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Uluguru Mountains Biodiversity Conservation Project In collaboration with Uluguru Mountains Agriculture Development Project (UMBCP), Regional Natural Resources Office, and the Regional Catchment Project Office

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STATUS AND DOMESTICATION POTENTIAL OF MEDICINAL PLANTS IN THE ULUGURU MOUNTAIN AREA, TANZANIA

¹Hamisy, W. C., ²D. Mwaseba, ¹I. E. Zilihona and ¹S. T. Mwihomeke

¹ Tanzania Forestry Research Institute, Silviculture Research Centre, P.O. Box 95,
Lushoto

² Sokoine University of Agriculture, Department of Agricultural Education and
Extension, P.O. Box 3010, Morogoro

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ABBREVIATIONS AND ACRONYMS

FAO	- Food and Agriculture Organization of the United Nations
For. Div.	- Forest Division
UMBCP	- Uluguru Mountain Biodiversity Conservation Project
TAFORI	- Tanzania Forestry Research Institute
UMADEP	- Uluguru Mountain Agriculture Development Project
SUA	- Sokoine University of Agriculture
LSRC	- Luushoto Silviculture Research Centre
SNAL	- Sokoine National Agricultural Library
IUCN	- International Union for Conservation of Nature

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EXECUTIVE SUMMARY

This study was conducted in Tandai, Tegetero and Nyandira villages in Morogoro Rural District. The overall objective of the study was to develop appropriate knowledge for the sustainable management of medicinal plants in the Uluguru Mountain Area. The specific objectives were to document medicinal plants used in curing human diseases in the Uluguru mountains thus to contribute to the data base of medicinal plants; generate knowledge on the social economic importance of medicinal plants in the area; generate knowledge on the status of medicinal plants in the study area and evaluate the effect of human activities on medicinal plants in the area.

The study has shown that plant species used in traditional medicine in the Uluguru Mountain area belong to different habits ranging from herbs, climbers and shrubs to big tree species. The woody plant communities (trees and shrubs) are more used by the traditional healers than the non-woody (climbers and herbs) communities. Except for the woody plants, which are planted on farmlands as agricultural crops, fruits and timber species, the woody species are mostly collected from the forest reserve. The non-woody plants are collected from the farmlands and in open area of the forest reserve. Some of the plants are collected very far from the area. This includes from the lowland forests, Miombo woodlands and the coastal forest. *Pterocarpus angolensis* and *Brachystegia spiciformis* are among the species collected from the Miombo woodlands.

Medicinal plants are used to treat human and domesticated animals' diseases as well as crops diseases. Their socio-economic value in the Uluguru Mountain area are high. This is because their use helps in saving the lives of hundreds of people and reduces the financial cost for health care. A large number of people depend on traditional medicine because of poor infrastructure (road and health centres) and in addition, some diseases like spirits and mental illnesses are perceived to be not treatable by modern medicine. However, traditional medicine practice in the Uluguru is unable to cure diseases like Cancer, AIDS and Typhoid, as there are no verified research findings. Traditional medicine is also a source of employment and income for the traditional healers.

Differences in medicinal trees and saplings composition between the villages were very small. However, a big difference occurred between the forest and the farmlands. In general, only 13 medicinal tree species were recorded on farmlands compared to 45 species in the forest reserve. The non-woody medicinal plants community account for 45% of the total medicinal plants identified in the study area. Of the recorded species, herbs account for 68% and climbers 22%. A large number of non-woody medicinal plants were recorded on farmlands than in the reserve.

Human activities in the Uluguru Mountain area pose a serious threat to the ecosystem and hence availability of medicinal plants for health care. For example, timber harvesting affected the survival of *O. Usambarensis* (Mvumba), annual fires threaten the availability of *Landolphia burchananii* (Luziwana) while *Satureja biflora* (Lupara Iwa mlungu), *Landolphia burchananii* (Luziwana) and *Vangueria infausta* (Msada) are affected by root cutting. On the other hand debarking is affecting *Dodonaea viscosa* (Mhange), *Bersama*

abyssinica (Mfumbi) and *Agauria salicifolia* (Mwavi). While root cutting and debarking are selective harmful harvesting practices, annual fires and forest clearance for arable farming are non-selective. Their effects on the medicinal plants in terms of availability may therefore be more far reaching than those aforementioned.

To improve the status of and promote the domestication of medicinal plants in the Uluguru Mountain area, the study, among others, recommends for provision of environmental education to local people on hazards of human activities on the ecosystem and support for the domestication of the valuable and threatened medicinal plants. *In situ* conservation in their natural habitat is a viable option for *O. usambarensis*. On the other hand, *Milicia excelsa* and *Khaya anthotheca* can be conserved by planting on farmlands, while species like *Landolphia buchananii* (Luziwana) and *Satureja biflora* (Lupara Iwa mlungu) could be conserved by planting in the home gardens.

INTRODUCTION

The Eastern Arc forests of Tanzania have been classified as one of the most important tropical forest hot spots world-wide due to their unusual concentration of endemic species. Despite their small size in terms of area of the closed forest, which is less than 0.2% (1,800 km²) of the land surface of mainland Tanzania, these forests contain approximately 18 % of all plant species, 43 % of all butterflies, 22.5 % of all amphibians and reptiles, 26 % of all birds and 24 % of all mammals found in The country (Newmark 1996).

The Uluguru mountain forest is one of the forests in the Eastern Arc Mountain area, with enormous plant resources. A number of endemic plant species are known to occur in this area, and some of them have been used for several centuries in treatment and prevention of diseases and medical problems. Knowledge on the use of plant species as a potential source of medicine in Uluguru mountain area is believed to have evolved over a long time. To date the knowledge still plays an important role in the improvement of general health care of people at a time when already there is high level of development in modern medicine.

Development of medicinal plants needs more attention due to its important role in the improvement of people's health. It is an essential component of human health care especially for the rural communities who sorely rely on forest plants for food, shelter, energy and medicines. Hamann (1991) has reported that 75-90% of the world's rural populations depend on traditional herbal medicines in their primary health care. Further, in this decade, the world is experiencing an increasing rate of resistance by pathogens to some of the synthetic drugs, as well as the struggle against Cancer and AIDS which have not found treatments from modern medicine. Consequently, this has challenged the scientific community to seek solutions from plant species. This is reflected by a number of research programmes aimed at testing plant species for their pharmacological value (Msuya, 1998).

Regardless of its long historical background, the African traditional medicine as a discipline is facing a lot of problems that threaten its future existence. This includes the high rates of habitat destruction caused by human disturbances. FAO (1993) estimated the rate of disappearance of natural forest world-wide at about 0.8 % annually between 1980 to 1990. In Tanzania, about 300,000 ha to 400,000 ha of the forest cover is estimated to be lost annually through deforestation (For. Div. 1992). In the Uluguru Mountain area the situation is not far from the general trend. It is reported that only about 270 km² of forest remains intact, mostly inside the forest reserve with most of the public land forest already cleared. Activities such as land clearance for agricultural production, fire setting either accidentally or deliberately as well as extraction of some forest products like timber, fuel wood, building poles and withies are common. These affect the survival of plant species including the medicinal plants. In some instances, extraction (harvesting) of medicinal plants involves ring debarking and root cutting which causes the death of the plants involved.

Apart from physical damage, which directly damages the plants, the disappearance of the traditional human cultures around the globe is acknowledged as a threat to further discoveries. This is accompanied by the disappearance of the traditional knowledge on medicinally useful plants and their uses (Norman *et al.* 1991; Temu and Chihongo 1998). Modernisation in the living norms of the people in rural areas, as well as migration of a number of villagers and especially the youths to town, is threatening the future of most of the important cultures including knowledge on the use of plant species. As a result, there is an urgent need for documenting the plants and knowledge of their uses in many rural areas (Iwu, 1993; Akerere 1991).

Understanding the importance of medicinal plants to the general health care of the people in the villages around the Uluguru Mountain, and the threats facing them, the Uluguru Mountain Biodiversity Conservation Project (UMBCP) commissioned the work of documenting important medicinal plants and their uses in the area to TAFORI researchers.

Objective

The overall objective of the study was to develop appropriate knowledge for the sustainable management of medicinal plants in the Uluguru Mountain Area.

The specific objectives were:-

- To document medicinal plants used in curing human diseases in the Uluguru Mountains and thus contribute to the database of medicinal plants.
- To generate knowledge on the socio economic importance of medicinal plants in the area.
- To generate knowledge on the status of medicinal plants in the study area in terms of distribution and abundance.
- To evaluate the effect of human activities on medicinal plants in the area.

The work was based on the assumptions that:-

- There are useful plant species that provide potential sources of medicines for the people in the study area.
- Medicinal plants have enormous socio-economic value for the rural communities in the study area.
- A large number of medicinal plants are at the verge of extinction due to over exploitation.
- Human activities have great impact on the existence of medicinal plants in the study area.

1.1. Back ground information of the Uluguru Mountain Biodiversity Project

The UMBCP is managed by the Wildlife Conservation Society of Tanzania (WCST). The project started in 1999, and works in collaboration with Uluguru Mountain Agriculture Development project (UMADEP) based at Sokoine University of Agriculture (SUA), the Regional Natural Resource Office (Morogoro), and the Regional Catchment Forestry Project under the Ministry of Natural Resources and Tourism.

The main objective of the UMBCP is to improve conservation of the globally important Uluguru Mountains biological diversity. A number of activities to support this objective are stipulated in the logical framework for the project. They include: supporting forestry activities such as, establishment of village nurseries, and tree planting on farmlands; assisting the formulation of agreements between forest division and local people on sustainable uses of forests; monitoring changes in biodiversity and forest conditions in the Uluguru Forest Reserves, and supporting sustainable agricultural practices in villages adjacent to Uluguru Forest Reserves.

Several studies have been conducted in the Uluguru Mountain area to characterise the biodiversity value of these mountains, e.g. Mabula *et al.* (1993); Svendsen & Hansen (1993); others have investigated the socio-economic value (Lyamuya *et al.* 1994, Bhatia and Ringia 1996). However, little attention has been paid to documentation of local knowledge on various uses of natural resources. The study by Bhatia and Ringia (1996) identified traditional medicine as a potential practice in the area and proposed further research in this field.

2. METHODOLOGY

2.1. Study area

2.1.1. Location

The study was conducted in three villages (Tandai, Tegetero and Nyandira) that are located in the Uluguru Mountain Area in Morogoro Rural District. The study area is located approximately 180km from the Indian Ocean. Except for the high Lukwangule Plateau, the ridges are characterised by many steep forested peaks. The northern part of the ridge is separated from the southern part by the Bunduki depression (Bhatia & Ringia 1996).

2.1.2. Climate

In the Uluguru Mountain Area, rainfall varies in different places, ranging from 900mm per year at Morogoro Municipality to 1200-3100mm on the drier Western slopes, and to 2500-4000mm on the wetter eastern slopes (Bhatia & Ringia 1996). There are generally two rainy seasons punctuated by a dry season, although in some parts of the Ulugurus there may be some rains in every month of the year. The long rains (Masika) usually fall from February to June, with the dry season (Kiangazi) extending between July and September and the short rains fall from October to January. The area is also characterised by cold weather with a mean maximum and mean minimum temperature of 22 °C and 17 °C respectively, and much colder than this at high altitudes where frosts may occur in July and August.

2.1.3 Vegetation type

The reserves are mainly covered with moist forest. Sub montane forest is found on the eastern slopes between 800 - 1500 m.a.s.l. On the western slopes this type of forest is restricted to valley bottoms near the lower edges of the reserve. Montane forest occurs between 1500 - 1900 m.a.s.l. Upper montane forest is found above 1900 m.a.s.l. on wetter slopes and ridges in the cloud belts. This is characterised by stunted elfin forest on the higher ridges. The sub montane forest is dominated mainly by *Albizia gummifera*, *Aningeria adolfi friedericii*, *Anthocleista grandiflora* and *Cephalosphaera usambarensis*.

2.1.4. Social economic environment

2.1.4.1. Population and settlement pattern

The Waluguru who are both matrilineal and matriarchal inhabit the three study villages. The maternal uncle wields great authority in family affairs including those related to land management and distribution of family resources. Members of the family can easily access land grown to annual crops. However, land planted with permanent crops including trees is not easily accessible to other members of the family. This is the type of land that is inheritable by the owner's siblings.

Of the three villages, Nyandira is the biggest while Tegetero is the smallest. The settlements are relatively evenly distributed in Nyandira and Tegetero while a bigger

chunk of Tandai village, especially the area close to the catchment forest, is sparsely settled.

Table 1: Population data from the three villages in the Uluguru Mt. Area.

Division	Village	Population*		
		Men	Women	Total
Mkuyuni	Tegetero	638	690	1328
	Tandai	1275	1417	2692
Mgeta	Nyandira	na	na	4827

* - Estimated figure for 1996

n.a - not available)

Fig. 1. Map of the Uluguru Mountains showing the study areas (modified from Bhatia and Ringia 1996).

2.1.5.3 Economic activities

Crop production is the main income generating activity for the people in the study villages. While fruit crops are the main source of income for the people in Tandai, people in Nyandira depend on vegetables. Fruits like banana, citrus and pineapples are the most common in Tandai, while in Tegetero banana is the most important cash crop. Cabbage is the dominant vegetable crop in Nyandira. However, the importance of cabbage is declining due to disease attack, leaving chances for peas and Irish potatoes.

2.1.5.4 Socio-economic infrastructure

The hilly terrain and high rainfall in the study area makes the roads inaccessible especially during the rainy season, as a result there is no reliable public transport. Each village has a primary school and Tegetero has a health center owned by the Catholic mission and Tandai has a government owned health center. Nyandira has a pharmacy and is building a small dispensary.

2.2. Methods of data collection

2.2.1 Library search and informal interviews

Secondary data on use of medicinal plants were obtained through literature search from libraries at LSRC, TAFORI; and Sokoine National Agriculture Library (SNAL).

Methods used to collect primary data from people based in Morogoro town included key informant interviews and discussions with UMBCP, Morogoro Region Catchment Forest Office and UMADEP staff.

2.2.2. Ethnobotanical surveys

Ethnobotanical surveys were conducted through open-ended interviews with the traditional healers and village elders. Then a structured questionnaire (Appendix IV) was added. A total of six traditional healers and village elders were interviewed in each study village. The information elicited was, the important plant species used in traditional medicine, the diseases treated, those part of plants used and their preparations.

2.2.3. Socio-economic value

To evaluate the socio- economic importance of medicinal plants, key informant interviews were conducted with traditional healers and selected group of people. The interviews focused on the diseases treated, costs for offering the service and the effectiveness of the medicine. Informants were grouped based on age and gender (Tables 2 & 3) and a semi-structured questionnaire (Appendix V) was used to gather the information. Visits were made to a nearby health center (in Tandai) and a nearby pharmacy (in Nyandira) during which interviews were conducted with the medical practitioners and pharmacists on the common diseases in the area, treatments as well as prices for various drugs.

Table 2. Distribution of key informants by age

Village	Age groups			Total
	10 - 20	21 - 40	41 and above	
Tandai	10	10	10	30
Tegetero	12	6	8	26
Nyandira	10	6	7	23
	32	22	25	79

Table 3. Distribution of key informants by gender

Village	Gender		Total
	Male	Female	
Tandai	18	12	30
Tegetero	14	12	26
Nyandira	13	10	23
Total	45	34	79

2.2.3. Field surveys

Field surveys were done on farmland and in the forest reserves to identify the plants, area of collection and also to study the general status of medicinal plants. A strip transect method was employed both on farmland and in the forest reserve. When laying out the transect, a base line point was selected based on the identified feature on a map and the direction was determined using a compass. In each transect, 20 x 20 meters plots were laid at a spacing of 1000m on farmlands and 100m in the forest reserve (Munishi 1996). The selection of the distance was based on the fact that farmland areas are more variable as some of them were cultivated; others left fallow over six years and some with disturbed forest. Short distances were adopted for surveys in the forest reserves because they were more uniform.

