

ANNEX 2

Annotated Bibliography of some of the areas around the Ulugurus.

NOTE : This bibliography does not include all that has been written on the Ulugurus, due to the short period in which this had to be done some important works such as Young and Fosbrooke's Land and Politics among the Luguru of Tanganyika have been left out, while others works have not been found.

This should be used more to familiarise oneself with the events and the work that has already gone on in the Ulugurus, so a clearer idea of the heterogeneity and the problems of the area can be seen.

Location : Ulugurus

Population

- 1970 - Population greater 75 people per km² (Lundgren, 1978).
- 1996 - High population density > 150 persons / km² in many areas (Bhatia and Ringia, 1996).
- 1996 - Rapid population increase up to 6.5 % / year (Bhatia and Ringia, 1996).
- 1996 - On average the population increases at 2.8% a year (Bhatia, 1996).

Traditions, Land Tenure, Policy and Attitude

- c. 17 century - Probable first settlement of the Uluguru mountains (Ulvila, 1995).
- c. 19 century - Increase in migration due to violence in the plains (Ulvila, 1995).
- c. 1884 - Before the arrival of Europeans there was no uniform or unified political organisation, with land ownership depending on clans, lineage's, background and time settled in the mountains. (Ulvila, 1995).
- 1929 - No burning of grass or bush, other than his own land, without permission (Temple, 1972).
- 1936 - Regulations against indiscriminate burning, involving meter-wide fire break around all shambas (Temple, 1972).
- 1943 - Regulation to prevent large-scale burning (Temple, 1972).
- 1945 - Setting up of Committee on rehabilitation of eroded areas ULUS. (Temple, 1972).
- 1945 - Reinforcement of regulation against burning, forbidding it at all times except to breaking or preparing new land or destroy weeds in flat country (Temple, 1972).
- 1945 - Committee proposed: - (Temple, 1972).
 - a) Re-demarcation of forest boundary as in German times, restore forest and wood land to this line;
 - b) Plant trees outside these limits for pole and fuel wood, reduce cutting and fire damage to margins of the reserve;
 - c) Control burning;
 - d) Adopt contour tie-ridging on a large scale.
- c. 1950 - Terracing period referred to as a hunger period by local people (Maack, 1996).
- c. 1953 - Households forced to bench terrace 500m² per year (Temple, 1972).

- 1954 - Stringent control on bush fire enforced (Temple, 1972).
- 1955 - Cultivators allowed to choose what conservation methods they wished to use (Temple, 1972).
- 1955 - Permission given to burn fields (Temple, 1972).
- 1975 - Forbidden to burn mulch, burning only allowed on grazing areas (Lundgren, 1978).
- 1994 - People perceived a decrease in rainfall but cannot say when this started, and data from Sokoine University only bear this out for the height of the dry season (Lyamuya *et al*, 1994).
- 1994 - Trees are individual property, while the land may not be, this means that tree planting is limited by this (Lyamuya *et al*, 1994).
- 1996 - Villagers do not feel a sense of ownership of the forest. The village government is felt to be weak and often corrupt in relation to forest usage. (Bhatia, 1996).
- 1996 - Villagers are required by law to obtain permits from the forest officer to enter and exploit any products from the forest (Bhatia and Ringia, 1996).
- 1996 - People are weary of corruption that led to destruction of their vital natural resources (Bhatia and Ringia, 1996).
- 1996 - People would like to be more in control of their forest resources (Bhatia and Ringia, 1996).
- 1996 - Preferred tree species are *Eucalyptus maidenii*, *Grevillea robusta*, *Pinus* spp. and indigenous species such as *mnguti*, *mvungi*, *mhange*, *msulu*, *mseri*, *mkongolo*, *mkenge*. (Bhatia and Ringia, 1996).
- 1996 - The importance of preserving water sources including riverine forest is realised by many villages (Bhatia and Ringia, 1996).
- 1996 - People blame problems of soil erosion on terracing (Maack, 1996).
- 1996 - Land ownership and tenure is usually base on lineage systems (Bhatia and Ringia, 1996; Ulvila, 1995).
- 1996 - Broad range of local knowledge, local innovators and experts. With some villagers fully understanding agroforestry and terracing while others do not (Bhatia, 1996).
- 1996 - Traditional systems are important in village life though the higher commercialisation the more these are being eroded (Bhatia, 1996).
- 1996 - General facilities are limited (Bhatia, 1996).
- 1996 - Land tenure is usually distributed and owned through the lineage system based on traditional rules and customs. Membership to the lineage implies the right to live on and till the land for both males and females. The female members of the lineage usually have a between access to land. People without lineage status have to borrow or rent land and pay a proportion of the harvest. (Bhatia and Ringia, 1996).
- 1996 - In some areas the lineage rules and customs are undergoing transition. (Bhatia and Ringia, 1996).
- 1996 - Most of the lineage land has no land title deeds, and following decentralisation and the villigisation programs in the 1970s land is legally owned by the village authorities. (Bhatia and Ringia, 1996).
- 1996 - Usually on rented land permanent crops cannot be grown (Bhatia and Ringia, 1996).
- 1996 - Land fragmentation has started to occur in recent years, land scarcity is a common problem in the area Land scarcity is partly due to the lineage system and declining soil fertility and deforestation. Other factors that contribute to land scarcity are villigisation, land lease to private use, lack of land title deeds, lack of technology for integrated agriculture and to a lesser extent population increases. (Bhatia and Ringia, 1996).
- 1996 - Some villagers have shown a willingness to migrate to the lower plains where land is relatively abundant, but there is a lack of amenities in such areas (Bhatia and Ringia, 1996).
- 1996 - Traditional systems of natural resource management that were enforced by taboos, rebuke or social rewards are no longer in place due to modernisation (Bhatia and Ringia, 1996).

1996 - In more commercial areas the traditional rules of land ownership has been destroyed (Bhatia and Ringia, 1996).

Gender

1996 - Local system of land ownership dictates who is to take decisions relating to natural resources (Bhatia and Forrester, 1996).

1996 - Tree planting and felling generally men's activities (Bhatia and Forrester, 1996).

1996 - Local brewing important income generating activity for women (Bhatia and Forrester, 1996; Bhatia, 1996).

1996 - Many of the production resources and benefits from agriculture controlled by men (Bhatia and Forrester, 1996).

1996 - In northern Ulugurus women tend to be more restricted to farming and household activities (food security), while men do more off farm activities. In the South women have a greater role in income generation (Bhatia, 1996).

1996 - Tree cutting and felling is generally viewed as a mans activity (Bhatia, 1996).

1996 - The production and benefits from agriculture are usually controlled by men (Bhatia, 1996).

1996 - Harvesting of food crops mainly done by women and children, that of cash crops done by men and children (Bhatia and Ringia, 1996).

Climate

c. 1974 - In submontane forest zone there was no regular dry season. A dry season existed in the woodland vegetation types lower down the slope (Lyamuya *et al*, 1994).

c.1974 - Removal of forest in sub-montane zone and cultivation of slopes caused evaporation to increase by four times, so producing a drier dry season (Lyamuya *et al*, 1994).

1994 - Mean annual temperature 24.4oC, maximum is 26.5oC in December and minimum of 21.1oC in July (Lyamuya *et al*, 1994).

1994 - Average evapotranspiration is 1760 mm per annum (Lyamuya *et al*, 1994).

Soils / Topography

1994 - Soils generally acidic lithosols and ferralitic red, yellow and brown latosols which have developed over the Precambrian granulite, gneiss and migmatite rocks making up the Uluguru mountains (Lyamuya *et al*, 1994).

1996 - Decline of soil fertility and so crop yields as reduced fallow period (Bhatia and Forrester, 1996).

1996 - Cultivation on steep slopes is prone to erosion and landslides. This is made worse by cutting trees for fuelwood and building poles. The soil fertility is further decreased due to the burning or removal of crop residues so that organic matter is not replaced. (Bhatia and Ringia, 1996).

Vegetation status / type

1920 - 30s - Most slopes were well covered with trees (Lyamuya *et al*, 1994).

1976 - Several broad vegetation types in the Uluguru mountain, related to altitude and rainfall variations:- (Lyamuya *et al*, 1994)

- 1) Low altitude dry forest and savanna woodland zone (Western and Northern foothills below 600 m altitude, annual rainfall 700 to 900 mm, dry season 4-6 months).
- 2) Low land semi-evergreen rain forest (Eastern central foothills between 250 to 500 m, annual rainfall 1700 to 2400 mm, and dry season 1-2 months).
- 3) Submontane dry forest and miombo woodland (On drier Eastern foothills up to 800 m, did occur on western, northern and southern slopes as high as 1500 m in Uluguru North and 1600 - 1700 in Uluguru South, annual rainfall 950-1300 mm, dry season 2-6 months).
- 4) Submontane evergreen or semi-evergreen forest zone (Eastern slopes between altitude 500 and 1500 m, annual rainfall over 1800 mm usually exceeding 2500 to 3000 mm, Dry season short, much of this outside the reserve has been cleared).
- 5) Montane evergreen forest zone (Belt around the mountains at altitude of 1500 - 2100 m in the north and 1600 - 2400 m in the south, annual rainfall 1300 to > 3000 mm, limited dry season, mostly remains as in reserve).
- 6) Upper montane or lower subalpine zone (above 2100 - 2400 m, temperature may go below 0oC, contains elfin woodland, bamboo thickets, peat bogs and secondary grassland, in the reserve).

1976 - Description of vegetation for full description see Pocs (Pocs, 1976 a) :-

- 1) Lowland semi-evergreen or evergreen rain forest on granolite. Altitude 300 to 500 m, annual rainfall 2300 mm. No real dry season. Canopy height 30-40 m.
- 2) Lowland evergreen and semi-evergreen rain forest on dolomitic marble - In Kimboza area Trees are 20 to 40 m, with a understory of 2 - 10 m tall trees.
- 3) Dry semi-evergreen forest with succulents - 8 to 12 m canopy.
- 4) Riverine or fringing forest.
- 5) Submontane semi-evergreen forest - between 500 and 800 m, forms belt on eastern slopes. Canopy of 30 m. Drier than a rain forest.
- 6) Submontane rain forest - between 800 and 1500 m is a continuous belt around the eastern slopes, and found in deep valleys on the western side of the hills. Annual Rainfall is of 2500 - 3000 mm with no dry season.. Canopy height is 30 to 50 m.
- 7) Mesophilous montane forest - In Northern Ulugurus between 1500 and 1850 m. In Southern Ulugurus they dominate the western slopes between 2000 and 2400 m, while on eastern slopes they are subordinate. Canopy is 20 to 30 m high.
- 8) Montane rain forest - Occur in same belt as Mesophilous montane forest but in more humid conditions where mean annual precipitation is about 3000 mm.
- 9) Montane mossy forest - On both sides of main ridge, between 1850 and 2400 m, developing in areas with more than 3000mm of annual rainfall. Canopy height between 10 to 25 m.

- 10) Subalpine elfin forest - In the permanent mist zone above 2100 m in the north and 2400 m in the south. This zone is rich in indigenous species.
- 11) Occurrence of montane bamboo - Above 2400 m in southern Ulugurus, on top of highest peaks in Northern. Lowest height found is 1630 m at Mgeta River.
- 12) Montane and subalpine heath - Rare in the Ulugurus, found on exposed rocky ridges.
- 13) Complex of secondary savanna and cultivated land on ferralitic soils - Below 600 m. Highly cultivated, rainfall 700 to 1000 mm, dry season 4-6 months. Soils ferralitic soil, and loosely sands soil.
- 14) Savanna woodland on loose sandy soil - below 600 m.
- 15) Submontane Pterocarpus-Combretum woodland - Western and northern slopes below 1400 m. Dry and rainy season divide is sharp. 900 to 1300 mm of rainfall per year, with dry season between 2.5 to 3.5 months.
- 16) Submontane miombo (*Brachystegia-Julbernardia*) woodland - More wide spread on northern and western foothills than in central parts. More or less closed canopy growing to 12 to 25 m high.
- 17) Montane Protea-Agauria woodland - At altitude of 1000 to 1500 m.
- 18) Montane secondary grassland .
- 19) Permanent swamps and lakes - In Ngerengere and Mgeta River valleys.
- 20) Cultivated forests - Mostly Morogoro and Bunduki areas.
- 21) Cultivated land replacing lowland rain forests (see also 1 and 2 in this section).
- 22) Cultivated land replacing submontane forests (see also 5 and 6 in this section).
- 23) Cultivated land replacing montane forests (see also 7 and 8 in this section).
- 24) Cultivated land replacing savanna woodland on sandy soils (see also 14 in this section).
- 25) Cultivated land replacing submontane woodlands (see also 15 and 16 in this section).
- 26) Cultivated land replacing valley grasslands and swamps (see also 19 in this section).
- 27) Rocky-vegetation in different vegetation belts :-
 - a) Vegetation on marble rocks in the lowland rain forest belt at about 300 m.
 - b) Vegetation on graniolite rocks in the submontane belt between 600 and 1500 m
 - c) Vegetation on shady graniolite rocks in the montane forest belt between 1500 and 2500 m
 - d) Vegetation on open rock surfaces in the subalpine belt between 2200 and 2600 m.
- 28) *Xerophyta scabrida* (*Velloziaceae*) bush - below 1000 m, in very dry exposed rocky places.
- 31) Subalpine grasslands of the Lukwangule Plateau - Between 2300 and 2664 m.
- 32) Spring bogs - Near the springs and along the streamlets of the Lukwangule Plateau at 2300 to 2500 m
- 33) Subalpine moorland in the valleys of the Lukwangule Plateau - in valley bottoms.
- 34) *Sphagnum* bog on the Lukwangule Plateau - Only in one place, where the pathways crosses the plateau near the watershed between the two branches of the Mgeta Springs at 2400 m.
- 35) *Cliffortia nitidula* (*Rosacea*) bush along watercourses.

- 1993 - North Reserve entirely covered in forest except rocky outcrops. Submontane forest occurs on eastern slope between 800 and 1500 m, in the west restricted to valley bottoms near to lower edge of forest reserve. Montane forest occurs between 1500 and 1900 m. Upper montane forest above 1900 m on wetter slopes and ridges in cloud belt. Stunted elfin forest occurs on highest ridges (Lyamuya *et al*, 1994).
- 1993 - South Reserve eastern and western slopes covered by moist forest, surrounds an upland grassland, swamps and forest patches of Lukwangule plateau. Montane forest occurs from 1500-2400m, upper montane forest above 2000m. Bamboo thickets cover large area in Mgeta valley (as low as 1600m) and Kimhandu summit (above 2000m) (Lyamuya *et al*, 1994).
- 1994 - Remains of forest is found in Reserves (Lyamuya *et al*, 1994).

Food and Crops Grown

- c. 1895 - Early crops were pumpkin and sorghum, with relish collected from forest, then maize, cassava, sweet potatoes and beans introduced from America via Europe and bananas and rice from Indian Ocean trade. (Ulvila, 1995).
- c.1900 - Cotton chosen as the export crop for Morogoro Region. (Maack, 1996).
- 1996 - Little diversification of cash crops, due to poor road system and so market accessibility (Bhatia and Forrester, 1996).
- 1996 - Vegetables, insects, small animals, mushrooms and honey collected from the wild are important and reliable source of nutrition (Bhatia and Forrester, 1996).
- 1996 - Main crops are maize, rice, sorghum, cassava, sweet potatoes, bananas, yams, beans, pigeon peas, green grams, peanuts, cow peas, chick pea, soya beans and Irish potatoes (Bhatia and Ringia, 1996).
- 1996 - Maize is produced in all zones and in every season though the amount produced is not sufficient to meet food requirements due to low yields. (Bhatia and Ringia, 1996).
- 1996 - Vegetables grown are cabbages, onions, tomatoes, amaranths. These are used both for subsistence and cash (Bhatia and Ringia, 1996).
- 1996 - Fruit grown are avocados, citrus, pineapples, jackfruits, mangoes, peaches, plums, blackberries. These are used for both subsistence and cash (Bhatia and Ringia, 1996).
- 1996 - Cash crops vary from place to place but include bananas, fruit, spices (e.g. cardamom, black pepper cloves.), coffee, sunflower seeds, sesame, coconut, palm oil, soya bean, chick peas, and beans (Bhatia and Ringia, 1996).
- 1996 - Some maize brought into the area (Bhatia and Ringia, 1996).
- 1997 - Annual crops cover 52.8% of the land, fallow only covers 30 % of the land (Bhatia and Ringia, 1996).

