

**FOREST RESOURCE MANAGEMENT FOR SUSTAINABLE
DEVELOPMENT: A CASE OF MOUNT MERU FOREST
RESERVE IN NORTHERN TANZANIA.**

By
Ufoo C. Lema

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Abstract

Management systems as applied to most of the world's tropical forests are anthropocentric. In view of this, conservation of these ecosystems has been threatened by overuse and pressure of exotic monocultures. Sustainable forest development aims at utilizing the forest resource without unduly degrading the forest ecosystems.

This study examines the case of Mount Meru forest reserve, a tropical montane rainforest in northern Tanzania. The main aim of the study is to investigate human induced causes of forest degradation and to propose ways to improve the forest management so as to attain sustainable forest development. The study is based on survey data obtained from the study area through semi-structured interviews conducted with 198 key informants. Social study methods have been used for data analysis and interpretation.

It has been found that human instinct, both at the individual level and at community and national levels, emphasizes short-term gain, threatening long-term survival. This has resulted in exploitative use of the forest ecosystem reducing options for its future use. Implementation of forest policies to intensify forest conservation is difficult due to poor supervision, partly caused by the extensiveness of the areas involved, and the large population dependent on forest resources for survival. Raising awareness of the implications of human actions on these ecosystems is found to be an essential prerequisite for enabling change in attitudes and behaviour and a move towards actions necessary to generate sustainable development. Co-operative ingenuity in relation to the use and allocation of forest resources is essential. This necessitates considerations for the predicament of the majority poor. Consistent review of government policies is also important. It is recommended that local communities be involved in forest management activities. In addition, immediate action to restore degraded areas is also recommended.

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Glossary of terms

Agroforestry - systems of using land which involve consciously raising crops or grazing animals among specially planted or encouraged trees.

Andosols - a soil developed on newly weathered base-rich volcanic material. It is characterized by a dark, organic A-horizon and a barely altered B-horizon.

Bequest value - motives related to the idea of willing a supply of natural environments to ones' heirs or to future generations.

Cumulative effects - are the combination of different individual impacts of various activities which may be different in nature or extent from any of the individual impacts when acting individually.

Ecosystem - a community of plants and animals plus their physical environment.

Existence values - the value that an individual places upon the preservation of some asset which will never be directly used either by him/herself or by future generations.

Environmental impact assessment (EIA) - a process for identifying the likely consequences for the biophysical environment and for man's health and welfare of implementing particular activities and for conveying this information. at a stage when it can materially affect their decision, to those responsible for sanctioning the proposals (Munn, 1979). It is a process having the ultimate objective of providing decision makers with an indication of the likely consequences of their actions (Davies and Muller, 1983).

Externalities - Economic effects which exists when costs are imposed on others without their being fully compensated or when benefits are received by others for which these beneficiaries do not make full payment.

Firewood - includes parts of trees made up into bundles or loads, or cut wood for burning, and all refuse wood generally, but does not include logs or poles.

Forest guard - the lowest cadre in the forestry sector; may have had formal forestry training but mostly on job-training.

Forest manager - a person appointed by the Director of Forestry to control and administer a forest in its totality i.e. forest activities including the personnel involved.

Forest ranger/beat-incharge - a keeper of a specified political area of a forest. Mostly middle cadre in the forestry sector with certificate forestry training.

Irreversible - likeliness or chances of elimination of an asset when not preserved.

Land degradation - a composite term describing the aggregate reduction of the productive potential of the land, including its major uses (rainfed arable, irrigated, rangeland, forestry), its farming systems (e.g. smallholder subsistence) and its value as an economic resource.

Logging - is concerned essentially with the felling and removal of timber from a forest area.

Normal forest - a classic concept of an ideal man-made forest with even 'normal' age distribution by area. The stands are stocked with the maximum amount of wood that the site will produce, and from which the same amount of wood product may be harvested annually forever (Haden-Guest et al., 1956).

Option value - the value of the environment as a potential benefit as opposed to actual present use value.

