

Assessment Of The Remaining Forests On The Uluguru Mountains And The Pressures That They Face.

by

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**A report for CARE Tanzania
and Uluguru Mountains Biodiversity Conservation
Project (WCST & DOF).**



Wildlife Conservation
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CARE
Tanzania



Danish Ornithological Society

CONTENTS

Objective.....	1
Background.....	1
Overview of the Forest Reserves in the Uluguru mountains.....	2
Mountains Forest Reserves.....	2
Bunduki I and III Forest Reserve (Vinile).....	2
Nyadiduma Forest Reserve.....	2
Shikurufumi Forest Reserve.....	2
Uluguru North Forest Reserve.....	3
Uluguru South Forest Reserve.....	3
Vigoza Forest Reserve.....	3
Foothill forest and lowland forest reserves.....	5
Mvuha and Chamanyani Forest Reserve.....	5
Ruvu Forest Reserve.....	5
Kimboza Forest Reserve.....	5
Outlying Hills Forest Reserves.....	7
Dindili Forest Reserve.....	7
Kitulanghalo Forest Reserve.....	7
Mindu Forest Reserve.....	7
Mkungwe Forest Reserve.....	7
Nguru ya Ndege Forest Reserve.....	8
Methods.....	9
Overview.....	9
Literature.....	9
Vegetation.....	9
Social.....	9
Results.....	11
Forestry.....	11
Forest uses.....	11
Public Land Forest.....	12
Reserve Forest.....	17
Social.....	17
Infrastructure.....	17
Land Tenure.....	18
Renting and buying land.....	20
Migration.....	21
Agriculture.....	21
Field Size and Distance to.....	24
Yields.....	26
Food crops.....	28
Cash crops.....	31
Forests.....	34
Tree planting.....	36
Discussion.....	37
Forest on Public lands.....	37
Forest use.....	37
Areas felt to be the most threatened.....	40
Bibliography.....	41

Appendix 1 - List of questions used in the semi structured interviews

Appendix 2 - References

Literature Arranged Alphabetically
Literature Arranged by Subject Area
Population
Sociological / Economic / PRA
Farmers - Institutions
Farmers - Institutions – Gender
Farmers / Land use
Livestock / Traction
Soil / Erosion / Agriculture decline
Climate
Conservation
Forests
Biodiversity
Projects / Progress Reports
Miscellaneous
Swahili

Appendix 3 - Terms of References for the three studies

An Assessment Of Environmental Degradation In And Around The Forests Of The Uluguru Mountains
Tor For Institutional And Policy Study Towards The Design Of A Project For Uluguru Mountains
Tor For Consultant For A Rapid Livelihood Study Towards The Design Of A Project For Uluguru Mountains

ANNEXES AVAILABLE ON REQUEST

Annex 1 - Results from interviews carried out during the field work

Summary of Interviews 1

Summary of Interviews 2

Summary of Interviews 3

Annex 2 - Annotated Bibliography of some of the areas around the Ulugurus

Location - Ulugurus

Location - Ulugurus north side

Location - Morogoro

Location - Bigwa village

Location - Mbeti village

Location - Ulugurus southern side

Location - Bwakila Juu village

Location - Singisa village

Location - Uluguru western side

Location - Tangeni village

Location - Mgeta division

Location - Nyandira village

Location Bunduki village

Location - Tchenzema Ward

Location - Kibuku village

Location - Tchenzema village

Location - Uluguru eastern side

Location - Mwarazi village

Location - Kinole Ward

Location - Tandai village

Location - Matombo division

Location - Tawa village

Location - Kiswira village

Location - Mtamba village

Location - Gozo village

Location - Kilosa district

Annex 3 - Annotated Bibliography of some reserves that people have investigated

Mountain Forest Reserves

Location - Bunduki I and III Forest Reserves

Location - Kasanga Local Authority Forest Reserve

Location - Nyandiduma Forest Reserve

Location - Shikurufumi Forest Reserve

Location - Uluguru North Forest Reserve

Location - Uluguru South Forest Reserve

Location Vgoza Forest Reserve

Foothill Forest Reserve

Location - Mvuha and Chamanyani Forest Reserve

Location - Ruvu Forest Reserve

Lowland Forest Reserve

Location - Kimboza Forest Reserve

Location - Konga Local Authority Forest Reserve

Location - Mangalal Local Authority Forest Reserve

Location Milawilila Local Authority Forest Reserve

Location - Ngambaula Local Authority Forest Reserve

Outlying Hills Forest Reserve

Location - Dindili Forest Reserve

Location - Kitulanghalo Forest Reserve

Location - Mindu Forest Reserve

Location - Mkungwe Forest Reserve

Location - Nyuru Ya Ndege Forest Reserve

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FOREWORD

This study has been written as a academic overview rather than as a paper setting out what policies that I would recommend.

The most important part of this document is the main section, the appendices and annexes are there for people who would like to know where to get further information and not as a study in there own right. I could have left most of these sections out but felt that it would be helpful to people whom would like to work in the Ulugurus especially if they have a specific location in mind. Dawn Hartley has rightly pointed out that some of the papers mentioned contradict each other and can be further analysed, the original material should therefore be referred back to if any work is to be done.

This report forms a package of three reports concerning the environment, institutions and livelihood of the people in the Uluguru Mountains. These studies were undertaken with the objective of supplying information for a written proposal concerning the conservation of the forest of the Ulugurus. For the full Terms of Reference of all the three studies undertaken during this short research period see Appendix 3.

The report also has three annexes that have not been distributed with the report but are available on demand, these annexes are titled : Annex 1 - Results from interviews carried out during field work, Annex 2 - Annotated Bibliography of some of the areas around the Ulugurus and Annex 3 - Annotated Bibliography of some reserves that people have investigated. They each contain information collected during the work.

OBJECTIVE

To gather information on the environmental pressures faced by the forested lands of the Ulugurus, to input into a project proposal to be written and submitted to GEF/DANIDA for the conservation of the biodiversity and natural resources of the Ulugurus. The research assesses the amount of forested land found outside the forest reserves, comparing this with the amount of forested land present in the past. It also assesses the condition of the Forest Reserves in the Ulugurus. Those practices, which are degrading the forest resources inside and outside the Forest Reserves of the Ulugurus, are also identified.

BACKGROUND

The importance of the Uluguru forests cannot be overstated - their future is also the future of Tanzania as a whole. For it is here that the water for Dar es Salaam starts its long journey (see map in Hymas, 2000). More than 20 years ago, Pócs (1980) discovered that the forest could hold more rainwater compared to the surrounding farmlands, and that this water is slowly released throughout the year damping the effects that the dry season has on water supplies and also the effects of flash floods.

Water from the Ulugurus also has direct importance to the surrounding area, which is mostly agricultural land with both subsistence crops and cash crops. The cash crops mostly end up in Dar es Salaam to feed its increasing population. There are also important industries that rely on the water from the Ulugurus (e.g. Sisal estates, and most Dar es Salaam industries).

Without the forest, water levels in the rivers would fluctuate greatly with the seasons and have the potential to cause vast damage during peak floods. These floods have been noted since Stanley's visit in 1874 (Young *et al.*, 1960) and in the 1970s (Temple, 1972).

The Ulugurus have also acquired many accolades due to their Biodiversity values (Hymas, 2000), but until recently there has been little effort in protecting this biodiversity, which contrasts with two of the other biodiverse mountain areas in the Eastern Arc that have received a lot of attention (East Usambaras and Udzungwas). There are several reasons for this lack of conservation; two of the main ones are a disastrous soil conservation project in the 1950s and after independence the military sensitivity of the area (Temple, 1972). Due to this lack of effort the largest area of public forest has recently been severely degraded (Hymas, 2000), smaller forest patches in the public lands remain known only from aerial photos taken in 1955 and 1977, and the current status of the Uluguru Catchment Forest Reserves is not described.

The aim of this study is to fill in knowledge gaps by mapping the remaining public forests and to roughly check the state of the boundaries of the Uluguru Catchment Reserves, especially in the South where few patrols have been undertaken since independence, and perhaps not since the border was re-demarcated and trees planted by the British. This checking is vital because the state of the border can only be inferred from the 1977 aerial photography, which in some cases is no longer a true picture of the areas with forest (Hymas, 2000).

Overview of the Forest Reserves in the Uluguru mountains.

The Germans set up 277 km² of forest reserves on the Ulugurus in 1909, the occupants of which were expelled and compensated (Young *et al.*, 1960; Temple, 1972, Lyamuya *et al.*, 1994). In some areas, such as the northern part of Uluguru North, the British expanded the boundaries of the reserve towards the end of their administration period (Bhatia and Ringia, 1996).

There are 15 known Catchment Forest Reserves in the Ulugurus, and a number of local authority Forest Reserves. The Catchment Forest Reserves can be divided into 3 categories depending on their location: -

Mountain Forest Reserves
Foothill and Lowland Forest Reserves
Outlying Hills Forest Reserves

This study mainly investigated the six forest reserves in the mountains, of which three are mostly covered in “natural” forest, two are mainly plantations and the last one has been cleared.

Mountain Forest Reserves (Table 1).

Bunduki I and III Forest Reserve (Vinile)

These reserves are in Bunduki Ward of Mgeta Division between Uluguru North and Uluguru South reserves. Official records state they were gazetted in 1950, although the reserve maps indicate planting of exotic species was proceeding in the German and early British periods. The total gazetted area of the two reserves is 107 acres with a gazetted boundary of 5.6 km at an altitude of 1220 to 1540 meters. Vegetation in these forests consists of both Plantation in Bunduki I (Vinile) and montane or submontane forest in Bunduki III (Lovett and Pócs, 1993; Doggart *et al.*, 2000). Some of the plantation is being logged, firewood and building poles are also collected, and there is a trade in animals (especially chameleons) from the reserves (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Nyandiduma Forest Reserve

This reserve is on the road between Nyandira and Luale above the Mbakama River. The gazetted area covered by this reserve is 118 to 140 acres with a gazetted boundary length of 8.5 km at an altitude of between 1500 to 1600 m. Vegetation in this forest is plantation with some secondary montane forest. The timber in this reserve is being cut, and the boundary is highly damaged (Lovett and Pócs, 1993).

Shikurufumi Forest Reserve

This reserve is found above Lukungui in Kikeo Ward and was established in 1937 or 1948 but gazetted in 1948. The gazetted area is 642 acres with a gazetted boundary of 9.1 km at an altitude of 1100 meters. The reserve is mostly submontane forest some of which may be secondary growth. There is also a plantation of *Eucalyptus* trees inside the reserve. A clearing is found in the middle of the reserve that may be an old village but no one remembers it. There also used to be a mica mine on the southern edge of the reserve but this has been long abandoned (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Some Firewood, building poles and medicines are being extracted. The edge is probably influenced by fires and is scrubby regeneration. (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Uluguru North Forest Reserve

This large reserve covers most of the summits of the northern part of the mountains. It runs N to S from just above Morogoro to Bunduki. It was created in 1909 (Young *et al.*, 1960) but gazetted in 1963 (Anon.) along with the Tongeni River northern extension. The gazetted area is 20,649 acres with a boundary length of 68 km at an altitude of 1000 to 2340 meters. The reserve is entirely covered by moist forest except for some rocky outcrops. On the eastern slopes between 800 and 1500 m submontane forests occurs, but on the western side this is restricted to valley bottoms. Montane forest occurs between 1500 and 1900 meters. Upper montane forest occurs above 1900 m in the wetter slopes and ridges. (Lovett and Pócs, 1993).

Around the reserve there is intense cultivation and in some areas encroachment has occurred with even the boundary markers being purposely moved. In general farms now extend up to the border of the reserve, with very little public forest found outside but continuous with the reserve. Fire from the agricultural land regularly damages the forest edge, with pole-cutting restricting re-growth. Illegal logging occurs, especially in areas with easy access. Logging is often blamed on the WaHehe tribe, with local people collecting fuel wood, poles, vegetables, medicines, ropes and seedlings from the forests; there is also hunting with, for example, wild pig traps above Tegetero. Tree Hyrax and the threatened Abbots Duiker are also hunted using dogs.

Uluguru South Forest Reserve

This covers the remaining major summits of the Southern part of the mountains and runs from west of Tawa across to Bunduki and down south to above Singiza. There is a plateau at over 2300 meters halfway between Bunduki and Singiza. The reserve was created in 1909 (Young *et al.*, 1960) with a gazetted area is 42,731 acres with a gazetted boundary of 36.3 meters at between 1200 to 2638 meters (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

The eastern and western slopes are covered by moist forest that surrounds the upland grassland and swamps of the Lukwangule Plateau. Montane forest occurs from 1500 to 2400 meters and upper montane forests above 2000 meters. Bamboo thickets cover large areas in upper Mgeta valley and Kimhandu summit (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Only the south west and south east is any public forest continuous with the reserve, in other areas, especially Mgeta, agriculture goes up to the border of the reserve. Above Tchenzema agriculture reaches up to 2000 meters and in this area the forest is also highly disturbed.

In Bunduki nearly all the large timber has been extracted with the canopy being only 10-15 m up to 2300 meters (Svendsen *et al.*, 1995). Pitsawing is rumoured to be the major reason for the lack of large trees in this area.

Local people collect fuelwood, poles, timber, vegetables, medicines, ropes and seedlings from the forest. There is also hunting and a trade for Chameleons which are sold in Dar es Salaam. Illegal logging is carried out above Tchenzema and probably elsewhere. In most cases this is for local use and only when there is easy access (e.g. around Bunduki) is logging commercial.

Vigoza Forest Reserve

Vigoza was established in 1947. It covers the slopes above the Vigoza river close to Tchenzema, and the Nyandira to Tchenzema road passes through it. The gazetted area was 223 acres with a boundary length of 1.7km and its is found at an altitude of 1700 meter. The reserve was formerly a plantation that was harvested and is now a vegetable garden. (Lovett and Pócs, 1993).

Table 1 : Summary data on mountain forest reserves in the Ulugurus

Reserve name	Year gazetted	Area covered (acres)	Boundary length (km)	Altitude (meters)	Types of forest
Bunduki	Established by Germans. Gazetted 1950	107	5.6	1220 to 1540	Mostly Plantation. Montane. Submontane.
Nyandiduma		118 -> 140	8.5	1500 to 1600	Plantation. Secondary Montane growth.
Shikurufumi	1948	642	9.1	1110	Submontane. Secondary growth.
Ulugurus North	Established 1909. Gazetted 1963	20,649	68	1000 to 2340	Moist forest. E slopes, 800 to 1500 m - Submontane W slopes 1500 to 1900 m - Montane. Above 1900 m - Upper montane .
Ulugurus South	Established 1909. Gazetted 1930.	42,731	36.3	1200 to 2638	E + W slopes - Moist forest. Lukwangule Plateau - Grasslands. 1500 to 2400 m - Montane. 2000 m + - Upper montane.
Vigoza	1947	22.3	1.7	1700	Was plantation, now is a garden.

Foothill forest and lowland forest reserves (Table 2).