Plant species encountered on plots both in the forest reserve and on farmlands were identified and some specimens collected. Tree and shrub communities with DBH \geq 5cm were measured. Those with DBH < 5 cm and 1 meter height were considered saplings and their numbers were counted. The herb communities encountered in every plot were also enumerated. Plant species found along the transect but not in the plots were also recorded. Records of human activities along the transect were also taken.

Table 4: Distribution of transects and plots in the Farmland and Forest Reserves of study villages

Village	Farmland		Forest reserve	
	Transect No.	No. of plots	Transect No.	No of plots
Tandai	1	4	1	6
	2	9		
Tegetero	1	4	1	5
	2	3	2	4
Nyandira	1	3	1	6
	2	3		
	3	3		

2.2.4. Workshop on potential for domestication of medicinal plants

A one-day workshop was conducted in Mkuyuni. The workshop was attended by 16 male and female traditional healers from Tandai, Tegetero, and Nyandira villages. The main purpose of the workshop was to explore the main problems facing traditional medicine and specifically the potential for domestication of medicinal plants.

2.3 Data analysis

Data analysis was done in Microsoft Excel. Descriptive statistical methods were employed. These were complemented by other statistical methods like t - test and Chi - square. The plant species were first grouped into their respective families and categorised based on diseases they treat and then classified into group of medical uses. Consistency in the use of medicinal plants by the reporters was determined using the factor of informant consensus (F_{IC}) (Henrich *et al.* 1998).

$$\text{Given as, } F_{IC} = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

Where,

F_{IC} = Factor of informant consensus

n_{ur} = Number of use reports in each category

n_t = Number of taxa used (Plant species)

3. RESULTS AND DISCUSSION

The findings of the medicinal plants used in curing human diseases, knowledge on the social economic importance of medicinal plants; the status of medicinal plants and the effect of human activities on medicinal plants in the area are presented and discussed in the following pages.

3.1. General problems in the study area

During interviews conducted with UMADEP, four major problems were revealed. These are low productivity of the agricultural land, loss of biodiversity as a result of human activities, difficulty in marketing local products, and insect pests of some agricultural crops. The major challenge facing UMADEP was how to sustain conservation of biodiversity while at the same time improving the economic status of the rural communities in order to reduce their dependency on the forest. Currently UMADEP places more emphasis on the planting of indigenous tree species. But the challenging issues include the type of indigenous tree species preferred by the people and how to propagate them, availability of low cost products and input with minimal environmental impact such as use of plant species in treatment of human and animal diseases and in crop preservations. It was clearly understood that the rural communities have a wealth of this knowledge, but the problem is how to tap it for the good of the community.

The Catchment Forest Project, which is the main conservator of the Uluguru mountain catchment forest and one of the partner institutions of the UMBCP, is faced with three major problems. These are illegal harvesting of valuable timber species in the forest reserve, annual wild fires, and the lack of hard data on the actual status of biodiversity in the area.

3.2 Ethnobotanical information

3.2.1 Traditional healing

The study revealed the presence of a substantial number of healers in the area. According to interviews there were a total of 20 traditional healers distributed as follows: Tandai, Tegetero and Nyandira had 10 healers, four and six, respectively. The figure could be even higher than this as it represents only those who reported for the interviews.

Like in many other areas, there are four major types of traditional healers who operated in the study villages. These are the diviner or fortune-teller, the herbalist, birth attendant (midwife) and the surgeon. Diviners are those who use spirits to find out about suffering. They usually give prescriptions that involve performance of certain rituals pertinent to the community concerned. Divination is regarded as the only way in which a healer can diagnose the disease of a patient and is the equivalent of laboratory investigations in modern medicine. Apart from using spiritual powers, the fortune-tellers also treat their patient using herbs only after prescription.

The herbalists form the second group of healers. These use only herbs in healing. They are more common and they include people who acquire the skill through experience, inheritance or from hearing. A third group is comprised of midwife. They deal with matters related to conception and birth, by taking care of pregnant women and attending their delivery. Furthermore, they help to solve problems, which arise after delivery. A number of plant species are used in labour induction and expulsion of the placenta. The role of birth attendants is quite important in the Uluguru Mountain Area considering that transportation in the area is not reliable and there is an absence of health centers in some villages. The last group is made up of surgeons. They form a small group of specialised healers. This group treats traumatic wounds, abscesses, and they perform circumcision. They also attend to *orthopaedic* cases.

3.2.2. Plant species and families used in traditional healing in the Uluguru Mt. Area

Plant species are potential sources of medicine for the people and animals. They are also used as a low cost and less environmentally damaging agricultural input, especially in pest control (Mgumia, undated). A total of 201 plant species were recorded as sources of medicine in the Uluguru Mountain area (Appendix 1). These plants were reported to treat 68 human, animal, crop diseases and related problems.

Most of the plants were used to treat one disease, some two and still others more than two diseases. The 10 most highly used plant species are listed below. In this group, *Abrus precatorius* (Lufambo) was the most highly used plant species reported to treat nine diseases. *Ocotea usambarensis* (Mvumba), *Ocimum suave* (Mnung'a), *Azadirachta indica* (Mwarobaini) and *Senna petersiana* (Mkundekunde) were the second highly used species with the reported ability to treat seven diseases. *Dissotis rotundifolia* (Kinzasu), Mavumbula (unidentified), *Vangueria infausta* (Msada), *Senna hirsuta* (Mwambalasinba), and *Landolphia buechananii* (Luziwana), Malosa (unidentified) and *Impatiens ulugurensis* (Mapoza) occupied the third position as they were used to treat six diseases. Most of the recorded medicinal plant species were collected from the near by farmland and forest reserves. However, a considerable number of plants were also collected from the lowland forest, Miombo woodlands and the coastal forest.

The medicinal plants in the Uluguru Mountain area belong to 61 families (Appendix II). The families were ranked into 8 groups based on the number of plant species (Table 5). Compositae was the leading family with 14 medicinal plant species. Three families (Euphorbiaceae, Papilionaceae and Rubiaceae) had seven medicinal plant species; two families (Caesalpinioideae and Moraceae) were in the third rank while the rest had 5 - 2 plant species. The lowest group had 35 families with one medicinal plant species each.

Table 5. Distribution of medicinal plant species into different families

Rank	Number of Family	Number of species
1	1	14
2	3	7
3	2	6
4	1	5
5	4	4
6	6	3
7	9	2
8	9	1

The analysis has revealed differences in the number of diseases treated by different plant families. While 19 diseases were treated by Compositae, 18 diseases were treated by Papilionaceae, 17 by Caesalpinoideae, 12 by Rutaceae, 11 by three families (Labiatae, Moraceae & Piperaceae), 10 diseases were treated by Euphorbiaceae family with the rest treating 9 - 1 diseases (Table 6).

Table 6. Family ranking based on the diseases treated by each family

Rank	Number of Families	Number of diseases
1	1	19
2	1	18
3	1	17
4	1	12
5	3	11
6	1	10
7	4	9
8	1	8
9	5	7
10	4	6
11	2	5
12	4	4
13	7	3
14	13	2
15	13	1

3.2.3. Diseases and conditions treated by traditional healers

A total of 704 use reports (UR) of 201 plant species were recorded and assigned to 12 groups of medicinal uses with 0.37 Factor of Informant Consensus F_{IC} as indicated in Table 7 following the grouping by (Medical practitioner in Tandai personal com; Iwu 1993; Schlage *et al.* 1998).

Table 7. Main groups of medicinal uses.

Group of medicinal uses	Plant Species	% of all taxa	Use report	%of Use report	F _{IC}
Gastrointestinal disorders	92	46	231	33	0.5
Gynaecological, Andrological and Urogenital disorders	50	25	101	14	0.5
Skin disease	43	21	100	14	0.6
Condition caused by spirit	40	20	60	9	0.3
Pain and inflammation	35	17	57	8	0.4
Respiratory diseases	27	13	50	7	0.5
Malaria and fever	16	8	20	3	0.3
Brain & Nervous system	13	6	18	3	0.3
Animal diseases	8	4	9	1	0.1
Other Human diseases	7	3	11	1	0.4
Crop pests	6	3	8	1	0.3
Children disease	26	13	4	6	0.3
Total			704	100	4.5
Mean					0.37

Total Species 201 Total use report UR 704

Gastrointestinal disorders

This is the largest group of plant species with medicinal value. It had 92 plant species (46% of the groups taxa) with a F_{IC} 0.5. About eight human diseases have been classified into the group. These are Hernia (Ngiri/ Mchango wa Ngiri in Kiluguru) and these were treated by 53 plant species or 58 % of the plants use in that group. Ngiri is a disease that causes severe pain to the lower belly and sometimes it is associated with swelling of the scrotum. It is a very common disease among men. In this group there are diseases like stomach ache which is treated by using 32 plant species (35 % of this groups taxa); Diarrhoea (25%), while haemorrhoid, stomach worm, vomiting, stomach tumour, and peptic ulcers were treated by 17 % of the plants (Table 8). Species like *Vernonia iodocalyx* (Kitugutu), *Ocimum suave* (Mnung'ha), *Carica papaya* (Mpapai) and *Psidium guajava* (Mpera) were commonly used. Also species like Kilumbulumbu (unidentified), *Abrus precentorius* (Lufambo), *Landilphia buchananii* (Luziwana), *Helichrysum schimperii* (Lweza), Mavumbula (unidentified), *Piper capensis* (Mdaha) and others are used.

Table 8. Plant species used in treatment of gastrointestinal diseases

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
<i>Ageleae heterophylla</i>	Bandebande	Haemorrhoid	L
<i>Mucuna pruriensis</i>	Bumu	Hernia	L
-	Daka la tangabebe	Hernia	R
<i>Ficus stuhlmanii</i>	Foza/ Mtamba	Stomach tumour	R
<i>Chassalia parvifolia</i>	Kiberuberu/ Mguhu	Hernia	R
<i>Rhus vulgaris L.</i>	Kikulagembe/ Mkulanachilo/ Msulu	Diarrhoea, Stomachache	R
-	Kilumbulumbu	Diarrhoea, Haemorrhoid	R, L
<i>Spermacose princeae</i>	Kimbwigambwiga	Diarrhoea	L

-	Kindukule	Diarrhoea	R
<i>Erlangea cordifolia</i>	Kisungu pori	Diarrhoea	L
<i>Vernonia hymenolepis</i>	Kisungumili/ Msungu	Stomach ache	B
<i>Vernonia iodocalyx</i>	Kitugutu	Stomach ache, Diarrhoea, Hernia	R, L
<i>Craterispermum longipendunculatum</i>	Kizang'wa	Stomach ache	L
<i>Abrus precatorius</i>	Lufambo	Diarrhoea, Haemorrhoid	R, L
<i>Costus sarmentosus</i>	Lugobedilukwale/ Ngobedi	Diarrhoea, Hernia	L, S
<i>Adenie cissampeloides</i>	Lugole/ Gole	Stomach ache	L
<i>Culcasia scandens</i>	Luhalamila/ luhambanti	Hernia	L
<i>Veronica abyssinica</i>	Lutizo	Hernia	R
<i>Landolphia buchananii</i>	Luziwana	Diarrhea, Hernia, Stomach-ache	R
<i>Helichrysum schimperi</i>	Lweza	Stomach ache, Diarrhoea	R, L
-	Mavumbula/ mvumbasi	Hernia, Stomach ache	R, B
<i>Cajanus cajan (L.) Millsp.</i>	Mbaazi	Diarrhoea	L, R
-	Mboriti	Hernia	L
<i>Adansonia digitata L.</i>	Mbuyu	Hernia	R
-	Mcharaka/ Mharaka	Stomach ache,	T
<i>Piper capense. L.</i>	Mdaha/ Ludaha	Hernia, Stomach tumour	R
<i>Musa sapientum</i>	Mdizi	Hernia	L
<i>Toddalia asiatica (L.) Lam.</i>	Mgegeba/ mgogandima	Hernia, Stomach ache	R
<i>Myrica salicifolia A. Rich</i>	Mgeremamondo	Hernia	R
-	Mghosa	Hernia	R
<i>Rytigynia lichenixenos</i>	Mhambalamaziwa	Hernia	R
<i>Dodonaea viscosa</i>	Mhange/ Mhangehange	Hernia	R
<i>Manihot esculenta Cratz.</i>	Mhogo	Stomach ache	R, L
-	Mhogole	Hernia	R, L
-	Mhungaginyi	Diarrhea	L
-	Mhunza	Diarrhoea	B
<i>Khaya anthotheca (Welw.) C. D. C.</i>	Mkangazi	Stomach ache, Hernia,	R
<i>Allanblackia ulugurensis Engl.</i>	Mkani/ Mkanyi	Stomach ache	F, L
<i>Clausena anisata</i>	Mkomavikali	Haemorrhoid	R
<i>Vigna unguiculata</i>	Mkunde	Hernia	R
<i>Senna petersiana</i>	Mkundekunde	Stomach ache, Hernia,	R
<i>Ficus lutea Vahl.</i>	Mkuyu	Hernia	R
<i>Flueggea virosa</i>	Mkwambekwambe	Hernia, Stomach ache	R, L
<i>Tabernaemontana pachysiphon</i>	Mlengolengo	Hernia	R
<i>Citrus limon</i>	Mlimau	Hernia, Stomach ache	R
-	Mlosa	Stomach ache, Stomach tumour	R
<i>Zanthoxylum deremens (Engl.)</i>	Mlungulungu	Stomach ache, Hernia	L
<i>Citrus aurantifolia</i>	Mndimu	Diarrhoea, Stomach tumour	R, L
<i>Suregada zanzibariensis</i>	Mndimu pori	Stomach tumour	L
-	Mng'alumo	Diarrhoea, Hernia	R
<i>Anthocleista grandiflora</i>	Mngua	Stomach ache	R
<i>Maesa lanceolata Forsk.</i>	Mnguti/ Mngutinguti	Hernia	R
-	Mnikakozi	Diarrhoea,	R, L
<i>Pterocarpus angolensis D.C.</i>	Mninga	Hernia	R
<i>Ocimum suave</i>	Mnung'ha (Nung'anung'a)	Stomach ache, Hernia, Stomach worm, Haemorrhoid	R, L