Pole - a tree or part of a tree of suitable size for use in the round as a telegraph, telephone, power transmission or building or for similar purposes.

Pruning - the removal of the dead and dying branches from the bole of the tree with axe, knife or a saw. Knots in lumber are the result of branches, the fewer and smaller the knots and the higher the grade of lumber produced.

Regeneration - as used in this study, it is a practical concept that includes not only natural secondary successions but also types of forest manipulation that can lead intentionally to new and more productive stages for forest growth.

Resilient - the ability of the system to maintain its structure and patterns of behaviour in the face of external disturbance, i.e. its ability to adapt to change (Pearce et al., 1989).

Rotation age - the age at which tree crop reaches maturity. After this age, negative financial returns will be experienced by having the trees standing.

Silviculture - is applied forest ecology and forest genetics; it may be described as the development and use of cutting methods and cultural treatments of the forest: 1) to ensure adequate regeneration of desirable species as soon as possible after the mature stand is cut, 2) to bring about conditions favourable to the optimum yield and quality of production in keeping with the objectives of management and the conditions of the forest, and 3) to maintain and where possible improve the quality or productivity of the site (Haden-Guest et al., 1956).

Skid trails - a foresters' term for the track in a forest along which logs are dragged or skidded.

Softwood - wood of a conifer.

Strategic Environmental assessment (SEA) - is a systematic process for evaluating environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations (UNEP, 1996).

Sustained yield - the amount of timber cut in the national forest must equal the amount grown. It requires that the timber be cut annually or periodically in such quantities that a continuous and fairly uniform yield will be provided throughout the rotation (the period required to grow a crop from seed to maturity).

Taungya - a Burmese name which describes a kind of shifting cultivation where a farmer is given a piece of forest land to clear and grow subsistence crops. He subsequently tends the planted tree crop until the canopy closes when he moves to another taungya area.

Thinning - cuttings made in a fully stocked to overstocked immature stand in order to increase the rate of growth of the remaining trees.

Uncertainty - the future is not known, and hence there are potential costs if the asset is eliminated and a future choice is forgone.

List of Abbreviations and Acronyms

B	Beekeeping
CF	Community Forestry
CFPO	Catchment Forest Project Officer
DC	Donor Coordinator
FAO	Food and Agriculture Organization of the United Nations
FBD	Forestry and Beekeeping Division
FDM	Forestry Development and Management
FHU	Forest Harvesting, Utilization and Industries
GDP	gross domestic product
G.N.	Government Notice
GNP	gross national product
ha	hectare
IUCN	International Union for Conservation of Nature and Natural Resources
LMDA	Logging Miscellaneous Deposit Account
m.a.s.l.	metres above sea level
MLNRT	Ministry of Lands, Natural Resources and Tourism
MNRT	Ministry of Natural Resources and Tourism
NORAD	Norwegian Agency for Development
NPK	Nitrogen Phosphorus and Potassium
PRA	Participatory Rural Appraisal
RAPA	Regional Office for Asia and the Pacific
SADCC	South African Development Cooperation Conference
SCAPA	Soil Conservation and Agroforestry Programme in Arumeru District
SI	Survey and Inventory
SIDA	Swedish International Development Authority
SUA	Sokoine University of Agriculture
TAFORI	Tanzania Forest Research Institute
TANESCO	Tanzania Electrical Company
TAWICO	Tanzania Wildlife Corporation
TFAP	Tanzania Forest Action Plan/Tropical Forest Action Plan

TPRI	Tropical Pesticide Research Institute
TR	Training and Research
UNCED	The United Nations Conference on Environment and Development
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCED	World Commission on Environment and Development
ZOFOMO	Zonal Forest Management Office

US\$ 1 = Tanzanian shillings (T. shs) 600. (This was during the time of the study).