Agricultural practices

- 1871 - The land already has a high population and irrigated (Coniat *et al*, 1997).
- c.1920 - Coffee was replaced by vegetables which needed irrigation (Coniat *et al*, 1997).
- 1936 - 1937 - Planting of live grass barriers tested (Temple, 1972).
- c. 1950 - Provincial Administration decided to use ULUS money to build bench terraces, set up demonstration plots, removal of barren land from cultivation, tree planting, demarcation of special reserves for stream headwater protection (Temple, 1972).
- 1950 - ULUS began full-scale operation (Temple, 1972).
- 1952 - Diversification of ULUS program to include fish farming, stall feeding cattle, soft wood and coffee planting, experiments with cloves, citrus and coconuts (Temple, 1972).
- c. 1953 - Households forced to bench terrace 500m² per year (Temple, 1972).
- 1954 - Trash bunding, live barriers, contour ridging was almost standard practice in fields not terraced (Temple, 1972).
- 1955 - ULUS collapsed (Temple, 1972).
- 1967 - Half the land was used for annual crops in the densely populated parts of the mountains. 30 % was under fallow grasses or secondary bush. 13.7 % had tree crops (Lyamuya *et al*, 1994).
- 1994 - Low food production cuts across the rainfall and altitude zonation. Per capita annual food production an acre ranges from 27 kg to about 117 kg in a good year to 10 to 30 kg in a bad year (Lyamuya *et al*, 1994).
- 1996 - Intercropping of cereals / tubers crops and legumes e.g. maize and cow peas, sorghum and beans, cassava and pigeon peas (Bhatia and Forrester, 1996).
- 1996 - Agriculture is the main economic activity of the people in the Ulugurus, with slash and burn and shifting cultivation and very short fallow periods being common methods of farming (Bhatia and Ringia, 1996).
- 1996 - There are 4 main local agricultural zones which have different cropping systems the main cropping systems by type of field are: -
(Bhatia and Ringia, 1996).
- 1) Hilly / Forest fields - Long rains - Maize / rice relay, Vegetables, potatoes, yams cassava, Bananas. Short rains - Maize / Rice relay, Bananas, beans, yams. Dry season - Woodlots, Bananas.
 - 2) Home gardens - Long rains - Intensive agroforestry, bananas, fruit trees, multi-purpose trees, beans, peas, livestock, maize, sweet potatoes. Short rains - Maize and beans, bananas and multi purpose trees, small livestock. Dry season - Agroforestry, multi purpose trees and bananas.
 - 3) Valley bottoms - Long rains - Maize and rice, bananas, beans. Short rains - Maize / rice, agroforestry. Dry season - Irrigated / residual moisture crops : vegetables, maize, beans.
 - 4) Lowers plains - Long rains - Maize and cow peas, Sorghum and cassava. Short rains - Early maturing maize, cow peas, pigeon peas. Dry season - Grass / bush fallow.
- 1996 - Intercropping is a common practice in the Ulugurus with cereals and root crops commonly intercropped with legumes and cereal - cereal intercropping occurring in some places especially the southern parts. (Bhatia and Ringia, 1996).
- 1996 - The main cropping season is in the long rains but in some areas the long rains are too heavy and the main cropping season is during the short rains. Cropping is also carried out during the dry season in the valley bottom where there is still moisture. (Bhatia and Ringia, 1996).

- 1996 - Rice is harvested between June and August while maize is harvested in February and March. Maize is planted during the long rains and is harvested between June and August, whilst harvesting of the dry season maize takes place between November and December. Perennial crops such as fruit bananas, cassava, and tree products are harvested continually depending on need. (Bhatia and Ringia, 1996).
- 1996 - Home gardens and intensive agroforestry are widely practised, but are not fully planned (Bhatia and Forrester, 1996; Bhatia, 1996).
- 1996 - Ridging practised before bench terracing introduced and still used in many areas (Bhatia and Forrester, 1996; Bhatia, 1996).
- 1996 - Some farmers use compost, farm yard manure and nitrogen fertilisers in vegetable production, not used in other crops (Bhatia and Ringia, 1996).
- 1996 - Intercropping, mixed cropping and alley cropping methods are used. The main reason for intercropping were optimise labour / land, reduced risk and provide a diversity of food and cash (Bhatia, 1996).
- 1996 - Some good examples of fishponds, zero grazing, composting, etc. (Bhatia, 1996).
- 1996 - Each family have several fields which may be a long distance from each other and where the family lives. Intensive home gardens are used so as to have easy access to products that villagers regularly need. (Bhatia and Ringia, 1996).
- 1996 - Alley cropping and Head row intercropping involving planting annual or perennial crops between rows of planted trees or shrubs occur (Bhatia and Ringia, 1996).
- 1996 - Managed forest fallow occur where people clear a forested / wooded area are cleared for fields and annual or even perennial crops that are grown on for a few years. The area is then left fallow for a period long enough to allow soil fertility to regenerate. Farmers then come back and re-cultivate. (Bhatia and Ringia, 1996).
- 1996 - Fallow period reduced from 15 years to less than 3 years in many areas. (Bhatia and Ringia, 1996).
- 1996 - Most farmers practice flat cultivation with contours constructed using grasses, shrubs and trees (Bhatia and Ringia, 1996).
- 1996 - Minimum or zero tillage practised especially on hilly fields to control erosion and land slides especially in the north. (Bhatia and Ringia, 1996).
- 1996 - Farming on steep slopes common even in areas where there is no land scarcity (Bhatia and Ringia, 1996).
- 1996 - Hand hoe is the implement used for cultivation (Bhatia and Ringia, 1996).
- 1996 - Crop rotation is not common except in the North (Bhatia and Ringia, 1996).

Forestry

- 1909 - Germans set up of 277 km² of the forest reserve, with occupants expelled and compensated (Lyamuya *et al*, 1994).
- 1924 - Forest starts at an altitude of 1600 m (Coniat *et al*, 1997).
- 1996 - Some people have intensive home garden agroforestry systems with multipurpose trees and shrubs intercropped with annuals (Bhatia and Ringia, 1996).
- 1996 - There is a high interest in agroforestry, with a positive attitude towards tree planting, but a lack of seeds and some land tenure problems (Bhatia, 1996).
- 1996 - There are 3 tree nurseries operated by the Regional Natural Resources Office in Morogoro and assisted by the Uluguru Slopes Planning Project.. A total of 511,000 seedlings were raised during 1995 / 1996 (an increase of 57% on the previous year), of which 117,400 were planted in villages on the mountains (Bhatia, 1996).
- 1996 - Villagers see the need to plant trees but tree planting is very patchy (Bhatia and Ringia, 1996).

- 1996 - Catchment reserve forms a part of the peoples lives and it is generally recognised and respected. From the forest the collect poles, firewood, ropes, wild vegetables, wildlife, wild fruit, insects, tubers, and medical plants. (Bhatia and Ringia, 1996).
- 1996 - Forest seen as a source of water and rainfall (Bhatia and Ringia, 1996).
- 1996 - Villagers distinguish between the forest reserve and the forest on the public lands (Bhatia and Ringia, 1996).
- 1996 - Forest in the public and reserves are under exclusive management and control of the government, due to this the local people do not feel that the resource belongs to them and are happy to exploit it (Bhatia and Ringia, 1996).
- 1996 - Demand on fuelwood is high with men, women and children collecting depending on the season (Bhatia and Ringia, 1996).
- 1996 - Trees planting efforts hindered by scarcity of land, land ownership does not allow long term investment, rented land cannot be used for perennial crops, problem of vermin is made worse by the planting of trees, the permit required for the cutting of some trees makes people feel that he do not own them, access to indigenous species is hard, lack of technical know how (Bhatia and Ringia, 1996).
- 1996 - The trees that are planted are sometimes stolen (Bhatia and Ringia, 1996).
- 1996 - Preferred species for fuel wood are *Eucalyptus maidenii*, *Grevillea robusta*, *Pinus* spp and indigenous species *mnguti*, *mvungi*, *mhange*, *msulu*, *mseri*, *mkogolo*, *mkenge*.. Preference changes from different locations and with gender. (Bhatia and Ringia, 1996).
- 1996 - Demand for fuel wood is high with 9% of wood cutting being for fuel wood. Fuel wood is needed for cooking, brick making, fish smoking, banana ripening, ironing and warmth (Bhatia and Ringia, 1996).

Problems

- c. 1900 - Widespread famine (Maack, 1996).
- 1945 - Food shortages on northern and western slopes (Ulvila, 1995).
- 1994 - Soil erosion and loss of fertility produces very low yields, this is due to poor agricultural practices (Lyamuya *et al*, 1994).
- 1994 - Yields are continuing to decrease due to the land being re used without sufficient fallow period, decrease in farm size, soil erosion and lack of fertilisers (Lyamuya *et al*, 1994).
- 1994 - Shortage of land is acknowledged by some people (Lyamuya *et al*, 1994).
- 1995 - Vermin causing damage to crops (Ulvila, 1995).
- 1995 - Decrease in soil fertility is seen as a problem (Ulvila, 1995).
- 1996 - Scarcity of land - usually connected to land ownership (Bhatia and Forrester, 1996; Bhatia and Ringia, 1996).
- 1996 - Poor agricultural systems so more land needed (Bhatia and Forrester, 1996).
- 1996 - Seasonal food shortages especially maize and sorghum due to low production and pests (Bhatia and Forrester, 1996).
- 1996 - Sources of protein are limited as few livestock (Bhatia and Forrester, 1996).
- 1996 - Decreasing agricultural productivity (Bhatia and Ringia, 1996).
- 1996 - Due to land tenure system, some people have lots of land while other have little. Some people even have to rent land out (Bhatia and Ringia, 1996).
- 1996 - Road access is major problem leading to insufficiency of teachers and other services (Bhatia and Ringia, 1996 and Bhatia and Forrester, 1996).
- 1996 - Schools and dispensaries are usually without the necessary equipment (Bhatia and Ringia, 1996).
- 1996 - Vermin / wild animals are a problem, this has discouraged some people from planting trees (Bhatia and Forrester, 1996 and Bhatia and Ringia, 1996)..
- 1996 - Enormous crop losses in field and in storage due to poor crop management, pests, disease, vermin, weeding, manureing, harvesting, processing and storing (Bhatia and Ringia, 1996).
- 1996 - Major limiting factors to marketing is the state of the roads (Bhatia, 1996).
- 1996 - Seasonal food shortages, due to low production (Bhatia, 1996)

- 1996 - Livestock limited due to scarcity of grazing land and disease (Bhatia, 1996).
- 1996 - Due to land scarcity tree planting is a problem with villagers perceiving that planting trees will worsen the problem (Bhatia and Ringia, 1996).
- 1996 - Access to preferred seedlings from the nurseries is a problem. With some seedling being stolen once planted (Bhatia and Ringia, 1996).
- 1996 - Villager keen to start their own nurseries but lack the technical know how (Bhatia and Ringia, 1996).

Environmental degradation

- 18th - 19th century - Intense clearance and settlement by the Luguru (Lyamuya *et al*, 1994).
- 1874 - Uluguru villages washed away. Simbaweni near what is Morogoro today was left in ruins (Young *et al*, 1960).
- c. 1909 - Expulsion of people increased pressure on land outside the reserve (Lyamuya *et al*, 1994).
- c. 1914 - Some of the people expelled went back to their shambas (Lyamuya *et al*, 1994).
- 1930 - Ngerengere river dried up completely (Temple, 1972).
- 1934 - Ngerengere river dried up completely (Temple, 1972).
- 1936 - Landslides occurred (Ulvila, 1995).
- 1943 - Ngerengere river dried up completely (Temple, 1972).
- 1949 - Ngerengere river dried up completely (Temple, 1972).
- 1953 - Ngerengere river dried up completely (Temple, 1972).
- 1955 - Ngerengere river dried up completely (Temple, 1972).
- 1955 - No conservation was being undertaken by cultivators (Temple, 1972).
- 1956 - Live barriers dug up, tilling on banks of watercourses, re-opening of steep land (Temple, 1972).
- 1958 - Ngerengere river dried up completely (Temple, 1972).
- 1960 - Ngerengere river dried up completely (Temple, 1972).
- c. 1961 - More accessible parts of Forest Reserve plundered of timber (Temple, 1972).
- 1963 - Flood damage, bank erosion., increase in fluctuations of rivers in dry and wet season (Temple, 1972).
- 1966 - Ngerengere river dried up completely (Temple, 1972).
- 1968 - Landslides recorded (Lundren, 1978).
- 1969 - Landslides recorded (Lundren, 1978).
- 1970 - Landslides recorded (Lundren, 1978).
- 1972 - Normal annual erosion from splash and sheet wash in the Morogoro Catchment corresponds to a general denudation of 0.26 mm or 260 m³/km². This increases by ten fold on land that is under cultivation. (Rapp, 1972)
- 1973 - Landslides recorded (Lundren, 1978).
- 1974 - Landslide occurred (Ulvila, 1995).
- 1990 - Landslide occurred (Ulvila, 1995).
- 1994 - Potential of around 1.4 m³ per household per year of fire wood is used. (Lyamuya *et al*, 1994).
- 1994 - The forests are being degraded by removal of building poles and fire wood by local people. Some small scale encroachment for farmland and by illegal pitsawing operations. The spread of fire into the forest from the surrounding agricultural lands is also a problem 1994 (Lyamuya *et al*, 1994).
- 1996 - Under planting of natural forest with bananas (Bhatia and Ringia, 1996).
- 1996 - Bush fires especially in north, fires are used to control weeds but they often get out of hand (Bhatia and Ringia, 1996).
- 1996 - Continued commercial forest use (Bhatia and Ringia, 1996).
- 1996 - Shifting cultivation practices usually with no fallow (Bhatia and Ringia, 1996).
- 1996 - Mining and logging both legal and illegal (Bhatia and Ringia, 1996).

- 1996 - Agricultural expansion, poorly developed agricultural systems, direct forest use and incidental forest damage were found to be the main issues relating to environmental degradation and deforestation(Bhatia, 1996).
- 1996 - Causes of degradation: Scarcity of arable land, under planting of natural forest, poor agricultural systems / technologies, decline of soil fertility and hence crop yields. Bush fires especially next to Uluguru N Forest Reserve, continued commercial forest use (Bhatia, 1996).
- 1996 - Large scale timber production done by Hehe tribe with pitsawing still occurring even in the Forest Reserve and rapidly in the remains of the Public land forest, with legislation not working (Bhatia, 1996).
- 1996 - The natural forest is still used for local purposes and in some places disturbance can be high.(Bhatia, 1996). 1996 - Farming on steep slopes common even in areas where there is no land scarcity (Bhatia and Ringia,1996).
- 1996 - Roads and market accessibility has accelerated pitsawing. (Bhatia and Ringia, 1996).
- 1996 - Encroachment into the reserved forests has occurred. Partly due to population pressure. But the forest may also be opened up by pitsawers. In some cases farmers pay pitsawers to remove trees (Bhatia and Ringia, 1996).

Other

- 1997 - 65 % of Dar es Salaam's vegetables come from the Ulugurus (Coniat *et al*, 1997).

Location : Ulugurus north side.

Gender

1996 - Women are more restricted to farming and household activities, men do more off farm activities (Bhatia and Forrester, 1996).

Soils

1994 - Soils on cleared and intensively cultivated northern facing slopes are thin (less than 10 cm thick), made of a variety of fine and coarse sand originating from the weathering of the underlying metamorphic Pre-Cambrian rocks. (Lyamuya *et al*, 1994).

Location : Morogoro

Climate

- c. 1972 - Mean annual rainfall 890 mm near Morogoro Municipality, and 2392 mm at Morningside meteorological station (Lyamuya *et al*, 1994).
- 1978 - Maximum Mean yearly temperature 30.°C (altitude 530 m, 40 years recordings) (Lundgren,1978).
- 1978 - Minimum Mean yearly temperature 18.6 °C (altitude 530 m, 40 years recordings) (Lundgren,1978).
- 1978 - Mean yearly temperature 24.3 °C (altitude 530 m, 40 years recordings) (Lundgren, 1978).
- 1978 - Mean monthly potential evaporation 1760 mm (altitude 530 m, 13 year records) (Lundgren,1978).
- 1992 - Rain fall from the Meteorological station at University of Sokoine shows little change between since 1972 to 1992. But there has been significant decline in the July rainfall between 1972and 1992 (Lyamuya *et al*, 1994).
- 1997 - Mean annual rain fall 900 mm (Coniat *et al*, 1997).

Food and crops grown

- c. 1900 - Germans choose the cotton to be the export product for Morogoro Region (Maack, 1996).

Agricultural practices

- c. 1936 - Small area above Morogoro were set aside and protected to show benefits of protection against annual fires (Temple, 1972).
- c. 1970 - Mgeta system of laying down grasses (Temple, 1972).

Forestry

- c. 1970 - Forest natural lower limit 1300 to 1400 m (Temple, 1972).

Environmental degradation

- 1958 - Morogoro river too low to measure (Temple, 1972).
- 1960 - Morogoro river too low to measure (Temple, 1972).

Location : Bigwa village, Kingolwira ward, Morogoro urban district.