Mvuha and Chamanyani Forest Reserves

The reserves are located next to the road between Matombo to Mvuha, just after Shepherds pass. They cover hilly country to the East of the main Uluguru mountains, with an altitude of between 140 to 400 meters. The gazetted area covers 3,724 acres with a boundary length of 48 km. Most of the reserves are covered by woodland or woodland grassland, with riverine forests along streams and the Mvuha river (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

For many years timber has been extracted from the reserves, which this continues today, and more recently the reserve has been encroached due to a lack of boundary markings. Building poles and firewood are also collected. Miners pan for gold, rubies and rhodolite in the Mvuha river that runs through the reserves. Massai graze their cattle in the east of the reserve and fire is regular in the dry season (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Ruvu Forest Reserve

Ruvu Forest Reserve was gazetted in 1955. Covering 7,640 acres it is near the Mkuyuni to Matombo road covering a plateau on either side of the Ruvu River gorge at an altitude of 200 to 480 meters. The western half of the reserve is covered with seasonal lowland forest while in the rest there is mixed woodland (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Ruby mining is the most serious problem of this reserve with people coming from all over Tanzania to dig holes looking for the stones and hence destroying the vegetation (Bhatia and Ringia, 1996; Lovett and Pócs, 1993; Doggart *et al.*, 2000). There are also gold miners who camp on the banks of the Ruvu in the reserve. Encroachment by local farmers is occurring near the villages of Kibungo and Kibangile. Hunting of bush pigs also occurs (Doggart *et al.*, 2000).

Kimboza Forest Reserve

This was established in 1964 with a gazetted area of 1,059 acres and a boundary length of 11 km at an altitude of 180 to 500 meters. It is very near the Ruvu Forest reserve. The Ruvu river flows through the reserve and the Mkuyuni to Matombo road bisects it. The reserve is mainly lowland rain forest, though there are also plantations of native and exotic trees (Lovett and Pócs, 1993; Rodgers *et al.*, 1983).

Legal and Illegal pitsawing occurs usually with outsiders playing a role; this has resulted in the loss of many tall canopy trees (Lovett and Pócs, 1993; Rodgers *et al.*, 1983). Firewood, building poles, foods and medicines are collected by local villagers, especially near the road. Mining of dolomite marbles occurs very near to the reserve border. Fires are a regular occurrence. There is currently a village environmental committee who regularly patrol the forest border.

Table 2 : Summary data on Foothill and Lowland Forest reserves around the Ulugurus

Reserve name	Year gazetted	Area covered (acres)	Boundary length (km)	Altitude (meters)	Types of forest
Mvuha and Chamanyani	Boundary map from 1910	3,724	48	140 to 400	Mostly woodland and wooded grasslands, some riverine forests.
Ruvu	Est. 1955	7,640		200 to 480	Mostly lowland forest
Kimboza	Est. 1964	951	11	300 to 400	Mostly lowland forest.

Outlying Hills Forest Reserves (Table 3).

Dindili Forest Reserve

Established in 1953 (Lovett and Pócs, 1993) but gazetted in 1964 (Anon.) this forest reserve covers 2,488 acres with a boundary length of 15.3 km. It is found to the East North East of Morogoro town on the way to Dar es Salaam, and covers a ridge that runs north-south at an altitude of 849 meters (Lovett and Pócs, 1993).

40 % of the area is covered in Woodlands mostly on the lower ridges and drier western slopes. On the wetter eastern slopes dry evergreen forests cover the remaining 60 % of the reserve (Lovett and Pócs, 1993).

Fires occur regularly in the woodlands, and illegal charcoal making takes place close to the main road. Small amount of encroachment occurs with traps being set up for small antelopes (Lovett and Pócs, 1993).

Kitulanghalo Forest Reserve

This was gazetted in 1955 and covers 6,518 acres with a boundary length of 18 km. It is near the Morogoro to Dar es Salaam road, east north east of Morogoro. Woodland covers 60 % of the reserve, occurring on the lower and higher slopes. Dry semi-evergreen forests cover the remaining 30 % of the area on the eastern slopes and summits. In this reserve there is large scale charcoal making at the northern end, with the whole woodland area being regularly burnt (Lovett and Pócs, 1993).

Mindu Forest Reserve

Established in 1954 (Lovett and Pócs, 1993) and gazetted in 1964 (Anon.) the reserve covers 5,647 acres with a boundary of 20.7 km. The reserve lies West of Morogoro town near the Morogoro to Mikumi road, it covers a ridge that runs North-South at an altitude of 1260 meters. 50 % of the reserve is wetter woodland on the slopes and ridges, while at the base there is dry woodland, which covers 20 % of the reserve. Dry semi evergreen lowland forest covers another 20 % but is restricted to areas that are naturally protected from fires. Submontane forest occurs in fragments and only on summit ridges, and is being replaced by grasslands due to regular fires. Rocky outcrops cover less than 4 % of the area. (Lovett and Pócs, 1993).

Charcoal making and regular burning has an impact on the wetter woodlands, and mining takes place in the lower slopes. Cultivation does not occur and grazing is very limited. (Lovett and Pócs, 1993).

Mkungwe Forest Reserve

This reserve was gazetted in 1954 to cover an area of 4,860 acres and with a boundary length of 30 km. It is found near Kikundi village north east of the Uluguru mountains, at an altitude of 360 to 1104 meters. The reserve is covered with Submontane forest with a transition to lowland forest below 800 meters. On the lower margins and on ridges of the western slopes dry forest occurs and woodlands are found below 700 meters. (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Intense pitsawing occurs in the central, eastern and western areas of the forest, with a camp being made for the pitsawing. Bush fires occur yearly that damage to edge of the closed forest. Hunting also occurs (Lovett and Pócs, 1993; Doggart *et al.*, 2000).

Nguru ya Ndege Forest reserve

This reserve is found North West of Morogoro town with access on the Morogoro to Dodoma road. It is an isolated hill ranging from 700 meters to 1357 meters. The gazetted area is 94,367 acres with a boundary of 25 km. Woodland is the main vegetation of the reserve with submontane forest occurring on the summits. Remnants of a dry semi evergreen forest occur on the foot of the hill around 600 meters (Lovett and Pócs, 1993).

Fires occur every year on the slopes. The Northwest slopes are completely deforested. Charcoal making is deforesting the lower slopes and encroachment occurs near the villages (Lovett and Pócs, 1993).

Table 3 : Summary data on reserves on the outlying hills.

Reserve name	Year gazetted	Area covered (acres)	Boundary length (km)	Altitude (meters)	Types of forest
Dindili	Est. 1953 Gaz. 1964	2,488	15.3	Approx. 849	40 % - Woodland. 60 % Dry evergreen forest.
Kitulanghalo	Est. and Gaz. 1955	6,518	18	350 to 774	60 % - Woodland. 30 % - Semi evergreen forest.
Mindu	Est. 1954 Gaz. 1964	5,647	20.7	600 to 1260	50 % - Wetter woodland. 20 % - Dry woodland. 20 % - Dry semi evergreen lowland forest. 2% - Submontane evergreen forest. 4 % - Secondary grasslands. 4 % - Rocky outcrops.
Mkungwe	Est. and Gaz. 1954	4,860	30	360 to 1104	Mostly submontane forest. Below 800 m Lowland forest. Lower side ridges have Dry forest. Below 700 m woodland.
Nguru Ya Ndege		94,367	25	700 to 1357	60 % - woodland. Foothills dry semi evergreen forests. Rocks and cliffs have many endemics.

METHODS

Overview

Due to the limited time period, the methods chosen can be summarised as quick and dirty, with the data providing only a rough overview of each of the villages visited. Care has to be taken when using information from one village to generalise about the surrounding villages, there can be large differences between neighbouring villages due to large topographical and infrastructure (roads, markets, dispensaries, mission) differences between villages. Hence the data collected should be used as a general indicator of the possible situation that one may encounter in the villages of the Ulugurus. People should be aware of this when interacting with villagers.

The Research was carried out in two stages, the first consisted of a literature review concerning the range of human practices that have the potential to effect the environment both past and present and any information that relates to the condition of the forests both past and present. The second stage consisted of fieldwork to collect social data on the use of natural resources and to discover the amount of forest that now remains in the public lands, in total 18 villages were visited during the field work (Table 4, and maps 1 to 4)

Table 4 : Name of villages visited during the fieldwork.

Village name	Ward name	Division name
Kibungo	Mkuyuni	Mkuyuni
Mkuyuni	Mkuyuni	Mkuyuni
Changa	Mkuyuni	Mkuyuni
Tawa	Tawa	Matombo
Mtamba	Kisemu	Matombo
Kibungo	Kibungo	Matombo
Lanzi	Kibungo	Matombo
Mvuha	Mvuha	Mvuha
Kolero	Kolero	Mvuha
Kasanga	Kasanga	Mvuha
Ukwama	Kasanga	Mvuha
Longwe	Kasanga	Mvuha
Magata		Mvuha
Nyamigadu B	Bwakila Juu	Bwakira
Nyamigadu A	Bwakila Juu	Bwakira
Lumba Juu	Bwakila Juu	Bwakira
Mhale		Mgeta
Kikeo		Mgeta

Literature

A literature review was undertaken for two reasons. Firstly, the review aimed to compile a list of all reference materials concerning the Ulugurus, and from this a Bibliography and an Annotated Bibliography was produced (Appendix 5). Secondly the review provided information on previous research pertaining to other villages and the state of the forests around the Ulugurus.

Vegetation

Forested areas were mapped onto 1:50,000 East Africa (Tanzania) Series Y742 maps (Table 5), from aerial photos of the Uluguru mountains taken in 1955 and again in 1977. These were used to indicate the possible areas in which forest outside the reserves may still occur. During the fieldwork the areas marked on the maps were located and the presence or absence of forest was noted. At the same time any other forested areas were also noted on the maps.

Table 5 : Maps used during field work

Map name	Sheet number	Year of Map Publication	Map edition	Map prepared by	Map prepared from
Morogoro	183 / 3	1970	3-D.O.S. 1970	British Government's Ministry of Overseas Development	Aerial photos (1964) and Field Completion (1970)
Kingolwira	183/4	1970	3-D.O.S. 1970	British Government's Ministry of Overseas Development	Aerial photos (1964) and Field Completion (1970)
Mgeta	201/1	1982	1-TSD	Government of the United Republic of Tanzania and the Canadian International Development Agency	Aerial photos (1978)
Matombo	201/2	1982	1-TSD	Government of the United Republic of Tanzania and the Canadian International Development Agency	Aerial photos (1978)

Due to the lack of recent aerial photos the extent of remaining forest on the Ulugurus had to be determined by using binoculars, compass, GPS and altimeter and by drawing forest patches onto the map from suitable vantage points. The forested boundary of the forest reserve (i.e. not the physical reserve boundary) was checked with that which occurs on the map, so giving a rough idea if any encroachment has been occurring.

The disadvantage of this crude method is that some forest patches may be missed due to being within topographical features such as gullies, or behind hills. This of course would not occur with aerial photos, this disadvantage was reduced during the interviews where the interviewees were asked about the occurrence of forest in the public lands.

Using this method it is also not possible to map every single tree or small patches of trees, instead large patches (greater than approximately 50 trees) or important patches (islands of tree patches in a sea of agriculture) were noted. It was not always possible to get an idea of the state of the forest patches due to the distances involved, this also made it hard to tell if these forest patches are natural or plantations.

Combined with the aerial photos of 1977 these results provide an assessment of extent to which forest on the public lands have been lost. Mapping both the forest patches of today and those of 1977 onto the same map using different colours highlights this (Maps 1 to 4).

Social

Any social study that is investigating the way in which people use forest resources in a reserve is fraught with difficulties. There is reluctance for people to divulge information freely which may get them in trouble with the authorities, this is especially true in the current situation where people are unsure of the status of, and their rights to, the forest reserve.

This is made worse by the fact that little time is spent in the villages so people do not get the chance to fully appreciate to what ends the research is being carried out. For these reasons the issue of forest products was kept at a broad level with no reference to their origins being made (i.e. from the reserve of public forests) unless it was offered freely. The reserve was only discussed at the end of the interview and only concerning its political status and how this is being upheld.

The interviews were undertaken using a semi-structured approach with a checklist used to cover many of the issues involved (Appendix 1). This method was chosen due to the variety of responses that would need to be further investigated, the disadvantage is that no two interviews are carried out in the same manner so comparison between interviews has to be done with care. Group interviews were mainly carried out with village leaders and executive officers, and the opinions of these two groups are a common factor in all village surveys. Where possible, environmental groups and farmers groups were asked to participate or interviewed separately, but few villages have either.

Due to the limited time the interviews were done with the people who were present rather than waiting for a official meeting to be organised, this has the disadvantage of not allowing some key groups of leaders to participate due to them being away e.g. farming. Sometimes only one person was available. The advantage was that there was no need to wait, perhaps for days, for everyone to come together, and the responses were also more spontaneous.

Questions aimed to collect information on land tenure, farming practices and activities carried out in the forests. They were not aimed to collect precise figures on yields, acreage, etc. but rather an order of magnitude of change, or distance. Precise figures cannot be acquired without spending time working out what is meant by each measurement, as few people have a correct idea of, for instance, the size of a acre or the length of a kilometre and even fewer can estimate it. But people do have an idea of how much they feel things have changed or the distance that has to be covered before some activity can be undertaken, these can be used as indicators of change.

RESULTS

Forestry

Forest uses

People collect a variety of products from the forests, which can be split into several categories depending on their uses (Table 6). Each of these uses has a different impact on the forests and involves different actors who benefit in different ways. The actors involved have different objectives that are influenced by the area that they are in.

In remote areas most of the forest products used are for domestic use, such as fuelwood, food and building material. But in areas where there is easy access the forest products can be both for domestic use and commercial purposes. It seems to be in these commercial areas that there is the largest pressure on the forests for it is in these areas that timber cutting and encroachment by farmers is more frequently found.

Table 6 : Summary of activities concerned with the forests.

Activity	Degradation caused by activity	Impact on forest	Probable actors
Domestic	Firewood, Medicines, Ropes, Food, Hunting (food).	Occurring over a wide areas, but damage is relatively small.	All villagers living near to the forest.
Construction	Poles, Thatching, Ropes, Timber.	Occurring over a wide areas, but damage is relatively small though does cause problems for tree regeneration.	All villagers living near to forest.
Agriculture	Encroachment, (Ng'ungulu), Hunting (Vermin)	Damage concentrated around boundary of reserve, areas are clear felled and then burnt.	All villagers who have farms near the boundary.
Commercial agriculture	Encroachment, Twine, hunting.	Heavy damage, occurring in areas of easy access where intensive agriculture occurs. The areas are clear felled and then burnt, usually going further into the forest than normal agriculture.	Farmers who farm in areas with intensive agriculture and cash crops.
Commercial fuel wood extraction.	Firewood needed for Pombe making and banana smoking.	Medium damage sometimes concentrated on a few species. Wood needed is more than what would usually be used in a household.	Areas where banana smoking is carried out. Pombe making occurs in most villages it is carried out by women.
Commerce - Timber Harvesting	Timber, Firewood (for Banana smoking and Pombe making), Hunting (pet trade).	Medium to heavy degradation in specific areas. The area is either clear felled or selective logging occurs. This is worst in areas where there is easy access allowing the timber to be taken out.	Local villagers are used to cut and carry the wood, though WaHehe are blamed. Middlemen may either be local villagers or outsiders.