CHAPTER 1

INTRODUCTION

Mount Meru forest reserve in northern Tanzania, which is the focus of this study, is a montane tropical rainforest. Before the case of Mount Meru forest reserve can be addressed, the characteristics and concepts underpinning the management of tropical forest ecosystems will be addressed in this chapter. These include: the general causes for tropical forests depletion and the concept of sustainable development. Forest ecosystems, forest management, forest benefits and the governments' failures in forest resource management are also discussed to show the complications and the necessity for improved decision-making on forest management. In addition forest distribution in Tanzania is described to introduce a localized case of Mount Meru forest reserve.

1.1 THE TROPICAL FOREST LANDS - GENERAL TRENDS

In recent years many well-documented articles and reports have established the importance and urgency for improved knowledge and management practice for tropical forest lands (Quareshi, 1979; Carpenter, 1981; FAO, 1986b; World Resource Institute, 1987; World Bank, 1991; Gomez-Pampa and Burley, 1991; Sharma, 1992; Shepherd, 1992; Kupchella and Hyland, 1993; Mather and Chapman, 1995). The recurring themes in this literature are:

- Many new uses for tropical forest land may not be sustainable due to soil erosion, nutrient depletion, altered water resources, and the vulnerability of monoculture;
- Technology developed in temperate zones may not be appropriate for tropical forest lands;
- Developing countries are exploiting the goods and services of their forests and forest lands for economic growth, but they must also protect the essential productivity of these ecosystems for the benefits of future generations; and
- Tropical forests are important to all nations for their watershed value, genetic richness, wildlife habitat, continuous supply of lumber and other products, aesthetic and recreation values, and possibly for their role in global climate patterns.

Pressure of population in Sub-Saharan Africa is causing deforestation to accelerate, because it forces people and their livestock further onto marginal land (World Bank, 1989; Sayer et al.,

1992). The World Bank (1989) argue further that the growing population also raises the demand for fuelwood and cropland, and the resulting deforestation increases runoff and erosion, lowers groundwater levels, and may further reduce rainfall in arid areas.

Blame for the decline of natural water and land resources in Sub-Saharan Africa have been attributed by the World Bank (1989) to:

- the region's economic decline due to factors beyond Africa's control - bad weather, weak world commodity prices, fluctuating international interest rates, and little capital investment;
- policies which have led to poor management of public resources and inappropriate incentives for natural resource management.

These concerns have led to widespread recognition of the need for the wise utilization of forests and forest lands. Utilization of forest resource according to the principles of sustainable development have been one of the advocated concepts for the conservation of the forest resource base as will be shown below.

1.2 SUSTAINABLE FOREST USE

Sustainable development has been a global discourse since the Brundtland Commission's report in 1987, followed by the 1992 United Nations Conference for Environment and Development in Rio de Janeiro. According to Brundtland's report (WCED, 1987) sustainable development means that in attaining economic growth the environment is not unduly degraded. UNEP (1994) suggests that an action is sustainable if it improves the prospects that future generations will enjoy the same level of welfare as enjoyed by members of present-day society.

Similarly, Goodland and Ledec's (1986) define sustainable development as, "a pattern of social and structural economic transformations (i.e. development) which optimizes the economic and other societal benefits available in the present without jeopardizing the likely potential for similar benefits in the future". The concept of sustainable development thus encompasses both development and environmental goals and a sense of compromise - but not a one-sided 'compromise' (Rydin, 1995). The concept incorporates equity dimensions in terms of the distribution of economic resources to ensure basic 'needs and aspirations' are met, and to ensure that dissatisfaction with prevailing patterns of distribution can be addressed through the political system without significant stress to that system (Rydin, 1995).

It is evident that the concept of sustainable development has its origin in the need to assert the primacy of “living within ecological limits”, without forfeiting the idea of “progress”. The concept embrace social goals. It is socially constructed in the sense that living within limits is a challenge to human ingenuity that cannot be avoided.

Sustainable use of forests is concerned with overall forest management, maintaining the ecological integrity of the forest environment and keeping future options open (Mgeni, 1993). Sustainable development of forest land and its multiple economic and environmental values involves maintaining indefinitely without unacceptable impairment, the productive and renewal capacities as well as the species and ecological diversity of forest ecosystems.