Population

- 1988 - Population = 1,757 of which 44 % men (Bhatia and Ringia, 1996).

Infrastructure

- 1995 - Road access is good (Bhatia and Ringia, 1996).
- 1995 - There is a mission, medical service, school, (Bhatia and Ringia, 1996).
- 1995 - Agricultural and forest extension workers rarely come (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitudes

- 1994 - All the people interviewed acknowledged a decrease in rainfall (Lyamuya *et al*, 1994).
- 1994 - 42 % of the people related low crop yields to low rainfall (Lyamuya *et al*, 1994).
- 1994 - 5.5 % of the people related low crop yields to poor soil fertility (Lyamuya *et al*, 1994).
- 1994 - 88 % of the farmers interviewed were willing to plant trees, 59 % said this was for Fuel wood while 41 % for fruit trees (Lyamuya *et al*, 1994).
- 1994 - Of the people interviewed 98 % said that the forest was important for the trapping of rain, 0 % for the provision of fire wood and 2 % for other uses (Lyamuya *et al*, 1994).
- 1994 - 88 % People interviewed on the reasons for setting fire said it was done for Land preparation, 0% to control vermin, 0 % to scare wild animals and 12 % for other uses (Lyamuya *et al*, 1994).
- 1994 - 90 % of the farmers interviewed knew about soil erosion problems, 64 % of them acknowledged a problem on their land, 41 % knew about soil conservation methods and 38 % used soil conservation methods (Lyamuya *et al*, 1994).
- 1995 - Land tenure is usually through the clan lineage, with both males and females having equal access. There is some buying and renting (Bhatia and Ringia, 1996).
- 1996 - People feel very strongly about corruption that leads to a reduction in their natural resources. (Bhatia and Ringia, 1996).
- 1996 - Traditional rules and regulations governing the lineage land ownership are being abused and corrupt. Lineage leadership no longer distributes land to member on the bases of need but on favouritism and financial ability. (Bhatia and Ringia, 1996).

Food and cash crops grown

- 1994 - The average yield in a bumper crop year is 0.31 tons per acre but when there is crop failure get 0.10 tons per acre. (Lyamuya *et al*, 1994).
- 1995 - Main food crops are Maize, yams, rice, beans, pumpkins, cucumber, cabbages, and cassava (Bhatia and Ringia, 1996).
- 1995 - cash crops include bananas, cassava, plantains (Bhatia and Ringia, 1996).

Agricultural practices

- 1995 - Soil and conservation practices include cereal / legumes inter cropping, planting fruit trees, fallowing. (Bhatia and Ringia, 1996).
- 1996 - Zero and minimum tillage is practised (Bhatia and Ringia, 1996).

Forestry

- 1996 - Along the borders of farms tree planting has been carried out to reduce erosion (Bhatia and Ringia, 1996).
- 1995 - Forest products include wild vegetables, medicines, fruits, firewood, ropes, timber and building poles. (Bhatia and Ringia, 1996).
- 1995 - The boundary of the reserve has been increased since the original boundary by the Germans (Bhatia and Ringia, 1996).

Environmental degradation

- 1995 - The public forests is being cleared for planting of maize and bananas (Bhatia and Ringia, 1996).
- 1995 - Pit sawing done in public land by Wahehe (Bhatia and Ringia, 1996).

Location Mbete village, Mlimani ward, Morogoro municipality division, Morogoro Urban District.

Infrastructure

- 1995 - Passable roads (Bhatia and Ringia, 1996).
- 1995 - Dispensary and primary school (not finished) (Bhatia and Ringia, 1996).
- 1995 - Agricultural officer is rarely seen (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitudes

- 1995 - Belief that poor rains / drought is due to neglect of traditions (Bhatia and Ringia, 1996).
- 1995 - Clan and direct inheritance are mixed together. There is also buying and renting (Bhatia and Ringia, 1996).

1996 - Traditional rules and regulations governing the lineage land ownership are being abused and corrupt. Lineage leadership no longer distributes land to member on the bases of need but on favouritism and financial ability. (Bhatia and Ringia, 1996).

Food and crops grown

1995 - Main food crops are maize, beans, cowpeas, pigeon peas, cassava, cabbage, tomatoes and rice (Bhatia and Ringia, 1996).
1995 - Main cash crops are tomatoes, avocados, bananas, mangoes and pawpaws. (Bhatia and Ringia, 1996).

Agricultural practices

1995 - Zero and minimum tillage is practised (Bhatia and Ringia, 1996).
1995 - Contour farming is practised. (Bhatia and Ringia, 1996).
1995 - Main food crops planted in the short rains with long rains being too heavy. (Bhatia and Ringia, 1996).
1995 - Some irrigation is practised (Bhatia and Ringia, 1996).
1995 - In the valleys cropping is sometimes done all year (Bhatia and Ringia, 1996).
1995 - Soil erosion / improvement schemes are practised to varying degrees : fallow is up to 7 years, contour farming is practised, planting grasses along contours, agroforestry, cowpeas, planted with maize in same hole, industrial fertiliser uses (Bhatia and Ringia, 1996).
1995 - Crop rotation carried out to enhance soil fertility (Bhatia and Ringia, 1996).
1995 - Terraces and contour farming made using cascas grass and trees, banana groves, or pineapples. (Bhatia and Ringia, 1996).

Forestry

1995 - Along the borders of farms tree planting has been carried out to reduce erosion (Bhatia and Ringia, 1996).
1995 - Products from the reserve include fruits and vegetables, traditional medicines, wild animals, firewood, and building poles (Bhatia and Ringia, 1996).
1995 - Trees are a source of vermin but are also useful to prevent soil erosion, fodder, latex, soil fertility, windbreaks and firewood (Bhatia and Ringia, 1996).
1995 - Villagers do not see the need to protect the Forest reserve (Bhatia and Ringia, 1996).
1995 - Tree planting is carried out (Bhatia and Ringia, 1996).
1995 - Tree planting efforts are encouraging (Bhatia and Ringia, 1996).

Environmental degradation

1995 - Encroachment into the forest has occurred (Bhatia and Ringia, 1996).
1995 - Collection of fire wood takes 6 hours return (Bhatia and Ringia, 1996).

Location : Ulugurus southern side

Gender

1996 - Women have a role in income generation (Bhatia and Forrester, 1996).

Degrading practices

c. 1931 - Report noting sever shortages of wood for fuel and poles (Temple, 1972).
c. 1931 - Mica mining (Temple, 1972).

Location Bwakila Juu Village, Bwakila Juu ward, Bwakila Chini division, Morogoro rural district.

Population

1988 - Population = 1,836 of which 45 % men (Bhatia and Ringia, 1996).

Infrastructure

1996 - Weekly market, primary court, primary school, shops and dispensary (Bhatia and Ringia, 1996).
1996 - Road are bad (Bhatia and Ringia, 1996).
1996 - No forest or agriculture extension in the village (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitudes

1996 - Forest on top of hills is though to bring clouds and so rain, as does burning. (Bhatia and Ringia, 1996).
1996 - Land is passed according to lineage, and it seems to be more paternal (Bhatia and Ringia, 1996).

Food and crops grown

1996 - Main food crops are maize, sorghum, cassava, beans and rice (Bhatia and Ringia, 1996).
1996 - Main cash crops are soya beans, simsim, cashew nuts, bananas and mangoes. These are limited due to lack of market access (Bhatia and Ringia, 1996).

Agricultural practices

- 1996 - Grass or tree fallow are rotated with annual crops. (Bhatia and Ringia, 1996).
- 1996 - Fallow periods can be for 13 years as there is relatively a lot of land (Bhatia and Ringia, 1996).
- 1996 - Farming on steep slopes common even though land scarcity is not serious. (Bhatia and Ringia, 1996).
- 1996 - Two main agriculture zones. Short rains and lowlands where Cassava, sorghum, rice, maize and soya beans are planted In the upland zones at the end of the long rains Cassava, maize and beans are planted (Bhatia and Ringia, 1996).
- 1996 - There is intercropping especially of maize and sorghum (Bhatia and Ringia, 1996).
- 1996 - Land is fallow and left for 10 years (Bhatia and Ringia, 1996).
- 1996 - Many of the farms are in uplands with the people having to move down during villagisations (Bhatia and Ringia, 1996).

Forestry

- 1996 - There are few wood lots with some village growing fruit trees (Bhatia and Ringia, 1996).

Problems

- 1996 - Land fragmentation was made worse by villigisation as it moved villagers away from their land on higher ground so they no have to walk a long distance, many have started to return and rebuild their homes on traditional lands. (Bhatia and Ringia, 1996).

Environmental degradation

- 1996 - Most of the villagers are too far to use the forest reserve regularly, while they are near to Miombo woodlands (Bhatia and Ringia, 1996).
- 1996 - Villagers close to the forest reserve do use it for building poles and fuelwood. (Bhatia and Ringia, 1996).
- 1996 - Illegal pit sawing occurs in the reserve with some people being certified by the local forester (Bhatia and Ringia, 1996).
- 1996 - The miombo is being clear felled for shambas, it is under a lot of pressure with no licensing being done. (Bhatia and Ringia, 1996).

Location Singisa village, Singisa ward, Bwakila Chini Division, Morogoro Rural District

Infrastructure

- 1996 - Weekly market, mission, dispensary, primary school, shops, milling machine. (Bhatia and Ringia, 1996).
- 1996 - No agricultural or forestry extension staff (Bhatia and Ringia, 1996).
- 1996 - The roads are impassable during rains (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitudes

- 1996 - Land is inherited by lineage (Bhatia and Ringia, 1996).
- 1996 - Forest perceived as a source of water and rainfall (Bhatia and Ringia, 1996).

Food and crops grown

- 1996 - Main food crops are rice, beans, maize, cassava, peanuts, yams and Irish potatoes. (Bhatia and Ringia, 1996).
- 1996 - Cash crops are soya beans, simsim, coffee, bananas, sun flowers, cardamoms, beans and chick peas. (Bhatia and Ringia, 1996).

Agricultural Practices

- 1996 - Fallow periods can be for 13 years as there is relatively a lot of land (Bhatia and Ringia, 1996).
- 1996 - Two main agricultural zones relating to altitude (Bhatia and Ringia, 1996).
- 1996 - Mix cropping is carried out of rice and maize. And cassava with beans or pigeon peas. (Bhatia and Ringia, 1996).
- 1996 - Land shortage is not a problem and land is left fallow for 3 to 10 years (Bhatia and Ringia, 1996).
- 1996 - Vermin are a problem (Bhatia and Ringia, 1996).
- 1996 - Farming on steep slopes common even though land scarcity is not serious. (Bhatia and Ringia, 1996)

Forestry

- 1996 - Villagers interested in planting trees (Bhatia and Ringia, 1996).
- 1996 - The forest reserve is mainly used by villages near it as there is lots of miombo close to the village (Bhatia and Ringia, 1996).
- 1996 - Forest products collected are rope, building materials, fuelwood, medicines, too handles and timber. (Bhatia and Ringia, 1996).

Problems

- 1996 - Land fragmentation was made worse by villagisation as it moved villagers away from their land on higher ground so they no have to walk a long distance, many have started to return and rebuild their homes on traditional lands. (Bhatia and Ringia, 1996).

Environmental degradation

1996 - Pitsawing is done in the reserve with permits issued by the village government (Bhatia and Ringia, 1996).

Location : Uluguru western side

Climate

- c. 1972 - Mean annual rainfall is less than eastern. (Lyamuya *et al*, 1994).

Food and crops grown

- 1995 - Maize, beans, millet and cassava are cultivated lower altitudes as it is drier (Ulvila, 1995).
- 1995 - In higher altitudes maize, beans, cabbages and peas are the main crops . (Ulvila, 1995).
- 1995 - In wetter areas yams and bananas are grown (Ulvila, 1995).

Agricultural practices

- c. 1970 - Ladder or step terrace widely employed and accepted soil conservation practice. Involves spreading of vegetation and crop residues on top of terraces and cover with soil from the face of the terrace above (Temple, 1972).

Forestry

- c. 1978 - Tree seedlings distributed free of charge from Bunduki, supposed to be planted for erosion control and reduce pressure on forest (Lundgren, 1978).

Environmental degradation

- c. 1931 - Report noting sever shortages of wood for fuel and poles (Temple, 1972).
- c. 1931 - Mica mining (Temple, 1972).

Location : Mzumbe ward, Mlali division.

Agricultural practices

- c. 1956 - Series of experimental plots set up to measure sheet wash and observe crop yield under different management (Temple, 1972).
- 1960 - Experiment plots abandoned (Temple, 1972).

Location Tangeni village, Mzumbe ward, Mlali Division, Morogoro rural district

Population

1988 - Population 3,826 of which 48 % men (Bhatia and Ringia, 1996).

Infrastructure

1996 - Daily market and shops, schools, dispensary, orphanage, mission. (Bhatia and Ringia, 1996).

1996 - Road is passable with daily buses to Morogoro (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitudes

1994 - All people interviewed acknowledge a decrease in rainfall (Lyamuya *et al*, 1994).

1994 - 76 to 86 % of people interviewed related low crop yields to low rainfall (Lyamuya *et al*, 1994).

1994 - 12 to 16.5 % of people interviewed related low crop yields to poor soil fertility (Lyamuya *et al*, 1994).

1994 - All the farmers interviewed were willing to plant trees, between 6 to 25 % said this was for Fuel wood while 72 to 90 % for fruit trees (Lyamuya *et al*, 1994).

1994 - Of the people interviewed 53 to 93 % said that the forest was important for the trapping of rain, 5 to 47 % for the provision of fire wood and 0 to 2 % for other uses (Lyamuya *et al*, 1994).

1994 - 62 to 81 % People interviewed on the reasons for setting fire said it was done for Land preparation, 5 to 13 % to control vermin, 0 to 6 % to scare wild animals and 0 to 33 % for other uses (Lyamuya *et al*, 1994).

1994 - 88 to 83 % the farmers interviewed knew about soil erosion problems, 70 to 95 % of them acknowledged a problem on their land, 73 to 83 % knew about soil conservation methods and 0 to 15% used soil conservation methods (Lyamuya *et al*, 1994).

1996 - Traditional rules and regulations governing the lineage land ownership are being abused and corrupt. Lineage leadership no longer distributes land to member on the bases of need but on favouritism and financial ability. (Bhatia and Ringia, 1996).

1996 - Land is owned by the clan with land sometimes being rented but commercialisation is changing things. (Bhatia and Ringia, 1996).

1996 - People feel very strongly about corruption that leads to a reduction in their natural resources. (Bhatia and Ringia, 1996).

Food and crops grown

1994 - The average yield in a bumper year is of 0.36 tons / acre while in a bad year get 0.11 tons per acre (Lyamuya *et al*, 1994).

1996 - Main food crops are maize, cassava, rice, sorghum, beans, pigeon peas, cowpeas, sweet and Irish potatoes, bananas (Bhatia and Ringia, 1996).

1996 - Main cash crops are bananas, yams, sweet potatoes, cassava, tomatoes, cabbages, chick peas, amaranthus, mangoes, carrots, jack fruits, avocados, oranges, cardamoms, okra, sugar cane (Bhatia and Ringia, 1996).

Agricultural practices

- 1996 - Irrigation is practices, and horticultural crops such as tomatoes, cabbages and onions are rotated with long or short rain crops (maize, legumes, sunflower, millet) (Bhatia and Ringia, 1996).
- 1996 - Crop rotation carried out to enhance soil fertility (Bhatia and Ringia, 1996).
- 1996 - Long rains are February to April, short rains are October to December and cropping out of season depends on residual moisture (Bhatia and Ringia, 1996).
- 1996 - Two different agricultural zones based on altitude (Bhatia and Ringia, 1996).
- 1996 - Land shortages with average land holding of 3 acres. (Bhatia and Ringia, 1996).
- 1996 - Cultivation is continuous, with no fallow period. (Bhatia and Ringia, 1996).
- 1996 - Contour farming is practised. (Bhatia and Ringia, 1996).
- 1996 - Along the borders of farms tree planting has been carried out to reduce erosion (Bhatia and Ringia, 1996).

Forestry

- 1996 - Woodlots are used to allow soil fertility regeneration (Bhatia and Ringia, 1996).
- 1996 - Some villagers are planting woodlots on fallow land due to wood shortages (Bhatia and Ringia, 1996).
- 1996 - Tree planting is carried out (Bhatia and Ringia, 1996).
- 1996 - Tree planting efforts are encouraging (Bhatia and Ringia, 1996).
- 1996 - Tree planting in individual or village wood lots is common (Bhatia and Ringia, 1996).
- 1996 - Selective felling carried out to reduce soil erosion (Bhatia and Ringia, 1996).