Public Land Forest

In general there is little public forest left (Maps 1 to 4), most of what does still occur is plantations, such as black wattle that was planted in 1923 (Temple, 1972), but these are also being much degraded, with little replanting being carried out. If there is a market, people are willing to plant fruit trees, such as oranges.

At the foot of the hills there is miombo woodland that stretches out onto the plains, these are under heavy pressure as people come down the mountains to cultivate cash crops. Cultivation in this area usually consists of slash and burn. Savile (1947, quoted in Temple, 1972) noted that the creation of the reserves in 1909 forced people to further exploit the land outside these reserves, this process may still be continuing with the people hesitating to cultivate in the reserves but they have no problems in doing so in the unprotected miombo woodlands.





Some small patches of sacred forests still occur in the public lands. These are used for traditional purposes, but they are of little value for biodiversity conservation due to their small size.


Note on the following maps

The boundaries marked on the maps are only approximate, they should be used more to give an idea of the extent of deforestation in the Ulugurus and not for the precise position of the forests.

These maps are based on the topographical maps of East Africa (Tanzania) see Table 4 for more detail on these maps.

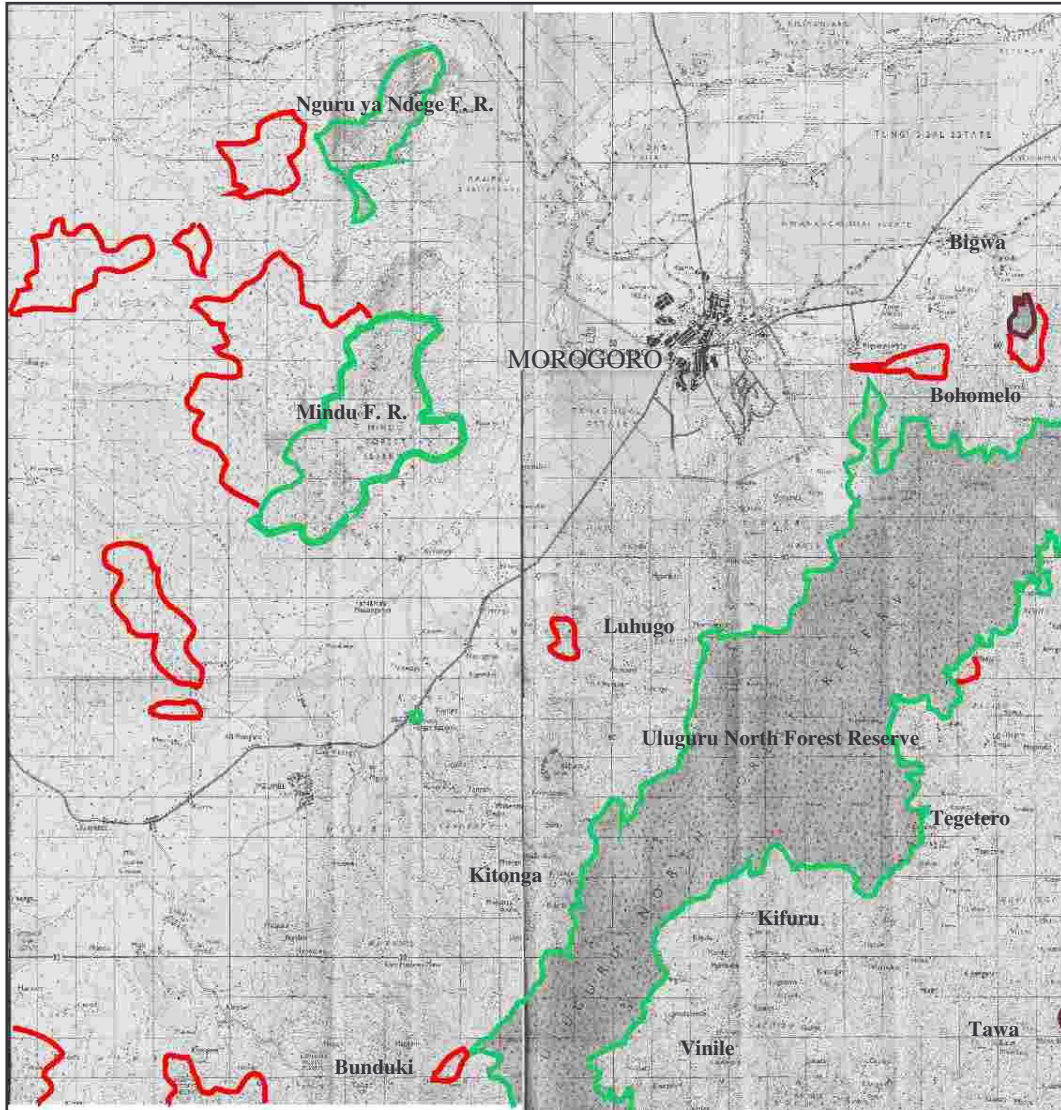
Key to maps

	Forest indicated on maps.
	Boundary of Forest Reserves.
	Boundary of Forest under planted with Banana
	Remaining forest in the Public Lands

1 km  5 km

Scale is approximate for each map.

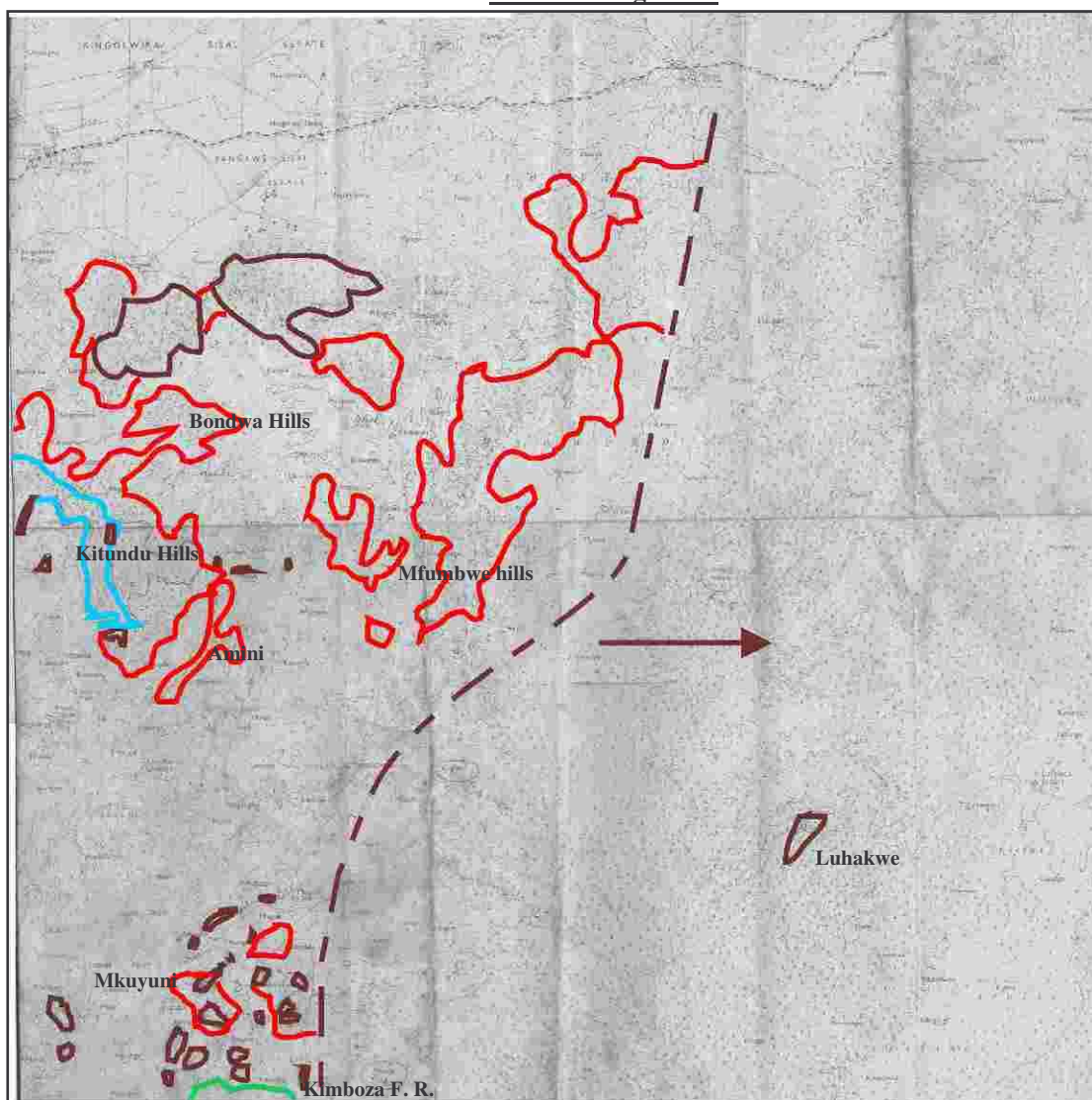
MAP 1 - Morogoro and Uluguru North Forest Reserve



Notes to Morogoro and the Uluguru North Forest Reserve. Map 1

- Bigwa - The 'forest' that occurs along the road between Bigwa and Kiroka is mostly dry woodland that burns yearly.
- Bohomelo - In the reserve pitsawing can be found, but between Bohomelo and Tegetero there is little evidence of pitsawing, though the farmland goes right up to and in one case into the reserve. Above Tegetero there are bush pig traps.
- Kifiri - The reserve border beacons here have been purposely moved allowing people to farm in the reserve.
- Vinile - There is pitsawing in this area and encroachment of the reserve boundary. Illegal permits have been given to harvest timber.
- Tawa - No forested area, except for small patches in local authority reserves to the East, which have an old road running through them.
- Bunduki - Heavy Pitsawing occurring here, with the plantation being heavily degraded. Farms are found inside the reserve boundary.
- Kitonga - In the reserve at around 1600 m there is evidence of pitsawing in the past, maybe 10 years ago, there are also large open areas with no evidence of secondary growth. At 1800 m recent pitsawing can be found with people still working the area, but they are selectively cutting.
- Kitonga to Luhugo - Pit sawing is found in the reserve, farmland goes into the reserve.

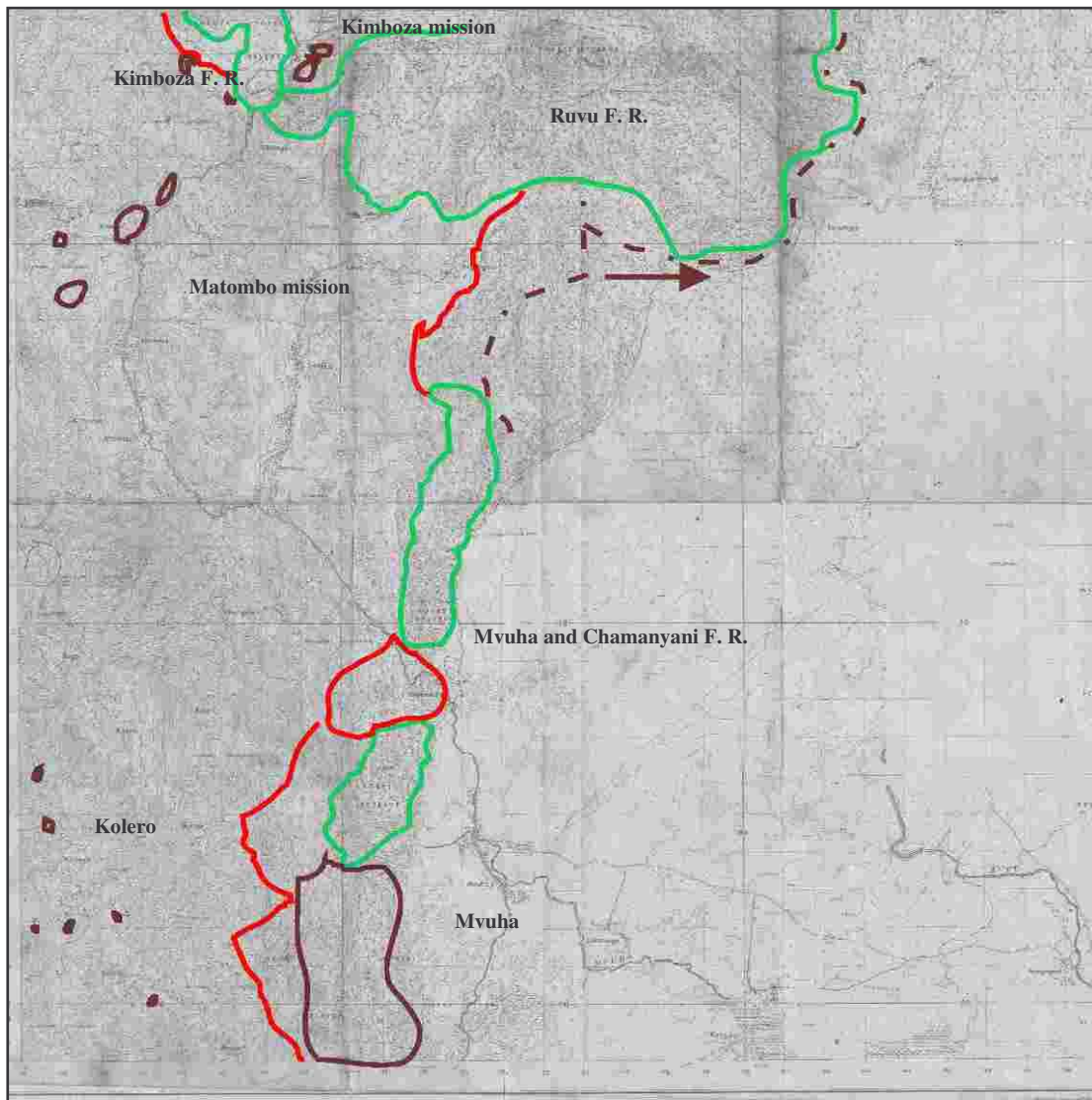
MAP 2 : Kingolwira



Notes on Kingolwira. Map 2

- East of the dotted brown line is miombo woodlands with some areas that have agriculture. There is a patch of moist forest on top of Luhakwe.
- Kitundu Hills - Large forested area that has now mostly been turned to banana plantation under the original forest trees. Only small inaccessible patches remain such as on top of the mountain. A Sawmill used to be in Amini until the 1970s. The remaining trees between the bananas are being pitsawed or clear felled and burnt for agriculture.
- Mfumbwe hills - Scattered Miombo woodlands in a sea of agriculture
- Mkuyuni - Patches of forest in inaccessible areas where there are too many rocks. Along the road the rocks are currently being "hacked away" to get the limestone. Many of these patches are fragmented.
- Kimboza forest reserve - This is more or less surrounded by agricultural land, except to the East where the Ruvu Forest reserve occurs. An environmental committee patrols the forest but timber is being extracted and warning notices are being slashed.