The acceptable threshold of impairment is determined by the choice and decisions made by individuals, institutions and nations. It is based on human understanding of both ecological principles and socio-economic imperatives (Mgeni, 1993). What is acceptable under specific socio-economic and ecological conditions may be totally rejected under another set of conditions. Consequently, choice and trade-offs must be made in terms of local risk management and the cost of inaction to affected communities.

While forests are resilient ecosystems, there are limits to their ability to withstand, environmental change and they degrade when these limits are exceeded (Watt, 1973). Understanding such limits allows foresters to enhance various forest outputs through silviculture. Sustainable forest development requires:

- i) recognition of the limits of forests to withstand environmental change; and
- ii) managing human activities to produce the maximum level of benefits obtainable within these limits.

1.3 THE FOREST ECOSYSTEM

A forest is a community of trees, other plants, and animals which live in the forest environment (Bromley, 1987). While trees are the dominant form of vegetation the forest community also includes shrubs, herbs, mosses, fungi, insects, reptiles, birds and mammals. All these organisms live on or in the soil, water, and air of the forest. Each is a part of the community, and each reacts with all the other parts to form the forest ecosystem.

Forests also encompass natural resources - both renewable and non-renewable. Non-renewable resources are so termed because extraction from the stock depletes the usable quantity remaining and, even if some is being formed, the rate of formation is too slow for practical purposes (Cain, 1987). Renewable resources are so termed because they involve organic growth and reproduction, or because they are relatively quickly recycled or renewed in nature as in the case of water in the hydrologic cycle. Some processes are intermediate: soil for example, is commonly thought of as renewable, as erosion and nutrient depletion can in some cases be corrected, but if the upper layer of the soil is removed or bedrock is exposed, renewal may take thousands of years.

1.4 FOREST BENEFITS

The maintenance of **biodiversity** (short for biological diversity which includes all species, genetic variation within species, and all varieties of habitats and ecosystems) is an important feature of forests. Biological resources form the basis of a large number of industries and are important sources of food, medicines, chemicals and other products used in both traditional and industrialized societies (Myers, 1983; Oldfield, 1984; Dixon and Sherman, 1991).

Some forests have potentials for **recreational and tourism** interests. Provision of such services is a primary means of receiving direct financial benefits and stimulating employment and rural development in surrounding areas (Dixon and Sherman, 1991).

Research is often integrated with **education**, and forests provide fertile ground for field study by students of all levels. They also provide an arena in which to instill in the general public an understanding and appreciation of the environment.

A number of **consumptive benefits** also accrue. These are direct benefits which include extraction of; timber, forage, wildlife and wildlife products, herbs and traditional medicine, resins and gums. When these are harvested sustainably, they become available in perpetuity.

Non- consumptive values are those values which people currently derive from forests which are not related to extractive use. Such values include **aesthetic, option, existence, bequest** and **intrinsic** values (Pearce et al., 1989; 1990).

Other benefits are less direct but nevertheless important (Bromley, 1987), these include:

- modification of **microclimate**. Forests reduce the force of the wind horizontally for as much as 40 times the vertical height of the trees;
- **rain water** tends to penetrate the ground more under trees than in the open. This causes the release of water from forests to be extended over a longer period of time than in open spaces. A more even flow of water ensures and the severity of flooding is reduced;
- the spongelike nature of organic matter on the forest floor protects soils from erosion and provides for **cleaner and clearer water** in the streams which drain the forested areas. (This is an important aspect of keeping the water from large watershed areas in a healthy condition for human and wildlife consumption).

