji Msufini	Mkula
20.	Edward Tesha	Elimu/Mtendaji Kata	Mkula

21.	Rhoda Ngomo	VEO- Mapuli A	Majula
22.	Hauza Madoto	VEO Sole	Sole
23.	Athumani Madamba	Mtendaji kata tarafa	Mangula/Mangula
24.	Emanueli Nollo	VEO Mfufini	Mkula/Msufini
25.	Avaline Mapunda	VEO, Mang'ula	Mang'ula
26.	Kimaryo.E	Udzungwa	Com
27.	Herrick Nzilen	M/Kt. Msulwa	Sonje Msolwa.

I. GROUP X NAMES OF KEY INFORMANTS.

	NAME	DOSGNATION	ORGANISATION
1.	Sabaliel Maachu	Field Manager Agronomy	ILLOVO - Kilombero Sugar Company
2.	Athumani Mndemba	Act. Katibu Tarafa Kidatu	Kidatu
3.	Magreth Nyange	WEC & WEO kisawasawa	Kisawasawa
4.	Mr. Kimaryo	UMNP- Commit Dept.	Udizungwa
5.	Mr. Tumbuka	Chief – Wooden UMNP	Udizungwa
6.	Mr. L. oishooki	Protection Dept. UMNP	Udizungwa
8.	Simon Natai	Conductor	
9.	Ben Msuya	Assist Head teacher	Kisawasawa
10.	Mr. Naivasha	Community Dept. UMNP	
11.	Mr. Hamadi	Chairman KSG	Sanje
12.	Aveline Mwrunda	Agricultural Office	Mangula
13.	Lazaro Sanga	Catechist	Mkula
14.	Mr. Mtui	Ecologist UMNP	Udizungwa.