Environmental degradation

- 1996 - The forest reserve supplies building poles, firewood, ropes and medicine. (Bhatia and Ringia, 1996).
- 1996 - Pit sawing occurs in the Forest reserve (Bhatia and Ringia, 1996).
- 1996 - Cutting and selling of fuelwood (Bhatia and Ringia, 1996).

Other

- 1996 - Some people are willing to move to the lowlands (Bhatia and Ringia, 1996).

Location : Mgeta division.

Population size

- c. 1900 - People moving down the mountains. (Maack, 1996).
- 1967 - 118.5 / km² (Temple, 1972).
- 1945 - 290 / km², probably miscalculated (Temple, 1972).
- 1967 - 50 people per km² (Lundgren, 1978).
- 1970 and 1976 - No clear correlation between changes in agricultural practices and population density (Lundgren, 1978).
- c. 1978 - > 150 people per km² (Lundgren, 1978).
- 1978 - Shamba supports 5-8 people (Lundgren, 1978).

Traditions, Land tenure and Attitudes

- 1905 - Mgeta mission set up (Coniat *et al*, 1997).
- 1978 - Land rights are inherited matrilineally, men and women hold equal parts of land (Lundgren, 1978).
- 1978 - Not allowed to plant trees without permission, as tree planting invalidates lineage control of land, this has weakened since independence (Lundgren, 1978).
- 1997 - Until recently permission was needed to plant trees from the head of the lineage, this was rarely granted. This has been eroded due to necessity of wood and economics (Coniat *et al*, 1997).

Gender issues

- 1994 - In 83 % of cases women and men made the decision of what crop to plant together (Due *et al*, 1994).

Climate

- c. 1972 - Annual rainfall 950 mm at Mgeta mission. (Lyamuya *et al*, 1994).
- 1978 - Mean annual rainfall 1058 at Mgeta Mizugu (altitude 1100 m, 18 year record) (Lundgren, 1978).
- 1978 - Mean annual rainfall Mgeta Mizugu 1972 = 1529 mm, 1973 = 841 mm, 1974 = 358, 1975 = 1182 and 1976 = 806 mm (Lundgren, 1978).
- 1978 - Mean annual rainfall 950 at Mgeta mission (altitude 1020 m, 21 year record) (Lundgren, 1978).
- 1978 - One dry season between June to October (Lundgren, 1978).
- 1978 - Approximate annual evaporation in Mgeta valley is 1600 mm (Lundgren, 1978).
- 1981 - Rainfall = 760 and 1600 mm per year (Due *et al*, 1994).

Soils / Topography

- 1970 - 36 % of total area consisted of slopes > 20 %, of these slopes 58 % used for annual crops or annual crops with tree crops, 35% for fallow land and grazing, and 8% for other uses (Lundgren, 1978).
- 1978 - Precambrian rocks dominate, e.g. meta-anorthosites with gabbroic anorthosite as the most common type. In Mgeta valley banded pyroxene granulites occur. Most important mineral of the gabbroic anorthosite is plagioclase feldspar, with an anorthite percentage of more than 50. Other minerals garnet, pyroxene, hornblende, biotite and muscovite. The rock appears white or pinkish in colour (plagioclase), studded with dark minerals. Low silica and high alumina and lime contents. Some areas with muscovite. (Lundgren, 1978).
- 1978 - Soils in cultivated area are thin and coarse textured. Soils are a sandy loam with feldspar (10% clay, 10% silt, 30% fine sand and 10% coarse sand) (Lundgren, 1978).
- 1994 - Altitude = 1200 to 1800 meters (Due *et al*, 1994).
- 1994 - Soils developed from the base rock are often 2 meters deep, comprise of yellow-red and kaolinitic clay (with 30% clay, 30% silt, 30% fine sand and 10% coarse sand) with relatively high alumina content, this is in areas that have probably not been cultivated for a long period. There are also found shallow (less than 2 m deep), whitish coloured feldspar sands overlaid by a 10-20 cm deep blackish top soil (Lyamuya *et al*, 1994 and Lundgren, 1978).

Food and Crops grown

- c. 1960 - Food security not universal (van Donge, 1992).
- c. mid 1960 - Boom in vegetable growing for urban markets (van Donge, 1992).
- c. 1970 - Food security very rare (van Donge, 1992).
- 1978 - Maize is staple food crop, grown by all, low yields of 250 - 400 kg / ha (Tanzanian average 700kg/ha. Average farmer grows 1 ha of maize (Lundgren, 1978).
- 1978 - Subsistence crops also millet and sweet potatoes intercropped usually with maize. Cassava grown on land that is not fit for other crops. Cow peas and pigeon peas. (Lundgren, 1978).
- 1978 - Cash crop Coffee, but vegetables and fruits are dominant (Lundgren, 1978).
- 1978 - Tomato most important vegetable, others are cabbages, carrots, cauliflower, Irish potatoes, lettuce, onions, peas and reddish (Lundgren, 1978).
- 1978 - Common fruits are apples, avocados, peaches and plums (Lundgren, 1978).
- 1978 - Trees crops (not fruit) are black wattle (*Accacia mearnsii*), Maiden's gum (*Eucalyptus maidenii*), cypress (*Cupressus lusitanica*). Grown for erosion control, fire wood and timber (Lundgren, 1978).
- 1978 - Goats, sheep, chickens and some pigs are commonly kept (Lundgren, 1978).
- 1992 - Maize is the staple food and pulses (mostly beans) are the major secondary crop, other crops includes rice (van Donge, 1992).
- 1992 - Pigs, goats, sheep and fowl are kept (van Donge, 1992).
- 1992 - Millet, cassava, pigeon pea are planted in pure stands (van Donge, 1992).
- 1992 - Yams cultivated in water logged areas (van Donge, 1992).
- 1992 - Bananas are planted near streams (van Donge, 1992).
- 1992 - Sweet potatoes are also sometimes an important subsidiary crop (van Donge, 1992).
- 1992 - Coffee no longer important (van Donge, 1992).
- 1994 - Maize (2.8 acres of which 99 % consumed), beans (1.4 acres of which 46 % consumed), cabbage (0.8 acres of which 18 % consumed), cauliflower (0.6 acres of which 6 % consumed), Cassava (0.3 acres of which 100 % consumed), Pigeon peas (0.7 acres of which 20 % consumed), other crops (1.8 acres of which 35 % consumed) (Due *et al*, 1994).

- 1996 - Rain-fed corn and kidney beans have been grown for the past 100 years (Maack, 1996).
- 1997 - Bananas are found in 3/4 of farms but it is declining. Coffee, which had to be grown for the government, was done on marginal soils. (Coniat *et al*, 1997).
- 1997 - Maize, and legumes are the main crops grown (Coniat *et al*, 1997).
- 1997 - Maize and cabbage are the main crops grown, with maize as the staple and cabbage as the cash crop. (Coniat *et al*, 1997).
- 1997 - With distance from road cabbage farming decrease due to the cost of transport to the road. (Coniat *et al*, 1997).
- 1997 - 60 % of the field are used for sustainable food, maize, beans, banana, cassava (Coniat *et al*, 1997).
- 1997 - 85 % of fields have maize either as pure or mixed (Coniat *et al*, 1997).
- 1997 - Other vegetables grown as cash crops are carrots, parsley, runner beans, tomatoes, courgette, radish, lettuce, beetroot, leek, turnips. (Coniat *et al*, 1997).
- 1997 - For the cash crops inputs are used such as fertilisers, this is not used for food crops. (Coniat *et al*, 1997).

Agricultural practices

- c.1914 - Several reasons for the origins of terracing in Mgeta - Missionary influence, early European settler influence and indigenous invention. It spread rapidly especially as soil erosion reached crisis proportions in to the First World War. (Maack, 1996).
- c.1920 - Thomas Bain the British administration of the mica mines in the area introduced vegetables over which he held a monopoly. Once this monopoly on vegetable seeds and marketing was broken the terracing of vegetables spread rapidly (Maack, 1996).
- c. 1923 - Mgeta system of laying down grass and weeds in ridges along contours to counteract erosion (Temple, 1972).
- 1930 - The practice of terracing started, probably due to the introduction of iron hoes which replaced wooden ones (Coniat *et al*, 1997).
- c. late 1930 - Mgeta system replaced by improved system (Temple, 1972).
- 1936 to 1937 - Trial plots and experimental bench terraces for vegetable and potato growing. (Temple, 1972).
- 1944 - Demonstrations of storm draining, terracing and tie-ridging set up (Temple, 1972).
- 1948 - 50 - The system of irrigation canals was set up, using the initiative of two lineage heads, this is said to be the last time traditional collective ward was done (Coniat *et al*, 1997).
- 1953 - Bench terracing started (Temple, 1972).
- 1956 - Anti-erosion methods continued (Temple, 1972).
- 1970 - 50% of the total area used for annual crops, 11% used for annual crops in combination with tree crops, 5~% for tree crops, 28% for fallow and grazing and 7% for other uses (Lundgren, 1978).
- 1970 - 36 % of total area consisted of slopes > 20 %, of these slopes 58 % used for annual crops or annual crops with tree crops, 35% for fallow land and grazing, and 8% for other uses (Lundgren, 1978).
- 1970 and 1976 - No clear correlation between changes in agricultural practices and population density (Lundgren, 1978).
- 1978 - Area dominated by cultivation, fallow and grazing lands (Lundgren, 1978).
- 1978 - Average shamba size is 2 ha, supports 5-8 people (Lundgren, 1978).
- 1978 - Land fragmentation occurring, with average of 6 plots per household scattered over large distance (Lundgren, 1978).
- 1978 - No overgrazing present (Lundgren, 1978).
- 1978 - Ladder or step terraces still being made, though not bench (Lundgren, 1978).
- 1978 - Fertilisers and irrigation furrows used with cash crops but not subsistence crops (Lundgren, 1978).

- 1978 - Intercropping and increase interest in growing fruit trees (Lundgren, 1978).
- 1987 - Each family had 5 plots of land (Lyamuya *et al*, 1994).
- 1992 - Average acreage per family ranges from 2.02 to 2.28 acres, each household used to own 8 plots but now own 2 plots (Lyamuya *et al*, 1994) 1992 - Agriculture tied to outside economy (van Donge, 1992).
- 1992 - Low altitudes maize planted in short rains (November - December), harvested in the long rains (June - July). Cabbage is marketed during September to October. In higher areas agriculture is less seasonal. At higher altitudes maize is planted in June or July and harvested 10 to 11 months later, here peas are usually intercropped with maize rather than beans. More different varieties of vegetables grown in higher altitudes and this is done throughout the year. At higher altitudes fruit such as plums and peaches are grown. (van Donge, 1992).
- 1994 - Multiple cropping can be done due to higher elevation and rainfall. (Due *et al*, 1994).
- 1994 - Average of 5.5 fields per family of about 8.4 acres, 47 % used for food (Due *et al*, 1994)..
- 1994 - Labour use is uniform through out the year (Due *et al*, 1994).
- 1996 - Some form of terracing or ridging is a common practice (Bhatia and Ringia, 1996).
- 1996 - Chemicals pesticides not used due to being not available and farmers also know that they can be harmful in the long run. However some farmers used extracts of the neem tree as a pesticide (Bhatia and Ringia, 1996).
- 1997 - 95 % of the land below the reserve is cultivated with the remaining 5% being plantations from the colonial period (Coniat *et al*, 1997).
- 1997 - In general between 1,200 and 1,600 m maize is intercropped with beans during end of October and start of November. With the beans harvested between January and February and the maize during march to April. (Coniat *et al*, 1997).
- 1997 - In general between 1,600 and 2,000 m peas are planted between may to June and maize is planted between June to July. The peas are harvested between august and September after which beans are planted between October to November. The maize is harvested between march and April and the beans between January and February (Coniat *et al*, 1997).
- 1997 - Between 1,200 and 1,800 m cabbage is planted near houses between January and February. Get 50 t /ha and 35 t / ha for cauliflower. (Coniat *et al*, 1997).
- 1997 - On slopes that are not steep cultivation is done all year round, except for a small break between September to October, year in year out (Coniat *et al*, 1997).
- 1997 - At low altitude the distance for irrigation limits intensive farming, while at high altitudes the transportation of fertilisers limits intensive farming (Coniat *et al*, 1997).

Forestry

- 1923 - Local people began planting trees for firewood and to prevent erosion (Temple, 1972).
- 1977 - 100,000 seedlings of *Cupressus lusitanica* (cypress) and *Eucalyptus maidenii* (Maiden's gum) given to farmers for free to use in Mgeta valley, from Bunduki nursery.
- 1978 - Trees crops (not fruit) are black wattle (*Accacia mearnsii*), Maiden's gum (*Eucalyptus maidenii*), cypress (*Cupressus lusitanica*). Grown for erosion control, fire wood and timber (Lundgren, 1978).
- 1978 - Setting aside areas for grazing and planting trees done around the land slide areas. (Lundgren, 1978).
- 1978 - Submontane woodland zone and Montane evergreen forest zones, after Pocs (Lundgren, 1978).

- 1978 - Two plant communities dominate in Mgeta valley are Submontane Pterocarpus - Combretum woodland and Mesophilous montane forest, after Pocs (Lundgren, 1978).
- 1997 - Fruit trees are only grown around houses with few trees further away (Contiat *et al*, 1997).

Problems

- 1996 - Tomatoes and cabbages are attacked by fungal and bacterial diseases and a variety of insect pests (Bhatia and Ringia, 1996).

Environmental degradation

- 1923 - Mica mining going on (Temple, 1972)
- 1970 - 1000 landslides triggered due to heavy rainstorms, about 75 km² of land effected (Lundgren,1978 and Temple *et al*, 1972).
- 1970 - 14% of households and nearly 1600 shambas caused by landslides (Temple, 1972).
- 1970 - 100 mm of rainfall recorded in less than 3 hours causing slope failures and landslides in 75 km² of land. Minimum economic loss was equal to E.A shs 600,000 (US \$ 90,000) (Temple *et al*,1972).
- 1972 - Landslide denudation of 14 mm over 20 km² from a single storm, erosion on agricultural land is faster than in the forests and woodlands (Rapp, 1972).
- 1973 - 100 new land slides
- c. 1978 - Mining of muscovite (Lundgren, 1978).
- 1978 - Burning takes place in December (Lundgren, 1978).
- 1978 - Natural vegetation in Mgeta Valley has been nearly totally destroyed by cultivation. Only forest left is in the Forest Reserve (Lundgren, 1978).
- c. 1978 - Landslides becoming more frequent (Lundgren, 1978).
- 1978 - Deep clays removed in areas where deforestation and cultivation of steep slopes (Lundgren, 1978).
- c. 1992 - No more virgin land (van Donge, 1992).
- c. 1992 - Land is eroded and exhausted (van Donge, 1992).
- 1997 - The irrigation system is now not being well managed due to a lack of labour, this has negative consequences on the environment, this is made worse by the ill conceived way in which the irrigation channels have been made. With little protection for the edge of the terrace. (Contiat *et al*, 1997).
- 1997 - 5 to 7mm of soil is lost yearly due to rain wash (Contiat *et al*, 1997).

Location Nyandira village, Tchenzema ward, Mgeta division, Morogoro Rural district

Population

- 1988 - Population = 2,675 of which 45 % men (Bhatia and Ringia, 1996).

Infrastructure

- 1996 - Weekly market, shops, UMADEP hostel. (Bhatia and Ringia, 1996).
- 1996 - Passable roads (Bhatia and Ringia, 1996).

Tradition, Land tenure, Policy and Attitudes

- 1996 - Forest perceived as a source of water and rainfall (Bhatia and Ringia, 1996).
- 1996 - Land is owned by the clan, with it being inherited materially. (Bhatia and Ringia, 1996).
- 1996 - Some people are moving to lowlands due to land shortages (Bhatia and Ringia, 1996).
- 1996 - People feel very strongly about corruption that leads to a reduction in their natural resources. (Bhatia and Ringia, 1996).

Food and crops grown

- 1996 - Main food crops are maize, pigeon peas, beans, yams, chick peas, cabbages, cauliflower, tomatoes, onions, leeks, Irish potatoes, sweet potatoes, fruit. (Bhatia and Ringia, 1996).
- 1996 - The main cash crops are green vegetables, fruit, cabbage, cauliflower, tomatoes, onions, leeks, Irish and sweet potatoes, beans, chick peas, and bananas. (Bhatia and Ringia, 1996).