Some of these benefits are easily expressed in monetary terms (e.g. consumptive benefits) while others can be estimated using existing tools of economic analysis (e.g. the travel cost approach to estimate recreational benefits or cost benefit analysis to examine the benefits of watershed protection). A larger number of benefits are difficult to express in monetary terms. Dixon and Sherman (1991) suggest that many of the benefits from ecological processes and the non-consumptive benefits, may be best left unmonetized and expressed in qualitative terms. Conrad (1980) and Dixon and Sherman (1991) also suggested that since conversion or development of a protected area will often have irreversible consequences, there may be a value in delaying development or conversion when **uncertainty** exists about the benefits of the alternatives available. When an irreversible event does not occur because of a delayed decision, this is termed a **quasi-option** value (Dixon and Sherman, 1991).

Sustainable exploitation of these benefits requires forest conservation. This entails technical, social, economic and ecological knowledge as well as moral support for forest management. Conservation entails protecting the environment against loss or waste while permitting appropriate use.

1.5 FOREST MANAGEMENT

Forest management refers to the practical application of scientific, economic, and social principles affecting the administration and working of a forest estate for specified objectives

(Bromley 1987). The term management has different meanings to different people, but the major trends in forest management have been summarized by Whitmore (1991):

- the nearly complete conversion of the original forest ecosystem into another system to suit the material and economic needs of those who decide to 'manage' the system;
- the extraction of some forest products without severely disturbing the system. This includes forest manipulation and partial conservation through natural or induced regeneration of the forest ecosystem;
- the total or strict preservation of representative samples of forest for conserving biological diversity, especially to conserve the genetic variation of many tree species, some of which are likely to prove useful to us and to be exploited at some future time.

In addition many forests are managed to ensure optimal release of water from forested catchments. Most tropical montane rainforests are important water catchment forests. Management of such forests presents a challenge to foresters because of the multiple socio-economic, political and environmental interests involved. Water catchment forests have thus often been managed as watersheds rather than as forests (Brooks, 1993).

Brooks (1993) defines a watershed as a hydrological unit that is used as a physical-biologic unit and a socio-economic-political unit for the planning and management of water resources. Watershed management is the process of guiding and organizing land and other resources to provide desired goods and services without adversely affecting water resources (Brooks, 1993). The concept recognizes the relationship among land use, soil, and water, and the linkages between uplands and downstream areas. It is thus accompanied by the importance of involvement of the communities around a watershed area in the holistic approach to the management of water resource base. Involvement of communities have been the current theme for forest management as will be discussed below.

1.5.1 Involvement of communities in forest management

Recent years have witnessed marked social trends: movements towards greater democracy, decentralization of power, and communication systems that penetrate even into the remotest areas (Sargent and Bass, 1992).

These trends have led, on the one hand to many strong voices calling for control of forests by local people; and, on the other to more national and international forestry initiatives such as the Tropical Forestry Action Plan (Sargent and Bass, 1992). UNEP (1994) and Veit et al., (1995) advocate for local empowerment and decentralization of natural resources, arguing that African value systems respect nature and that where traditional practices are still observed, the resource has been utilized sustainably. Management thus needs to be considered in terms of the inhabitants of forest regions. Such inhabitants may include traditional societies that belong to a great diversity of ethnic groups (Whitmore, 1991). According to (Whitmore, 1991) traditional societies have lived in and from forests for eons and have coexisted with them. These communities have an enormous, still untapped, knowledge about the ecosystems in which they have evolved (Mather and Chapman, 1995).

Some forest communities have had great success and have expanded geographically or culturally, while others have remained stable or deteriorated over time. Unfortunately, many forest based traditional societies have been ignored by the march of development (Mather and Chapman, 1995). Many of them are nearing extinction today, after flourishing in time past.

Barbier (1987) argues that real improvement of societies cannot occur in Third World countries unless the strategies which are being formulated and implemented are environmentally sustainable over the long term, and consistent with social values and institutions which encourage grassroots participation in the development process. Similarly, to be socially and culturally sustainable, development must be gauged by the values which a society itself, or some member thereof, deems to be requisite for its health and welfare (Goulet, 1971).