-	Mnyamimba	Hernia	R
<i>Lycopersicum esculentum</i>	Mnyanya	Stomach ache	L
-	Mnyanya mbago	Hernia	R
<i>Hoslundia opposita</i>	Mnzekonzeko/ Msekela	Hernia	L
<i>Podocarpus latifolius (Thumb.)</i>	Mnyanziri	Hernia	R
<i>Carica papaya</i>	Mpapai (dume)	Peptic Ulcer, Hernia, Stomach	R, L, F
<i>Psidium guajava L.</i>	Mpera	Diarrhoea, Hernia, Stomach ache	R, L
<i>Prunus americana</i>	Mpix	Stomach ache	L
<i>Vangueria infausta</i>	Msada	Hernia	R, L
-	Msanangare	Hernia	R
<i>Ficus exasperata Vahl.</i>	Msasa	Diarrhoea	R
-	Msigisi	Hernia	R
<i>Ficalhoa laurifolia</i>	Msomolo	Hernia	R
<i>Vernonia hymenolepis</i>	Msungu/ Mdugutu sungu/ Msungumili	Stomach ache, Hernia	R
<i>Halleria lucida</i>	Msusulamugi	Stomach ache	R, L
-	Mtang'we	Stomach ache	R
<i>Solanum incanum Linn.</i>	Mtula	Vomit	R
<i>Harungana madagascariensis</i>	Mtunu	Diarrhoea	R, L
<i>Milletia dura</i>	Mviza/ Mhavi	Hernia, Diarrhoea	R, L
-	Mvukwi	Hernia	R
<i>Ocotea usambarensis Engl.</i>	Mvumba/ Mbale/ Mseli	Stomach ache, Hernia	B
<i>Senna hirsuta (L.) Irwin & Barneby</i>	Mwambalasinimba	Hernia, Stomach ache	R
<i>Ehretia cymosa L.</i>	Mwamilang'anga	Hernia	R
<i>Azadirachta indica</i>	Mwarobaini	Hernia, Stomachache	L, R
<i>Agauria salicifolia (Lam.)</i>	Mwavi	Diarrhoea	L
<i>Cyphostemma adenocaula</i>	Mvunjamilima/ Rwengere/ Mweghele	Stomach ache	R
<i>Brideria micrantha (Hochst) Baill.</i>	Mwiza/ Msumba	Hernia, Stomach ache	L, F
-	Mzangwi	Hernia	L
<i>Piper umbellatum</i>	Nembenembe	Diarrhoea	L
<i>Maranthes goetzeniana</i>	Ng'angwe	Hernia	L
<i>Bidens pilosa</i>	Nyaweza	Hernia,	B
<i>Sonchus luxurrons</i>	Sungasunga	Stomach	R, L
<i>Nicotiana tabacum L.</i>	Tumbaku	Hernia	R
<i>Triumfetta cordifolia</i>	Ununvumweupe	Vomit	R
<i>Plectranthus chiradzulensis</i>	Vuga	Stomach ache, Diarrhoea,	L
<i>Celosia trigyna</i>	Zumanguku	Haemorrhoid	L

Foot Note. L - leaves, R - roots, B - Bark, F - Fruits, T - Twigs, C - cork, J - juice, Ex - exudate

- Not identified

Gynaecological, andrological and urogenital diseases

Human diseases related to male and female reproductive systems as well as urinary tract infections have been assigned to this group. This is the second largest group with a total of nine human diseases/ symptoms. A total of 50 plant species have been recorded for treatment of infections related to the group, with a F_{IC} 0.5. The most common diseases/ symptoms in the group is painful menstruation (Chango la Kizuka in Kiluguru) treated using 20 plant species or 40 % of the plants used in the group. This is followed by Gonorrhoea (26 %) and Bilhazia (18 %). The other diseases, namely prolonged

menstruation, infertility (Female), male virility, labour induction, after birth child death, and expulsion of placenta were treated by 2%-9% of the plants recorded within the group (Table 9). The plant species commonly used to treat the diseases in the group are *Dissotis rotundifolia* (Kinzasu), *Landolphia buchananii* (Lufambo) and Malosa (unidentified). Others include *Ipomea obscura* (Lufeafea), *Vitex doniana* (Mfulu), Mhunza (unidentified), and *Khaya anthotheca* (Mkangazi).

Table 9: Plant species recorded for the treatment of gynaecological, andrological and urogenital diseases.

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
<i>Mucuna pruriensis</i>	Bumu	Male virility	L
-	Kidindili	Labour inducement	L
<i>Spilanthes mauritiana</i>	Kigodi cha ngadu	Chango la kizuka	L
-	Kihozamsanga	Infertility (Women)	R, L
<i>Dissotis rotundifolia</i> (Sm.)	Kinzasu	Mchango wa kizukaa, Bilharzia, Expulsion of placenta	L
-	Kisaganumbu	Labour inducement	L
<i>Caloncoba welwitschii</i>	Kitonvutonvu	Bilharzia	L
-	Kongowekowe	Chango la kizuka	T
<i>Abrus preantorius</i>	Lufambo	Infertility (W), Child death after birth, Gonorrhoea, Labour induction, Bilharzia	R, L
<i>Ipomea obscura</i>	Lufeafea/ Mhambankulu	Labour inducement, Infertility (W), Chango la kizuka	R, L
<i>Rubus pinnatus</i> Willd.	Lufifi	Menstruation cycle	R
<i>Hibiscus surattensis</i> L.	Lumotomoto	Gonorrhoea	R
-	Lusila	Male virility	R
<i>Landolphia buchananii</i>	Luziwana	Male virility	R
<i>Cucurbita moschata</i>	Maboga	Expulsion of placenta	L
<i>Zea mays</i> L.	Mahindi	Bilharzia, Gonorrhoea	R, S
-	Malosa	Gonorrhoea, Child death after birth, Menstruation cycle, Chango la kizuka	R
<i>Impatiens ulugurensis</i>	Mapoza	Infertility (Women),	R, L
<i>Cajanus cajan</i> (L.) Millsp.	Mbaazi	Chango la kizuka	L
<i>Deinbollia borbonica</i>	Mfakuzimu	Bilharzia	L
<i>Vitex doniana</i>	Mfulu	Bilharzia, Chango la kizuka	R
-	Mfunguo	Child death after birth	R, L
-	Mhungaginyi	Diarrhoea Chango la kizuka	L
-	Mhunza	Menstruation cycle, Chango la kizuka	R
<i>Khaya anthotheca</i> (Welw.) C. D. C.	Mkangazi	Bilharzia, Gonorrhoea	R
<i>Ficus lutea</i> Vahl.	Mkuyu	Menstruation cycle, Chango la kizuka	L, F
<i>Tabernaemontana pachysiphon</i>	Mlengolengo	Promotion of lactation	L
-	Mnamiza	Male virility	R
-	Mnarasindi	Gonorrhoea	R
<i>Citrus aurantifolia</i>	Mndimu	Chango la kizuka, Gonorrhoea	L
-	Mnikakozi	Infertility (W), Chango la kizuka	R, L
<i>Hoslundia opposita</i> Vahl.	Mnzekonzeko/ Msekela	Chango la kizuka	L
<i>Carica papaya</i>	Mpapai	Gonorrhoea	R
<i>Psidium guajava</i>	Mpera	Chango la kizuka	R

<i>Vangueria infausta</i>	Msada	Menstruation, Male virility	R
<i>Ficus exasperata</i> . Vahl.	Msasa	Chango la kizuka, Gonorrhoea	R, L
-	Msigisi	Gonorrhoea	R
<i>Harungana madagascariensis</i> Poir.	Mtunu	Chango la kizuka, Gonorrhoea	R, L
-	Muhoma	Chango la kizuka	R, L
<i>Saccharum officinarum</i>	Muwa	Bilhazia	J
<i>Millettia dura</i>	Mviza/ Mhavi	Chango la kizuka	R
-	Mvukwi	Chango la kizuka	R,
-	Mvumbasi (pori)	Chango la kizuka	R, L
<i>Senna hirsuta</i>	Mwambalasiimba	Menstruation	R
-	Mwenguwengu	Infertility (Women)	R, L
<i>Phragmites mauritianus</i>	Ngugu	Gonorrhoea	C
<i>Capsicum frutescense</i>	Pilipili/ Pilipili	Male virility	R
-	Simbi	Gonorrhoea	S
<i>Celosia trigyna</i>	Zumanguku	Bilhazia	L

Skin diseases and related problems

The third largest group is made up of diseases of the skin and related problems. In this group a total of 12 diseases/ problems have been identified and were reported to be treated by 43 plant species or 21% of the taxa with F_{IC} 0.6. Other diseases with the percent of plants used to treat them in brackets are: wounds (35%), eye related diseases such as eye ache, eye inflammation, and conjunctivitis (35 %), ear ache (23 %), skin eruption (11 %), abscess, itching, pimples, scabies (16 %) and burn (2 %) (Table 10). In the group, *Trema orientalis* (Mbefu), *Ricinus communis* (Mnyonyo), *Hoslundia opposita* (Mnzekezeko) and *Annona senegalensis* (Mtomokwe) were most highly used plant species.

Table 10: Plant species used in the treatment of skin diseases/ problems

Botanical name	Name in Kiluguru	Disease/condition treated	Parts used
<i>Mucuna pruriensis</i>	Bumu	Wound	L
<i>Tragia brevipes</i>	Chafi	Itching	L
<i>Allophylus fermigirens</i>	Chivunagembe	Skin eruption (Sonde)	L
-	Fufula	Eye inflammation (Mwangeni)	L
<i>Drymaria cordata</i>	Funya	Eye ache	L
<i>Momordica foetida</i>	Huluhundu	Ear ache, Skin eruption	L
-	Kihozamsanga	Eye ache	L
<i>Ageratum conyzoides</i>	Kimtamta (Kivutavuta)	Wound	L
<i>Impatiens ulugurensis</i>	Kipoza/ Mapoza/ Mpoza	Eye ache, Wound	L
-	Kipozahuba	Eye ache	L
<i>Abrus preantorius</i>	Lufambo	Eye inflammation	R, L
<i>Hibiscus surattensis</i> L.	Lumotomoto	Wound, Abscess	R, L
-	Malosa	Eye ache	R
-	Mavumbula/ mvumbasi	Ear ache	L
<i>Trema orientalis</i> (L.) BL.	Mbefu	Itching/ Pimples/ Scabies	L
<i>Jatropha curcas</i> L.	Mbono/ Mnyembamwani	Wound	EX
<i>Sorindeia madagascariensis</i> Thon.	Mherehere/ Mhirihiri	Scabies	R, L

-	Mhungaginyi	Conjunctivitis	L
<i>Clausena anisata</i>	Mkomavikali	Eye inflammation	R, L
<i>Sansevieria intermedia</i>	Mkonge	Abscess	L
<i>Senna petersiana</i>	Mkundekunde	Skin eruption	L
<i>Ocimum suave</i>	Mnung'ha/ Nung'anung'a	Conjunctivitis	L
<i>Ricinus communis L.</i>	Mnyonyo/ Mnyemba	Ear ache, Wound	R, L, S
<i>Hoslundia opposita Vahl.</i>	Mnzekonzeko/ Msekela	Wound, Boil/ Abscess	L
<i>Annona senegalensis Pers.</i>	Mtomokwe	Abscess, Eye ache	R
<i>Harungana madagascariensis Poir.</i>	Mtunu	Eye inflammation	R, L
<i>Albizia harveyi</i>	Mvulanvula	Wound	L
<i>Milicia excelsa (Welw.) C.C. Berg</i>	Mvule	Wound	B
-	Mwekula	Eye inflammation	R, L
<i>Mangifera indica L.</i>	Mwembe	Wound	B
<i>Crassocephalum crepidioides (Benth.)</i>	Mwinika	Eye ache, Burn	L, F
<i>Brideria micrantha</i>	Mwiza	Skin eruption	R
<i>Kigelia africana</i>	Myegeya	Skin eruption	B
-	Myegeyege	Ear ache	L
-	Mzangwi	Ear ache	L
<i>Brachystegia spiciformis</i>	Mzingha/ Mtundu wa nyika	Ear ache	L
<i>Piper umbellatum</i>	Nembenembe	Ear ache	L
-	Ng'ongulu	Eye ache	L
<i>Phragmites mauritanus</i>	Ngugu	Wound,	L
<i>Crassocephalum montuosum</i>	Nyaluganza	Ear ache	L
<i>Conyza sumatrensis (Retz.)</i>	Nyangavuvu	Wound	L
<i>Bidens pilosa</i>	Nyaweza	Wound	R, L
<i>Capsicum frutescens</i>	Pilipililukwale/ Pilipili	Wound	R
-	Tundula	Wound	L
<i>Plectranthus chiladzulensis</i>	Vuga	Wound	L
<i>Celosia trigyna</i>	Zumanguku	Eye ache	L

Spirits and witchcraft

This group comprise of conditions or diseases whose occurrence is in most cases associated with superstition. Six diseases/conditions are assigned to this group. These diseases were reported to be treated by 40 plant species or 20 % of plants sampled with a F_{IC} 0.4. Spirit is the most common and is treated by 65 % of plant species of the group. According to the Waluguru, plant species are also used in the protection of personal properties against thieves as well as personal protection against witchcraft. In some cases plants are used in the inauguration of activities requiring special skills such as iron smithy and witchcraft. Snake bite is also treated by plants, however, the Waluguru associate snake bite with magic power rather than nature. Some rituals are also performed using certain plant species. In general, apart from spirits, the rest of the diseases/problems were treated by a total of 48% plants from the group (Table 11). *Impatiens ulugurensis* (Mapoza) and Mcharaka (unidentified) were the most highly used plant species in the group.

Table 11: Plant species recorded for the treatment of spirit and witchcraft related problems

Botanical name	Name in Kiluguru	Disease/condition treated	Parts used
-	Chiawa	Spirits	L
-	Kihozamsanga	Protection	R
-	Kilemelanembo	Ironsmithery	R, L, B
<i>Allium ascclonicum</i>	Kitunguu saumu	Spirits	L
<i>Landolphia kirkii</i>	Lubungo/ Lubungobungo	Spirits	R
<i>Piper capense L.</i>	Ludaha/ Mdaha	Spirits	R, L, B
<i>Hibiscus fuscus</i>	Luswagamene	Protection	R
<i>Impatiens ulugurensis</i>	Mapoza	Witch craft, Ritual, Protection	R, L
-	Mavumbula/ mvumbasi	Spirits	R, L
-	Mbagama	Ironsmithery	R
<i>Jatropha curcas L.</i>	Mbono/ Mnyembamwani	Ironsmithery	R
<i>Adansonia digitata L.</i>	Mbuyu	Spirits	R
-	Mcharaka/ Mharaka	Spirit, Snake bite	T
<i>Toddalia asiatica (L.) Lam.</i>	Mgegeba/ mgogandima	Spirits	R
<i>Sterculia appendiculata</i>	Mgude	Spirits, Rituals	R
-	Mhungaginyi	Protection	L
<i>Leptonychia usambarensis</i>	Mkole	Witchcraft	R
<i>Senna petersiana</i>	Mkundekunde	Witchcraft	R
<i>Ficus lutea Vahl.</i>	Mkuyu	Witchcraft,	R
<i>Maesa lanceolata Forsk.</i>	Mnguti	Spirits	R, L
<i>Albizia versicolor (Welw.)</i>	Mnyanza	Spirits	R
<i>Podocarpus latifolius (Thumb.)</i>	Mnyanziri	Spirits	R
<i>Trichoscypha ulugurensis</i>	Msemblerere	Spirits	R
<i>Ficalhoa laurifolia</i>	Msomolo	Spirits	R, L
-	Mtang'we	Spirits	R
<i>Diplorynchus condylocarpon</i>	Mtogo	Ironsmithery	R
<i>Solanum incanum Linn.</i>	Mtula	Spirits	R
<i>Harungana madagascariensis Poir.</i>	Mtunu	Witchcraft	R
<i>Albizia harveyi</i>	Mvulanvula	Spirits	L
<i>Cyphosterna adenocaula</i>	Mvunjamilima/ Rwengere	Drums/spirits	R, L
-	Mwenguwengu	Protection	R, L
<i>Justicia heterocarpa</i>	Mwidu	Snake bite	T, L
<i>Allophylus abyssinicus</i>	Mwoza/ Moza	Spirits, Protection	L
<i>Piper umbellatum</i>	Nembenembe	Spirits	L
-	Ng'alumwa	Spirits	R
<i>Crassocephalum sp.</i>	Tindimka	Spirits	L
<i>Zanthoxylum deremens</i>	Mlungulungu	Drums/ spirits	R, L
-	Mnikakozi	Spirits	R, L
<i>Senna hirsuta</i>	Mwambal asimba	Spirits	R
<i>Ocotea usambarensis</i>	Mvumba	Spirits	R, B

Pain and inflammation

The pain and inflammation group of diseases involves 17% of the plant species sampled. The group is made up of eight diseases/problems which are associated with general body pain caused by strenuous physical work and inflammations. In this category, there are

conditions like headache that were treated by almost 28% plant species. Another condition is Safura, which is characterised by a general body swelling due to abnormal body physiological impediments, and was treated by 23 % of the plant species. Tambazi, which is associated with body swelling originating from a localised point, and which then spreads over the whole body was treated by 20% species the group. Body pain due to strenuous physical work, inflammation, backache, Dulanzi (joint pain similar to gout), and rheumatism were treated by 43% of the plants in the group (Table 12). *Senna petersiana* (Mkundekunde) and *Cyphosterna adenocaula* (Mvunjamilima) were the most used plant species followed by Kongowekowe (unidentified), *Ocotea usambarensis* (Mvumba), *Azadirachta indica* (Mwarobaini), *Crassocephalum montuosum* (Nyaluganza) and others.