Agricultural Practices

- 1996 - Intensive home gardens using multipurpose trees occur (Bhatia and Ringia, 1996).
- 1996 - Contour farming is practised. (Bhatia and Ringia, 1996).
- 1996 - Use of terraces and contour farming (Bhatia and Ringia, 1996).
- 1996 - Irrigation is practiced, and horticultural crops such as tomatoes, cabbages and onions are rotated with long or short rain crops (maize, legumes, sunflower, millet) (Bhatia and Ringia, 1996).
- 1996 - There are a number of agricultural zones based on soil and water availability. The main zones are an upper zone of maize, yams, chick peas, cabbages, beans, cauliflower, leeks, onions, tomatoes, Irish potatoes and fruit. The lower zone of cowpeas, maize, cassava, yams, sweet potatoes, beans, pigeon peas. (Bhatia and Ringia, 1996).
- 1996 - step terracing is practised against soil erosion and irrigation is wide spread. (Bhatia and Ringia, 1996).
- 1996 - Composting is practised in more accessible fields (Bhatia and Ringia, 1996).

Forestry

- 1996 - Tree planting efforts are encouraging (Bhatia and Ringia, 1996).
- 1996 - Tree planting in individual or village wood lots is common (Bhatia and Ringia, 1996).
- 1996 - Some villagers are raising native seeds and tree planting is common, there are a number of woodlots that have been set aside by villagers (Bhatia and Ringia, 1996).
- 1996 - People link forest to rainfall (Bhatia and Ringia, 1996).
- 1996 - Some village woodlots come under the district foresters control. With the plantation being important for fuelwood and building poles. (Bhatia and Ringia, 1996).
- 1996 - Tree planting is carried out (Bhatia and Ringia, 1996).

Environmental degradation

- 1996 - People perceive a decline in soil fertility (Bhatia and Ringia, 1996).
- 1996 - Forest products that are collected include wild vegetables, ropes, tool handles, firewood, building poles, medicines. (Bhatia and Ringia, 1996).
- 1996 - There is harvesting of wood products from the plantation but no replanting. (Bhatia and Ringia, 1996).

Projects in area

- 1996 - UMADEP (Bhatia and Ringia, 1996).

Location Bunduki village, Bunduki ward, Mgeta Division.

Population

- 1988 - Population = 1,574 of which 45% men (Bhatia and Ringia, 1996).

Infrastructure

- 1995 - Village had church, dispensary, school and milling machine (Bhatia and Ringia, 1996).
- 1995 - Road access is poor (Bhatia and Ringia, 1996).
- 1995 - there is both a forester and agricultural extension worker but they are deemed as ineffective (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitudes

- 1995 - Individually owned and clan owned land. There is some renting. Inheritance is a mixture of old and new (Bhatia and Ringia, 1996).
- 1996 - Forest perceived as a source of water and rainfall (Bhatia and Ringia, 1996).

Climate

- c. 1972 - Mean annual rainfall 1922 mm (Lyamuya *et al*, 1994).
- 1978 - Mean annual rainfall 1922 mm (altitude 1280 m, 18 year record) (Lundgren, 1978).
- 1978 - One pronounced dry season lasting about 2 months (June to July <50mm) (Lundgren, 1978).

Food and crops grown

- 1995 - Main food crops are maize, beans, peas, cassava, cabbages, tomatoes, onions, bananas and fruit (Bhatia and Ringia, 1996).
- 1995 - Main cash crops are beans and peas (Bhatia and Ringia, 1996).

Agricultural practices

- 1995 - Soil improvement and erosion control practices: agroforestry, contour farming, planting grass on contour ridges, intercropping with legumes, crop rotation, ridging, fallowing, compost in home gardens (Bhatia and Ringia, 1996).
- 1995 - Fallow is up to 5 years (Bhatia and Ringia, 1996).
- 1995 - Some families have up to 10 fields (Bhatia and Ringia, 1996).
- 1996 - Crop rotation carried out to enhance soil fertility (Bhatia and Ringia, 1996).
- 1996 - Intensive home gardens using multipurpose trees occur (Bhatia and Ringia, 1996).
- 1996 - Cultivation is continuous, with no fallow period. (Bhatia and Ringia, 1996).

Forestry

- 1978 - Bunduki nursery giving out free seedlings, but demand cannot be met (Lundgren, 1978).
- 1996 - To control soil erosion fallow with trees *Acacia mearnsii* has been tried (Bhatia and Ringia, 1996).
- 1996 - Woodlots are used to allow soil fertility regeneration (Bhatia and Ringia, 1996).
- 1996 - Tree planting in denuded areas. The retired foresters in these areas own private tree lots which supply poles and fuelwood for sale. (Bhatia and Ringia, 1996).
- 1996 - Selective felling carried out to reduce soil erosion (Bhatia and Ringia, 1996).
- 1996 - Tree planting efforts are encouraging (Bhatia and Ringia, 1996).

Environmental degradation

- c. 1961 - Planted forests felled and burned to provide new agricultural land (Temple, 1972).
- 1995 - Soil fertility is declining (Bhatia and Ringia, 1996).
- 1995 - Land slides and stream erosion occurred in past (Bhatia and Ringia, 1996).
- 1995 - Firewood collected from woodlots, forest plantations and forest reserve. (Bhatia and Ringia, 1996).
- 1995 - Other products also from forest reserve are medicine, maintaining water, wild vegetables and fruit (Bhatia and Ringia, 1996).
- 1995 - People want to cut more of the Forest reserve for agricultural land, (Bhatia and Ringia, 1996).

Location Tchenzema ward, Mgeta Division

Population

1988 - Population = 9,248 (Bhatia and Ringia, 1996).

1988 - Population = 9,201 split into the following villages : - (????)

- 1) Kibuko = 1,162
- 2) Mwarazi = 1,924
- 3) Nyandira = 2,692
- 4) Tchenzema = 2,155
- 5) Ngungulu = 1,268

Climate

1997 - Mean annual rain fall is 1,377 mm (Coniat *et al*, 1997).

Soils / Topography

1997 - Little information available but they are mostly migmatic pre-cambrien, generally acidic (Coniat *et al*, 1997).

Location : Kibuku village, Tchenzema ward, Mgeta division.

Agricultural practices

1944 - Demonstrations of storm draining, terracing and tie-ridging set up (Temple, 1972).

Location : Tchenzema village, Tchenzema ward, Mgeta division.

Climate

1978 - Mean Annual rainfall 1377 mm at Kienzema ((altitude 1675 m, over 23 year record) Lundgren,1978).

Food and Crops grown

1978 - Coffee, vegetables and fruits are important cash crops (Lundgren, 1978).

Agricultural practices

1944 - Demonstrations of storm draining, terracing and tie-ridging set up (Temple, 1972).

Forestry

c. 1970 - Forest natural lower limit 1800m (Temple, 1972).

Environmental degradation

c. 1961 - Relic Rain forest cleared by fire and cultivation extended in new areas (Temple, 1972).

1969 - Over 200 landslides occurred (Temple, 1972).

c. 1978 - Small portions of the reserve have been cleared and cultivated since independence (Lundgren, 1978).

Location : Uluguru eastern side.

Climate

- c. 1972 - Mean annual rainfall 1500 mm (Lyamuya *et al*, 1994).
- 1995 - The eastern side is wetter than the western side (Ulvila, 1995).

Crops grown

- 1995 - Cassava, maize, upland rice, sweet potatoes, sorghum and fruits are the main crops on the slopes and the foothills (Ulvila, 1995).
- 1995 - In lowlands swamp rice cocoyam and tania are common crops grown (Ulvila, 1995).

Location Mwarazi village, Mkuyuni ward, Mkuyuni division.

Population

- 1988 - Population = 1,355 of which 51 % men (Bhatia and Ringia, 1996).

Infrastructure

- 1996 - Primary school, mission, dispensary, milling machine, shops, women group and Forrest extension worker but no agricultural extension worker (Bhatia and Ringia, 1996).
- 1996 - There is a environmental committee responsible for forest use (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitudes

- 1996 - Land is inherited by patriarchal lineage. Ngoto is paid in the village for rented land. (Bhatia and Ringia, 1996).
- 1996 - Conflict with miners over land rights (Bhatia and Ringia, 1996).
- 1996 - People feel very strongly about corruption that leads to a reduction in their natural resources. (Bhatia and Ringia, 1996).
- 1996 - New comers do not like the lineage system as they struggle for land while others have large areas that they do not farm. (Bhatia and Ringia, 1996).

Food and crops grown

- 1996 - Main crops are maize, rice, sorghum, cassava, pigeon peas, cow peas, yams, pineapples.
- 1996 - Main cash crops are simsim, oranges, mangoes, black pepper, yams, cassava, cowpeas, chickpeas.

Agricultural practices

- 1996 - Two agricultural zones relating to altitude. In the upper zone there is minimum tillage with sorghum, rice and cassava being grown. In the lower zone there is intensive agriculture of maize, simsim, cassava and other food crops. (Bhatia and Ringia, 1996).
- 1996 - Farms are small with a maximum of 2 acres. (Bhatia and Ringia, 1996).
- 1996 - Short rains are from mid October to January with long rains from late March to early June (Bhatia and Ringia, 1996).
- 1996 - Inter cropping is widely done. (Bhatia and Ringia, 1996).
- 1996 - Fallowing is practised and can be for long periods as no land shortage (Bhatia and Ringia, 1996).
- 1996 - Vermin are a problem (Bhatia and Ringia, 1996).
- 1996 - There is relatively abundant land (Bhatia and Ringia, 1996).
- 1996 - Grass or tree fallow are rotated with annual crops. (Bhatia and Ringia, 1996).

Forestry

- 1996 - There are patches of miombo and a village wood lot close to the village (Bhatia and Ringia, 1996).
- 1996 - There is public forest belonging to the Mission and the forest reserve of Kimboza and Ruvu forests. (Bhatia and Ringia, 1996).
- 1996 - Few trees are planted except fruit trees (Bhatia and Ringia, 1996).
- 1996 - Tree planting is carried out (Bhatia and Ringia, 1996).
- 1996 - Tree planting efforts are encouraging (Bhatia and Ringia, 1996).

Environmental degradation

- 1996 - In the Ruvu forest there is mining (Bhatia and Ringia, 1996).
- 1996 - Ruvu forest reserve suffers from encroachment, pitsawing and burning. Kimboza suffers from occasional cutting. Before they were demarcated some areas of the forest were inhabited. (Bhatia and Ringia, 1996).

Projects in area.

- 1996 - UNICEF (Bhatia and Ringia, 1996).

Location Kinole ward, Mkuyuni Division.

Population

1988 - Population = 10,270 (Bhatia and Ringia, 1996).

Climate

1994 - Annual rainfall 1500 to 2850 m (Lyamuya *et al*, 1994).

Location Tandai village, Kinole Ward, Mikuyuni Division.

Population

1988 - Population 3,386 of which 48% men (Bhatia and Ringia, 1996).

Infrastructure

1995 - Poor roads (Forrester *et al*, 1996 ; Bhatia and Ringia, 1996).

1995 - Milling machine, shops, market, dispensary, primary school (Forrester *et al*, 1996).

2000 - Poor roads, should soon be upgraded (Hymas, 2000).

2000 - Milling machine, shops, market, dispensary, primary school, restaurants, guest houses (Hymas,2000).

2000 - Market, is being moved (Hymas, 2000).

Traditions, Land tenure, Policy and Attitude

1994 - All people interviewed acknowledge a decrease in rainfall (Lyamuya *et al*, 1994).

1994 - 62 to 100 % of people interviewed related low crop yields to low rainfall (Lyamuya *et al*, 1994).

1994 - 0 to 4.4 % of people interviewed related low crop yields to poor soil fertility (Lyamuya *et al*, 1994).

1994 - All the farmers interview were willing to plant trees, between 56 and 100 % said this was for Fuel wood while 0 to 44 % for fruit trees (Lyamuya *et al*, 1994).

1994 - Of the people interviewed 11 to 61 % said that the forest was important for the trapping of rain, 73 % for the provision of fire wood and 16 % for other uses (Lyamuya *et al*, 1994).

1994 - 80 % People interviewed on the reasons for setting fire said it was done for Land preparation, 0% to control vermin, 0 % to scare wild animals and 20 % for other uses (Lyamuya *et al*, 1994).

1994 - All the farmers interviewed knew about soil erosion problems, 91 to 98 % of them acknowledged a problem on their land, 73 to 61 % knew about soil conservation methods and 0 to 9 % used soil conservation methods (Lyamuya *et al*, 1994).

- 1995 - Land is passed through the clan in a matrilineal system. (Bhatia and Ringia, 1996).
- 1995 - Villagers feel pitsawing does not benefit them (Forrester *et al*, 1996).
- 1995 - Land passed down through clan in matrilineal system (Forrester *et al*, 1996).
- 1995 - Men and women said to have equal ownership (Forrester *et al*, 1996).
- 1995 - Chief Kingalu lives in one of the villages (Forrester *et al*, 1996).
- 1995 - Burning of fires is believed to bring rains (Forrester *et al*, 1996).
- 1996 - People feel very strongly about corruption that leads to a reduction in their natural resources. (Bhatia and Ringia, 1996).
- 2000 - No evidence of matrilineal system working in banana farmers who are using the forest (Hymas, 2000).

Gender issues

- 1995 - Growing cash crops is a male activity (Forrester *et al*, 1996).
- 1995 - Firewood collected by both males and females but mostly female task (Forrester *et al*, 1996).

Food and Crops grown

- 1994 - The average yields in a bumper crop year is 0.70 tons / acre while in a year with crop failure there is 0.18 tons / acre (Lyamuya *et al*, 1994).
- 1995 - Livestock's were kept before villagisation (Forrester *et al*, 1996).
- 1995 - Zero grazing has started due to UMADEP (Forrester *et al*, 1996).
- 1995 - Main crops are maize, beans, bananas, peas, rice and cassava (Forrester *et al*, 1996 ; Bhatia and Ringia, 1996).
- 1995 - Main cash crops are bananas, pineapples, coconut, coffee, spices and fruits (Forrester *et al*, 1996; Bhatia and Ringia, 1996).
- 2000 - Bananas main cash crop, coffee mostly given up (Hymas, 2000).

Agricultural practices

- 1995 - Fallowing is old practice of soil regeneration but duration of fallow reduced due to land pressure (Forrester *et al*, 1996).
- 1995 - Some areas are irrigated and terraced, usually due to UMADEP (Forrester *et al*, 1996).
- 1995 - Horticultural crops for food and cash are cabbages, beans and peas grown in the rains (long and short) and tomatoes in the dry season (Forrester *et al*, 1996; Bhatia and Ringia, 1996).
- 1995 - Around houses in lower parts of the hills there are intensive home gardens (Forrester *et al*, 1996).
- 1995 - Some examples of using grass strips to stop erosion (Forrester *et al*, 1996).
- 1996 - Terraces and contour farming made using cascas grass and trees, banana groves, or pineapples. (Bhatia and Ringia, 1996).
- 1996 - Intensive home gardens using multipurpose trees occur (Bhatia and Ringia, 1996).
- 1996 - Zero and minimum tillage is practised (Bhatia and Ringia, 1996).

Forestry

- 1996 - Selective felling carried out to reduce soil erosion (Bhatia and Ringia, 1996).
- 1996 - Along the borders of farms tree planting has been carried out to reduce erosion (Bhatia and Ringia, 1996).

Problems

- 1995 - Food shortages at beginning of year for a few people (Forrester *et al*, 1996).
- 1995 - Not enough medicine for population (Forrester *et al*, 1996).

Environmental degradation

- 1995 - Timber coming into village from public land, villagers pay Wahehe to clear commercial trees before starting new shambas (Forrester *et al*, 1996; Bhatia and Ringia, 1996).
- 1995 - Much of forest burnt and planted with maize (Forrester *et al*, 1996 ; Bhatia and Ringia, 1996).
- 1995 - Much of remaining forest under planted with banana (Forrester *et al*, 1996).
- 1995 - Vegetation burnt during cultivation (Forrester *et al*, 1996; Bhatia and Ringia, 1996).
- 1995 - The duration of fallow has reduced due to land pressure (Bhatia and Ringia, 1996).
- 1995 - Villages collect firewood, building poles, medical plants, ropes, wild vegetables and wild game (Bhatia and Ringia, 1996).
- 1995 - Forest is felt to be important for water and soil conservation but many people want to get access to more land (Bhatia and Ringia, 1996).
- 2000 - Most of the public land forest now banana plantation (Hymas, 2000).
- 2000 - Little land left in Public area for cultivation (Hymas, 2000).

Projects in Area

- 1993 - UMADEP (Forrester *et al*, 1996).
- 2000 - UMADEP, UMBCP (Hymas, 2000).

Location : Matombo division

Agriculture

- 1950 - Bench terracing started (Temple, 1972).
- 1992 - Maize is the staple in the area, it is grown in both pure stands and mixed e.g. with cassava, beans, paddy and tree crops. (Masawe, 1992).
- 1992 - Cassava is sometimes found in pure stands or mixed with sweet potatoes, bananas and cocoyams. The biggest problem found with cassava is cassava mosaic virus (Masawe, 1992).
- 1992 - Intercropping is preferred as it saves labour, for instance the large canopy of cocoyams inhibits weed growth, planting and harvesting can be done together, yields are slightly higher than in monocrops. It also allows a more effective land utilisation and allows to minimise the effects of run off caused by heavy rainfall. (Masawe, 1992).
- 1992 - Fire is used for land clearance as it reduces labour and improves soil fertility. Crop rotation is not possible due to lack of land (Masawe, 1992).