1.5.2 Forest ownership: implications for management

Over most of human history, forests have been open-access or common-property resources (Panayotou, 1987). Common-property ownership by indigenous people accounted for most of the global forest areas until recently (Pearce et al., 1990). This type of ownership did not guarantee the survival of the forest: for example some forest land was cleared by native Americans so that agriculture could be practiced (Mather and Chapman, 1995).

Nevertheless, the use of the resources was usually regulated by rules or guidelines accepted by the group and handed down from generation to generation. While some trees might be owned by individuals or families, the concept of ownership, and hence of transferability of forest land was largely unknown (Mather and Chapman, 1995). Nature was not yet a commodity (Norgaard, 1992).

Historically, however, the vast majority of natural assets were transferred from one generation to the next because people simply did not have the technology to deplete resources; and furthermore, the transfer also occurred because parents knew their children's survival depended on the same resources as did their own (Norgaard, 1992).

The arrival of colonial powers in Africa and elsewhere brought an abrupt change (Mather and Chapman, 1995). In general terms, they regarded common-property land as ownerless or unoccupied, and in effect appropriated it (de Saussay, 1987). Post-independence governments have usually retained at least nominal ownership (Panayotou, 1987). Colonial, and later national, governments assumed central control over forest resources, both opening them up to commercial exploitation for international markets and closing them down to use by local people (Norgaard, 1992).

The breakdown in traditional management and regulation of forest was not offset by the advent of effective management by the state (Panayotou, 1987; Pearce et al., 1990; Norgaard, 1992; Mather and Chapman, 1995). In many cases, a management vacuum developed after appropriation by the state because local management was replaced by remote, state control, and often a sense of alienation set in (Mather and Chapman, 1995). In practice, what had previously been a common-property resource became an open-access resource as a free-for-all developed. As a result forests have been run down, unmaintained and even vandalized (Panayotou, 1987).

The failure of government forestry departments to manage forests sustainably is also common, not least in many parts of the developing world where the forest resource is continuing to degrade even though under (at least nominal) government ownership (Pearce et al., 1989; 1990; Shepherd, 1992). The claim of the state to ownership is not effectively enforced and resources

are not accorded sufficient protection, thus reverting into quasi open-access status with all the known consequences (Panayotou, 1987).

Another frequently alleged reason for government failure in forest resource management is that economic factors are not adequately taken into account in decision-making. Conversely, a common reason for market failure is that only economic factors **focusing on wood** have been acknowledged when wood or charcoal contributes to the national economic product reflected in **GNP** or **GDP**. Deforestation, bringing with it a loss of resources, is usually treated, for instance as a net contributor to capital growth (WCED, 1987; Shepherd, 1992; Mgeni, 1993). Forests are not given the desirable protection status because the benefits to society from forests are often grossly underestimated, and the immediate costs of protection appear large in comparison (Pearce et al., 1990).

The above part of this chapter have been given as an overview of the development and management of tropical forest ecosystems. The intent is to provide general characteristics and trends of the development and management of the forest resource base. It is believed that the overview will provide the reader with an understanding of the issues which will be discussed in the Mount Meru case study which is the focus of this thesis. However, before introducing the local area (i.e. Mount Meru forest reserve), a general trend of the forest resource in Tanzania is described to show the role of Mount Meru forest reserve as one of the forest lands in the country.