Table 12: Plant species used for the pain and inflammation problems

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
<i>Momordica foetida</i>	Huluhundu	Head ache	L
<i>Chassalia parvifolia</i>	Kiberuberu	Pain	R
<i>Acalypha fruticosa</i>	Kifulwe	Safura	R
-	Kihawa	Pain killer	L
<i>Rhus vulgaris L.</i>	Kikulagembe/ Mkulanachilo	Pain killer	R, L
-	Kilemelanembo	Tambazi	R, F, L
<i>Ageratum conyzoides</i>	Kimtamta (Kivutavuta)	Head ache	L
-	Kongowekowe	Tambazi, Headache	T
<i>Abrus precentorius</i>	Lufambo	Tambazi	R
<i>Culcasia scandens</i>	Luhalamila/ luhambanti	Head ache	L
-	Lusila	Rheumatism	R
<i>Hibiscus fuscus</i>	Luswagamene	Rheumatism	R
-	Mgoloka	Pain	L
-	Mkaviti	Inflammation	L
<i>Senna petersiana</i>	Mkundekunde	Safura, backache, Inflammation	R, L
<i>Ricinus communis L.</i>	Mlegezabwende/ Mnyonyo	Tambazi	R
<i>Zenkerella schliebennii</i> (Harms.)	Mlelati/ mlilati	Inflammation	L
<i>Zanthoxylum deremens</i>	Mlungulungu	Dulanzi	R, L
<i>Cocos nucifera L.</i>	Mnazi	Tooth ache	R
<i>Citrus aurantifolia</i>	Mndimu	Head ache	R, L
<i>Carica papaya</i>	Mpapai	Toothache	R
<i>Ficus exasperata Vahl.</i>	Msasa	Head ache	R
<i>Dracaena afromontana</i>	Msenene	Safura	R
-	Msono	Safura	R
<i>Vernonia hymenolepis</i>	Msungu	Safura	R
<i>Ocotea usambarensis</i>	Mvumba	Safura, Dulanzi	R, L
<i>Cyphosterna adenocaula</i>	Mvunjamilima/ Rwengere	Tambazi, Swelling of legs, Body pain	R, L
<i>Senna hirsuta (L.) Irwin & Barneby</i>	Mwambalasimba	Head ache	R
<i>Azadirachta indica</i>	Mwarobaini	Head ache, Back ache	R
<i>Costus sarmentosus</i>	Ngobedi	Safura	R, L, F

<i>Crassocephalum montuosum</i>	Nyaluganza	Head ache	L
<i>Piper nigrum L.</i>	Pilipilimanga	Safura	R
<i>Sonchus raxurians</i>	Sungasunga	Headache	R, L
<i>Rhoicissus tridentata</i>	Togoni/ Kidere	Tambazi	R

Respiratory diseases

There are seven diseases/conditions falling under this group with F_{IC} 0.5. These are Pneumonia, cough, chest pain, Asthma, sore throat, cold and Tonsillitis (treated by 30 %, 37 %, 40 %, 29 % and 11 % of the taxa) (Table 13). Mhafigonzo (unidentified) was the most highly used plant species.

Table 13: Plant species recorded for the treatment of Respiratory diseases and conditions

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
<i>Geranium sp.</i>	Chimtemte	Pneumonia	L
<i>Adenia cissampeloides (Planch.) Harms</i>	Gole/ Lugole	Chest pain, Asthma	R
<i>Culcasia scandens</i>	Hambanti	Chest pain, Asthma	T
<i>Dissotis rotundifolia (Sm.)</i>	Kinzasu	Chest pain, Asthma	L
-	Kongowekowe	Cough	R, L
<i>Pavonia urens</i>	Lukilingala/ Mkilingala	Cough	R
<i>Cassia mimosoides</i>	Lusangalala	Asthma, Severe cough	L
<i>Veronica abyssinica</i>	Lutizo	Cold	R
<i>Trema orientalis (L.) BL.</i>	Mbefu	Cough, Pneumonia	L
<i>Euclea divinorum</i>	Mdaa	Chest pain, Asthma	R
-	Mdingala	Pneumonia	L
-	Mgoloka	Tonsillitis	L
-	Mhafigonzo	Chest pain, Asthma, Sore throat	R
<i>Vigna unguiculata</i>	Mkunde	Chest pain, Cough	L
<i>Eucalyptus maidenii Muel.</i>	Mmaidini	Chest pain, Cough	R
<i>Ricinus communis L.</i>	Mnyonyo/ Mnyemba	Cough	L
<i>Vangueria infausta</i>	Msada	Pneumonia	L
<i>Rhus vulgaris</i>	Msulu/ Mtunune	Chest pain	R
<i>Solanum incanum Linn.</i>	Mtula	Chest pain, Cough	R
-	Mtungwi	Pneumonia	R
<i>Vangueria infausta Burch.</i>	Mviru/ Msada	Pneumonia	L
<i>Senna hirsuta (L.) Irwin & Barneby</i>	Mwambalasimba	Pneumonia	R
<i>Costus sarmentosus</i>	Ngobedi	Cough	F
<i>Piper nigrum L.</i>	Pilipilimanga	Chest pain, Asthma	R, F
<i>Zingiber officinale L.</i>	Tangawizi	Cough	R
<i>Helianthus annuus</i>	Ufuta/ Lufuta	Chest pain, Asthma	S
<i>Hypericum peplidifolium</i>	Vigengegenge	Pneumonia	L

Malaria and fever

The two diseases that belong to the group were treated by 16 plant species or 8 % of the total taxa sampled, with 0.2 F_{IC} . Fever was the most prevalent disease in the group treated by 81 % of the plant species while malaria was treated by 31 % of the plant species

(Table 14). *Ocotea usambarensis* (Mvumba) and *Azadirachta indica* (Mwarobaini) were the leading plant species used to treat the two diseases.

Table 14: Plant species assigned to the treatment of malaria and fever

Botanical name	Name in Kiluguru	Disease/condition treated	Parts used
<i>Chassalia pavifolia</i>	Kiberuberu/ Mguhu	Malaria,	L
<i>Artocarpus heterophyllus</i> Lam.	Mfenesi	Fever	R
<i>Myrica salicifolia</i> A. Rich.	Mfumbafumba	Malaria	R
-	Mfumbazi	Fever	L
<i>Bersama abyssinica</i>	Mfumbi	Fever	L
<i>Suregada zanzibariensis</i>	Mndimu pori	Fever	L
<i>Maesa lanceolata</i> Forsk.	Mnguti	Malaria	R, L
<i>Albizia versicolor</i> (Welw.)	Mnyanza	Fever	R
<i>Hoslundia opposita</i>	Mnzekonzeko	Fever	L
<i>Trichoscypha ulugurensis</i>	Msemblerere	Fever	R
<i>Albizia harveyi</i>	Mvulanvula	Fever	L
<i>Ocotea usambarensis</i> Engl.	Mvumba/ Mbale/ Mseli	Fever/ Malaria,	B
<i>Azadirachta indica</i>	Mwarobaini	Malaria/ Fever,	L
<i>Mangifera indica</i> L.	Mwembe	Fever	B
<i>Annona senegalensis</i>	Mtomokwe	Fever	R
<i>Vernonia hymenolepis</i>	Msungu	Fever	R

Brain and nervous system

Five different diseases and conditions are assigned to the group. These are mental illness, which were treated by 46% of the plants in the group, giddiness (30%), faint (15%), epilepsy and paralysis (15 %) each. In general the diseases under the group were reported to be treated by 6% of all the plants sampled (Table 15). Plants like Kidumilahakula (unidentified), *Vernonia hymenolepis* (Kitugutusungu), *Allium ascalonicum* (Kitunguusamu) and *Plectranthus chiradzulensis* (Luhungavisozi) were among the species used in treating diseases assigned to the group.

Table 15: Plant species assigned for the treatment of brain disease/conditions

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
-	Kidumilahakula	Epilepsy	L
<i>Vernonia hymenolepis</i>	Kitugutusungu	Mental illness	R
<i>Allium ascalonicum</i>	Kitunguu saumu	Paralysis	L
<i>Plectranthus chiradzulensis</i>	Luhungavisozi	Faint	L
<i>Satureja biflora</i>	Lupara lwa mlungu	Mental illness	R
<i>Hibiscus fuscus</i>	Luswagamene	Mental illness	R
<i>Helichrysum schimperi</i>	Lweza	Mental illness, Faint	R, L
-	Mavumbula/ mvumbasi	Mental illness	L
<i>Cajanus cajan</i> (L.) Millsp.	Mbaazi	Giddiness	L
-	Mngulu	Giddiness	R
<i>Ehretia cymosa</i>	Mwasangulu	Giddiness	L
<i>Cassia mimosoides</i>	Lusangalala	Mental illness	L
<i>Helianthus annuus</i>	Ufuta/ Lufuta	Giddiness	S

Children's diseases

26 plant species or 13 % of all the plants collected are used for the treatment of diseases referred to as Children diseases. Most of the plant species are used to treat a disease called 'child fever' (Degedege in Kiluguru). The disease is associated with high fever which develops into convulsions after which, if not contained, the child may die. Plant species are used to cure or relieve the condition before further treatment. Another few species were used for treatment of Kwashiorkor (Table 16). Species like Bandagala (unidentified), *Siphonochilus kirkii* (Hungahunga), *Senna petersiana* (Mwambalasimba), *Bidens pilosa* (Mnyaweza), and others were used for treatment of diseases assigned to the group.

Table 16: Species used for the treatment of children diseases

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
-	Bandagala	Child fever (Degedege)	T
<i>Multidentia fanshwei</i>	Degedege/ Degekulu	Child fever (Degedege)	L
<i>Siphonochilus kirkii</i>	Hungahunga	Kwashiorkor	R
<i>Rhoisissus tridentata</i>	Kidere	Child fever	L
<i>Allium ascalonicum</i>	Kitunguu saumu	Child fever	L
-	Kivunyangale	Child fever	L
<i>Culcasia scandens</i>	Luhalamila/ luhambamti	Child fever	L
-	Mavumbula/ mvumbasi	Child fever	R, L
-	Mcharaka/ Mharaka	Child fever	R
<i>Piper capense</i>	Mdaha/ Ludaha	Child fever	L
-	Mhungaginyi	Child fever	L
-	Mlambanda	Child fever	L
<i>Zanthoxylum deremens (Engl.)</i>	Mlungulungu	Child fever	L
<i>Maesa lanceolata Forsk.</i>	Mnguti/ mngutinguti	Child fever	R, L
<i>Ocimum suave</i>	Mnung'ha/ Nung'anung'a	Child fever	L
<i>Senna petersiana</i>	Mwambalasimba	Child fever	R, L
<i>Vangueria infausta</i>	Msada	Child fever,	R
<i>Cassipourea malosana</i>	Mwizongela	Child fever	L
<i>Allophylus abyssinicus</i>	Mwoza/ Moza	Child fever	L
<i>Kigelia africana</i>	Myegeya	Child fever	B
<i>Brachystegia spiciformis</i>	Mzingha/ Mtundu wa nyika	Child fever	L
<i>Piper umbellatum</i>	Nembenembe	Child fever	R
<i>Costus sarmentosus</i>	Ngobedi	Kwashiokoor	R
<i>Ficus stuhlmanii</i>	Ngulukila ya mtamba	Child fever	L
<i>Bidens pilosa</i>	Nyaweza	Child fever	L
<i>Pteridium aquilinum</i>	Silu	Child fever	L

Other human diseases

Two human diseases are assigned to this group. These are heart diseases and spleen enlargement (Bandama in Kiluguru). Seven plant species were reported to treat diseases in the group with a F_{IC} 0.4. Mfumbi, Mhange, Mnyanza and Msungu were some of the species used to treat these diseases.

Table 17: Plant species used in the treatment of heart problem and spleen enlargement

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
<i>Bersama abyssinica</i>	Mfumbi	Heart problem	L
<i>Dodonaea viscosa</i>	Mhange/ Mhangehange	Heart problem	R
<i>Albizia versicolor</i> (Welw.)	Mnyanza	Spleen enlargement	B
<i>Vernonia hymenolepis</i>	Msungu	Spleen enlargement	R
<i>Brideria micrantha</i> (Hochst) Baill.	Mwiza/ Msumba	Spleen enlargement,	R
<i>Bidens pilosa</i>	Nyaweza	Spleen enlargement	R
<i>Crassocephalum crepidioides</i>	Mwinika	Heart problem	R

Animal diseases

Apart from treating human diseases, the Waluguru also use a variety of plant species for treatment of animal diseases affecting goat and chicken. A total of three animal diseases/ conditions were reported and assigned to the group. The diseases treated by plant species are Mdondo (Newcastle disease) and Sotoka (Rinderpest). Plant species are also used to control parasites attacking the skin. This group of diseases was reported to be treated by about 4% of all the plants sampled (Table 18). Plants like *Momodica foetida* (Huluhundu), *Rhoisissus tridentata* (Kidere) and *Erythrophleum suaveolens* (Mkarati) were widely used.

Table 18: Plant species used for the treatment of animal diseases and conditions

Botanical name	Name in Kiluguru	Disease/condition treated	Part used
<i>Momordica foetida</i>	Huluhundu	Pesticide, Newcastle (Mdondo)	L
<i>Rhoisissus tridentata</i>	Kidere	Mdondo (Newcastle)	L
<i>Erythrophleum suaveolens</i>	Mkarati	Poison (Pest killer)	B
-	Ng'alumwa	Pest killer	R
-	Pilipili	Mdondo (Newcastle)	F
<i>Plectranthus sp.</i>	Vuga	Sotoka (Rinderpest)	L
<i>Ocimum suave</i>	Nung'anung'a	Sotoka (Rinderpest)	L
<i>Azadirachta indica</i>	Mwarobaini	Insecticide (Pest killer)	L

Crop protection

Insect pests are reported as among the biggest problems associated with yield losses in the field as well as under storage condition (Mgumia, undated). Traditionally, plant species were used in the preservation of stored grains against insect pest and in the protection of vegetables. A total of six plant species were reported to be used in grain storage and vegetable protection against insect pest (Table 19). In the discussion with UMADEP staff as well as during interviews with local farmers, insect pests were noted as a serious problem. In a study by Mgumia (undated) nine plant species were identified for the same purpose. However, these were not reported during this study indicating variability of information from different sources, hence the need for testing of the pharmacological value of the identified plants.