1992 - Farmers indicated that land scarcity and lack of labour were the main problems in farming. Other problems include very low crop yields and high crop losses before and after harvesting, decline in soil fertility due to lack of soil fertility conservation, low levels of education, uncertain about the weather, poor market infrastructure, lack of transport and poor roads, poor farming implements, high population density, land fragmentation, ageing agricultural labour, farmers involvement in non agricultural activities, lack of credit facilities. (Masawe, 1992).

Environmental degradation

1968 - Large number of landslides (Temple, 1972).

Other

1898 - Matombo mission set up (Coniat *et al*, 1997).

Location Tawa village, Tawa ward, Matombo division, Morogoro rural district

Population

1988 - Population = 3,474 (Bhatia and Ringia, 1996).

1988 - Population of ward = 10,310 (Bhatia and Ringia, 1996).

Infrastructure

1996 - The village has a school, health centre, market, pharmacy, shops, church, mosque, milling machine, primary court, and co-operative union. (Bhatia and Ringia, 1996).

1996 - No forester of agricultural officer (Bhatia and Ringia, 1996).

1996 - Road is poor in rains (Bhatia and Ringia, 1996).

Traditions, Land tenure, Policy and Attitudes

1996 - Clan ownership is common and is inherited through mothers side (Bhatia and Ringia, 1996).

1996 - Forest perceived as a source of water and rainfall (Bhatia and Ringia, 1996).

Food and crops grown

1996 - Main food crops are maize, rice, cassava, millet, beans (Bhatia and Ringia, 1996).

1996 - Main cash crops are coffee, bananas, pineapples, black pepper, cardamoms, and rice. (Bhatia and Ringia, 1996).

Agricultural practices

1996 - During short rains (October to December) maize, rice, cassava and millet are planted. In January to February early maturing rice's, cassava and sorghum are planted. The main growing seasons in the long rains (March - June) (Bhatia and Ringia, 1996).

1996 - Maize and rice are intercropped (Bhatia and Ringia, 1996).

1996 - There are intensive home gardens (Bhatia and Ringia, 1996).

1996 - Perceived land shortage (Bhatia and Ringia, 1996).

1996 - There is relatively abundant land in the area (Bhatia and Ringia, 1996).

Forestry

1996 - Fuelwood is collected from surrounding Miombo woodlands (Bhatia and Ringia, 1996). (NOTE : During my visit I saw no evidence of Miombo woodland around Tawa village).

1996 - Land shortages is discouraging tree planting (Bhatia and Ringia, 1996).

1996 - Villagers see an important link between forest and rainfall (Bhatia and Ringia, 1996).

1996 - Tree planting in denuded areas. The retired foresters in these areas own private tree lots which supply poles and fuelwood for sale. (Bhatia and Ringia, 1996).

Environmental degradation

1996 - Soil fertility is low due to soil erosion caused by deforestation (Bhatia and Ringia, 1996).

1996 - Forest products are sold which is resulting in deforestation (Bhatia and Ringia, 1996).

Location Kiswira village, Kisemu ward, Matombo division.

Population

1988 - Population = 1,425 of which 45 % men (Bhatia and Ringia, 1996).

Infrastructure

1996 - Shops, milling machine, secondary school, sawmill. (Bhatia and Ringia, 1996).

1996 - Roads are passable (Bhatia and Ringia, 1996).

1996 - Extension services are poor (Bhatia and Ringia, 1996).

Traditions, Land Tenure, Policy and Attitude

1996 - The land is leased by the church, villagers have to pay in crops to cultivate this land. (Bhatia and Ringia, 1996).

1996 - The land for the village is leased from the Catholic mission, all trees planted belong to the mission so villages hesitate to plant any trees. A percentage of any produce from the farm also has to be paid to the mission (Bhatia and Ringia, 1996).

Food and crops grown

1996 - Main food crops are maize, rice, cassava, beans, sweet potatoes, sorghum, pigeon peas and simsim (Bhatia and Ringia, 1996).

1996 - Main cash crops are coconuts, citrus fruits, pineapples, jack fruit, avocados, coffee, mangoes, palm trees, coca and spices. (Bhatia and Ringia, 1996).

Agricultural practices

1996 - Maize is relay cropped with rice on hills and valleys. Maize and cowpeas are sometimes planted in the same hole and maize is often intercropped with other crops. (Bhatia and Ringia, 1996).

1996 - Three seasons for maize: during the short rains maize is intercropped with rice, in the long rains and planted in valley bottoms in may to June (Bhatia and Ringia, 1996).

1996 - Fertilisers are not used as there is not enough manure and inorganic fertilisers are not available. (Bhatia and Ringia, 1996).

1996 - Home gardens are common (Bhatia and Ringia, 1996).

Forestry

1996 - Tree planting in individual or village wood lots is common (Bhatia and Ringia, 1996).

1996 - All the trees planted belong to the church, due to land ownership. This covers a lot of land in the village. (Bhatia and Ringia, 1996).

1996 - The church is reluctant for villagers to plant their own trees and if they do so they have to pay a percent of the profits (Bhatia and Ringia, 1996).

Environmental degradation

1996 - Loss of fertility due to land shortages not allowing long fallow. Lack of land is also the reason for lack of erosion controls (Bhatia and Ringia, 1996).

Location: Mtamba village, Matombo division

Food and Crops Grown

1992 - Maize (47.2 acres), Cassava (48.9 acres), Cocoyams (51.4 acres), Oranges (36.6 acres), Pineapples(22.2 acres). Maize and Cassava are the main food crops. Oranges and Pineapples are grown on the least amount of land indicating that agriculture is for subsistence. (Masawe, 1992).

Agricultural practices

1992 - Average distance between farm and home is 7 km. (Masawe, 1992).
1992 - Labour bottlenecks during peak periods of harvesting and land preparation (November to February). (Masawe, 1992).

Location : Gozo village, Matombo division

Food and crops grown

1992 - Maize (33.9 acres), Cassava (33.4 acres), Cocoyams (17.8 acres), Oranges (30.1 acres), Pineapples(19.3 acres). Maize and Cassava are the main food crops. Oranges and Pineapples are grown on the least amount of land indicating that agriculture is for subsistence. (Masawe, 1992).

Agricultural Practices

1992 - Average distance between farm and home is 5km. (Masawe, 1992).

Location : Kilosa district

Gender issues

1994 - 85 % of families made the decision of what to plant together (Due *et al*, 1994).

Climate

c.1981 - Rainfall - less than 1000 mm per year (Due *et al*, 1994).

Soils / Topography

1994 - Altitude - 500 to 1000 meters (Due *et al*, 1994).

Food and Crops grown

1994 - Major crops grown are maize (2.5 acres of which 55 % consumed), sorghum (1.3 acres of which 53 % consumed), rice (1.3 acres of which 43 % consumed), cotton (acres 1.4 of which 7 % consumed), beans (0.5 acres of which 67 % consumed), cassava (0.1 acres of which 100 % consumed), pigeon peas (0.1 acres of which 96 % consumed), other crops (1.2 acres of which 65 % consumed). With Maize being the staple (Due *et al*, 1994).

Agricultural practices

- 1994 - one cropping per season, with sometimes a second planted after the first is harvested (Due *et al*, 1994)..
- 1994 - An average of 3.8 fields per family, totalling about 8.4 acres of which 50 % for food.(Due *et al*, 1994).
- 1994 - Land is prepared for maize in mid December the season ends in late September with the marketing of millet and beans. Between February and June there is a labour concentration (Due *et al*, 1994).

APPENDIX 4

Annotated Bibliography of some reserves that people have investigated.

Mountain Forest Reserves

Location Bunduki I and III Forest Reserves

Year established

1950 - Year gazetted = 1950 (anon).

Location

1993, 2000 - 7° 01' S, 37° 38' E 10 km from Mgeta via Bunduki Village. Bunduki I covers the slope and valley of the Mgeta river from 1220 to 1540 m, Bunduki III is a small reserve on level ground by the Mgeta river south west of Bunduki I at 1220 m. Bunduki I is marked on the topographical map as Vinile FR (Lovett *et al* 1993 and Doggart *et al*, 2000).

Area

1993, 2000 - Gazetted area : Bunduki I, 252 acres (102 ha); Bunduki III, 7.41 acres (3 ha) (Lovett *et al* 1993 and Doggart *et al*, 2000).
1993, 2000 - Gazetted boundary length : Bunduki I, 4.9 km (plus some distance along the Mungulu River); Bunduki III, 0.7 km (Lovett *et al* 1993 and Doggart *et al*, 2000).

Soils

1993 - Brown sandy loams over crystalline gneiss (Lovett *et al*, 1993).

Climate

1993 - Oceanic rainfall with oceanic temperatures. Nearest rainfall station: Bunduki. Estimated rainfall: 2000 mm/year. Dry season: June - July. Temperature range: 22°C max. (Dec.) to 17°C min (July). (Lovett *et al*, 1993).

Vegetation

- 1993, 2000 - Bunduki I is mostly a plantation of *Pinus* spp., *Eucalyptus* spp., Bamboo, *Cupressus* spp., *Grevillea robusta* and Avocado. In the undergrowth beneath the plantation, and occasionally within the plantation itself, montane forest trees and shrubs occur. Bunduki III is a small patch of montane or submontane forest on a swampy area by the river (Lovett *et al* 1993 and Doggart *et al*, 2000).
- 1993, 2000 - Montane forest: Trees to 20 m including: *Alangium chinense*, *Albizia gummifera*, *Anthocleista grandiflora*, *Bersama abyssinica*, *Cussonia spicata*, *Cylicomorpha parviflora*, *Draceana steudneri*, *Ficus sur*, *Harungana madagascariensis*, *Parinari excelsa*, *Polyscias fulva*, *Rauwolfia caffra*, *Syzygium guineense* subsp. *afromontanum*. (Lovett *et al* 1993 and Doggart *et al*, 2000).

Biodiversity

- 1993, 2000 - Although most of the area is a plantation of exotics, some bird, reptile and amphibian species of restricted distribution remain in the reserves. Bunduki III is just downstream of the reserve, in the Mgeta valley. It is a small patch of submontane riverine forest that is of traditional cultural importance, and which may also contain some species of restricted distribution (Lovett *et al* 1993 and Doggart *et al*, 2000).

Catchment values

- 1993, 2000 - The reserves protect part of the Mgeta river catchment. (Lovett *et al* 1993 and Doggart *et al*, 2000).

Human impacts

- 1955- 1980 - Substantial amount of forest seems to have been cleared, but there is evidence that the forest has extended along the eastern edge and in the south.. In 1955 there was 1.15 km² of forest and in 1980 there was 1.09 km² of forest. (Quinn, n.d. and Brantock, n.d.).
- 1993 - Bunduki Forest reserve has been clear felled leaving only exotic plantations (Svendsen *et al*, 1993).
- 1993, 2000 - The reserve is largely converted to exotic plantations, some of which are presently being harvested. Firewood and building poles are also taken from the reserve. The reserve is a useful seed source for exotics (Lovett *et al* 1993 and Doggart *et al*, 2000).
- 2000 - Chameleons and butterflies have been collected for trade and larger mammals all appear to have been hunted (Doggart *et al*, 2000).
- 2000 - Tourists are beginning to visit the reserve. They stay at the Bunduki Fly Fishing Lodge and visit the forest and spectacular Hululu Falls in neighbouring Uluguru South Forest Reserve. They are specialist tourists interested in seeing birds particularly Mrs Moreau's warbler and Loveridge's sunbird (Doggart *et al*, 2000).
- 2000 - There is a road through the reserve, which was being improved in August 2000 (Doggart *et al*, 2000).

Location Kasanga Local Authority Forest Reserve

Year established

1907 - Year gazetted = 1907 (anon).

Location

2000 - 07°10' S, 037°45' E. 1 km north of Kasanga Village. After Mvuha on the Morogoro – Kisaki road, turn towards Kolero. Beyond Kolero the road is passable in the dry season as far as Kasanga Mission. Walk from the mission. The reserve covers a gentle north-facing slope from 660 m to 940 m asl east of Kimhandu Peak in Uluguru South Forest Reserve. In the north it is bordered by the Msuluzi River and in the west by the Mkwega Stream, a small permanent stream (Doggart *et al*, 2000).

Vegetation

2000 - There is a mix of submontane forest and plantation forest. On the steep slopes above the Msuluzi River all forest has been burnt leaving an area of grass and scrub. Submontane forest begins in the north of the reserve at 720 m. Trees include *Syzygium guineense*, *Albizia gummifera* and *Spirostachys africana*. *Parinari* sp. and *Podocarpus* sp. are present but are not common. *Dracaena* is dominant in the understorey close to the river. During the German colonial administration *Khaya anthotheca* was planted in the centre of the reserve and *Mangifera indica* in the south. These are still dominant in those areas. Other exotics planted include *Theobroma cacao*. (Doggart *et al*, 2000).

Biodiversity

2000 - Kasanga is important in being one of the few places in the Uluguru Mountains with natural forest between 700 m and 900 m asl. It is the only place in the Uluguru Mountains where the rodent *Beamys hindei* has been recorded. (Doggart *et al*, 2000).

Catchment value

2000 - The reserve protects the Mkwega and Bustani streams that flow into the Msuluzi. The reserve is a source of water for the irrigation channels around Kasanga Village.

Human impacts

2000 - Under the German administration there was a forest post in the south of the reserve. The forest here was cleared and replaced with mango trees. The German houses are still visible beneath a tangle of vegetation. After Independence the forest officer managed a small nursery in the south-east of the reserve. This was closed in 1983 when the forest officer was relocated to Mvuha (Doggart *et al*, 2000).

- 2000 - The land immediately above the Msuluzi River has been cleared and is subject to frequent burning. The village has been planting *Senna siamea* in this area. Along the western border 24.7 acres (10 ha) of *Cedrela odorata* has been planted. (Doggart *et al*, 2000).
- 2000 - Four active or recently abandoned pitsaw sites were observed during the survey. The density of pitsawing is high given the inaccessibility of the reserve. Bird traps were observed above the Bustani stream. A frequently used path leading to Mvuha passes through the forest. This is used for the bush meat trade from the Selous (Doggart *et al*, 2000).

Location Nyandiduma Forest Reserve

Location

1993 - 7° 06' S, 37° 34' E. 8 km from Mgeta. Access is from Mgeta via Nyandira on the Luwale road which forms the upper boundary. The reserve is on a steep east facing slope above the Mbakama river covering an altitude of 1500 to 1600 m. There is a 14.6 ha (36 acre) enclave of public land (Lovett *et al*, 1993).

Area

1993 - Gazetted area = 118 acres (48ha), 140 acres on Jb 647 (Lovett *et al*, 1993).
1993 - Gazetted boundary length = 27,809 ft (8.5 km) (Lovett *et al*, 1993).

Soil

1993 - Sandy brown loams over crystalline gneiss (Lovett *et al*, 1993).

Climate

1993 - Oceanic rainfall with oceanic temperatures. Nearest rainfall station: Tchenzema Mission. Estimated rainfall: 1300 mm/year. Dry season: June - Oct. Temperature range: 20°C max. (Dec.), 15°C min (July). (Lovett *et al*, 1993).

Vegetation

1993 - Much of the reserve is a *Cupressus* sp. plantation with some *Acacia melanoxylon*, *Podocarpus* sp. and possibly *Widdringtonia* sp. Small patches of indigenous much disturbed secondary montane forest occur. (Lovett *et al*, 1993).

1993 - Secondary montane forest: *Albizia gummifera* trees up to 10 m tall over 2-3 m tall scrub. Trees include: *Albizia gummifera*, *Cussonia spicata*, *Draceana steudneri*, *Ensete ventricosa*, *Halleria lucida*, *Millettia oblata*, *Myrianthus holstii*, *Trema orientalis*. (Lovett *et al*, 1993).

Biodiversity

1993 - The reserve has no indigenous biodiversity values, but the planted *Podocarpus* sp. and other species might be useful seed sources (Lovett *et al*, 1993).

Catchment Values

1993 - The reserve has limited catchment values, but does serve to protect some steep slopes from erosion. (Lovett *et al*, 1993).

Human impact

1993 - The reserve is mostly a plantation. Although still rather small, the *Cupressus* sp. is being harvested by the village because it is infected by pests. 6000 seedlings of *Grevillea robusta*, *Cupressus* sp. and Black Wattle have just been planted in the tuangya system. *Albizia gummifera* poles are cut for building. Goats are grazed in the reserve. (Lovett *et al*, 1993).