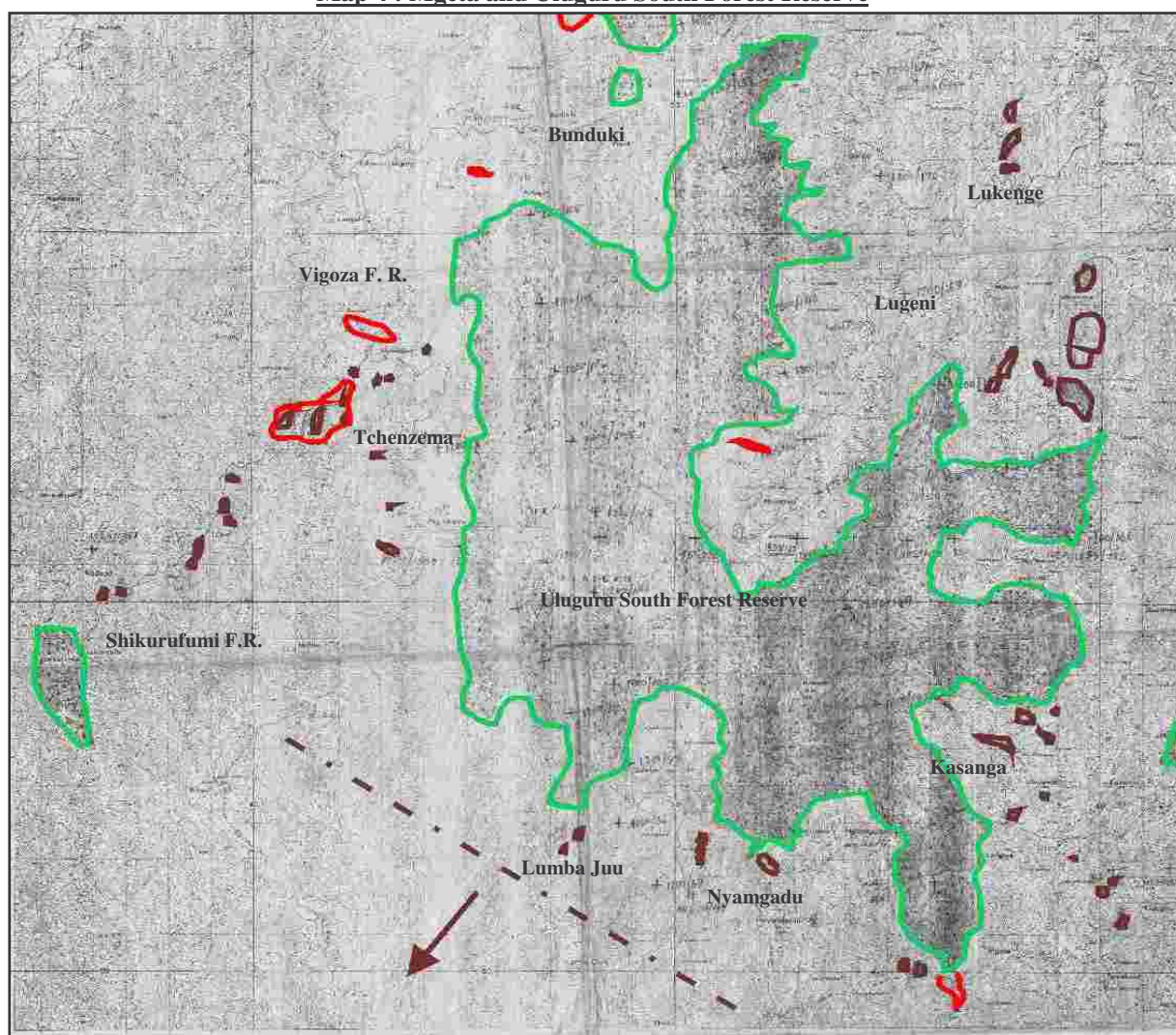
Map 3 : Mvuha and Ruvu forest reserves



Notes on Mvuha and Ruvu Forest reserves. Map 3.

- East of the dotted brown line is miombo woodland with scattered agriculture.
- Kimboza forest reserve - This is more or less surrounded by agricultural land, except to the East where the Ruvu Forest reserve occurs. An environmental committee patrols the forest but timber is being extracted and warning notices are being slashed.
- Between Kimboza Forest reserve and Ruvu forest reserve is a small mission reserve (Kimboza mission) and a village reserve.
- Matombo mission - The forests of the mission seem to be in the process of being clear felled to make money for the mission. Most are plantations with a natural forest understory.
- Mvuha and Chamanyani Forest reserve - mostly dry woodlands with some moist forest patches in wetter areas, mainly along watercourses.
- Mvuha - This forest is miombo woodland on the edge of the foothills and the plains. The western edge is being cut and burnt for farms.
- Kolero - Patches of forest on top of hills. Mostly plantation, but two are sacred forests.

Map 4 : Mgeta and Uluguru South Forest Reserve



Notes on Mgeta and Uluguru South Forest Reserves. Map 4.

- Bunduki - Heavy Pitsawing occurring here, with plantation being heavily degraded. Farms are found inside the reserve boundary.
- Lukenge - Forest patches on top of hills, these are now smaller than those seen on aerial photos and maps.
- Lugen - Forest patches on top of hills, these are now smaller than those seen on aerial photos and maps.
- Kasanga - Includes a forest reserve that is mostly plantation, the rest are plantations of black wattle on top of hills.
- Nyamgadu - Patches of black wattle plantation on top of hills, and some patches of true forest in hard to reach areas. Forest seems to exist outside of the Uluguru South Forest Reserve boundary.
- Lumba Juu - Patches of black wattle plantation on top of hills, and some patches of true forest in hard to reach areas. Forest seems to exist outside of the Uluguru South Forest Reserve boundary.
- Skikurufumi F. R. to Tchenzema - Forests along the ridge, seem to be plantations.
- Tchenzema - The mission there is cutting its own plantation. East of the Mission there are plantations that were planted by the Germans, but are now being cut down and not replanted. Above Tchenzema there is pitsawing and encroachment.
- Vigoza F. R - Plantation forest has been completely cleared.
- South West of brown dotted line - Below 800 m miombo woodland starts.

Reserved Forests

Most of these forests are being encroached (Maps 1 to 4), or farmland goes right up to the borders. Only in the harder to get to areas, such as at southern end of Uluguru South, is there forest found outside the reserve borders.

Villagers who live near the reserved forests collect the wood that they need from them. In areas where there is easy access, more pitsawing is found (Map 1 and Map 4). This is especially true in the Bunduki area. In Mgeta the intensive agricultural system seems to have added to the encroachment of the forest since farmers can benefit greatly from doing this. The canopy of this area is only 10 - 15 m height at 2300 m (Svendsen *et al.*, 1995) compared to 30 to 40 m in Tegetero (Hymas, 2000).

Social

Infrastructure

Of the villages surveyed only three have a main market; these were also the villages that had roads that were in good condition (Table 7). The villages where access was difficult or where there was no road access were also generally the ones with no governmental extension service (Table 7), i.e. no agricultural or forestry extension officer, an exception is Kolerolo. Some of these villages have no extension service at the Ward level either.

Bhatia and Ringia (1996) rightly pointed out that poor roads limit the access to markets and hence the cash crops that can be grown, and moreover this leads to an insufficiency of teachers and other services. This lack of extension services further undermines the possibilities that farmers have to improve their lives. In Kasanga the Ward leaders have even decided to move to another village (Bungu) which is a bit near to the road (NB. Kasanga does have a road, but it is in such poor condition and goes through such rough terrain that the only people who regularly use it are missionaries).

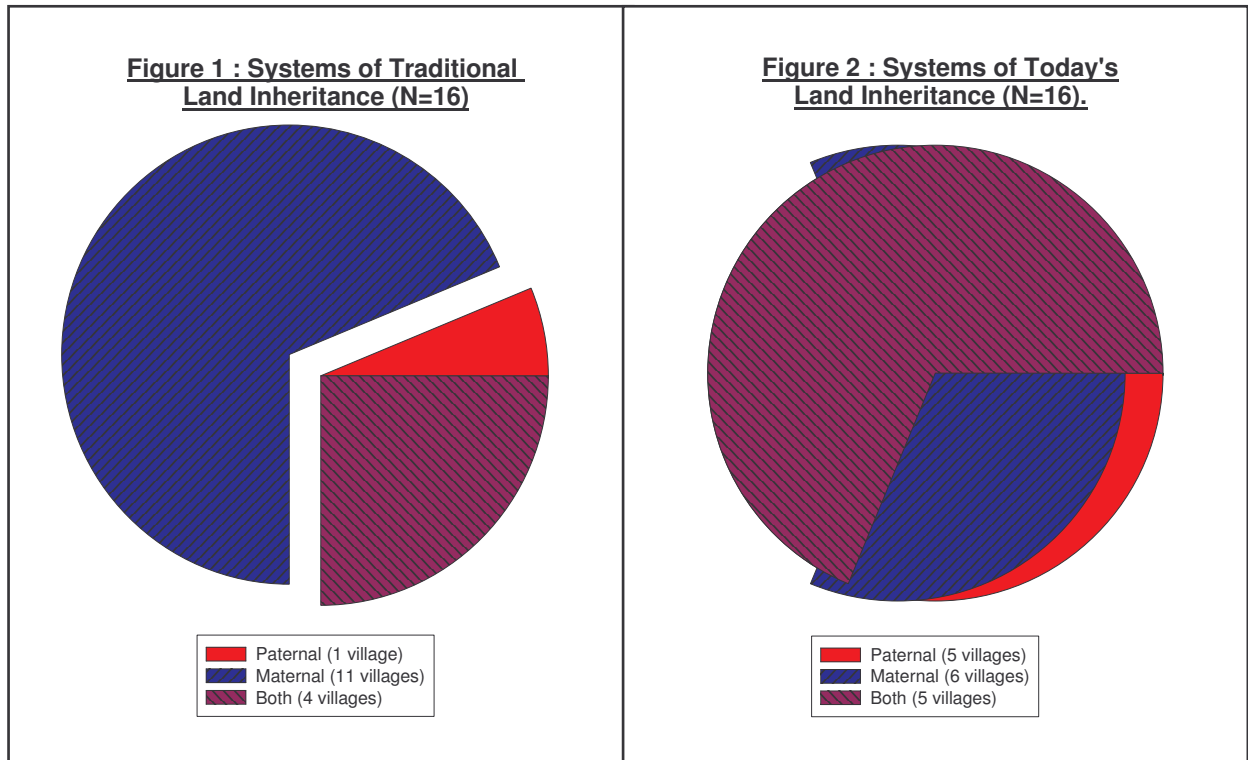
The lack of infrastructure was felt by the villagers who asked for extension workers to come to their village (Table 7 and Figure 11).

Table 7 : Access by villages to roads, markets and extension services.

Village / Ward	Road access	Main market	Villagers commenting on poor road and market facility	Presence of governmental extension.
Mkuyuni	Easy	Yes	Yes	Yes
Mtamba	Easy	Yes		Yes
Mvuha	Easy	Yes		Yes
Changa	Hard	No		Yes
Kolerolo	Difficult	No		Yes
Tawa	Difficult	No	Yes	No
Kibungo	Difficult	No	Yes	No
Lanzi	Very difficult	No	Yes	No
Kasanga	Very difficult	No	Yes	No
Ukwama	None	No		No
Longwe	None	No		No
Magata	None	No	Yes	No
Nyamigadu B	None	No	Yes	No
Nyamigadu A	None	No	Yes	No
Lumba Juu	None	No		No
Mhale and Kikeo	None	No	Yes	No

Land Tenure

Land was traditionally acquired through matrilineal inheritance (Young *et al.*, 1960), but today the situation is more complex with the traditional system slowly being eroded due to outside pressures. Figures 1 and 2 show how the traditional system has changed, with land inheritance through the father, or through either parent, becoming more common. It should be noted that in times of need it was always possible to inherit land from the father (Young *et al.*, 1960), this explains the occurrence of inheritance that can be either paternal or maternal in some villages.



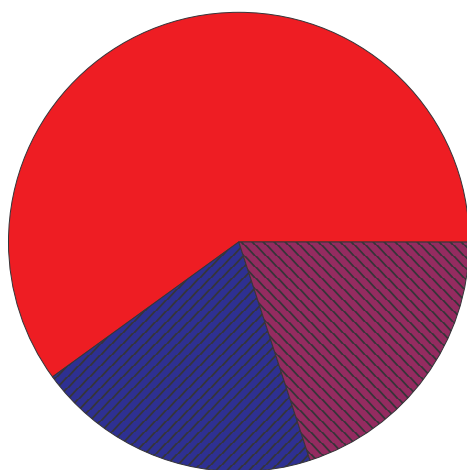
The only place where paternal inheritance was the traditional system of inheritance was Mvuha village. This village is on the edge of the plains and so may not be comparable with the other villages, for example there are many pastoral people here.

Cases of paternal inheritance occurring today, other than Mvuha, may be due to access to outside influences. Bhatia (1996) noted that the traditional village life was being eroded due to higher commercialisation, while Bhatia and Ringia (1996) found that land in Mwarazi village was inherited paternally. This is confirmed where all the villages in which paternal inheritance is found to be the norm today were also the villages which dedicated most of their land to cash crops (Table 8 and Figure 3). In the villages where maternal inheritance is still the norm the villagers dedicated most of their fields to subsistence food crops. (Table 8 and Figure 4).

Table 8 : Modes of inheritance of land both present and past, and the preference for food or cash crops.

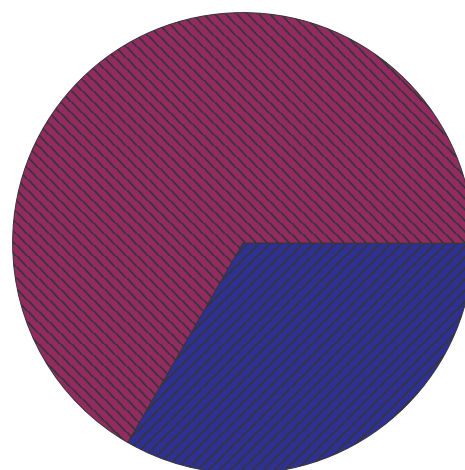
Village / Ward	Road access	Inheritance system of today			Traditional inheritance system			Farm for food	Farm for cash
		Paternal	Maternal	Both	Paternal	Maternal	Both		
Mkuyuni	Easy	Yes	No	No	No	Yes	No		
Changa	Not easy	Yes	No	No	No	Yes	No	25	75
Mtamba	Easy	Yes	No	No	No	Yes	No	34	66
Tawa	Difficult	Yes	No	No	No	Yes	No	34	66
Mvuha	Easy	Yes	No	No	Yes	No	No	75	25
Kibungo	Difficult	No	Yes	No	No	Yes	No	75	25
Lanzi	Very difficult	No	Yes	No	No	Yes	No	67	33
Kolero	Difficult	No	Yes	No	No	Yes	No		
Ukwama	None	No	Yes	No	No	Yes	No	75	25
Magata	None	No	Yes	No	No	Yes	No	50	50
Kasanga	Very difficult	No	No	Yes	No	Yes	No	66	34
Longwe	None	No	No	Yes	No	No	Yes	75	25
Nyamigadu B	None	No	No	Yes	No	No	Yes	50	50
Nyamigadu A	None	No	Yes	No	No	Yes	No		
Lumba Juu	None	No	No	Yes	No	No	Yes		
Mhale and Kikeo	None	No	No	Yes	No	No	Yes	50	50

Figure 3 : Most important crops of villages with Paternal inheritance at present (N = 5).