Table 19: Plant species used in grain storage and vegetable protection

Botanical name	Name in Kiluguru	Uses	Part used
<i>Trilopsium madagascariensis</i>	Bange la mbwa	Insect repellent	L, F
<i>Momordica foetida</i>	Huluhundu	Insect repellent	L
-	Ng'alumwa	Pesticide	R
<i>Tephrosia vogelii</i>	Kitupa	Pesticide	L
<i>Brideria micrantha</i>	Mwiza	Pesticide	R
<i>Azadirachta indica</i>	Mwarobaini	Pesticide	L

3.2.4. Interaction in plant uses among the healers

The study revealed that traditional healers do not share information on the medicinal use of different plant species. As a result, information is restricted to a limited number of healers. In many cases, different healers gave different information on the use of a similar plant species. It was also common that, when two or more healers were brought together, nobody volunteered to explain whatever he/she knew about medicinal plants. Such knowledge was also not disclosed to other members of the family. This observation is supported by a low value of informant consensus obtained ($F_{IC} = 0.37$). This value tests the homogeneity in medicinal plants use information among the informants and provides the measure of the reliability of the results.

There is great variation in knowledge distribution among the healers on different medicinal use groups. The knowledge on skin diseases is homogeneously distributed among the healers as compared to other groups (Table 5). The information on gastrointestinal, gynaecological and respiratory diseases is more or less evenly distributed among the healers ($F_{IC} = 0.5$), while information on medicinal uses for the other disease categories are greatly restricted to specific healers ($F_{IC} 0.4 - 0.1$). Since the Waluguru are not pastoralists, hence their knowledge of plants used in the treatment of animal diseases is very limited and restricted to only a few healers ($F_{IC} = 0.1$). Exchange of information on the medicinal use of different plant species is a key factor for the sustainability of the practice. As most of the healers do not keep records of their knowledge in writing, lack of sharing of it among the healers and with other people might result in the disappearance of the knowledge in the event of the death of the owner.

3.2.5. Plant parts used in preparation of medicine

In the Uluguru Mountain, eight plant parts were used as a source of extracts. These parts are, roots, leaves, barks, fruits, twigs, juice and exudates. Plant leaves were the most used part accounting for 47% of the total plant parts used, followed by roots (42%), bark (5%) and the rest (6%).

Analysis of use of species by disease shows that roots were mostly used in the preparation of medicine for the treatment of gastrointestinal, gynaecological, spirits, pain and inflammatory and respiratory diseases, while leaves were mostly used in the treatment of skin diseases, malaria, animal diseases, crop protection, and children's diseases. Root excavation and bark stripping were the most harmful harvesting methods (Cunningham 1991). In the Uluguru Mountain, bark stripping is less practiced compared

to root excavation. Regardless of its low rating, bark stripping may be a serious problem to a particular species. For example, in India, bark stripping is reported to threaten the existence of *Rauwolfia serpent* (Akerere 1991).

3.2.6. Preparation and application of medicine

The preparation of medicine from plants varies depending on the plant species, part of the plant and the type of disease to be treated. In most cases, roots and leaves are used as sources of extracts and to some extent fruits, bark juice and the cork. Normally the young leaves are preferred for use in traditional healing. These are picked from a plant and brought home for processing. While roots are dug from the plants without selection, the leaves are either pounded or applied when they are raw or boiled before use. After collection the roots and barks are washed, then soaked in cold water, or pounded before soaking and sometimes they are dried and ground into powder form. A medicine can be taken orally in liquid form when mixed with water or with tea or with a meal. The preparation of some medicines involves mixing of the plant products with meat (in most cases chicken) or milk. This is done in order to reduce bitterness from the extracts. In some cases, the plant parts are burnt after which the ash is collected and used either in tea, porridge or for scarification.

As revealed by the respondents, in most cases a single plant is used in the preparation of the medicine. However, sometimes a mixture of two to seven plant species is used. In the mixture, only few plants may be responsible for the provision of active compound with the rest used for neutralisation purposes. Screening of the medicinal plants will facilitate understand of the plant species which provide the active compound in the treatment. For the gastrointestinal diseases such as hernia, stomach ache, diarrhoea and the gynaecological diseases, a liquid medicine is prepared and taken orally. Direct application to the body is common for the treatment of skin diseases and in some cases pain and inflammatory diseases, here the leaves are mostly used. They are pounded, the juice squeezed and applied to the affected part like eyes, ears, wound and skin eruption. In other cases, like in the treatment of pain and children disease (Degedege), the leaves are soaked in warm bathing water.

3.2.7. Plant habits (Physiognomic groups)

Plant species used in traditional medicine in the Uluguru Mountain Area can be classified into trees, shrubs, herbs, climbers and grasses. The tree group was mostly used as a source of medicine, accounting for 34 % of the total plants used, followed by the herb community (28 %), shrubs (20 %), climbers (17 %) and grasses (1 %). The groups can be further classified into woody plants (trees and shrubs) and non-woody plants (herbs, climbers, and grasses). In this grouping, the woody plants account for 54 % of the total medicinal plants used, and the non-woody plants account for 46 %. Classification of medicinal plants into physiognomic group can be used as a key factor in predicting susceptibility of the plants to forces of extinction. It has been reported that, the non-woody plants are very much susceptible to disturbances such as fires. This is worth considering when deciding which plant species are suitable for domestication.

3. 3. Socio-economic value of medicinal plants

The socio-economic importance of medicinal plants can be viewed in terms of the lives of people saved through their use. They can also be considered in terms of the financial resources saved due to the low cost of herbal medicines.

3.3.1 Uses and effectiveness of medicinal plants

During this study 79 people from three villages were asked on whether they used medicinal plants in treating diseases affecting them. The results show that, about 78% of those interviewed agreed while the rest (22%) did not (Table 20). This result agrees with the observation that many people in rural areas have once used or uses medicinal plants in health care (Hamman (1991). According to traditional healers in the area, people opt for traditional medicine because:

- Most of them get cured
- It can treat a number of diseases such as those caused by witchcraft (spirits and in some cases mental illness) which cannot be treated in the hospitals
- It is cheap

There is great variation in the number of patients attending to different healers (Table 21). To a large extent this is determined by the perceived professional competence of the healer. The number of patients per healer ranges from four per month to 20 people per month, with an average of 10 patients per healer per month. Since there are more than four healers in each of the three villages, the number of people treated could be more than the estimated figure.

Table 20: Use of medicinal plants in Tandai, Tegetero and Nyandira villages

Villages	No. people using medicinal plants	%	No. people not using medicinal plants	%	Total
Tandai	23	37	7	41	30
Tegetero	22	36	4	24	26
Nyandira	17	27	6	35	23
Total	62	100	17	100	79

Significant difference between users and non users ($t = 4.604$; $p = 0.01$).

Table 21: Estimated number of cases attended by individual healer

Healer number	Number of cases/ month
1	6
2	10
3	4
4	20
Total	40
Mean	10

The study further sought to find out the perception of people regarding the effectiveness of medicinal plants in the treatment of diseases. The findings are as presented in Table 22. In all the villages a greater number of people perceived the medicinal plants to be effective than those who thought otherwise. The difference was significant. However, in a workshop with traditional healers it was revealed that traditional medicine could not treat some diseases. These were AIDS, Cancer and Typhoid.

Table 22: Perceived effectiveness of medicinal plants in treatment of diseases in Tandai, Tegetero, and Nyandira villages

Village	Effective	%	Not effective	%	Total
Tandai	22	4	1	14	23
Tegetero	20	36	2	29	22
Nyandira	13	24	4	57	17
Total	55	100	7	100	62

Significant difference between the observations ($t = 4.604$; $p = 0.01$)

Knowledge on the use of medicinal plants among age groups indicates a significant difference between the groups and little variation between the villages. On average, the youth were able to tell two plant species used in the treatment of diseases while a group of middle aged people (21-40 years) were more knowledgeable as they identified seven plant species used in medicine. In Nyandira the middle-aged people could identify more useful plant species for medicine than in the other villages. The elders could identify an average of 16 plant species, which indicates their greater level of knowledge. The average figure is rather low compared to the actual number reported by the most knowledgeable, and reflects the fact that a few elders knew only some of the plant species (Table 23). This study has shown that most of the youth know only the best known useful medicinal plant species. In some cases they know the name but cannot identify the plant itself. Hence, this result agrees with the growing fears among many people that indigenous knowledge on useful plant species is in danger of being lost (Iwu, 1993; Akerere *et al.* 1991, Cunningham, 1991). There are other factors that might contribute to the loss of the knowledge.

These include:

- Most healers are not willing to share their knowledge with other people as they consider it a secret, which is not shared or given to other people including their relatives (sons and daughter).
- The migration of the youth to towns means that the healers don't have people to understudy them even when they are willing to share the knowledge.
- Sometimes traditional healers are considered witches and therefore most young people are hesitant to be associated with them and therefore cannot tap their knowledge
- Most of the healers do not keep records of their knowledge in writing hence the danger of loss of the knowledge once they die is heightened.

Table 23: Knowledge of medicinal plants by age groups

Village/Age class	10 - 20	21 - 40	41 - 100
Tandai	2*	4	10
Tegetero	3	4	22
Nyandira	1	12	16
Total	6	20	48
Mean	2	7	16

Foot note; * Average number of plant species reported

There is a significant different between the age groups ($\chi^2 = 7.88$; $p > 0.005$)

Analysis of knowledge of useful plant species by gender (Table 24) shows that both men and women are equally knowledgeable of the species used in traditional medicine. The table further shows that people in Tegetero village knew more plant species, followed by those in Nyandira while people in Tandai were the least knowledgeable.

Table 24: Knowledge of use of medicinal plants by gender

Village/ Group	Male	Female	Total
Tandai	6*	4	10
Tegetero	8	8	16
Nyandira	6	9	15
Total	20	21	41
Mean	7	7	

Foot note. * average number of plants per individual

3.3.2. Treatment cost and charges

The cost for the treatment of the 10 common diseases in the area is as presented in Table 25. According to the table treatment costs range from 150 Tshs to about 1,500.00 Tshs per single dose. Further analysis shows that, the opportunity cost of using modern medicine is high amounting to Tshs. 3700/= for the selected seven diseases. Generally it is much more expensive to use modern medicine in treating various diseases compared to traditional medicine (Table 26).

Table 25: List of 10 most common diseases in Tandai, their treatments and treatment cost.

Name of disease	Treatment	Cost Tshs.
Malaria	Chloroquine tbs.	1500.00
	Chloroquine injection	1500.00
	Fansidar	1000.00
Lung infection	Amoxaciline	1200.00
	Chlotrimoxazole	800.00
	PPF injection	1000.00
Anaemia	Fesolate	Not available
Mouth (teeth)	Amoxaciline	1200.00
	PPF Injection	1000.00
	Extraction	In big hospitals

Diarrhoea	Doxaciline	1200.00
	Amoxiciline	1200.00
Wound	Dressing (Poridon)	500.00
Venereal diseases	Doxaciline	1200.00
	Septin	900.00
	Metronidazole	800.00
	Erythromycin	Not available
	Panadol injection	Not available
Eye	Tetracycline	1000.00
Worms	Mabendazole	600.00

Table 26: Comparative costs for treatment of selected diseases with modern medicine against traditional medicine in Tandai, Nyandira and Tegetero villages.

Disease	Modern	Local
Malaria	1500.00	500.00
Lung disease	1200.00	500.00
Worm	600.00	500.00
Diarrhoea	1200.00	500.00
Wound	500.00	500.00
V. diseases	1200.00	500.00
Eye	1000.00	500.00
Total cost	7200.00	3500.00
Opportunity cost of Modern	3700.00	

Note. Cost for local medicine ranges from 200.00 - 500.00 A constant, high cost value is assumed. Similarly, with regard to modern medicine, medicine with high cost is used

In the course of the study, it was apparent that traditional healers had no fixed rate for the services. In most cases payment is negotiable and depends on whether the patient is a relative or not. The payment is made in two installments, the first one is paid in advance while the second is done after recovery. The payment may be done in cash or in kind in the form of chicken, goat or cow.

Most of the traditional healers could not quote the fees they charged. However, some few were able to reveal them. For local inhabitants they ranged from 200-500 Tshs for minor diseases like wound and stomach ache. Patients paid more for complicated cases caused by witchcraft, spirits, mental illness and related diseases. It was found that the complicated cases are not treatable in hospitals. Generally, outsiders paid more than the local inhabitants did for the same treatment (Table 28). Given the above, it is apparent that the local communities can save money by using medicinal plants for some diseases because it is comparatively cheap and easily accessible (Bhatia & Ringia 1996). However, in a workshop with traditional healers it was acknowledged that traditional medicine is not always cheap. For example, the treatment of spirits and mental illnesses costs up to Tshs.10,000.00 and Tshs 30,000.00 respectively.

Table 27: Cost of treatments for the people from out side the area

Disease	Cost/ treatment
Hernia	6,000
Witchcraft	12,000*
Haemorrhoid	9,800
Painful menstruation	10,000
Mental illness	30,000
Diarrhoea	5,000
Severe cough	12,000
Safura (General body swelling)	10,000
Fever	8,000
Child fever	8,000
Spirit	10,000
Total	120,800

* Cost based on the average of six healers estimates

3.4. Status of medicinal plants

3.4.1. Medicinal trees and shrubs composition

During the study, 50 medicinal woody plant species were recorded on farmlands and in the forest reserve close to Tandai, Tegetero, and Nyandira villages (Table 28). These species occur in different proportions in terms of numbers and density among the sites. While eight species with dbh \geq 5cm were recorded on farmlands in Tandai village, four and one species were recorded in Tegetero and Nyandira respectively. On the other hand, a large number of saplings were recorded on farmlands in Tandai village (26 species) compared to Tegetero (15 species) and Nyandira (10 species). The situation in the forest reserve is different from that on the farmlands. Differences in medicinal trees and saplings composition between the villages were very small. However, a big difference occurs between the forest and the farmlands. In general, only 13 medicinal tree species were recorded on farmlands compared to 45 species in the forest reserve. This reveals that the forest reserve is the main source of medicinal plants for the traditional healers.

Differences in medicinal tree diversity between the villages are partly due to human activities. Clearance of forest for farming in the two villages (Tegetero and Nyandira) was reported to have started many years ago. Consequently, most of the forests have been converted into agricultural land and no natural forest exists outside the reserve in the two villages. Land shortage has forced people to practice intensive cultivation with a short fallow period. In Tandai the situation is different, as land is not a serious problem, as indicated by the long fallow periods of up to six years, this allows trees that are cut to sprout and explains for the observed large number of medicinal tree saplings on farmlands. The village has also a remnant natural forest outside the reserve that contributed substantially to the richness of medicinal tree species in Tandai farmlands.

Table 28. Distribution of medicinal tree species in Tandai, Tegetero and Nyandira villages

Site/ Village	Tandai		Tegetero		Nyandira	
	Tree	Saplings	Tree	Saplings	Tree	Saplings
Farmlands	8	26	4	15	1	10
Forest	15	19	17	21	13	12
Total	23	45	21	36	14	22

3.3.2. Herb and climber composition

During the study, a total of 47 herbs and climbers with medicinal value were recorded on farmland and in the forest reserves close to Tandai, Tegetero and Nyandira villages (Appendix III). This non-woody medicinal plant community accounts for 45 % of the total medicinal plants identified. Of the recorded species, herbs account for 68 % and climbers 22 %. A large number of non-woody medicinal plants were recorded on farmlands than in the reserves (Table 29). Most of the plants in this group are light demanding and were numerous in forest patches and gaps as compared to the closed part of the forest. In his study, Hamilton (1989), observed a high density of herb communities in secondary forest in East Usambara Mountain forest. It seems, therefore, that herbalists get their medicinal resources (non-woody plants) on the farmlands especially in areas with long fallow period. But these plant species are likely to become rare or extinct as fallow period decreases and as a result of annual bush fires.