Location Shikurufumi Forest Reserve

Year established

1993, 2000 - Reserve established in either 1948 or 1937. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Location

1993, 2000 - 7° 09' - 7° 11' S, 37° 31' E. 20 km from Mgeta, at an altitude of 1100 meters. Access is from Mgeta through Langali, Nyandira, Kibuko, Luale to Kidege. The road to the reserve is in poor condition, but the road to Kikeo mission passing through the reserve is in quite good condition and not under heavy pressure. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Area

1993 - Gazetted area = 642 acres (269 ha) (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993 - Gazetted boundary length = 29,753 ft (9.1 km) (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Soils

1993, 2000 - Sandy brown loams over gneissic basement rocks. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Climate

1993, 2000 - Oceanic rainfall with oceanic temperatures. Nearest rainfall station: Kibuko Coffee Plantation. Estimated rainfall: 1500 mm/year. Dry season: June - Oct. Temperature range: 22°C max. (Dec.), 17°C min (July). (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Vegetation

1993, 2000 - The reserve is mostly covered by submontane forest, part of which appears to be old secondary growth. The edges of the forest are scrubby regeneration and are probably influenced by fire. In the centre of the reserve is a clearing which may be edaphic or the site of an old village and is now influenced by fire. On the southern edge there is a *Eucalyptus* sp. plantation. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - Submontane forest: Old secondary areas on the top of the ridge have a fairly open canopy 15-20 m high dominated by *Macaranga kilimandscharica* with: *Alangium chinense*, *Albizia gummifera*, *Bridelia micrantha*, *Cussonia spicata*, *Harungana madascariensis*, *Polyscias fulva*, *Trema orientalis*. *Aframomum* sp. dominates the herb layer. On more sheltered slopes, more mature areas of forest have a closed canopy 25-30 m high with: *Afrosersalisia cerasifera*, *Entandrophragma excelsum*, *Macaranga capensis*, *Myrianthus holstii*, *Newtonia buchananii*, *Odyndea zimmermannii*, *Parinari excelsa*, *Strombosia scheffleri*, *Trichoscypha madagascariensis*, *Trilepisium madagascariensis*. On the forest edge, scrubby regeneration includes: *Bersama abyssinica*, *Catha edulis*, *Cussonia spicata*, *Macaranga kilimandscharica*. The clearing in the forest is covered by bracken with occasional *Agauria salicifolia* and *Myrica salicifolia* trees. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Catchment values

1993, 2000 - Shikurufumi stream originates in the reserve and flows through Lukungule village to Mbakana river through Kikeo mission. On the north east side water is taken from the forest via irrigation channels to Kododo Kitongoji Bomo. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Biodiversity

1993 - The forest is of the Eastern Arc type and has various species of restricted distribution. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Human impacts

1955-1980 - Tchenzema region, the forest here has shrunk considerably between 1955 and 1980, with there being 1 km² of forest in 1955 and 0.44 km² of forest in 1980 (Quinn, n.d. and Bantock, n.d.).

1993, 2000 - On the ridge tops the forest appears to be in an old secondary successional stage, and the central clearing in the reserve may be the result of former inhabitation. Local people do not remember cultivation or habitation within the reserve and disturbance may date back several hundred years. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - The road to Kikeo mission (the Kibuko to Mkinha road as mentioned in the schedule) passes through the reserve, but is no longer used by motor vehicles. Formerly there was a mica mine and small farm on the southern edge of the reserve this area is still cultivated by local people. There are many eucalyptus trees around the old mine buildings. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - There is some cutting for firewood and building poles but this is not extensive. *Eucalyptus* sp. poles are taken for building from regeneration in the *Eucalyptus* sp. plantation. Medicine is taken from the reserve, notably bark from *Entandrophragma excelsum* and *Myrica salicifolia* trees. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Location Uluguru North Forest Reserve

Year established

1960 - Year established 1909 (Young and Fosbrooke, 1960)
1963 - Year gazetted 1963 (Anon)

Location

1993 - 6° 51' - 7° 01' S, 37° 37' - 37° 45' E. 6 km from Morogoro. Access is from the Morogoro to Morningside road on the western side, and Tegetero on the eastern side. The reserve covers the steep summit ridge and easterly slopes of the northern half of Uluguru Mountains between Morogoro town and the Mgeta - Bunduki depression, within an altitudinal range of 1000 and 2340 m. From north east to south west the main summits are: Lupanga (2138 m), Kinazi (2150 m), Bondwa (2120 m), Nziwane (2270 m), Magari (2340 m), Miwa (1900 m), Mnyanza (2140 m) and Kifuru (2010 m) (Lovett *et al*, 1993).

Area

1993 - Gazetted area = 20,649 acres (8356 ha) (Lovett *et al*, 1993).
1993 - Gazetted boundary length = 223,628 ft (68 km) (Lovett *et al*, 1993).

Soil

1993 - Acidic lithosols and ferralitic red, yellow and brown latosols have developed over Precambrian granulite, gneiss and migmatite rocks (Lovett *et al*, 1993).

Climate

1993 - Oceanic rainfall with oceanic temperatures. Nearest rainfall stations: Kinole Primary School, Morningside Farm, Tegetero Mission. Estimated rainfall: 1200-3100 mm/year on the western slopes, 2900-4000 mm/year on the eastern slopes. Dry season: Not marked. Temperatures: 22°C max. (Dec.), 17°C min (July) at lower altitudes (Lovett *et al*, 1993).

Vegetation

1993 - With the exception of rock outcrops, the reserve is entirely covered in moist forest. Submontane forest occurs on the eastern slopes between 800 and 1500 m above sea level, with the best stands above Kinole and Tegetero villages. On the western slopes this forest type is restricted to valley bottoms near to the lower edge of the forest reserve. Montane forest occurs between 1500 and 1900 m altitude. Upper montane forest occurs above 1900 m altitude on wetter slopes and ridges in the cloud belt, with stunted elfin forest on the highest ridges. Landslides occur (Lovett *et al*, 1993).

- 1993 - Submontane forest: Canopy 30-50 m tall with: *Albizia gummifera*, *Allanblackia stuhlmannii*, *Aningeria adolfi-friedericii*, *Anthocleista grandiflora*, *Cephalosphaera usambarensis*, *Cylicomorpha parviflora*, *Funtumia africana*, *Myrianthus holstii*, *Sapium ellipticum*, *Syzygium guineense* subsp. *afromontanum*. Trees and shrubs include: *Chlamydostachya spectabilis*, *Lagynias pallidiflora*, *Micrococca holstii*, *Psychotria* spp. and *Pavetta* spp, *Pseuderanthemum campylosiphon*, *Memecylon cognauxii* and *M. myrtilloides*, *Mesogyne insignis*, *Micrococca holstii*, *Oxyanthus speciosus*, *Peddiea fischeri* and *P. subcordata*. *Commelinaceae* subshrubs include *Palisota orientalis*, *Pollia condensata* and *P. bracteata*. Herbs include: the *Zingiberaceae*, *Aframomum* spp. and *Renealmia engleri* with broad leaved grasses such as *Leptaspis cocleata*. On shady cliffs the large *Antrophium mannianum* fern is typical, and a common canopy epiphyte is the giant nest fern *Asplenium nidus*. In drier areas on the lower edge of the forest, usually below 1000 m, a semi-evergreen submontane forest type also occurs, dominated by *Albizia gummifera* and *Milicia excelsa*. (Lovett *et al*, 1993).
- 1993 - Montane forest: The canopy is much less complex than in the previous type and usually consists of a single layer of 15-30 m tall trees. The dominant species are *Bridelia brideliifolia*, *Cornus volkensisii*, *Cussonia spicata*, *Ficalhoa laurifolia*, *Ocotea usambarensis*, *Podocarpus latifolius*, *Syzygium guineense* subsp. *afromontanum* and *Zenkerella capparidacea*. Shrubs include: *Chassalia parviflora*, *C. violacea*, *Lasiodiscus usambarensis*, *Galineria coffeoides*, *Erythrococca usambarica*, *Euphorbia usambarica*, *Memecylon myrtilloides*, *Mostuea brunonis*, *Psychotria* spp. and *Pavetta* spp, and along streamlets large stands of the treefern *Cyathea manniana* occur. There are many epiphytic ferns and even in the ground layer ferns are the dominants, for example: *Asplenium hypomelas*, *Blotiella stipitata*, *Ctenitis lanuginosa*, *Diplazium pseudoporrectum*. On drier slopes and ridges a drier type of montane forests occurs with *Olea mildbraedii* and *Cussonia lukwangulensis* in the canopy, and *Blechnum ivohibense*, *P. punctulatum* and *Gleichenia* species in the herb layer. (Lovett *et al*, 1993).
- 1993 - Upper montane forest: Canopy 15-20 m tall with: *Allanblackia ulugurensis*, *Balthasaria schliebenii*, *Podocarpus latifolius*, *P. ensiculus*, *Rapanea melanophloeos*, *Rauvolfia volkensisii*, *Schefflera myriantha* and *S. barberi*. Epiphytes include the endemic orchids *Stolzia* spp. The trees and forest floor are thickly covered by bryophytes, which contribute to the catchment value. Shrubs include: *Lasianthus* spp. of which 8 are endemic, and the tree ferns, *Cyathea manniana*, the subendemic *C. pumila* and the endemic *C. fadenii* and *C. schliebenii*. On the mossy ground several endemic *Impatiens* spp. (like *I. uluguruensis*), *Cincinnobotrys oreophila*, endemic *Linnaeopsis* spp. and *Streptocarpus* spp. (like *S. bullatus*) are typical. Elfin forests cover the highest summits and sharp ridges above 2100 m (but at windy, misty habitat sometimes down to about 1800 m altitude), where the shallow soil is completely leached and peaty. The canopy is 2-6 m tall with: *Agauria salicifolia*, *Allanblackia uluguruensis*, *Balthasaria schliebenii*, *Cussonia lukwangulensis*, *Garcinia volkensisii*, *Podocarpus ensiculus*, *P. latifolius*, *Syzygium cordatum*, *Ternstroemia polypetala*, *Polyscias stuhlmannii* and *Lobelia lukwangulensis*. The trees form a tight, dense canopy, with masses of bryophytes and tiny, endemic orchids, like *Tridactyle brevifolia*. Dwarf shrubs, like the monotypic endemic *Dionychastrum schliebenii* (on Magari peak), the endemic *Stapfiella ulugurica* and *Streptocarpus hirsutissimus* (on Lupanga peak), also occur in this habitat. Bamboo (*Sinarundinaria alpina*) thickets occur in the elfin forest on the sharp north ridge of Magari peak. (Lovett *et al*, 1993).

Biodiversity

1993 - The forests are of the Eastern Arc type and so are rich in species of restricted distribution. More than 40 endemic species of woody plant are recorded from the Uluguru mountains. The genera of *Impatiens*, *Lasianthus*, *Linnaeopsis* and *Stolzia* contain many endemics and monotypic endemics and near endemics are; *Chlamydostachya spectabilis*, *Dionychastrum schliebenii*, *Sooia macrantha* and *Urogentias ulugurica*. The Uluguru mountains have three endemic or subendemic giant *Lobelia* species: *L. morogoroensis* in submontane forest, *L. longisepala* in montane forest and *L. lukwangulensis* in upper montane forest. There are many subendemic species which also occur in the Usambara or Nguru mountains (Lovett *et al*, 1993).

Catchment Value

1993 - The catchment value is very high as the area has one of the highest rainfalls in Tanzania without a marked dry season. On eastern side the reserve is part of the Ruvu river catchment, and supplies Dar es Salaam with water. On the western side it supplies Morogoro town and villages on the mountain slopes.

Human Impact

1955-1980 - Rubwe region, there have been slight changes in forest between 1955 and 1980 with a total of 1.31 km² of forest being lost. In 1955 there was 18.7 km² of forest while in 1980 there was 17.39 km² of forest. (Quinn, n.d. and Bantock, n.d.).

1955-1980 - Bunduki region, 1.8 km² of forest was lost between 1955 and 1980. with there being 5.24 km² of forest cover in 1955 and 3.44 km² of forest cover in 1980 (Bantock, n.d.).

1993 - The area adjacent to the reserve is intensively cultivated. Although the forest boundaries are well marked and seemingly intact, many encroachments occur and illegal logging takes place. Pole collecting for building purposes has resulted in most regeneration being removed from areas near the edge of the reserve. Heavy rains have caused serious landslides several times in the area. Fires lit at the end of the dry season cause serious damage every year in the forest reserve. The steep slopes result in the fires spreading rapidly in dry bush and grasslands neighbouring the forest. The area most affected are the slopes of Lupanga above Morogoro town. (Lovett *et al*, 1993).

Location Uluguru South Forest Reserve

Year established

1909 - Year established 1909 (Young and Fosbrooke, 1960).

Location

1993, 2000 - 7° 01' - 7° 12' S, 37° 36' - 37° 45' E. 10 km from Morogoro, 5 km from Mgeta. Access is from Mgeta via Tchenzema or Bunduki. The reserve covers the southern half of the Uluguru mountains from about 1200 m upwards on the east and from 1800 m on the western slopes to the summits of Makumbaku (2420 m), Kimhandu (2634 m) and Lukwangule Peak (2638 m). The 20 km² Lukwangule Plateau lies between two parallel north - south ridges at an altitude of over 2300 m. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Area

1993 - Gazetted area = 42,731 acres (17,293 ha) (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993 - Gazetted boundary length = 360,490 ft (36.3 km) (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Soils

1993, 2000 - A wide range of acidic lithosols and ferralitic red, yellow and brown latosols have developed on Precambrian granulite, gneiss and migmatite rocks. A large area of the Lukwangule Plateau is covered by peat deposits. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Climate

1993, 2000 - Oceanic rainfall with oceanic temperatures. Nearest rainfall stations: Bunduki Kibungo mission, Tchenzema Mission. Estimated rainfall: 2500-4000 mm/year on the eastern slopes and summit to 2000 mm/ year on the western slopes. Dry season: On the eastern slopes there is no marked dry season, on the western slopes there is a dry season of from June - July. Temperature: 20°C max. (Dec.), 15°C min (July) at lower altitudes. On the Lukwangule plateau frosts are common on clear nights during the cool season (measured down to -7°C). (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Vegetation

1993 - Basal area on : -

(Svendsen *et al*, 1993 b).

	Total BA (m ² /ha)	No. of stems	No. of individuals	No. of species	Canopy base	Height of mid-	Height of canopy	Height of emergent
Kimhandu (1510 m)	141.57	91	84	26	5-6 m	10-12 m	20-30 m	40 m
Kimhandu (1710 m)	39.64	152	145	34	3-4 m	6-8 m	20-30 m	55 m
Kimhandu (1940 m)	50.21	157	142	28	6-10 m	10-15 m	25-30 m	45 m
Kimhandu (2145 m)	136.12	146	141	27	6-8 m	10-12 m	20-25 m	35 m
Kimhandu (2520 m)	37.28	170	136	17	3-5 m	5-7 m	12-15 m	25 m
Lanzi (1710 m)	99.81	101	98	20	6-8 m	15-20 m	24-28 m	40 m
Lanzi (1920 m)	89.20	233	222	30	6-8 m	15-20 m	25-30 m	40 m
Lanzi (2110 m)	82.75	100	93	93	8-10 m	20-25 m	27-30 m	40 m

1993, 2000 - The eastern and western slopes are covered by moist forest, which surrounds the upland grassland, swamps and forest patches of the Lukwangule plateau. Montane forest occurs from 1500-2400 m, and upper montane forest above 2000 m. Bamboo thickets cover large areas in the upper Mgeta valley and on Kimhandu summit, usually above 2000 m, but also as low as 1600 m in the Mgeta River Valley above Hululu Falls. Landslides occur. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - Montane forest. No data, but presumably similar to Uluguru North montane forest. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - Upper montane forest: Canopy 10-15 m tall. Trees on the eastern side include: *Bersama abyssinica*, *Cassipourea malosana*, *Cornus volkensii*, *Cussonia lukwangulensis*, *C. spicata*, *Dombeya torrida*, *Draceana afromontana*, *Garcinia volkensii*, *Halleria lucida*, *Podocarpus latifolius*, *Rapanea melanophloeos*, *Maesa lanceolata*, *Mystroxydon aethiopicum*, *Nuxia congesta*, *Ocotea usambarensis*, *Polyscias stuhlmannii* and *Xymalos monospora*. Bamboo thickets form dense stands of *Sinarundinaria alpina* 12-15 m tall and 15 cm diameter, with the commonest species in the ground flora being *Selaginella kraussiana*. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - Grasslands and tree clumps: Grasslands on the Lukwangule plateau consisting of *Panicum lukwangulense* and *Andropogon thystinus* with scattered trees of *Agauria saliciflora*, *Adenocarpus mannii*, *Myrica salicifolia* and *Berberis* sp. are thought to have replaced upper montane forest following fire. Forest patches contain the trees: *Apodytes dimidiata*, *Cussonia lukwangulensis*, *Ochna oxyphylla*, *Olea capensis*, *Pittosporum goetzei*, *Syzygium cordatum*, *S. parvulum*; and the giant herb *Lobelia lukwangulensis*. At the Ruvu river springs, peat bogs formed by *Sphagnum* spp, *Eriocaulon schimperi* and *Pycreus nigricans* occur. In boggy places afroalpine species, such as *Ranunculus oreophytus* and *Alchemilla johnstonii* occur. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Catchment values

1993, 2000 - The catchment value of the reserve is extremely high. It covers one of the highest rainfall areas in Tanzania, feeding the Ruvu river which supplies Dar es Salaam. The locally important Mgeta river also originates in the reserve. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Biodiversity

1993, 2000 - The forests are of the Eastern Arc type and so are rich in species of restricted distribution. The Uluguru mountain forests contain more than 40 endemic woody species, and they are particularly rich in endemic species of the genera; *Impatiens*, *Lasianthus*, *Linnaeopsis* and *Stolzia*. Monotypic endemics are; *Dionychastrum schliebenii* and *Sooia macrantha*. *Moraea callista* occurs on the Lukwangule plateau. The wetter eastern part of the reserve is not known botanically and is likely to contain many species of restricted distribution. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Human impacts

1955--1980 - Nyingwa area small clearing were appearing in 1980. In 1955 there was 7.82 km² of forest while in 1980 there was 6.65 km² of forest in total the Nyingwa region has lost 1.77 km² (Quinn, n.d. and Bantock, n.d.).