■ Cash crops (3Villages)
■ Food crops (1 villages)
■ Not known (1 villages)

Figure 4 : Most important crops of villages with Maternal inheritance at present (N = 6).



■ Cash crops (0 villages)
■ Food crops (4 villages)
■ Not known (2 villages)

Reasons for the change may not be simply due to the need for trading and so increased pressure from outside, but it may also be due to people looking for more land. Under these conditions there is a possibility for people to ask for land from their father.

Further investigation is therefore needed, especially when a project is to be set up in a village. Land tenure is an important issue with many people, it is the relationship between a farmer and his land that determines the crops that he can grow, for instance if the farmer is renting the land he rarely has permission to plant trees on that land. Van Donge (1992) has gone into great detail on the effects land disputes have when they are taken to court, the outcomes of these cases are not only slow but require large sums of money from each side.

Renting and buying land.

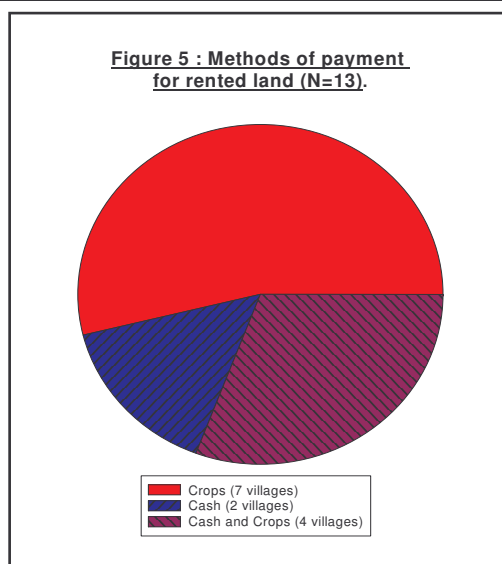
There is a possibility for people to rent land in the Ulugurus. This occurs in nearly all villages, except Lumba Juu (Table 9). The rent is usually paid in crops (Figure 5) with the possibility to pay in cash. However, villages with a main market usually only accept cash (Table 9).

Only in a few villages is it possible to buy land, again these are the villages that are more involved in trading (e.g.. Mkuyuni, Mtamba and Changa) (Table 8); it is also in these villages that immigration occurs (Table 9).

Table 9 : Other ways in which villages can acquire land, and people migration issues.

Village / Ward	Main market	Land rented	Rent paid by	Land bought	Immigration	Emigration
Mkuyuni	Yes	Yes	Cash	Yes	Yes	Yes
Mtamba	Yes	Yes	Cash	Yes	No	Yes
Mvuha	Yes	Yes	Cash		Yes	No
Kibungo	No	Yes	Crop	No	No	Yes
Lanzi	No	Yes	Crop	No	No	Yes
Kolero	No	Yes	Crop	No	No	Yes
Nyamigadu A	No	Yes	Crop	No	No	Yes
Kasanga	No	Yes	Crop	No	No	Yes
Ukwama	No	Yes	Crop	No	No	Yes
Longwe	No	Yes	Both	No	No	Yes
Magata	No	Yes	Both	No	No	Yes
Nyamigadu B	No	Yes	Both	No	No	Yes
Mhale and Kikeo	No	Yes	Both	No	No	Yes
Changa	No	Yes		Yes	Yes	No
Tawa	No	Yes		No	No	Yes
Lumba Juu	No	No		No	Yes	Yes

Figure 5 : Methods of payment for rented land (N=13).



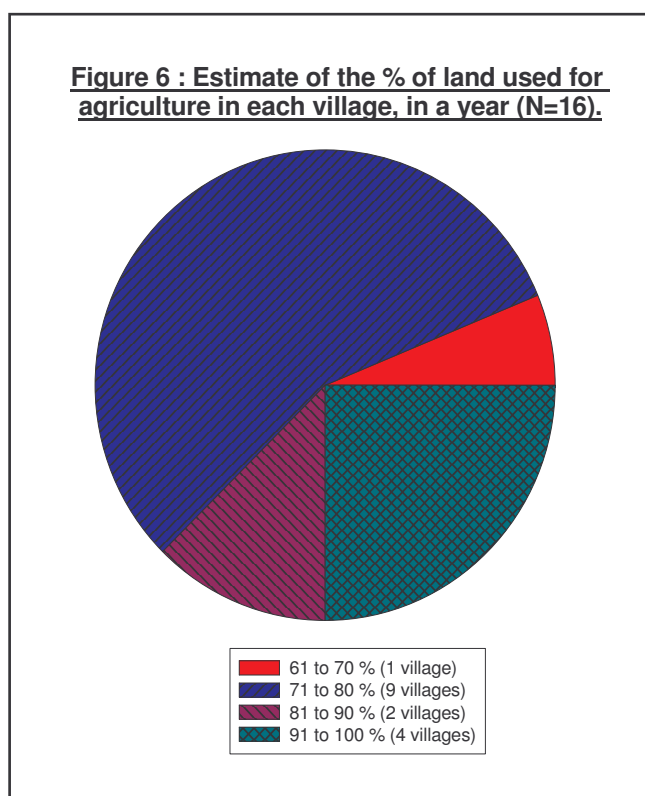
Migration

The villages in which land can be bought are also the ones where immigration occurs, but this occurs in only a few villages (Table 9) while in most there is only emigration. Emigration occurs in all the villages, and seems to be mostly temporary involving a few people who go to the lowlands to cultivate cash crops, although some also move to Morogoro and even Dar es Salaam.

In some villages, such as Longwe, people were interested in moving to the lowlands permanently, if they were given assistance; this was also found by Bhatia and Ringia (1996).

Agriculture

In general about 3/4 (71 to 80 %) of the land is used for agriculture during the year (Figure 6), which compares well with estimates in Bhatia and Ringia (1996). However, caution should be used when interpreting these figures, as there are areas where all the land is used throughout the year, e.g. in Mgeta Division where agriculture is extensive, while in other areas there is still some land under long fallow e.g. Mvuha and Bwakila Juu (Bhatia and Ringia, 1996). This difference is due to the agricultural practices carried out in different villages, e.g. in Mgeta there is irrigation and terracing, as well as the location of the village e.g. in Mvuha there is a long dry season prohibiting cultivation all year round.



The amount of land / effort that farmers invest in either cash or food crops depends on market access. In areas where access is not much of a problem then more effort is placed on the farming of cash crops (Table 8, Figure 7). For example in Mgeta Division 60 % of the land is dedicated to sustainable foods with fertilisers being used on the cash crops (Coniat *et al.*, 1997), while in the same Division Due *et al.* (1994) found that 47 % of the land was used for subsistence. In other areas such as Longwe nearly all the land is used for subsistence crops and no inputs of any kind are used.

Villages that use all the available land to cultivate have little land left for fallow and if any land is left fallow it is only for a very short period (Figure 8). While the villages with the most fallow land are usually the ones with the longest fallow periods, e.g. Mvuha (Table 10), this is not very clear cut since all the villages use more than 65 % of their land and the variability of fallow lengths is large.

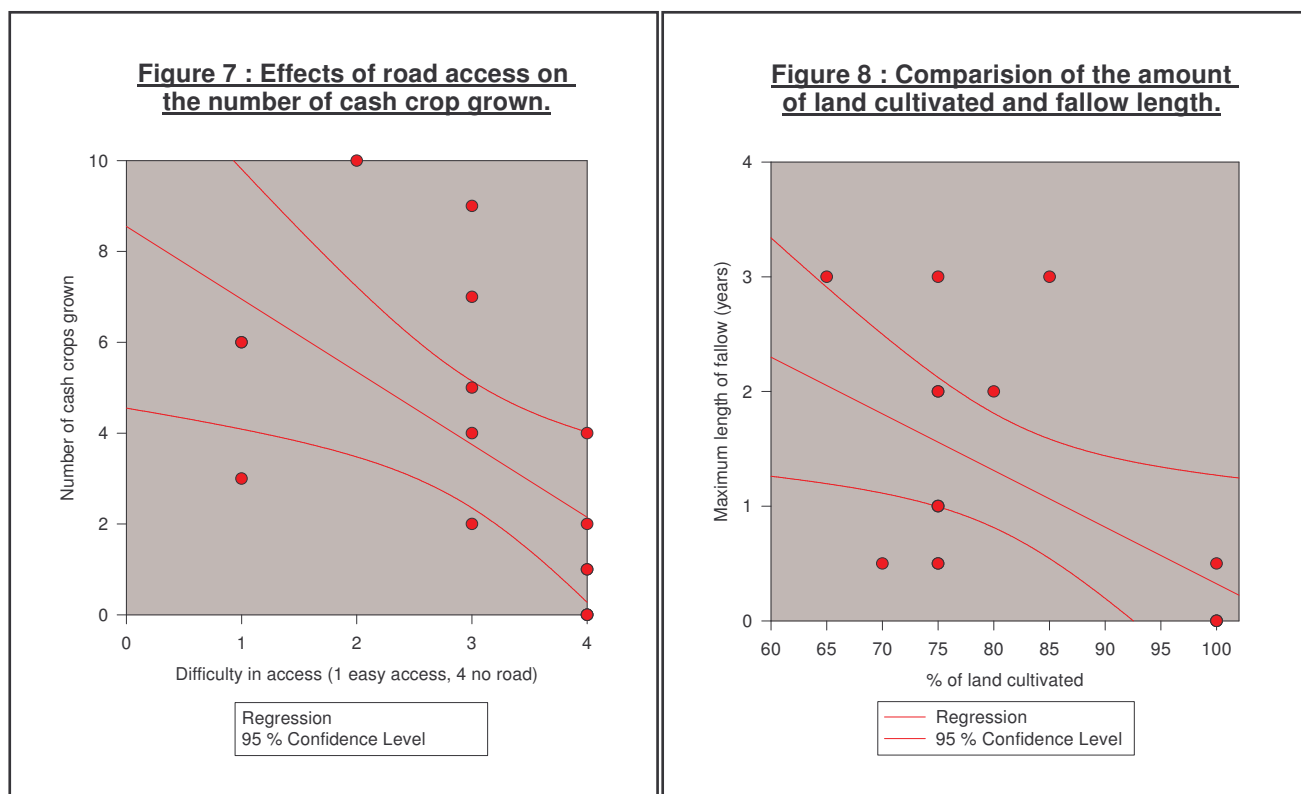


Table 10 : Amount of land cultivated in a year and the length of fallow periods.

Village / Ward	Total amount cultivated (per year)	Maximum length of fallow of remaining land (years)
Changa	100	0
Ukwama	100	0
Nyamigadu B	100	0.5
Mhale and Kikeo	100	0
Mtamba	85	3
Nyamigadu A	80	2
Tawa	75	3
Kibungo	75	0.5
Lanzi	75	2
Kolero	75	1
Kasanga	75	0.5
Longwe	75	2
Magata	75	1
Lumba Juu	75	1
Mkuyuni	70	0.5
Mvuha	65	3

Interestingly few people complained about the lack of land (Table 11, Figure 13) although Masawe (1992) found this to be the greatest problem in Matombo Division. Certainly the short period that land is left fallow could be related to a shortage of available land.

There is a difference in the season that farmers choose to do the bulk of their cultivation, in some areas it is during the short rains while in others it is during the long rains. The difference is due to differences in climate and the difficulties of farming in the long rains, due to too much rain. It seems that the villages further south are the ones that practice most of their cultivation during the short rains (Table 11), but this data set is too small to really make a strong link.

A change in climate is the main reason given for the decrease in fertility of the land (Table 12), this especially effects the farmers whose agriculture is mostly done in the short rains, as the decline of these rains has increased the risk of crop failure.

Figure 11 : Main agricultural season and position of villages.

Village / Ward	Peak agricultural period	Altitude (meters)	Side of mountain
Mkuyuni	Long rains	340	North East
Changa	Long rains	360	North East
Mtamba	Long rains	340	East
Tawa	Long rains	380	East
Kibungo	Long rains	1000	East
Lanzi	Long rains	1000	East
Kolero	Long rains	1000	South East
Mvuha	Long rains	140	South East
Ukwama	Short rains	1200	South East
Kasanga	Short rains	760	South East
Longwe	Short rains	1400	South East
Magata	Short rains	1300	South
Nyamigadu A	Short rains	1600	South
Nyamigadu B	Short rains	1000	South
Lumba Juu		1500	South
Mhale and Kikeo	Year round	700	West

Figure 12 : Problems that the villages claimed to have.

Village / Ward	Problems			
	Decreased rainfall	Reduced soil fertility	Lack of available land	Crop raiding and pests
Mkuyuni	Yes			Yes
Changa			Yes	Yes
Mtamba	Yes			Yes
Tawa				Yes
Kibungo		Yes		Yes
Lanzi				Yes
Mvuha	Yes	Yes		Yes
Kolero				Yes
Kasanga	Yes			
Ukwama	Yes		Yes	
Longwe	Yes	Yes	Yes	
Magata	Yes	Yes	Yes	
Nyamigadu B	Yes	Yes		Yes
Nyamigadu A	Yes	Yes	Yes	
Lumba Juu	Yes	Yes		
Mhale and Kikeo	Yes			

Although there was only one sample site in the south west (Mhale and Kikeo) it is likely that climate differences have a smaller effect on agriculture here due to the presence of irrigation and terracing, permitting cultivation to take place nearly all year.

It is important to know when the peak agricultural activity is, since this is the time where people would have little time to spend in other activities, such as tree planting. For this reason further study is needed in villages that are to be project sites.