Table 29. Herb, climber composition on farmlands and in forest reserve close to Tandai, Tegetero and Nyandira villages

Plant habit	Tandai		Tegetero		Nyandira	
	Farm	Forest	Farm	Forest	Farm	Forest
Climber	6*	5	5	4	1	3
Herb	9	9	12	6	12	4
Shrub	5	2	1	0	1	1
Unidentified	1	0	3	2	1	1
56	21	16	21	12	18	8

Foot Note: * Number of species

3.3.3. Status of medicinal tree species (woody plants) in the Uluguru Mountain area

Densities of the recorded medicinal tree species on farmlands and in the forest reserve were categorised into three classes, rare tree species (1 - 10 tree/ ha), uncommon tree species (11 - 50 tree/ ha) and common species (above 50 tree/ha) (Krebs 1989). Based on this categorisation, there were 18 rare tree species, 19 uncommon and five common tree species (Table 30).

Table 30. Density (Tree/ ha) of medicinal tree species (Woody plants DBH \geq 5 cm)

Rare tree	Density Tree/ha	Uncommon trees	Density Tree/ ha	Common	Density Tree/ ha
Mbefu	0	Foza	25	Mgida	237
Mgidamhulo	4	Msusulamugi	39	Mhange	158
Mbono	8	Mfumbi	21	Mkanyi	136
Kitugutu sungu	0	Mlengolengo	37	Mkole	134
Luhungavisozi	0	Mlilati	34	Mnguti	115
Mbagama	4	Msemblerere	38		
Mdaha	4	Msenene	36		
Mkundekunde	0	Mvumba	29		
Mkuyu	0	Hungahunga	13		
Mngua	3	Kitugutu	15		
Mnzekonzeko	0	Mdimumhulo	20		
Moza	4	Mfulu	11		
Msasa	3	Mgeremamondo	13		
Mvulanvula	4	Mhirihiri	14		
Mvule	0	Msada	20		
Mwavi	4	Msanyanzale	13		
Mwiza	0	Mtomokwe	16		
Mwizongela	0	Mtonvutonvu	20		
		Mtunu	16		

The saplings of different species (tree and shrubs with dbh < 5 cm) were grouped into three classes as follows: rare (0 - 50 sapling/ ha), uncommon (51 - 100 saplings/ ha) and common (above 100). On the basis of this grouping the study found 15 rare plants, eight uncommon and 26 common species (Table 31).

Table. 31. Densities of saplings in the forest reserve close to Tandai, Tegetero and Nyandira

Rare saplings	Density Tree/ ha	Uncommon saplings	Density Tree/ Ha	Common	Density Sapling/ Ha
Foza	27	Mkuyu	86	Kigidamhulo	1384
Hungahunga	0	Mngua	57	Msusulamugi	543
Mvule	6	Mtomokwe	77	Kitugutu	562
Msasa	8	Kitugutusungu	88	Mbambalamaziwa	1542
Msanyanzale	0	Luhungavisozi	64	Mdaha	2111
Kitupa	17	Mbagama	82	Mbono	104
Mbefu	41	Kikulagembe	53	Mdimumhulo	167
Mfulu	23	Lufifi	83	Mfumbi	167
Lutizo	6			Mgeremamondo	375
Mkundekunde	6			Mgida	353
Mvumba	0			Mvulanvula	543
Mwavi	0			Mhange	1125
Mwizongela	6			Mhirihiri	414
Msulu	8			Mkanyi	1379
Mwambalasimba	3			Mkole	4280
				Mlengolengo	3824

Milati	450
Mnguti	319
Mnzekonzeko	118
Msada	679
Msemblerere	458
Msenene	1117
Mtonvutonvu	129
Mtunu	884
Mwiza	1034
Moza	3125

There was a big variation in medicinal tree density distributions between the big tree class (DBH \geq 5 cm) and sapling class (DBH < 5cm). The study found that 18 tree species had low density of big trees (DBH \geq 5cm) and as a result, they were classified as rare trees. However, some of them also had a large number of saplings (DBH < 5cm). In this group, species like Mgidamhulo had a density of 4 tree/ha in the large tree class and 1384 tree/ha in the lower class. *Vernonia hymenolepis* (Kitugutu sungu), *Plectranthus chiradzulensis* (Luhungavisizi), Mbagama (unidentified), Msono (unidentified) and *Piper capense* (Mdaha) did not belong to the big tree class but had a large number of trees in the lower class.

Generally, the absence of members in the big tree class for some species may not be an indication of rarity. It could be associated with the growth habit of a particular species and its interaction with the surrounding environment. For this reason, a combination of both groups (big tree and saplings) will give a clear indication of the degree of rarity for species. On the other hand, some species had low density in the big tree class and no saplings. This could be attributed to lack of regeneration. The phenomenon was common to *Ocotea usambarensis* (Mvumba) and *Agauria salicifolia* (Mwavi). The last group is comprised of species that had no members in the big tree class and very low density in the saplings. This was a typical characteristic of *Milicia excelsa* (Mvule), which is a commonly harvested timber species.

Using density as a key measure of rarity and considering the density distribution in both classes (big tree and lower class), the threatened medicinal tree species were Mbagama (unidentified), *Trema orientalis* (Mbefu), *Senna petersiana* (Mkunderkunde), *Ficus exasperata* (Msasa), *Milicia excelsa* (Mvule), *Agauria salicifolia* (Mwavi), *Cassipourea malosana* (Mwizongela), *Ficus stuhlmanii* (Foza), *Ocotea usambarensis* (Mvumba), *Siphonochilus kirkii* (Hungahunga), *Vitex doniana* (Mfulu), *Rhytiginia uhligii* (Msanyanzale), *Senna hirsuta* (Mwambalasiswa), *Rhus vulgaris* (Msulu) and *Veronica abyssinica* (Lutizo).

Ocotea usambarensis (Mvumba) was one of the threatened tree species in the Uluguru Mountain area. This is because mature trees were observed at a very low density. There were no middle class trees (25-5cm DBH) and young plants (saplings) were not observed. Lack of regeneration for Mvumba in the area was associated with lack of flowering among other factors. Historically, the species is reported to have been heavily logged before closure of the forest in 1993. Also it could be that, selectivity in logging and the

small number of remaining populations could have been contributory factors. But in studies by Hamilton (1989) and Zilihona *et al.* (1998) in East Usambara and Udzungwa Mountains respectively, lack of regeneration was noted as a common phenomenon for the species. In this area too, intensive logging had occurred in the past (Hamilton 1989). The causes behind the phenomenon could be established through further investigations. One other theory states that climatic warming may have made the species unable to regenerate.

Mvule is also one of the threatened species in the area. Pócs (1976 b), reported the occurrence of Mvule in the lowland forest of the Uluguru Mountains. Interviews with the villagers indicated that Mvule used to be abundant in Tandai village. However, as a result of timber harvesting very few trees have remained. No mature tree of Mvule was found on the survey plots and along the transect, except for the coppices which sprout from the harvested trees. This could be due to timber harvesting and the fact that the lower altitude land is out side the reserve and has been already converted to agriculture.

Non woody medicinal plants

Non-woody medicinal plants include herbs and climbers. They account for about 45% of the total medicinal plants identified in the Uluguru Mountain forest and farmlands. They were also classified into three group as follows: rare (1-50 plants/ ha), uncommon (51-100 plants/ ha) and common (≥ 100 plants/ ha). Based on this classification, there were 16 rare non-woody medicinal plants, four that were uncommon and 21 common plants. Of the rare plants, 13 species occurred on farmlands and only two were recorded in the forest reserve and one on both farmland and in the reserve. *Adenia cissampeloides* (Lugole), *Crassocephalum crepidioides* (Mwinika), *Rhoisissus tridentata* (Togoni), *Justicia heterocarpa* (Mwidu), Kivumyangale (un identified) and Mwepula (unidentified) were the most rare plants with estimated densities of < 10 plants/ ha.

Table 32. Density of none woody medicinal plants on farmlands and in the forest reserve close to Tandai, Tegetero and Nyandira villages.

Rare plants	Density plants/ha	Uncommon	Density plants /ha	Common	Density plants/ ha
Lugole	3	Bumu	86	Bandebande	717
Hunduhundu	45	Lumotomoto	89	Bungobungo	1663
Mfeafea	40	Mpoza/ Poza	59	Kidere	165
Mwinika	6	Mngua	60	Mgegeba	290
Togoni	3			Mhambamti	243
Degegede	42			Kifulwe	1110
Kinzasu	21			Kifutafuta	214
Lupara Iwa Mlungu	22			Lweza	843
Lusangalala	28			Mnungha	1430
Luswagamene	10			Nembenembe	1959
Luziwana	42			Ngobedi	1059
Mwidu	4			Ngugu	147
Rwengere	21			Nyaluganza	192
Kivunyangale	4			Nyangavuvu	433
Mwepula	8			Silu	852

Ng'unzulu	21	Sunga	123
		Vuga	111
		Ununvuweupe	589
		Kihawa	550
		Mkilingala	750
		Mkwagaya	114

3.4. Effects of human activities on medicinal plants

Human activities have been reported by several authors to threaten the existence of the forest ecosystem in which medicinal plants are among the components (FAO 1993; For. Div. 1992; Akerere *et al.* 1991; Cunningham 1991; Msuya 1998; Mahunnah and Mshigeni 1996; Monela 1995; NEAP 1994; Zilihona *et al.* 1998). During the study, five human activities that are detrimental to the medicinal plants in the Uluguru Mountain area were reported (Table 33). Forest clearance for agriculture was reported in all the villages. In Nyandira and Tegetero villages, the main forest clearance occurred many years ago. As a result, all the forest area outside the reserve was converted into agricultural land, except for a small area in Nyandira which was planted with exotic timber species (*Eucalyptus sp.*). In Tandai, forest clearance also started a long time ago however, there are still some remnants of natural forest outside the reserve which are also under heavy pressure.

Annual fire is a common phenomenon in the Uluguru Mountain area especially in the dry seasons of the year. During this study no fire incidence was observed probably because it was in the rainy season. Fires were reported as a major threat especially to the herb communities in the reserve and on farmlands. It was pointed out that medicinal plant like *Landolphia buchananii* (Luziwana), which is a potential source of medicine, is currently not easily available as a result of annual fires and land clearance.

Tree cutting was another human activity reported in the study villages. Forty-four cases of tree cutting were recorded in the forest reserve. Tandai and Nyandira had high frequency of tree cutting cases as compared to Tegetero. The observed tree cutting was mainly for building poles and firewood. There were no sign of recent timber harvesting, although it was reported to have occurred before 1993. The impact of past timber harvesting was still apparent especially to tree species like *Ocotea usambarensis* whose density was very low and seedlings were not observed. Seven dead butts of *Ocotea usambarensis* were recorded during the study.

Root digging is also practiced in the forest reserve. Nine cases of root digging were recorded. Tandai had the highest rate followed by Nyandira. No root digging was recorded in Tegetero. Among the species affected were *Satureja biflora* (Lupara Iwa mlungu), *Landolphia buchananii* (Luziwana) and *Vangueria infausta* (Msada). Debarking was mainly recorded in the forest reserve close to Nyandira. Four cases of ring debarking were recorded. *Dodonaea viscosa* (Mhange), *Bersama abyssinica* (Mfumbi) and *Agauria salicifolia* (Mwavi) were the trees species affected by debarking.

Table 33. Different human activities encountered along the transect on farmlands and in the forest reserve close to Tandai, Tegetero and Nyandira villages.

Village/ Activity	Species	Tandai	Tegetero	Nyandira	Total
Agriculture land clearance		x	x	x	
Annual fire		x	x	x	
Tree cutting	Mkole	4*	1	0	5
	Mkanyi	4	1	0	5
	Msanyanzale	1	0	0	1
	Kiberuberu	1	0	0	1
	Mhirihihi	1	0	0	1
	Mvumba	7	0	0	7
	Mtunu	0	1	0	1
	Mgidamhulo	0	2	0	2
	Mhange	0	0	6	6
	Mnguti	0	0	4	4
	Mkwego	0	0	1	1
	Mzona	0	0	2	2
	Msada	0	0	5	5
	Mkongolo	0	0	1	5
	Lumotomoto	1	0	0	1
	Mkanyimhulo	1	0	0	1
Sub total		20	5	19	44
Root cutting	Lupara lwa	0	0	3	3
	mlungu				
	Luziwana	4	0	0	4
	Msada	2	0	0	2
Sub total		6	0	3	9
Debarking	Mhange	0	0	3	3
	Mfumbi	0	0	4	4
	Mwavi	0	0	1	1
	Mkongolo	0	0	1	1
Sub total		0	0	9	9
Total		26	5	31	62

x - Activities observed; * - Frequency

3.5. Potential for domestication of medicinal plants

The potential for domestication of medicinal plants was explored during a workshop with traditional healers. As indicated in Tables 34 and 35 availability of medicinal plants was acknowledged by both male and female traditional healers as one of the main problems facing traditional medicine in general. They saw the domestication of medicinal plants as an opportunity of ensuring sustainable access to plants.

Table 34: Problem analysis of traditional medicine with male herbalists

Problem	Causes	Opportunities
1. Medicinal plants are not readily available	<ul style="list-style-type: none"> • Some medicinal plants are only obtained from the catchment forest • Some indigenous medicinal plants are not easily available 	<ul style="list-style-type: none"> ■ Establishment of tree nurseries for medicinal plants by the herbalist ■ Growing of medicinal trees on farmland
2. Client do not pay for services on time	<ul style="list-style-type: none"> • Clients know that legal measures cannot be taken against them as most of the healers are not licensed 	<ul style="list-style-type: none"> ■ Form an association to fight for the right of herbalists ■ Institute legal measures to protect the right of herbalists
3. Cheating in the business among the herbalists	<ul style="list-style-type: none"> • Lack of knowledge on traditional medicine 	<ul style="list-style-type: none"> ■ Legal action to be taken against the culprits

Table 35: Problem analysis of traditional medicine with female herbalist

Problem	Causes	Opportunities
1. Limited knowledge on medicinal plants	<ul style="list-style-type: none"> • Herbalist do not share their knowledge with colleagues 	<ul style="list-style-type: none"> • Sharing of knowledge on medicinal plants among herbalists through seminars, workshops etc.
2. Medicinal plants are not readily available	<ul style="list-style-type: none"> ■ Bush fires ■ Expansion of farming activities ■ Some plants are only obtained from the catchment forest 	<ul style="list-style-type: none"> ■ Control bush fires ■ Preservation of medicinal plants ■ Growing of plants with medicinal value on farmlands
3. Client do not pay for the herbalists services timely	<ul style="list-style-type: none"> ■ - Clients know that legal measures cannot be taken against them 	<ul style="list-style-type: none"> ■ Apply for licence by the herbalist
4. Inability to cope with the demand for the herbalist services	<ul style="list-style-type: none"> ■ Failure of clients to pay their fees timely ■ Small scale business (lack of facilities) 	<ul style="list-style-type: none"> ■ Legal measures to be taken to enforce timely payment ■ Government should assist to improve the working capacity of herbalists
5. Inability to treat some of the diseases (TB, AIDS, TYPHOID)	<ul style="list-style-type: none"> ■ Herbalist do not have medicine to treat them ■ Some of the diseases are new to the herbalist 	<ul style="list-style-type: none"> ■ Reference of the cases to hospitals ■ People should follow medical advice

During the discussions, some healers reported that there is a potential for domestication of medicinal plants since some of the species were already being planted on farmlands. These included species like *Maesa lanceolata* (Mingutinguti), *Myrica salicifolia* (Migeremamondo), *Senna petersiana* (Mikundekunde), *Piper capense* (Ludaha), *Azadirachta indica* (Mwarobaini) and *Khaya anthotheca* (Mkangazi). However, the availability of seeds was seen to be the major constraint to exploiting the potential for

domestication of the plants. It was noted that some species like *Ocotea usambarensis* (Mvumba) does not produce seeds and cannot be grown on farmlands.