1955-1980 - Tchenzema region the forest does not seem to have changed between 1955 and 1980, with 4.34 km² of forest in 1955 and 4.32km² in 1980 (Quinn, n.d.).

1955-1980 - Bunduki region, 3.02 km² of forest was lost between 1955 and 1980. With 7.52 km² of forest cover occurring in 1955 and 4.50 km² of forest cover occurring in 1980 (Bantock, n.d.).

1993 - The very south seems untouched by man. (Svendsen *et al*, 1993).

1993 - In Lanzi area pitsawing only occurs to a limited extent (Svendsen *et al*, 1993).

1993 - Above Tchenzema the forest is strongly disturbed, only being undisturbed above 2350 meters) (Svendsen *et al*, 1993).

1993 - Forest west of Lukwangule Plateau is heavily used for poles and firewood, with all the large timber having been extracted here (Svendsen *et al*, 1993).

1993 - Bunduki area nearly all the large timber has been extracted, with the forest being only 10-15 m tall below 2300 meters, it is more like secondary growth (Svendsen *et al*, 1993).

1993, 2000 - The reserve is surrounded by cultivation. The Mgeta valley is an important agriculture area producing vegetables which supply Morogoro and Dar es Salaam, the slopes above Tchenzema are cultivated up to 2000 m altitude. Building poles are intensively collected in areas adjacent to cultivation. Encroachment is common and logging is carried out. Heavy rainfall on steep deforested slopes has resulted in serious landslides. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

2000 - Local people are hunting *Cercopithecus mitis*, *Colobus angolensis* and *Cephalophus spadix*. There is also trade in chameleons which are sold to a Uluguru trader in Dar es Salaam. (Doggart *et al*, 2000).

Location Vigoza Forest Reserve

Year established

1993 - Year established = 1947 (Lovett *et al*, 1993).

Location

1993 - 7° 06' S, 37° 35' E. 12 km from Mgeta. Access from Mgeta to Nyandira and then to Tchenzema and by foot on the old road to the mission. The reserve covers a slope above the Vigoza river from an altitude of 1700 m (Lovett *et al*, 1993).

Area

1993 - Gazetted area = 23 acres (9 ha) (Lovett *et al*, 1993).

1993 - Gazetted boundary length = 5,487 ft (1.7 km) (Lovett *et al*, 1993).

Soil

1993 - Sandy brown loams over gneiss (Lovett *et al*, 1993).

Climate

1993 - Oceanic rainfall with oceanic temperatures. Nearest rainfall station: Tchenzema. Estimated rainfall: 1200 mm/year. Dry season: June - Oct. Temperature range: 20°C max. (Dec.), 15°C min (July). (Lovett *et al*, 1993).

Vegetation

1993- The reserve was formerly a *Cupressus* plantation which was harvested and is now a vegetable garden. There is a *Polyscias fulva* tree still standing in the reserve. (Lovett *et al*, 1993).

Catchment Values

1993 - The reserve is bounded by the Vigoza river on the north west side and the Mhongolo river on the south side. Reforestation would help control runoff and soil erosion into these rivers. (Lovett *et al*, 1993).

Human Impact

1993 - The reserve is a cultivated field. The Mgeta to Tchenzema road traverses the reserve (Lovett *et al*, 1993).

Foothill forest Reserves

Location Mvuha and Chamanyani Forest Reserve

Location

1993, 2000 - 07° 08' - 07° 13' S, 37° 47' - 37° 51' E. 30 km from Kimboza. Access is from the Kimboza to Mvuha road, which traverses Chamanyani FR near the eastern boundary, and by foot up the southern side of the Mvuha river to Mvuha FR. The reserve covers hilly country to the east of the Uluguru mountains and part of the Mvuha river valley from an altitude of 140 to 400 m (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Area

1993 - Gazetted area = 3724 acres (1506 ha) (Lovett *et al*, 1993).
1993 - Gazetted boundary length estimated to be 48 km (Lovett *et al*, 1993).

Soils

1993, 2000 - Brown sandy soils over crystalline gneiss under the woodlands with more humus and occasionally flooded sandy loams in the Mvuha valley. Richly calcareous slopes are recorded from the eastern side of Bewa Hill. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Climate

1993, 2000 - Oceanic rainfall with oceanic temperatures. Nearest rainfall stations: Bwikira Juu, Mkuyuni. Estimated rainfall: 1400 mm/year. Dry season: June - Sep. Temperature range 28°C max. (Dec.), 23°C min (July) (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Vegetation

1993, 2000 - Most of the reserve is covered by woodland or wooded grassland, the more open areas of which appear to be maintained by fire. Valleys and valley heads are forested (Lovett *et al*, 1993 and Doggart *et al*, 2000).
1993, 2000 - Woodland: Trees 5-10 m tall with: *Albizia versicolor*, *Brachystegia boehmii*, *B. spiciformis*, *Cassia abbreviata*, *Pterocarpus angolensis*, *Sclerocarya caffra*. (Lovett *et al*, 1993 and Doggart *et al*, 2000).
1993, 2000 - Riverine forest: Canopy 20-25 m with: *Antiaris toxicaria*, *Khaya*, *Milicia excelsa*, *Ricinodendron* sp., *Sorindeia madagascariensis* and *Sterculia appendiculata*. (Lovett *et al*, 1993 and Doggart *et al*, 2000).
2000 - Riverine forest : The cycad *Encephalartos hildebrandtii* (to be confirmed) is common around the streams leading into Mvuha River (Doggart *et al*, 2000).

Biodiversity

- 1993 - The woodlands are composed of widespread species, but it is likely that the riverine forests contain some Eastern Arc and Coastal Forest species of restricted distribution. The Red Colobus (Mbega Nekundu) was reported by the local forester but was not seen. If it occurs then it is an important indicator of high biodiversity (Lovett *et al*, 1993).
- 2000 - The reserve has many species typical of lowland forests. However the *Cercopithecus* sp. appear to be quite different to blue monkeys in the Usambara Mountains. Red fur extends from between the shoulders to the base of the tail on males and females, the forelegs and hind legs are black as is the nose and mouth. (Doggart *et al*, 2000).

Catchment values

- 1993, 2000 - The reserve protects a number of small catchments feeding into the Mvuha river, and the banks of the Mvuha river itself. There are seasonal water courses in the woodland. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Human impacts

- 1993 - Mvule and Mkangazi were extracted from the reserve many years ago. More recently the reserve was encroached due to lack of boundary marking. Building poles and firewood are taken for local use. Fire occurs every year. Ancient graves are marked on the 1910 border map on the western side of Mvuha FR (Lovett *et al*, 1993).
- 2000 - There is pitsawing in the reserve although most of the *Milicia excelsa* and *Khaya anthotheca* were extracted from the reserve many years ago. In the 1980's the reserve was encroached due to lack of boundary marking. The marking of the boundary has not been completed and beacons are missing. Along the Mvuha miners are panning for rubies and gold. They have established camps on the banks of the river. Building poles and firewood are taken for local use. Fire occurs every year. Ancient graves are marked on the 1910 border map on the western side of Mvuha FR. Maasai graze their cattle in the east of the reserve. (Doggart *et al*, 2000).

Location Ruvu Forest Reserve

Date established

1993, 2000 - Established in 1955 (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Location

1993, 2000 - 6° 53' - 7° 02' S, 37° 49' - 37° 54' E. Access is from the Mkuyuni to Matombo road. The reserve is in the eastern Uluguru mountain foothills, covering a plateau on either side of the Ruvu River gorge at an altitude of to 200 m to 480 m asl. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Area

??? - Gazetted area 7,640 acres (Anon.).

Soils

1993, 2000 - Tropical rendzina on dolomitic marble (in the western half) and red ferrallitic latosols on Precambrian granulite and gneiss (in the eastern half). (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Climate

1993, 2000 - Oceanic rainfall with oceanic temperatures. Nearest rainfall station: Kibungo. Estimated rainfall: 1800 mm/year on the western edge with peaks in Dec. and May, decreasing rapidly eastwards. Dry season: July to Sept. on the western edge, longer in the east of the reserve. Temperature: 28° C max. (Dec.), 23° C min (July). (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Vegetation

1993, 2000 - The western half of the reserve is covered with seasonal lowland forest. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - Lowland forest: Canopy trees include: *Albizia gummifera*, *Khaya anthotheca* (formerly *K. nyasica*), *Milicia excelsa*, *Parkia filicoidea*, with *Barringtonia racemosa* on the stream bank. Smaller trees include: *Scorodophloeus fischeri* with *Acridocarpus cf. scheffleri*, *Meineckia fruticans*, *Pycnocomma macrantha*, *Rawsonia reticulata*, *Afrosersalisia cerasifera*, *Diospyros* sp. Shrubs include: *Dorstenia cameruniae* and *Psychotria cf. riparia*. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

2000 - In the east there is mixed woodland with *Brachystegia* sp. and *Acacia* sp. At the transition between lowland forest and woodland *Acacia polyocantha*, *Annona senegalensis*, *Markhamia obtusifolia* and *Lannea stuhlmannii* are common. (Doggart *et al*, 2000).

Biodiversity

1993, 2000 - The forests are of the Eastern Arc and Coastal forest type and so will be rich in species of restricted distribution. An Eastern Arc endemic is *Pycnocomma macrantha*. *Rawsonia reticulata* occurs here below its normal altitudinal range. Ruvu Forest Reserve might be an important link in the chain of coastal lowland forests. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Catchment values

1993, 2000 - The area protects the banks of the Ruvu river, and is part of the catchment. The Ruvu River supplies Dar es Salaam with water. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

Human impacts

1993 - Ruby mining takes place in the reserve (Svendsen *et al*, 1993).

1993, 2000 - The most serious disturbance in the forest is caused by ruby mining as the reserve is one of the most important localities for this gemstone in Tanzania. Licensed mining causes much damage, but is restricted to a licensed area. Unlicensed mining is carried out in many places in the reserve, the soil cover is removed and the whole area is much disturbed by the digging. Miners have also established camps on the banks of the Ruvu River where they can pan for gold. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

1993, 2000 - Encroachment by small scale farming and fire also causes damage near the villages of Kibungo and Kibangile. (Lovett *et al*, 1993 and Doggart *et al*, 2000).

2000 - Duiker and bush pig are being hunted. (Doggart *et al*, 2000).

Lowland Forest Reserves

Location Kimboza Forest Reserve

Year established

1983 - Year established = 1964. (Lovett *et al*, 1993).

Location

1983 - 7°00'S, 37°48'E. Kimboza Forest lies astride the Ruvu River and is crossed by the main Morogoro to Kisaki road (Rodgers *et al*, 1983).

1993 - 6° 59' - 7° 02' S, 37° 47' - 37° 49' E. Access is from the Morogoro to Kisaki road between Mkuyuni and Matombo villages. The reserve is in the eastern Uluguru foothills covering a karstic plateau south of Kibungo Mission at an altitude of 300 to 400 m. (Lovett *et al*, 1993).

Area

1983 - Gazetted area: 951 acres (385 ha) (Rodgers *et al*, 1983).

1993 - Gazetted boundary length: 11 km (Lovett *et al*, 1993).

Topography

1983 - The reserves goes from 180 m to 500 m (Rodgers *et al*, 1983).

Soils

1983 - Kimboza Forests is on calcite and dolomite marbles of the Matombo Group. The marble gives rise to a karstic landscape, with large isolated blocks and pinnacles of marble. (Rodgers *et al*, 1983).

1983 - Soil are moderately good for agriculture, but are probably highly leached of their calcium parent material due to the high rainfall (Rodgers *et al*, 1983).

1993 - Tropical rendzina on Precambrian dolomitic marble base rocks. (Lovett *et al*, 1993).

Climate

1983 - Annual rainfall 1683 mm with only 3 months getting less than 50 mm (records over 13 years) . The major rainy season is from November to April. Temperatures are high with a cool season from May to August. Humidities remain high for much of the year. (Rodgers *et al*, 1983).

1993 - Oceanic rainfall with oceanic temperatures. Nearest rainfall station: Kibungo. Estimated rainfall: 1700 mm/year with groundwater. Dry season: June - Aug. Temperature: 28°C max. (Dec.), 23°C min (July) (Lovett *et al*, 1993).

Vegetation

- 1983 - Kimboza forest is virtually all lowland rain forest with a closed canopy to 20 m, in places 30 m and with emergent up to 40 m. A distinct middle story at 10-15 m and a shrub layer from 2-5 m are present. Trees of the Leguminosae, *Moraceae* and *Sapotaceae* dominate the canopy layer. (Rodgers *et al*, 1983).
- 1983 - Major emergent species are *Antiaris toxicaris*, *Aningerias pseudoracemosa*, *Chlorophora exelsa*, *Cordyla africana*, *Ficus* spp., *Parkia filicoidea*, *Rhodognaphalon scumaniuanum*, *Riciniodendron heudolottii*, *Sterculia appendiculata*. (Rodgers *et al*, 1983).
- 1983 - Main canopy species are, *Cussonia zimmermannii*, *Dialium holtzii*, *Newtonia paucijuga*, *Scorodophleus fischeri* and *Tessmanai* sp. nov. (Rodgers *et al*, 1983).
- 1983 - The middle story is dominated by *Scorodophleus* and *Sorindela madagascariensis*. These two trees are the commonest trees above 20 cm in diameter in the forest. Other components are *Bequartiodendron natalense*, *Diospyros brucei* and *D. verrucosa*, *Drypetes natalensis*, *Funtumia africana*, *Lannea antiscorbutica*, *Lettowianthus stellatus*, *Rauwolfia mombasiana*, *Pandanus goetzel* and *Uvarioidendron gorgonis*. (Rodgers *et al*, 1983).
- 1983 - The shrub layer is variable, but the following are most frequent *Allophylus* spp. *Cola* spp., *Diospyros greenwayi*, *Grandidiera bolvinii*, *Leptonychia usambarensis* (rarely seen as a tree), *Ophrypetalum odoratum* and several *Rubiaceae*. (Rodgers *et al*, 1983).
- 1983 - The herb layer depends on surface conditions. *Costus* is frequent in damper areas. Several *Acanthaceae* occur and grasses are not common, although *Olyra latifolia* and *Setaria megaphylla* are conspicuous in patches. A rocky community with many succulent herbs: *Amorphophallus*, *Dorstenia denticulata*, *Gonatopus*, *Impatiens cinnabarina*, *Laportea*, *Steptocarpus*, *Kimbozanus* and *Zamioculcas* is widespread (Rodgers *et al*, 1983).
- 1983 - Lianess are common and include *Acacia* sp., *Combretum* spp., *Coccinia*, *Entada*, *Grewia*, *Hippocratea*, *Landolphia*, *Paullinia* and *Saba*. (Rodgers *et al*, 1983).
- 1983 - Epiphytes are conspicuous due to the abundance of large ferns, *Platyserium* and *Asplenium nidus*, Orchids are rare and include small *Aerangis*, *Angraceum* and *Bulbophyllum*. (Rodgers *et al*, 1983).
- 1993 - The predominant natural vegetation type is seasonal lowland forest formerly with a 30-40 m high canopy of tall emergent, most of which have now been extracted. Within the forest protruding metamorphosed limestone karsts are a prominent feature (Lovett *et al*, 1993).