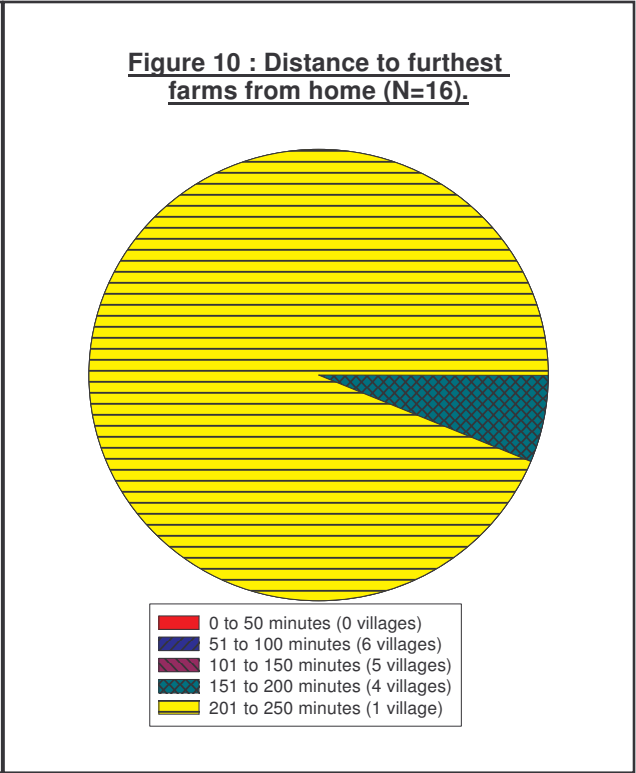
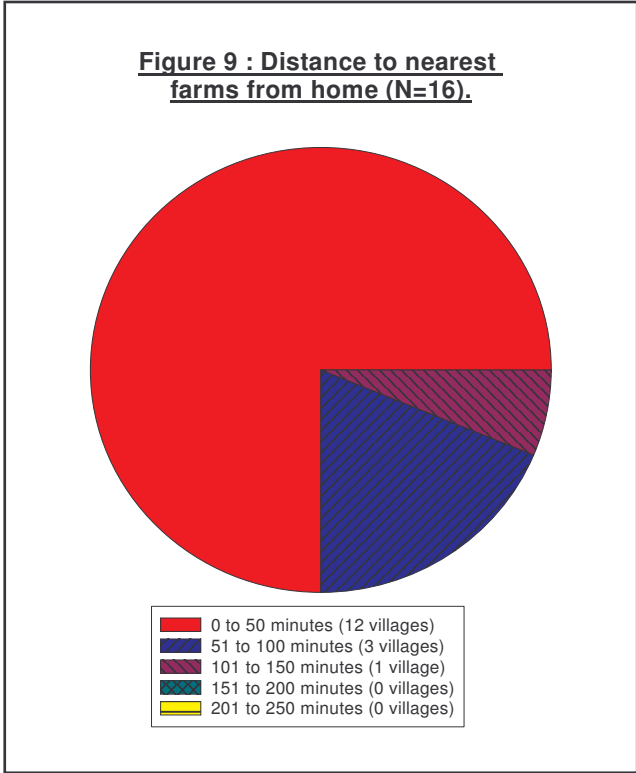
Field Size and Distance to Farms.

Most of the villages have a farm 0 to 50 minutes away from their home (Figure 9), on average people walk 40 minutes to get to their nearest farms (Table 13). To get to the furthest farm most people take 51 to 100 minutes (Figure 10) with people walking an average of 131 minutes to the furthest farm (Table 12).

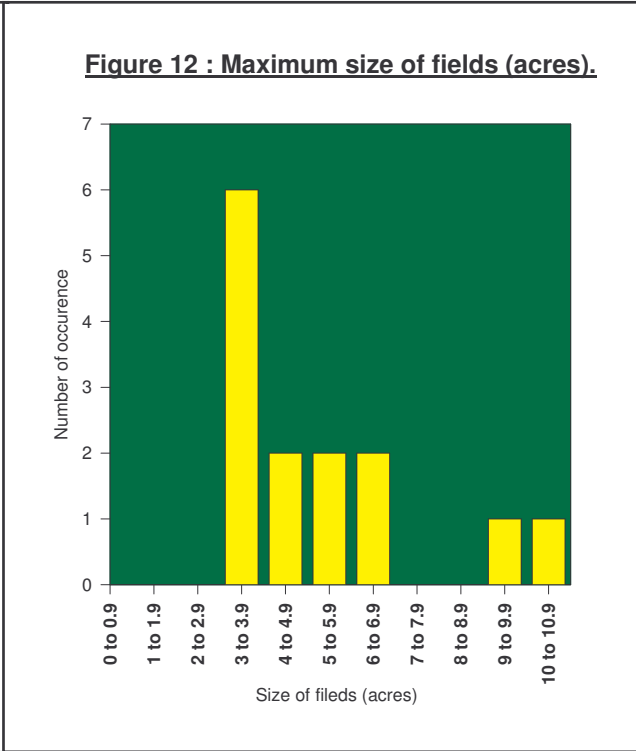
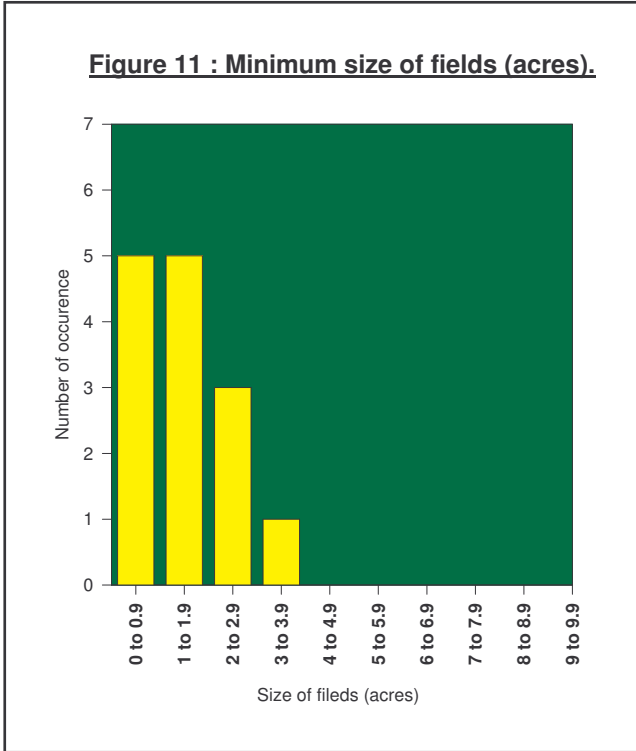
There seems to be little correlation between the amount of land remaining and the distance people have to walk, it would be expected that in areas where there was little land people would walk further. But this cannot really be investigated due to having a too small sample size. Villagisation may also be a factor as many farmers were moved far from their farms (Bhatia and Ringia, 1996), so a correlation may not occur.

Table 13 : Distance villages have to travel from their homes to their farms.

Village / Ward	Minimum distance to fields (minutes)	Maximum distance to fields (minutes)
Mkuyuni	15	90
Changa	30	120
Mtamba	30	60
Tawa	30	90
Kibungo	30	180
Lanzi	30	150
Kolero	10	180
Mvuha	120	180
Ukwama	30	60
Kasanga	60	240
Longwe	30	180
Magata	90	150
Nyamigadu A	60	90
Nyamigadu B	30	60
Lumba Juu	30	120
Mhale and Kikeo	15	150
Average	40	131.25



On average the total size of peoples fields is between 1.95 to 4.6 acres (Table 14) but the range goes between a minimum of 0.25 to 4 acres (Figure.11) and a maximum of 2 to 10 acres (Figure 12). This range indicates that the size of fields is also not uniform. In past studies, Bhatia and Ringia (1996) found an average of 3 acres per holding in Tangeni village, while Due *et al* (1994) found an average of 8.4 acres per family in Mgeta when Lyamuya *et al.* (1994) found that families had only 2.02 to 2.28 acres in the same area (Mgeta). There are clearly problems here, which we have not solved.



As with Bhatia and Ringia (1996) it was found that the fields themselves are not all in one area and may be far apart, on average farmers have between 2.9 and 4.6 fields but the range is between 1 and 10 (Table 14). Due *et al.* (1994) found an average 5.5 fields in Mgeta, while Lyamuya *et al.*, (1994) in the same year found an average of 2 fields per family with 8 in the past. Down the road in Bunduki, Bhatia and Ringia (1996) found families with 10 fields. So like the field size the number of plots also varies greatly from area to area, even in the same Division.

Table 14 : Size and number of farm plots.

Village / Ward	Minimum total size of farms (acres)	Maximum size of farms (acres)	Minimum number of plots	Maximum number of plots
Mkuyuni	2	3	3	3
Changa	1	10	3	3
Mtamba	4	4	4	5
Tawa	2	3	2	3
Kibungo	3	6	4	5
Lanzi	3	3	3	4
Kolero	2	2	3	4
Mvuha	2	5	2	3
Ukwama	2	3	3	3
Kasanga	1	4	4	4
Longwe	1.5	3	3	4
Magata	1	3	5	6
Nyamigadu A	3	6	2	6
Nyamigadu B	0.25	5	3	10
Lumba Juu			2	5
Mhale and Kikeo	1.5	9	1	5
Average	1.95	4.6	2.9375	4.5625

Yields

Agricultural yields have declined with people commenting that they were getting the best yields 10 to 40 years ago (excluding Mvuha = 3 years ago). Today people get 1 to 12 bags of rice compared to 7 to 30 that they were getting in the past (Table 15). For maize people get 1 to 3 bags while they used to get 3 to 10. It should be noted that the people further south do not grow rice, they say that it does not survive well.

In the literature many authors have also commented on this decline, for example Savile in 1947 (Young and Fosbrooke, 1960), and from then on (Temple 1972, Rapp 1972, Van Donge 1992, Lyamuya *et al.* 1994, Bhatia and Ringia 1996). One of these reports influenced the implementation of the disastrous Uluguru Land Usage Scheme (Savile 1947, in Young *et al.*, 1960).

The reports usually state that the poor yields are due to erosion and poor agricultural practices, the repetition of these claims, since at least 1947, indicates that low yields have been around for some time. These seem to be accepted by the farmers since the farmers have done little to change their farming practices, although they seemingly have the knowledge to do so (see Lyamuya *et al.*, 1994).

During this study the villagers did not give a decrease in soil fertility as their first reason for the low yields but instead related a decline to a change in climate (Table 12, Figure 13), with farming becoming more risky, especially in the short rains. Soil fertility was also given as a reason for the decrease in yields but only after deeper probing.

Decreased rainfall was also given to be the reason for decrease in yields rather than a decrease in soil fertility in all the villages that Lyamuya *et al.* visited in 1994, see Table 16.

Table 15 : Yields of past and present.

Village / Ward	Minimum yields at present (bags)	Maximum yields at present (bags)	Maximum yields in past (bags)	Crop used	Time between change (years)
Changa	5	8	30	Rice	
Mtamba	5	6	17	Rice	10
Tawa	1	2	10	Rice	
Kibungo	2	3	10	Rice	40
Mvuha	12	12	20	Rice	3
Kolero	5	5	7	Rice	30
Kasanga	1	1	6	Rice	10
Lanzi	1.5	2	3.5	Maize	30
Ukwama	2	3	6	Maize	20
Longwe	1	1.5	3	Maize	
Magata	1	1	3	Maize	23
Nyamigadu B	3	3	10	Maize	25
Nyamigadu A	3	3	7	Maize	25
Average	3.27	3.88	10.19		21.60

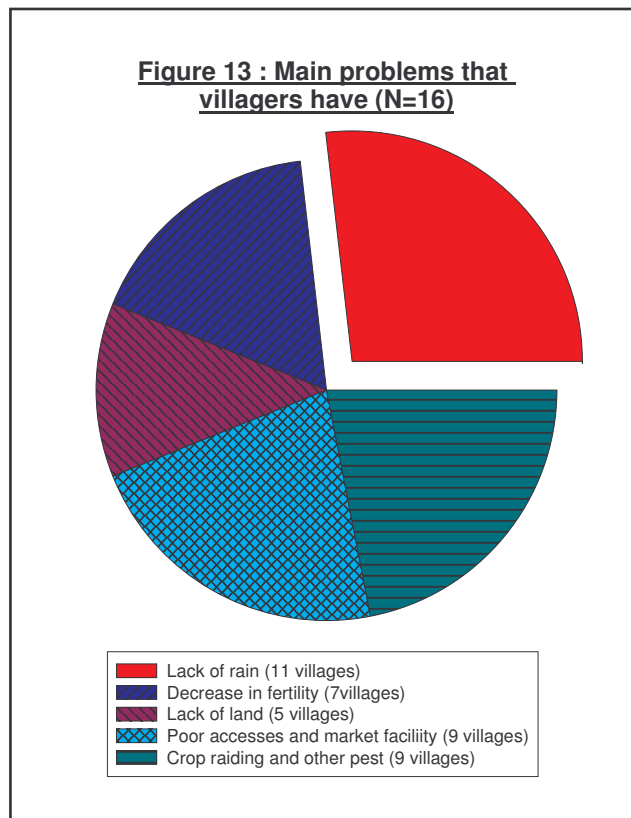
Table 16 : Reasons given for the decrease in yields.

Village	% Acknowledging decrease in rainfall	% Relating low crop yields to low rainfall	% Relating low crop yields to poor soil fertility
Tandai A	100	62	4.4
Tandai B	100	100	0
Kibwaya	100	100	0
Towero	100	87	12.3
Kibwe	100	94	5.1
Bigwa	100	42	5.5
Tangeni B	100	86	12
Tangeni A	100	76	16.5
Mlali	100	100	0

Table adapted from Lyamuya *et al.*, 1994.

In the light of the fact that yields have been low for a long time, in some cases for over 40 years, it might be expected that farm yields have reached a state of low equilibrium with the available soil nutrients (Bell, 1987 page 83).

If this assumption is correct then the shortage of rains may be a new factor that is further decreasing the yields and might therefore explain why villagers feel that the rains have more to do with the decrease in yields that does soil fertility.



Food crops

The main food crops grown are Maize and Cassava (Table 16, Figure 14), though a variety of other foods are also grown (Table 18, Figure 15). Maize is grown in all areas (Bhatia and Ringia, 1996) but in different seasons. Coniat *et al.* (1997) mentioned that maize was grown in over 85 % of the fields either as pure or mixed stands.

Other food crops are grown in different areas due to differences in climate and agricultural practices. For example in the south both rice and millet are not grown as the villagers say that it is too wet. The agricultural practices of the eastern slopes should not be compared with those of the western slopes due to the differences in rainfall (Coniat *et al.*, 1997), this difference also occurs at different altitudes (Lyamuya *et al.*, 1994). This not only makes it difficult to compare agricultural practices on different sides of the mountain but also those between different areas on the same slopes. Bhatia and Ringia (1996) divided the Ulugurus into 4 local agricultural zones hilly / forest fields, home gardens, valley bottoms and lower plains, each with a different cropping system.

Intercropping is done in all areas and includes a variety of different crops such as maize and rice, maize and cassava, maize and beans, cassava and pigeon peas etc. In general it can be said that intercropping is done between cereals / tuber crops and legumes (Bhatia and Forrester, 1996) and between fruit trees and annual crops.

Figure 17 : The main food crops grown in the villages.

Village	Maize	Rice	Cassava	Cocoyam	Sweat potato	Bananas
Mkuyuni						
Changa						
Matamba	Yes					
Tawa			Yes			
Kibungo	Yes		Yes			
Lanzi			Yes			
Mvuha	Yes	Yes				
Kolero			Yes			
Kasanga	Yes		Yes			
Ukwama	Yes		Yes			
Longwe	Yes		Yes			
Magata	Yes		Yes			
Nyamigadu B	Yes		Yes			
Nyamigadu A	Yes		Yes			
Lumba Juu	Yes		Yes			
Mhale and Kikeo	Yes		Yes	Yes	Yes	Yes
Occurrence	11	1	12	1	1	1

Figure 14 : The main crops used for food (N=16).