To facilitate better management of medicinal plants germplasm, the healers proposed that they:

- should be educated on how to handle different plant species
- should be given assistance in nursery establishment (education and materials)
- should be given the opportunity to share experiences through seminars/workshops

4.0. CONCLUSION AND RECOMMENDATIONS

Conclusions

The plant species used in traditional medicine in the Uluguru Mountain area belong to different habits ranging from herbs, climbers and shrubs to big tree species. The woody plant communities (trees and shrubs) are more used by the traditional healers than the non-woody (climbers and herbs) communities. Except for the woody plants, which are planted on farmlands as agricultural crops, fruits and timber species, the woody communities are mostly collected from the forest reserve. The non-woody communities are collected from the farmlands and in open area of the forest reserve. Some of the plants are collected very far from the area. These include the lowland forests, Miombo woodlands and the coastal forest. *Pterocarpus angolensis* and *Brachystegia spiciformis* are among the species collected from the Miombo woodlands.

Medicinal plants are used to treat human and domesticated animals diseases as well as crop diseases. Their socio-economic value in the Uluguru Mountain area is high. This is because their use helps in saving the lives of hundreds of people and reduces the financial cost for health care. A large number of people depend on traditional medicine because of poor infrastructure (road and health centers) and in addition, some diseases like spirits and mental illnesses are perceived to be not considerably treatable by modern medicine. However, traditional medicine practice is unable to cure diseases like Cancer, AIDS and Typhoid, as there are no verified research findings. Traditional medicine is also a source of employment and income for the traditional healers.

Differences in medicinal trees and saplings composition between the villages were very small. However, a big difference occurred between the forest and the farmlands. In general, only 13 medicinal tree species were recorded on farmlands compared to 45 species in the forest reserve. The non-woody medicinal plants community account for 45 % of the total medicinal plants identified in the study area. Of the recorded species, herbs account for 68 % and climbers 22 %. A large number of non-woody medicinal plants were recorded on farmlands than in the reserve.

Human activities in the Uluguru Mountain area pose a serious threat to the ecosystem and hence availability of medicinal plants for health care. For example, annual fires threaten the availability of *Landolphia buchananii* (Luziwana), while *Satureja biflora* (Lupara Iwa

mlungu), *Landolphia buchananii* (Luziwana) and *Vangueria infausta* (Msada) are affected by root cutting. On the other hand debarking is affecting *Dodonaea viscosa* (Mhange), *Bersama abyssica* (Mfumbi) and *Agauria salicifolia* (Mwavi). While root cutting and debarking are selective harmful harvesting practices, annual fires and forest clearance for arable farming are non-selective. Their effects on the medicinal plants in terms of availability may, therefore, be more far reaching than those aforementioned.

Recommendations

Based on the conclusion, the study makes the following recommendations for the sustainability of traditional medicine in the Uluguru Mountain area:

- More ethnobotanical surveys are recommended in the Uluguru and other part of the country to establish the status of medicinal plants.
- Environmental education should be provided to local people on the hazards of human activities to the ecosystem and hence the survival of the valuable medicinal plants. In addition traditional healers should be educated on methods of raising various plant species.
- The above should go hand in hand with encouragement and support for the domestication of valuable and threatened medicinal plants or *in situ* conservation in their natural habitat. For *Ocotea usambarensis* *in situ* conservation and on farm planting in woodlots is appropriate. There is also need to conduct research to investigate reasons for lack of regeneration and the best artificial regeneration method and tending practices. Domestication on farmlands could be a viable option for *Milicia excelsa* and *Khaya anthotheca*. Since most people have shown interest in growing *Khaya* due to its value and fast growth, they should be encouraged to plant more trees and be supplied with seeds where necessary. Valuable herb communities such as Luziwana and Lupara Iwa mlungu should be domesticated on the home gardens.

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APPENDIX I. A list of medicinal plants of the Uluguru Mountain Area

Family/ Botanical name	Name in Kiluguru	Uses
Acanthaceae		
<i>Justicia heterocarpa</i>	Mwidu	Snake bite
Amaranthaceae		
<i>Celosia trigyna</i>	Zumanguku	Bilhazia, Eye ache, Haemorrhoid
Agavaceae		
<i>Sansevieria intermedia</i>	Mkonge	Abscess
<i>Dracaena afromontana</i>	Msenene	Safura (Ankylostomiasis)
Anacardiaceae		
<i>Rhus vulgaris L.</i>	Kikulagembe/ Mkulanachilo/ Msulu	Diarrhoea, Pain killer, Chest pain, Stomach-ache
<i>Sorindeia madagascariensis</i> Thon.	Mherehere/ Mhirihiri	Scabies
<i>Trichoscypha ulugurensis</i>	Msemblerere	Fever, Spirit
<i>Mangifera indica L.</i>	Mwembe	Wound, Fever, Eye ache
Annonaceae		
<i>Annona senegalensis Pers.</i>	Mtomokwe	Abscess, Fever, Eye ache
Apocynaceae		
<i>Landolphia kirkii</i>	Lubungo/ Lubungobungo	Spirit
<i>Landolphia buchananii</i>	Luziwana	Stomach ache, Diarrhoea, Male virility, Hernia
<i>Tabernaemontana pachysiphon</i>	Mlengolengo	Hernia, Promote lactation
<i>Diplorhynchus condylocarpon</i>	Mtogo	Ironsmith
Araceae		
<i>Culcasia scandens</i>	Luhalamila/ Luhambanti	Chest pain, Asthma, Hernia, Head ache, Child fever
Balsaminaceae		
<i>Impatiens ulugurensis</i>	Kipoza/ Mapoza	Eye ache, Witchcraft, Infertility (women), Wound, Rituals, Protection
Bignoniaceae		
<i>Kigelia africana (Lam)</i>	Myegeya	Child fever, Skin eruption
Bombacaceae		
<i>Adansonia digitata L.</i>	Mbuyu	Hernia, Spirit
Boraginaceae		
<i>Ehretia cymosa L.</i>	Mwamilang'anga/ Mwasangulu	Hernia/ Giddiness
Caesalpinioideae		
<i>Cassia mimosoides</i>	Lusangalala	Mental illness, Asthma, Severe cough
<i>Erythrophleum suaveolens</i>	Mkarati	Poison
<i>Senna petersiana</i>	Mkundekunde	Stomach ache, Skin eruption, Hernia, Safura, Inflammation, Backache, Witchcraft
<i>Zenkerella schliebennii</i>	Mlelati/ mlilati	Inflammation

(L)		
<i>Senna hirsuta</i> (L.) Irwin & Barneby	Mwambalasilimba	Pneumonia, Hernia, Stomach ache, Child fever, Head ache, Menstruation, Spirit
<i>Brachystegia spiciformis</i>	Mzingha/ Mtundu wa nyika	Ear ache, Child fever
Caricaceae		
<i>Carica papaya</i>	Mpapai	Tooth ache, Peptic Ulcer, Hernia, Stomach-ache
Caryophyllaceae		
<i>Drymaria cordata</i>	Funya	Eye ache
Compositae		
<i>Spilanthes mauritiana</i>	Kigodi cha ngadu	Chango la kizuka
<i>Ageratum conyzoides</i>	Kimtamta (Kivutavuta)	Head ache, Wound
<i>Erlangea cordifolia</i>	Kisungu pori	Diarrhoea
<i>Vernonia iodocalyx</i>	Kitugutu	Stomach ache, Diarrhoea, Head ache, Hernia
<i>Vernonia myriantha</i>	Kitugutu	
<i>Helichrysum schimperi</i>	Lweza	Stomach ache, Diarrhoea Mental illness, Faint
<i>Vernonia hymenolepis</i>	Msungu/ Kitugutusungu/Msun gumili	Fever, Stomach ache, Diarrhoea, Hernia, Spleen enlargement
<i>Crassocephalum crepidioides</i> (Benth.)	Mwinika	Heart disease, Eye ache, Burn
<i>Crassocephalum montuosum</i>	Nyaluganza	Ear ache, Head ache
<i>Conyza sumatrensis</i> (Retz.)	Nyangavuvu	Wound
<i>Bidens pilosa</i>	Nyaweza	Wound, Spleen enlargement, Hernia,
<i>Sonchus luxurrons</i>	Sungasunga	Stomach, Headache
<i>Crassocephalum sp.</i>	Tindimka	Spirit
<i>Helianthus annus</i>	Ufuta/ Lufuta	Giddiness, Chest pain, Asthma
Connaraceae		
<i>Ageleae heterophylla</i>	Bandebande	Haemorrhoid
Convolvulaceae		
<i>Ipomoea obscura</i>	Lufeafea/ Mhambamkulu	Labour inducement, Infertility (W), Chango la kizuka
Costaceae		
<i>Costus sarmentosus</i>	Ngobedi/ Lugobedilukwale	Diarrhoea, Hernia, Cough, Safura, Kwashiorkor
Cucurbitaceae		
<i>Momordica foetida</i>	Huluhundu	Ear ache, Head ache, Skin eruption, Insect repellent, Mdondo (Chicken)
<i>Cucurbita moschata</i>	Maboga	Expulsion of placenta
Denstaediaceae		
<i>Pteridium equilinum</i>	Silu	Child fever
Ebenaceae		
<i>Euclea divinorum</i>	Mdaa	Chest pain, Asthma
Ericaceae		
<i>Agauria salicifolia</i> (Lam.)	Mwavi	Diarrhoea
Euphorbiaceae		
<i>Acalypha fruticosa</i>	Kifulwe	Safura
<i>Jatropha curcas</i> L.	Mbono/	Wound, Ironsmith

	Mnyembamwani	
<i>Manihot esculenta</i> Crantz.	Mhogo	Stomach ache
<i>Flueggea virosa</i>	Mkwambekwambe	Hernia, Stomach ache
<i>Suregada zanzibariensis</i>	Mndimu pori	Stomach tumour, Fever
<i>Ricinus communis</i> L.	Mnyonyo/ Mnyemba/ Mlegeza bwende	Cough, Ear ache, Wound, Tambazi
<i>Bridelia micrantha</i> (Hochst) Baill.	Mwiza/ Msumba	Hernia, Stomach ache, Spleen enlargement, Skin eruption, Insecticide
Flacourtiaceae		
<i>Caloncoba welwischii</i>	Kitonvutonvu	Bilharzia
Geraniaceae		
<i>Geranium</i> sp.	Chimtemte	Pneumonia
Gramineae		
<i>Zea mays</i> L.	Mahindi	Bilharzia, Gonorrhoea
<i>Saccharum officinarum</i>	Muwa	Bilharzia
<i>Phragmites mauritanus</i>	Ngugu	Gonorrhoea, Wound,
Guttiferae		
<i>Allanblackia ulugurensis</i> Engl.	Mkani/ Mkanyi	Stomach ache
<i>Harungana</i> <i>madagascariensis</i> Poir.	Mtunu	Eye inflammation, Witch craft, Chango la kizuka, Diarrhoea, Gonorrhoea
<i>Hypericum peplidifolium</i>	Vigengegenge	Pneumonia
Ixonanthaceae		
<i>Hoslundia opposita</i> Vahl.	Mnzekonzeko/ Msekela	Wound, Boil/ Abscess, Hernia, Chango la kizuka
Labiatae		
<i>Satureja biflora</i> <i>Ocimum suave</i>	Lupara lwa mlungu Mnung'ha/ Nung'anung'a	Mental illness Stomach ache, Conjunctivitis, Hernia, Stomach worm, Child fever, Haemorrhoid, Sotoka (Cows)
<i>Plectranthus</i> <i>chiradzulensis</i>	Vuga/ Luhungavisozi	Wound, Stomach ache, Diarrhoea, Sotoka (Cows), faint
Lauraceae		
<i>Ocotea usambarensis</i> Engl.	Mvumba/ Mbale/ Mseli	Stomach ache, Hernia, Fever, Malaria, Safura, Spirit, Dulanzi
Liliaceae		
<i>Allium ascalonium</i>	Kitunguu saumu	Paralysis, Spirit, Child fever
Loganiaceae		
<i>Anthocleista grandiflora</i>	Mngua	Stomach ache
Malvaceae		
<i>Pavonia urens</i>	Lukilingala/ Mkilingala	Cough
<i>Hibiscus surattensis</i> L.	Lumotomoto	Wound, Abscess, Gonorrhoea
<i>Hibiscus fuscus</i>	Luswagamene	Rheumatism, Mental illness, Protection
Melastomataceae		
<i>Dissotis rotundifolia</i> (Sm.)	Kinzasu	Mchango wa kizukaa, Wound, Bilhalzia, Chest pain, Asthma, Boil/ Abscess, Expulsion of placenta
Meliaceae		

<i>Khaya anthotheca</i> (Welw.) C. D. C.	Mkangazi	Bilhazia, Stomach ache, Hernia, Gonorrhoea
<i>Azadirachta indica</i>	Mwarobaini	Hernia, Head ache, Back ache, Malaria, Fever, Stomach-ache, Insecticide
Mellanthaceae		
<i>Bersama abyssinica</i>	Mfumbi	Heart problem, fever
Mimosoideae		
<i>Albizia versicolor</i> (Welw.)	Mnyanza	Fever, Spirit, Spleen enlargement
<i>Albizia harveyi</i>	Mvulanvula	Wound, Fever, Spirit
Moraceae		
<i>Trilepisium</i> <i>madagascariensis</i>	Bange la mbwa/ Sugasuga	Insect repellent
<i>Ficus stuhlmanii</i>	Foza/ Mtamba	Stomach tumour
<i>Artocarpus heterophyllus</i> Lam.	Mfenesi	Fever
<i>Ficus lutea</i> Vahl.	Mkuyu	Menstruation cycle, Hernia, Witch craft, Chango la kizuka
<i>Ficus exasperata</i> Vahl.	Msasa	Chango la kizuka, Gonorrhoea, Diarrhoea, Head ache
<i>Milicia excelsa</i> (Welw.) C.C. Berg	Mvule	Wound
Musaceae		
<i>Musa sapientum</i>	Mdizi	Hernia
Myricaceae		
<i>Myrica salicifolia</i> A. Rich.	Mfumbafumba/Mge remamondo	Malaria, Hernia
Myrsinaceae		
<i>Maesa lanceolata</i> Forsk.	Mnguti/ mngutinguti	Hernia, Malaria, Child fever, Spirit
Myrtaceae		
<i>Eucalyptus maidenii</i> Muel.	Mmaidini	Chest pain, Cough
<i>Psidium guajava</i> L.	Mpera	Chango la kizuka, Diarrhoea, Hernia, Stomach ache
Palmae		
<i>Cocos nusifera</i> L.	Mnazi	Tooth ache
Papilionaceae		
<i>Mucuna pruriens</i>	Bumu	Wound, Hernia, Male virility
<i>Tephrosia vogelii</i>	Kitupa	Insecticide
<i>Abrus precatorius</i>	Lufambo	Eye inflammation, Diarrhoea, Infertility (W), Child death after birth, Gonorrhoea, Tambazi, Haemorrhoid, Labour induction, Bilhazia
<i>Cajanus cajan</i> (L.) Millsp.	Mbaazi	Giddiness, Diarrhoea, Chango la kizuka
<i>Vigna unguiculata</i>	Mkunde	Chest pain, Cough, Abscess, Hernia
<i>Pterocarpus angolensis</i> D.C.	Mninga	Hernia
<i>Milletia dura</i>	Mviza/ Mhavi	Chango la kizuka, Hernia, Diarrhoea
Passifloraceae		
<i>Adenia cissampeloides</i> (Planch.) Harms	Gole/ Lugole	Chest pain, Asthma, Stomach-ache
Piperaceae		
<i>Piper capense</i> L.	Ludaha/ Mdaha	Hernia, Child fever, Spirit, Stomach tumour, Ironsmith

<i>Piper umbellatum</i>	Nembenembe	Diarrhoea, Ear ache, Spirit, Child fever, Conjunctivitis
<i>Piper nigrum L.</i>	Pilipilimanga	Chest pain, Asthma, Safura
Podocarpaceae		
<i>Podocarpus latifolius (Thumb.)</i>	Mnyanziri	Hernia, Spirit
Rhizophoraceae		
<i>Cassipourea malosana</i>	Mwizongela	Child fever
Rosaceae		
<i>Rubus pinnatus Willd.</i>	Lufifi	Menstruation cycle
<i>Prunus americana</i>	Mpix	Stomach ache
Rubiaceae		
<i>Multidentia fanshwei Pir.</i>	Degedege/ Degekulu	Child fever (Degedege)
<i>Spermaceoce princeae</i>	Kimbwigambwiga	Diarrhoea
<i>Craterispermum longipendunculatum</i>	kizang'wa	Stomach ache
<i>Rytigynia lichenixenos</i>	Mhambalamaziwa	Hernia
<i>Vangueria infausta Burch.</i>	Msada/ Mviru	Pneumonia, Menstruation, Male virility, Child fever, Stomach-ache, Hernia
<i>Rytigynia uhligii</i>	Msanangare	Hernia
<i>Chassalia parvifolia</i>	Kiberuberu/ Mguhu	Hernia, Pain, Malaria,
Rutaceae		
<i>Toddalia asiatica (L.) Lam.</i>	Mgegeba/ mgogandima	Hernia, Spirit, Stomach ache
<i>Clausena anisata</i>	Mkomavikali	Eye inflammation, Haemorrhoid
<i>Citrus limon</i>	Mlimau	Hernia, Stomach ache
<i>Zanthoxylum deremense (Engl.)</i>	Mlungulungu	Stomach ache, Hernia, Child fever, Spirit, Dulanzi
<i>Citrus aurantifolia (Christn.)</i>	Mndimu	Chango la kizuka, Gonorrhoea, Diarrhoea, Head ache, Stomach tumour
Sapindaceae		
<i>Allophyllus fermigirens</i>	Chivunagembe	Skin eruption(Sonde)
<i>Deinbollia borbonica</i>	Mfakuzimu	Bilhazia
<i>Dodonaea viscosa</i>	Mhange/ Mhangehange	Hernia, Heart problem
<i>Allophyllus abyssinicus</i>	Mwoza/ Moza	Child fever, Spirit
Scrophulariaceae		
<i>Veronica abyssinica</i>	Lutizo	Cold, Hernia
<i>Halleria lucida</i>	Msusulamugi	Stomach ache
Solanaceae		
<i>Lycopersicum esculentum</i>	Mnyanya	Stomach ache
<i>Solanum incanum Linn.</i>	Mtula	Chest pain/ Cough, Vomit, Spirit
<i>Capsicum frutescens</i>	Pilipililukwale/ Pilipili	Wound, Male virility, Mdondo (Chicken)
<i>Nicotiana tabacum L.</i>	Tumbaku	Hernia
Sterculiaceae		
<i>Sterculia appendiculata</i>	Mgude	Spirit, Rituals
<i>Leptonychia usambarensis</i>	Mkole	Witch craft
Theaceae		
<i>Ficalhoa laurifolia</i>	Msomolo	Hernia, Spirit

Tiliaceae		
<i>Triumfetta cordifolia</i>	Ununvumweupe	Vomit
Ulmaceae		
<i>Trema orientalis (L.) BL.</i>	Mbefu	Itching/ Pimples/ Scabies, Cough, Pneumonia
Umbeliferae		
<i>Heteromorpha trifoliata</i>	Kisungumili	Stomach ache
Verbenaceae		
<i>Vitex doniana</i>	Mfulu	Bilhazia, Chango la kizuka
Vitaceae		
<i>Rhoicissus tridentata</i>	Kidere/ Togoni	Child fever, Mdondo (chicken), Tambazi
<i>Cyphostemma adenocaula</i>	Mvunjamilima/Rwe ngere/Mwengele	Tambazi, Swelling of legs, Body pain, Spirit, Stomach ache
Zingiberaceae		
<i>Siphonochilus kirkii</i>	Hungahunga	Kwashiorkor
<i>Zingiber officinale L.</i>	Tangawizi	Cough
-	Bandagala	Child fever (Degedege)
-	Chafi	Itching
-	Chiawa	Spirit
-	Daka la tangabebe	Hernia
-	Fufula	Eye inflammation (Mwangeni)
-	Kidindili	Labour inducement
-	Kidumilahakula	Epilepsy
-	Kihawa	Pain killer
-	Kihozamsanga	Eye ache, Infertility (Women), Protection
-	Kilemelanembo	Ironsmith, Tambazi
-	Kilumbulumbu	Diarrhoea, Haemorrhoid
-	Kindukule	Diarrhoea
-	Kipozahuba	Eye ache
-	Kisaganumbu	Labour inducement
-	Kivunyangale	Child fever
-	Kongowekowe	Chango la kizuka, Cough, Tambazi, Headache
-	Lusila	Rheumatism, Male virility
-	Malosa/ Mlosa	Gonorrhoea, Child death after birth, Eye ache, Menstruation cycle, Chango la kizuka, Stomach-ache
-	Mavumbula/ mvumbasi	Ear ache, Spirit, Child fever, Mental illness, Hernia, Stomach ache
-	Mbagama	Ironsmith
-	Mboriti	Hernia
-	Mcharaka/ Mharaka	Child fever, Spirit, Snake bite, Stomach ache, Protection
-	Mdingala	Pneumonia
-	Mfumbazi	Fever
--	Mfunguo	Child death after birth
-	Mghosa	Hernia
-	Mgoloka	Pain, Tonsillitis
-	Mhafigonzo	Chest pain, Asthma, Sore throat
-	Mhogole	Hernia
-	Mhungaginyi	Diarrhoea, Conjunctivitis, Protection, Child fever, Chango la kizuka
-	Mhunza	Menstruation cycle, Diarrhoea, Chango la

-	Mkaviti	kizuka Inflammation
-	Mlambanda	Child fever
-	Mnamiza	Male virility
-	Mnarasindi	Gonorrhoea
-	Mng'alumo	Diarrhoea
-	Mngulu	Giddiness
-	Mnikakozi	Infertility (W), Chango la kizuka, Diarrhoea, Spirit
-	Mnyamimba	Hernia
-	Mnyanya mbago	Hernia
-	Msigisi	Gonorrhea, Hernia
-	Msono	Safura (Ankylostomiasis)
-	Mtang'we	Stomach ache, Spirit
-	Mtungwi	Pneumonia
-	Muhoma	Chango la kizuka
-	Mvukwi	Chango la kizuka, Hernia
-	Mvumbasi (pori)	Chango la kizuka
-	Mwekula	Eye inflammation
-	Mwenguwengu	Infertility (Women), Protection
-	Myegeyege	Ear ache
-	Mzangwi	Ear ache, Hernia
-	Ng'alumwa	Spirit, Hernia, Diarrhoea, Insecticide
-	Ng'angwe	Hernia
-	Ng'ongulu	Eye ache
-	Ngulukila ya mtamba	Child fever
-	Simbi	Gonorrhoea
-	Tundula	Wound

APPENDIX II. Distribution of Medicinal plant species into families

Family	Number of species	Number of diseases
Acanthaceae	1	1
Agavaceae	2	2
Anacardiaceae	4	9
Annonaceae	1	3
Apocynaceae	4	7
Araceae	1	5
Balsaninaceae	1	6
Bignoniaceae	1	2
Bombacaceae	1	2
Boraginaceae	1	2
Caesalpinioideae	6	17
Caricaceae	1	4
Caryophyllaceae	1	1
Compositae	14	19
Connaraceae	1	1
Convolvulaceae	1	2
Costaceae	1	5
Cucurbitaceae	2	6
Denstaediaceae	1	1
Ebenaceae	1	2
Ericaceae	1	1
Euphorbiaceae	7	10
Flacourtiaceae	1	1
Geraniaceae	1	1
Gramineae	1	1
Guttiferae	3	7
Ixonantaceae	1	4
Labiatae	3	11
Lauraceae	1	7
Litiaceae	1	3
Loganiaceae	1	1
Malvaceae	3	7
Melastomataceae	1	7
Meliaceae	2	9
Melianthaceae	1	2
Mimosoidae	2	4
Moraceae	6	11
Musaceae	1	1
Myricaceae	1	2
Myrsinaceae	1	4
Myrtaceae	2	6
Palmae	1	1
Papilionaceae	7	18
Passofloraceae	1	3
Piperaceae	3	11
Podocarpaceae	1	2
Rhizophoraceae	1	1
Rosaceae	2	2

Rubiaceae	7	9
Rutaceae	5	12
Sapindaceae	4	6
Scrophulariaceae	2	3
Solanaceae	4	9
Stecuriaceae	2	3
Theaceae	1	2
Tiliaceae	1	1
Ulmaceae	1	3
Umbelliferae	1	1
Verbenaceae	1	2
Vitaceae	3	8
Zingiberaceae	2	2

APPENDIX III. Distribution and densities (stem/ha) of medicinal tree (Woody plants) on farmlands and in forest reserve close to Tandai, Tegetero and Nyandira villagea.

Local name	Tandai				Tegetero				Nyandira				Total
	Farm		Forest		Farm		Forest		Farm		Forest		
	Tree	Sap	Tree	Sap	Tree	Sap	Tree	Sap	Tree	Sap	Tree	Sap	
Foza/ Mtamba	17		8					27					52
Hungahunga			13										13
Kigidamhulo			4	42				1300					1346
Kikulagembe		11		42									53
Kisusulamugi		22	8	125		7	6	27		30	25	332	582
Kitugutu		42			4	240	11	195		3		82	577
Kitupa		17											17
Kitugutu sungu										6		82	88
Lufifi		3		42		10						28	83
Luhungavisozzi						64							64
Lutizo											6		6
Mbaazi		111											111
Mbagama			4	82									86
Mbambalamaziw a		10	20	1450				82					1562
Mbefu		14						27					41
Mbono	8	75				29							112
Mdaha/ Ludaha				1332				195			4	584	2115
Mdimumhulo				167				20					188
Mfenesi*	11	3			4	5							23
Mfulu		6						11	27				44
Mfumbi											21	167	188
Mgeremamondo											13	375	388
Mgida		11	75	42				9	300		153		590
Mgidamhulo				42									42
Mhambamti		64		42		89	3						198
Mhange											158	112	1283
Mhirihiri		32	8	332				6	50				428
Mkanyi	3	32	125	582				8	765				1515
Mkole		3	95	3917				39	360				4414
Mkundekunde		6											6
Mkuyu		39							50				86
Mlengolengo		20		750		4	37	3050					3861
Mlilati						5	34	445					484
Mmaidini**									233	208			441
Mnazi*	29	8			4								41
Mngua								3	27	30			60
Mnguti				82		128	11	27			104	82	434
Mnzekonzeko		3				4				111			118

Moza			4									312	3129
Mpera*		3							3			5	6
Mpix*												14	14
Msada		6							6	20	667	699	
Msanyanzale			13										13
Msasa	3	3				5							11
Msemblerere							25				13	457	495
Msenene		6		332	4	32		82			32	665	1153
Msulu											8		8
Mtomokwe	16	50						27					93
Mtonvutonvu		36	17	82		11	3						149
Mtunu		64		582		75	12	167			4		900
Mvulanvula			4	540						3			547
Mvule		6											6
Mvumba/ Mseli			13				3				13		29
Mwavi											4		4
Mwambalasimba		3											3
Mwembe*	3												3
Mwiza		72		167		60		735					1034
Mwizongela										6			6
58	8	31	15	21	4	16	17	21	1	13	13	12	

* Planted fruit tree

** Planted timber tree

APENDIX IV. Distribution and densities of none woody medicinal plants (plants/ha) (Herb and Climbers) on farmlands and in forest reserve close to Tandai, Tegetero and Nyandira vilaaages

Local name/ Village	Tandai		Tegetero		Nyandira		Total	Habit
	Farm	Forest	Farm	Forest	Farm	Forest		
Bandebande	6	711					717	Climber
Bumu	6		53	27			86	Climber
Bungobungo		1207				456	1663	Climber
Gole/ Lugole	3						3	Climber
Hunduhundu			4			41	45	Climber
Kidere			140	27			167	Climber
Luhalamila/ Hambamti		42					42	Climber
Luziwana		42					42	Climber
Mfeafea	6		7	27			40	Climber
Mgegeba		82				208	290	Climber
Mhambamti	64	42	89	3			198	Climber
Mwinika					6		6	Climber
Pilipilimanga								Climber
Rwengere	11				10		21	Climber
Togoni	3						3	Climber
16	7	6	5	4	2	3	14	
Degedege		42					42	Herb
Kifulwe				1110			1110	Herb
Kifutafuta	25	42	7		140		214	Herb
Kinzasu			21				21	Herb
Konge		804				354	1158	Herb
Lumotomoto	3	82	4				89	Herb
Lupala lwa mlungu					22		22	Herb
Lusangalala	28						28	Herb
Luswagamene			7		3		10	Herb
Lweza	42		71		230	500	843	Herb
Mdizi	60						60	Herb
Miwa	90				3		93	Herb
Mnungha		40	7		8	1375	1430	Herb
Mpoza			4				4	Herb
Mwidu			4				4	Herb
Nembenembe		332		1627			1959	Herb
Ngobedi		125		945			1070	Herb
Ngugu			147				147	Herb
Nyaluganza					192		192	Herb
Nyangavuvu					433		433	Herb
Poza				55			55	Herb
Silu	3	82	550	50		167	852	Herb
Sunga			103		20		123	Herb
Vuga					111		111	Herb
Ununvu mweupe	17		99	360	113		589	Herb
Kihawa			550				550	

Kivunangale			4				4	
Mkilingara						750	750	
Mkwagaya				114			114	
Mngua				30	30		60	
Mwepula	8						8	
Ng'unzulu			21				21	
32	9	8	15	8	12	5		
48	21	14	20	12	14	8		

APPENDIX V. Questionnaires for the documentation of traditional medicinal practices in the Uluguru mountain area.

1. Study area

Region..... District..... Division.....Village
 Latitude.....Longitude.....Altitude.....

2. Personal information

Name.....Age.....Sex.....Tribe.....Occupation

3*. Medicinal plants.

Do you use plants to cure human diseases/ problems? If yes how?

Give the name of plants used,

Local name. Disease. Habit. Collection. Part used. Preparation. Application. Status.

.....

4 * How often do you collect the plants.....

5 * How much do you charge for the treatments.....

6 * How people do attend treatment per month.....

7* How do you ensure sustainability of the plants.....

8* Do you have any comment on conservation of medicinal plants?

9* Do you know any thing about trade of medicinal plants in the area ?

If yes, Name the plant species collected uses Trading agency

.....

Is the trade done at local of international level ?

Do you have any idea of the country which the species are being exported ?

10 Have you ever used plant species in treatment of diseases or problems ?

If yes, Name of the plant Diseases Was the treatment effective How much did paid ?

.....

If no, Do you know any plants used in disease treatments

Name of plant Disease

.....

* - question for the healers only