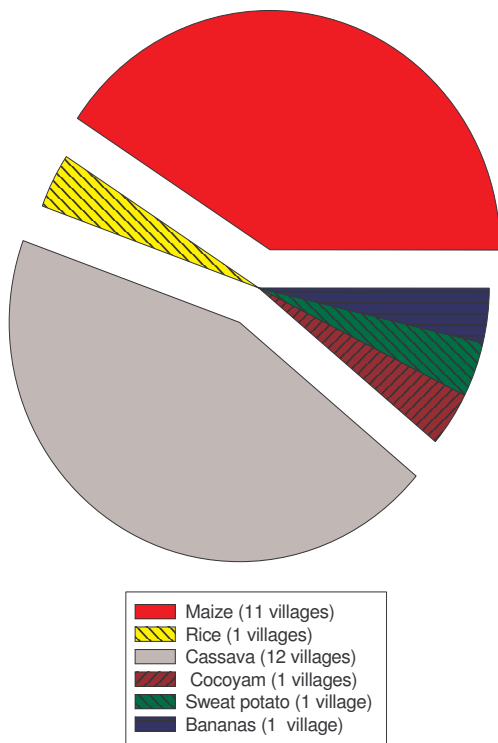


Figure 15 : Food crops grown in the villages (N=16).

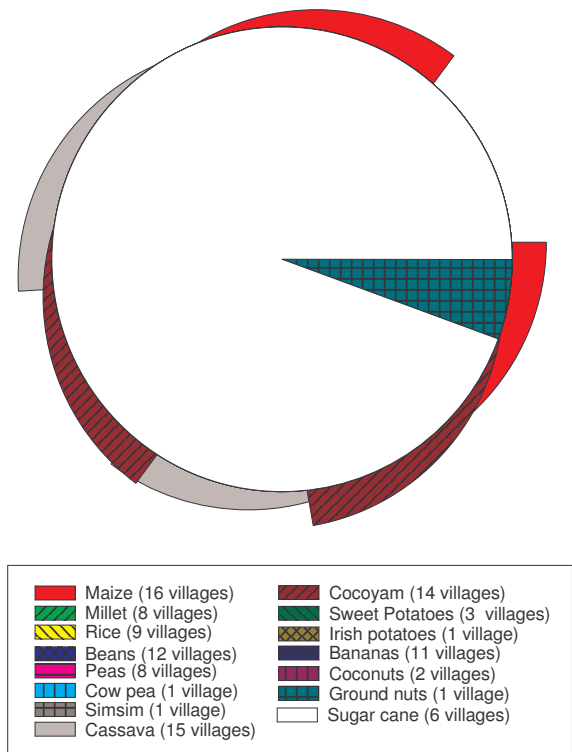


Table 18 : Food crops grown in the villages.

Village	Maize	Millet	Rice	Beans	Pea	Cow pea	Sim sim	Cassava	Coco Yam	Sweet Potatoes	Irish potatoes	Bananas	Coconuts	Ground nuts	Sugar cane
Mkuyuni	Yes	Yes	Yes	Yes				Yes				Yes			
Changa	Yes	Yes	Yes					Yes	Yes						Yes
Matamba	Yes	Yes	Yes					Yes	Yes						
Tawa	Yes	Yes	Yes	Yes					Yes	Yes			Yes	Yes	Yes
Kibungo	Yes	Yes	Yes	Yes				Yes	Yes			Yes			
Lanzi	Yes	No	Yes	Yes				Yes	Yes			Yes			
Mvuha	Yes	Yes	Yes					Yes							
Kolero	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Kasanga	Yes	No	Yes	Yes	Yes			Yes	Yes			Yes			
Ukwama	Yes	No	No	Yes	Yes			Yes	Yes			Yes			
Longwe	Yes	No	No	Yes	No			Yes	Yes			Yes			Yes
Magata	Yes	No	No	Yes	Yes			Yes	Yes			Yes			
Nyamigadu B	Yes			Yes	Yes			Yes	Yes			Yes			Yes
Nyamigadu A	Yes	Yes		Yes	Yes			Yes	Yes			Yes			Yes
Lumba Juu	Yes			Yes	Yes			Yes	Yes		Yes	Yes			Yes
Mhale and Kikeo	Yes			Yes	Yes			Yes	Yes	Yes		Yes			
Occurrence	16	8	9	12	8	1	1	15	14	3	1	11	2	1	6

Cash crops

Bhatia and Forrester (1996) found there is little diversification of cash crops in the Ulugurus, especially in the south where the main cash crops are bananas (Table 20, Figure 16), but this broad statement hides the effects of roads and markets, for it seems that the lack of diversification is due to the lack of access to markets. In areas where there is easy access to markets the variety of different cash crops increases (Figure 7 and 17), cash crops are therefore probably tied to the outside economy (van Douge, 1992).

The difficulty of access to some places makes it difficult to get products out of the village; this is especially true for bulky products such as cabbages (Coniat *et al.*, 1997) and for fragile products such as oranges. Other crops such as Coffee, Soya bean and Cotton were grown to fulfil government regulations but are now being replaced due to the market collapse of those products.

Climate also determines what cash crops are grown, in the wetter areas such as the south crops such as rice and millet were said not to grow well and so were not planted; this was also found in some areas by Bhatia and Ringia (1996). Farmers prefer to grow bananas in the wetter areas of the mountains, such as near or in forests and near river and gullies (Hymas, 2000; Coniat *et al.*, 1997).

Maize, cassava and some other food crops fulfil a dual purpose in being both for subsistence and cash, with the excess being sold. Some of the farmers living in remote areas end up going to the lowlands to grow cash crops such as millet, rice and simsim. This is usually only a temporary migration and in some cases coincides with the period when there is little agricultural work to be done in the mountains.

In conclusion the cash crops vary from place to place (Bhatia and Ringia, 1996) due to several reasons that also vary from place to place. The only cash crop that can be said to be widespread is bananas, and where it is not possible to cultivate them, either due to lack of markets or wrong environment, farmers tend to migrate to the lowlands to grow cash crops there.

Table 19 : The main cash crops grown in the villages.

Village	Rice	Beans	Bananas	Oranges	Simsim
Mkuyuni					
Changa				Yes	
Matamba			Yes		
Tawa				Yes	
Kibungo		Yes			
Lanzi			Yes		
Mvuha	Yes				
Kolero					Yes
Kasanga			Yes		
Ukwama			Yes		
Longwe			Yes		
Magata					
Nyamigadu B					
Nyamigadu A					
Lumba Juu					
Mhale and Kikeo		Yes			
Occurrence	1	2	5	2	1

Figure 16 : The main cash crops grown in the villages (N=16).

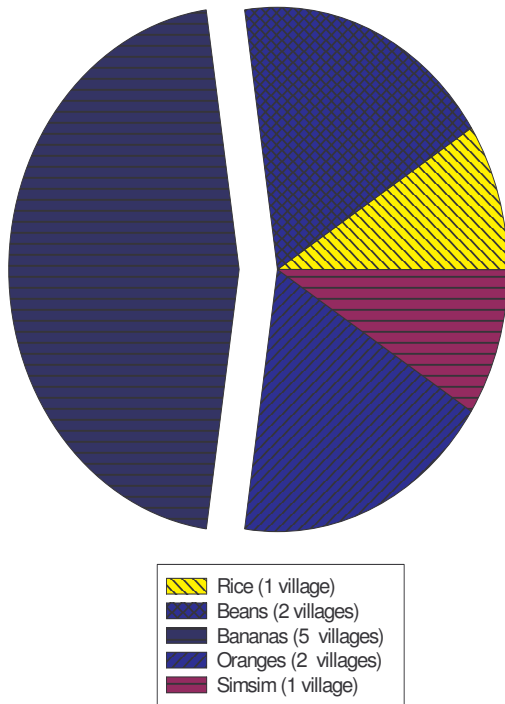


Figure 17 : Cash crops grown in the villages (N=16).

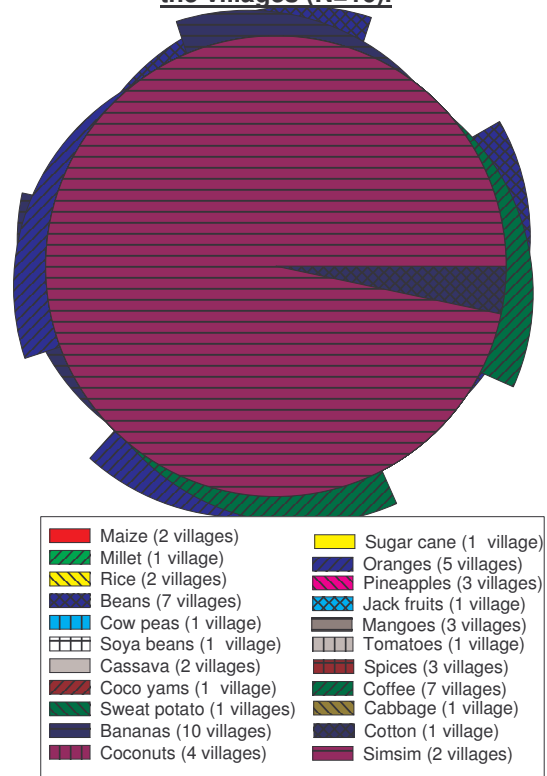


Table 20 : Cash crops grown in the villages.

Village	Maize	Millet	Rice	Beans	Cow peas	Soya beans	Cassava	Coco yams	Sweet Potato	Bananas	Coco nuts	Sugar Cane	Oranges	Pine apples	Jack fruit	Mangoes	Tomatoes	Spices	Coffee	Cabbage	Cotton	Sim sim
Mkuyuni							Yes			Yes	Yes		Yes					Yes	Yes			
Changa	Yes	Yes	Yes						Yes	Yes	Yes	Yes	Yes	Yes		Yes						
Matamba				Yes			Yes			Yes	Yes		Yes					Yes				
Tawa										Yes			Yes	Yes	Yes	Yes		Yes	Yes			
Kibungo				Yes						Yes							Yes		Yes	Yes		
Lanzi				Yes						Yes												
Mvuha			Yes																		Yes	Yes
Kolero					Yes	Yes				Yes	Yes		Yes	Yes		Yes			Yes			Yes
Kasanga	Yes			Yes						Yes									Yes			
Ukwama				Yes				Yes		Yes									Yes			
Longwe										Yes									Yes			
Magata																						
Nyamigadu B																						
Nyamigadu A				Yes																		
Lumba Juu																						
Mhale and Kikeo				Yes																		
Occurrence	2	1	2	7	1	1	2	1	1	10	4	1	5	3	1	3	1	3	7	1	1	2

Forests

All villagers collect firewood, and may walk between 30 to 240 minutes to collect it (average of 53.33 to 115.38 minutes), depending on the distance to the nearest wooded area (Table 21). Depending on the season men, women and children will collect wood (Bhatia and Ringia, 1996), with around 1.4 m³ of wood being collected per household per year (Lyamuya *et al.*, 1994).

In some cases this wood is collected from the reserves as no forest occurs on the public lands around the villages (Table 21). Villages that are near Miombo woodlands readily collect wood from it and even clear fell areas for agriculture, hence these areas are under heavy pressure (Bhatia and Ringia, 1996). Many other products are collected from the forests - all villages collect poles for building, but there are other products that are not collected in all villages - this includes, timber, ropes, medicines and plant foods (Table 22). Bhatia and Ringia (1996) also noted the collection of wildlife, insects and tubers by some villages.

In some villages sacred forests occur (Table 21). These are usually small patches of forest that are set aside for traditional purposes, and no wood collection is allowed in these areas. Further villages also have patches of forest on the public land but these are usually fragmented in nature, and highly degraded; if a village has easy access to such an area then it seems that they are more likely to go there to collect general wood species, but will enter the reserve for specific species if need be.

In most cases the villagers report no problems in getting all the forest products that they were getting in the past, only the distances are getting longer. The exception to this was found in two villages, Magata and Longwe who both reported that a plant used for food (*Delegae* and *Mnvue*) no longer grows lower down, giving climate change as the reason for this change (Appendix 1).

Table 21 : Status of forest and distance taken to collect fuelwood.

Village / Ward	Walking distance to collect fuel wood		Presence of			Reserve nearest forested area
	Minimum	Maximum	Sacred forest	Public forest	Reserve forest	
Mkuyuni			No	No	Yes	No
Changa			Yes	Yes	Yes	No
Mtamba	30	90	Yes	Yes	Yes	No
Tawa	30	60				No
Kibungo		180	No	Yes	Yes	Yes
Lanzi		120	Yes	No	Yes	Yes
Mvuha	90	120	No	Yes	No	No
Kolero	60	120	Yes	Yes	No	No
Kasanga	30	240	Yes	No	Yes	
Ukwama		90	No	Yes	Yes	Yes
Longwe	60	120	No	No	Yes	Yes
Magata	120	180	Yes	Yes	Yes	No
Nyamigadu B	30	60	No	Yes	Yes	Yes
Nyamigadu A	30	60	No	Yes	Yes	Yes
Lumba Juu			Yes	No	Yes	Yes
Mhale and Kikeo		60	No	No	Yes	Yes
Average	53.3333	115.3846				

Table 22 : Other wood products collected from the forests.

Village / Ward	Other Forest products				
	Poles	Timber	Ropes	Medicines	Plant food
Mkuyuni	Yes	Yes	Yes		Yes
Changa	Yes	Yes			
Mtamba	Yes	Yes			
Tawa	Yes	Yes		Yes	
Kibungo	Yes	Yes		Yes	Yes
Lanzi	Yes	Yes	Yes	Yes	
Mvuha	Yes	Yes	Yes	Yes	Yes
Kolero	Yes	Yes	Yes	Yes	Yes
Kasanga	Yes	No	Yes	Yes	Yes
Ukwama	Yes	No	Yes	Yes	Yes
Longwe	Yes	No	Yes	Yes	Yes
Magata	Yes	Yes	Yes	Yes	Yes
Nyamigadu B	Yes	Yes	Yes	Yes	Yes
Nyamigadu A	Yes	Yes	Yes	Yes	Yes
Lumba Juu	Yes	Yes	Yes	Yes	Yes
Mhale and Kikeo	Yes	Yes	Yes	Yes	Yes

Tree planting

Nearly all the villages participate in some sort of tree planting, this may either be fruit, timber or for fuel wood. The government committee and village executive seemed to think that people were interested in planting fuel wood and timber trees but only a few farmers can do so. The desire of the villagers to plant trees was also noted by Bhatia and Ringia (1996), but they also found it to be patchy and the implementation constrained by several factors including land tenure issues, lack of land, and technical ability.

Seedlings are usually obtained from the wild. Depending on how many are taken, the collection of seedlings for tree planting could have a degrading effect on the forest, since it is these seedlings that will form the trees of the future.

Some villages such as Changa have started a village nursery with the help of catchment foresters. Other villages would like to do the same but lack technical ability and seedlings, which were both requested by most of the villages (Table 23).

Table 23 : Number of villages that would like to plant trees and get help to do so.

Village / Ward	Trees grown	Help wanted to grow trees
Mkuyuni	Yes	Yes
Changa		
Mtamba	Yes	Yes
Tawa	Yes	
Kibungo	Yes	Yes
Lanzi	Yes	
Mvuha	Yes	Yes
Kolero		
Kasanga	Yes	Yes
Ukwama	Yes	Yes
Longwe	Yes	Yes
Magata	Yes	Yes
Nyamigadu B	Yes	Yes
Nyamigadu A	Yes	Yes
Lumba Juu	Yes	Yes
Mhale and Kikeo	Yes	Yes

DISCUSSION

Forest on Public lands

Between the Miombo forest on the plains and the montane forest in the reserves on the top of Uluguru Mountains, agricultural land dominates. Other than a few small forest reserves and some forest patches, there is very little forest in these public lands. The largest area of public forest is on the Kitundu hills and this has been mostly transformed into banana plantations. Other areas either have disappeared completely or have shrunk considerably since 1977 when the last aerial photographs of the area were taken. An example is the Kinole area that now has very little natural vegetation; this can probably be said for most of the Uluguru Mountains.

The lowland miombo woodland is itself being encroached by people practising slash and burn cultivation on the edge of these forests, and they are also under heavy pressure from the villages adjacent to them (Bhatia and Ringia, 1996). It may be that the lowland evergreen and miombo forests are paying the price for the protection of the reserves, since people are still reluctant to enter the reserves. The gap between the miombo and the mountain forest reserves is therefore increasing.

Temporary migration of people from the mountains to the lowlands occurs in some areas. These people usually come down to cultivate crops that cannot grow up in the mountains, but there seem to be few people making a permanent migration.

In some areas, especially the south of the Uluguru South Forest Reserve, forest in the public land next to the reserve can still be found. This acts as a buffer zone from which people can collect forest products without damaging the reserve. But with time these areas will slowly disappear, especially if the pressure on them increases. In most areas agriculture goes up to and even into the reserves, there have even been reports of beacons being moved to hide the encroachment of these fields.

The trees that do occur in the public lands are usually plantations or fruit trees. Areas under plantation, be they public areas or reserves such as Nyandiduma Forest Reserve, are themselves being eroded as more timber is taken out than planted. The exception to this is the small areas of sacred forests that have traditional uses to the local people.

Forest use

In all places where forest occurs villagers collect forest products from them. These forest products are mostly essential items that people need for their daily lives, such as fuel wood, foods, and medicines or for construction of their houses such as building poles, ropes and thatching. Many people also report the importance of the forest for rain and water, though it is difficult to tell if this is not just repetition of what they have been taught, as many people would readily cultivate forested land if they were given permission.

Those parts of the forest reserves that have relatively easy access seem to be where the most degradation occurs, this was also seen by Bhatia and Ringia (1996) who commented that pitsawing has accelerated in areas where there is easy access to roads and markets. This degradation can be either for direct commerce, for example the cutting of timber in Bunduki (Svendsen *et al.*, 1995) or for indirect trade such as the cutting of forest for cash crops like cabbages in Tchenzema (Svendsen *et al.*, 1995) or bananas in Kinole (Hymas, 2000). Fuelwood is also needed indirectly by the Pombe businesses run by women (Bhatia and Ringia, 1996).

Each of the above activities has a different effect on the reserves (Table 6) and is due to different reasons. This results in no two areas being exactly the same; the heterogeneity of activities makes it hard to apply sweeping statements about the reasons for degradation for the whole of the Ulugurus. The following is a summary of each of the activities in the Ulugurus that effect forests: -

Domestic - Forest products are needed for a variety of essential domestic uses, such as fuel, medicine and food. In most cases this is collected over a wide area. If there is enough available forest per household then it is probable that the off take is sustainable, and certainly in the south the people were mentioning that they could still collect fuel wood from material that was already dead.

In cases where there is not enough forest to support a village then domestic usage contributes to the degradation of the remaining forested area.

Domestic construction - People live in houses for which they need construction material, in the Ulugurus the material used is mud and poles. Throughout the forest pole extraction can be observed, but it is not concentrated in one particular area but evenly distributed around settlements.

Subsistence agriculture - Crops are an essential means of subsistence for the people in the Ulugurus, and in areas that have no easy access to markets the only method in which to acquire food is to grow it yourself. Farmland is found all over the Uluguru Mountains and in most cases goes right up to the border of the reserves.

The conversion of forest to farmland is probably the most destructive activity that occurs, for the area is not only clear felled but also burnt. However, this only occurs around the borders of the reserve and so, if all the forest is looked at, only a small percent of the forest is affected.

Banana trade - Direct pressure comes from the planting of bananas in the forests, farmers prefer to plant banana trees in moist areas, and under forest is the best area (Hymas, 2000).

The banana trade also has an indirect pressure on the forest depending on the method of banana ripening. Either the bananas are left for around 10 days to naturally ripen or they are smoked for around 2 days (Hymas, 2000). If bananas are ripened using the second method then a considerable amount of wood is needed, an average of 23.4 kg of wood is used to smoke the bananas over a period of 2 to 3 days (Hymas, 2000).

It is for this reason that the largest area of forested land outside the reserve, Kitundu Hills, has been more or less completely destroyed over the last 10 years (Hymas, 2000).

The wood needed for the smoking of bananas is more than what a household would usually use and is probably not wood that was found dead in the forest.

Pombe brewing - One of the activities that women participate in to make some money is Pombe brewing. This has an indirect effect on the forest since wood is needed for the brewing process. 3 long branches are needed per pot of brew.

As with banana smoking, the wood needed for this is in addition to what a household would normally use and is again probably not only dead material, since women have a preference for certain long burning species.

Commercial agriculture - One of the ways people can earn cash is through trade, the growing of cash crops is practised in all areas but especially in areas that have easy access to markets or transport to markets. As with subsistence agriculture forested areas are clear felled and burnt along their border, but it differs from subsistence agriculture as a smaller area is affected as not all the villages in the Ulugurus have access to markets. But in the areas where commercial agriculture does occur there seems to be less respect for the boundary of the reserves.

Timber trade - It is hard to say whom benefits more from the timber trade and whether local people or outsiders control it. But a few powerful people probably control it. The locals benefit by being paid to carry the wood to the road, from where it is loaded into lorries or trucks, which are then covered in grass or other products. In this way the timber is taken to places such as Dodoma, and probably also to Morogoro and Dar es Salaam.

The degradation to the forest due to timber extraction is very obvious. Areas such as Bunduki have been clear-cut while above it the canopy is only 10 to 15 meter high at an altitude of 2300 meters (Svendsen *et al.*, 1995). A comparison can be made above Tegetero, at around 1200 meters, where the canopy is 30 to 40 meters high (Hymas, 2000).

As with commercial agriculture the timber trade occurs mainly in areas with easy access, but people will go further into the forest to cut the trees. Usually trees are only selectively cut, but as mentioned they are sometimes clear felled in large numbers.

Table 24 : Ranking of the Direct threats to the forested areas of the Ulugurus.

Direct threat	Area ranking	Intensity ranking	Urgency ranking	Total ranking
Domestic	5	1	1	7
Domestic construction	4	2	2	8
Subsistence agriculture	3	4	3	10
Commercial agriculture	2	5	4	11
Timber trade	1	3	5	9

Note : The definition of the activities in this tables use the definition found in the summary of threats to the Uluguru above.

Using a very subjective ranking technique (Salafsky *et al.*, 1999), it was found that the main threat to the Ulugurus as a whole is commercial agriculture (Table 24). Caution must be employed when using such ranking techniques as they are subject to ones own observation, which cannot cover the whole of the Ulugurus in such a short time, but also change in time with any of the threats having the possibility to increase or decrease. Its use is therefore limited but may give an idea of what threats each area may be under once the background of the area is well known.

It would be preferable to pinpoint the threats in each area, but this is not possible due to the heterogeneity of the areas in the Ulugurus, with the activities that cause degradation being influenced by the physical layout of the area, as well as the social background. To do such an exercise would mean detailed studies at the level of each village, which would take a long time. This is why the ranking has been done over the whole area in general.

Important forest reserves.

As most of the remaining forest is now in the reserves, focus should be channelled to protecting the reserves that have the greatest biological and catchment role. Clearly Uluguru North and Uluguru South Forest Reserves are the most important reserves due to their high rates of species endemism and the role they play as catchment areas supplying Morogoro and Dar es Salaam with water. An overview of the main threats is presented as Map 5.

Though access to the Southern and Eastern areas of Uluguru South is hard, with few officials or projects being able to get to the area, this has not resulted in the mass deforestation that would be expected in unprotected forested areas. This may be due to the fear that people have of being thrown out of the reserve, as was done in the 1960s by the British.

On the other hand, the greatest exploitation of forest resources is found in those areas where there is easy access, for example to the north of the Northern Uluguru Reserves and on the western side west of Uluguru North and South Reserves. Here timber can more easily be brought out, and the land has an added value due to the commercial crops grown on it. There are many reports of pitsawing

occurring far into the reserves for example the area around Bunduki, especially when compared to the less accessible areas such as around Tegetero where no pitsawing is to be found (Hymas, 2000).

Kimboza and Ruvu are also important reserves, not only do they protect the banks of the Ruvu river but they also have a high species endemism. These two reserves are mostly threatened by encroachment and mining, this is especially true for the Ruvu reserve where the soil is being dug up to find rubies and the miners live inside the reserve.

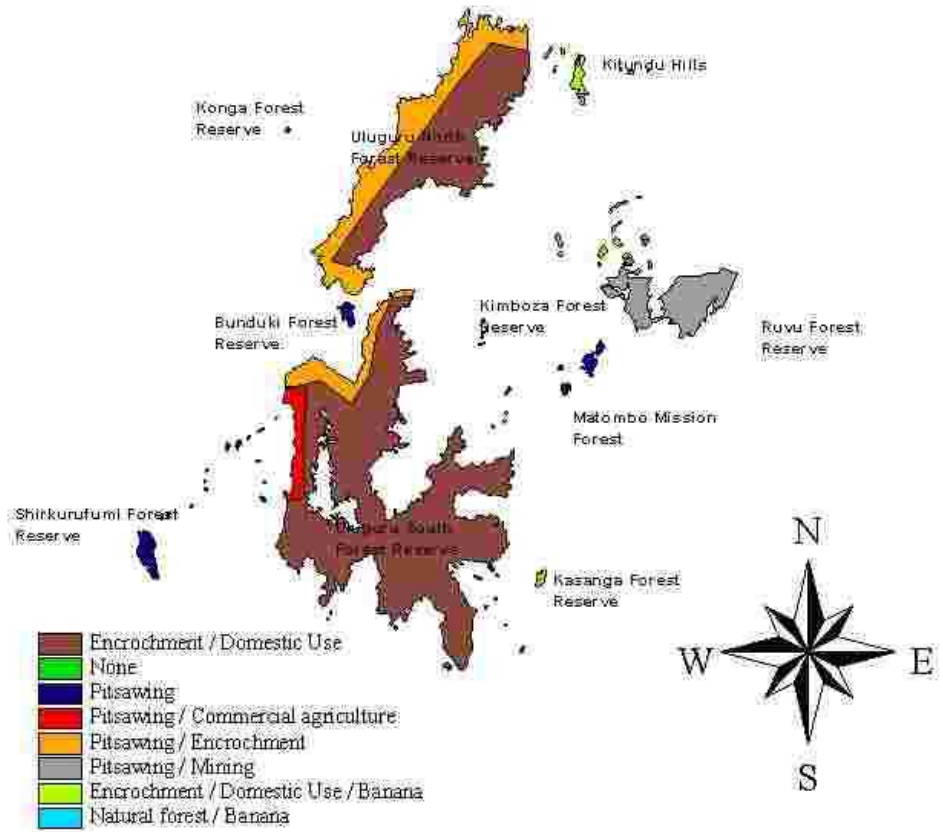
Other areas felt to be the most threatened

There are two forested areas outside of the reserves that are felt to be of importance in the Ulugurus, both of them are important for their role in biodiversity. Firstly and most importantly the public land forest in Kitundu Hills, this is linked with the Uluguru North Reserve and used to be under the protection of Chief Kingalu. As Chief Kingalu's influence on land tenure has decreased this forest has suffered.

About 10 years ago the village government of Tandai gave permission for people to enter the forest for cultivation (Hymas, 2000). Since then most of the forest has been under planted with bananas. Even though the forest has been degraded with some areas devoid of canopy, there is still a more or less continuous link between the Uluguru North Forest Reserve and forests on the Kitundu hills. At least one Uluguru endemic species is known to occur in this area, The Uluguru Bush Shrike, so the loss of this forest would mean the loss of its habitat. There is currently an effort to set up a village forest reserve in the last remaining intact forested patches, but this leaves the possibility of these patches being completely cut off from the reserve in the near future and so isolating the wildlife found there.

The second important area is the Bunduki gap found in between the Uluguru North Reserve and Uluguru South Reserve, this used to be forested and forms a natural corridor allowing animals to move from one Reserve to the other. At least in 1955 when aerial photos were taken this gap was partly forested. In 1977, the date of the next aerial photos, the gap had widened with the Bunduki reserves forming a stepping stone between the reserves, in fact Temple in 1972 noted that the planted forest in these reserves was being felled and burned to provide new agricultural land. Today the gap between the two forest is continuing to grow, with people wanting to use the forest in the reserve for agriculture and so further widening this gap (Bhatia and Ringia, 1996). The implications of this on many of the forest animals is unknown but some, such as the endemic Uluguru Bush Shrike (which has not been recently seen in the Uluguru South Reserve), are now seemingly isolated in one or the other of the forests.

Map 5 : Main causes of deforestation in and around Ulugurus.



Concluding remarks on areas that the project should focus on

All the Uluguru reserves are important both on biological basis and on a national basis, though the forest is being degraded all over these areas, the scale at which it is occurring reflects the social and economic situation of the areas surrounding the areas. In those areas where access is difficult and where commercial exploitation of crops is therefore restricted the forest is mostly used for the collection of domestic products such as fuelwood and building poles and also suffers from some encroachment due to subsistence agriculture. However, in these areas the people still remember the evictions of those farming in the reserves in the 1960s and are wary of similar events repeating themselves.

In areas where access is relatively easy, commercial crop production has been encouraged and this has led to businesses springing up; in these areas people seem less wary of the possible legal problems they may encounter if found in the forest and readily exploit the forests. It is in these areas that there seems to be the most pitsawing and encroachment, it is therefore in these areas that policing of the reserve needs to be reinforced, but caution should be taken as increased policing in only one area may result in people going to other areas to continue pitsawing.

For biodiversity reasons the forests around the Bunduki area should be preserved to allow the exchange of wildlife between the northern and southern reserves. The forest on Kitundu Hills has also an important biodiversity role, but it is also the only area where wood can be collected legally and is also a source of water for the surrounding villages. If this forest is totally lost then, people will probably end up collecting wood in the reserve so further increasing the pressure on these areas.

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