1.6 THE FOREST RESOURCE IN TANZANIA

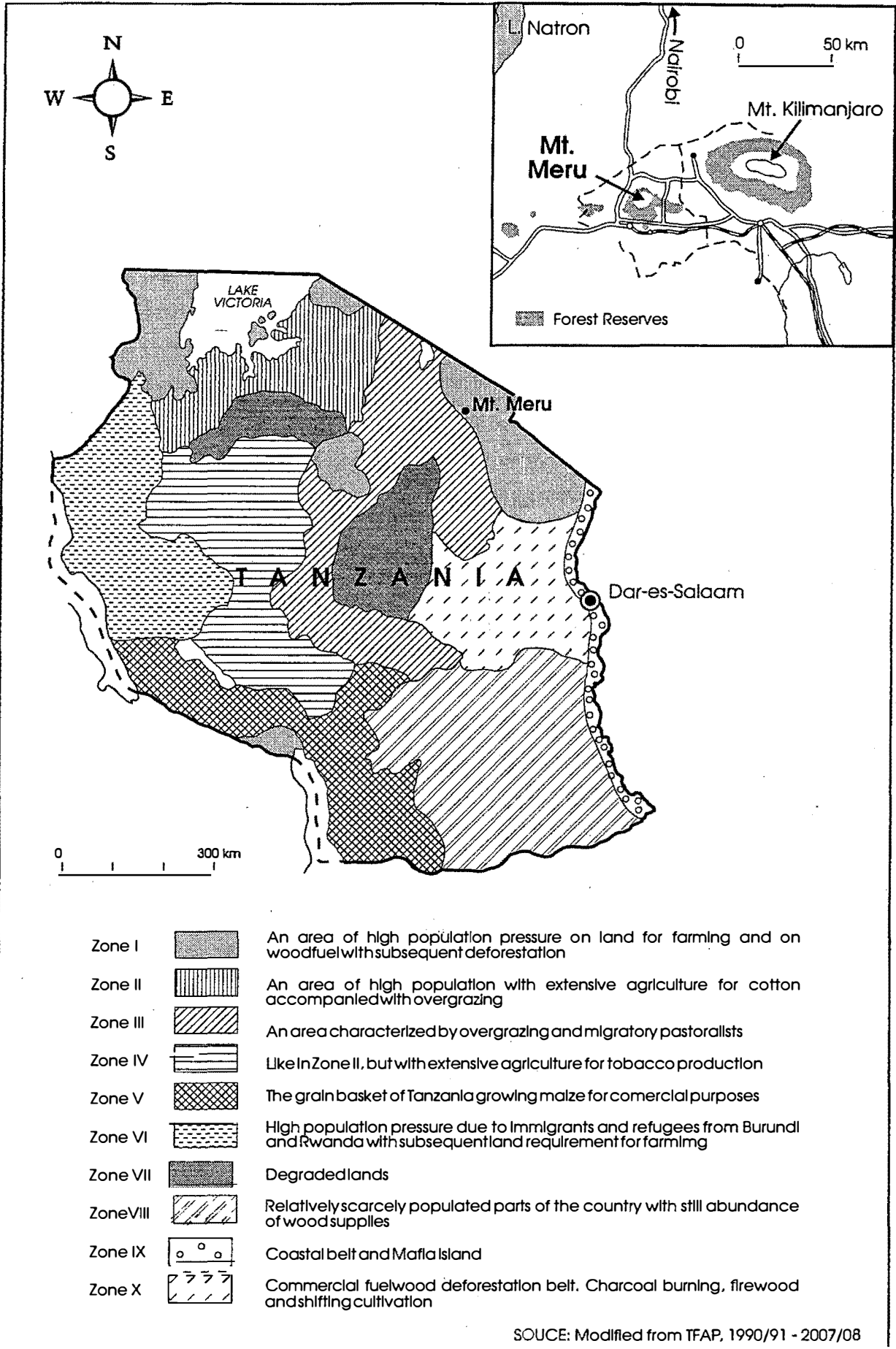
In Tanzania, forests cover about 44.3 million hectares while about 13 million hectares of forest are gazetted as permanent forest reserves (MLNRT, 1989). These are designated for catchment and conservation purposes or exploited under strict control of the government. Within the forest reserves are the forest plantations and mangroves. The total area under forest plantations within the forest reserves is estimated to be 150,000 hectares (80,000 hectares government owned and 70,000 hectares privately owned) while mangrove forests cover about 100,000 hectares (MLNRT, 1989).

Apart from the forest reserves, about 2 million hectares of forests are under National parks/game reserves and the remaining 29.3 million hectares are considered to be public forest land

(MLNRT, 1989). The forest sector contributes about 3% of the Tanzanian Gross Domestic Product and employs about 28% of the total employed manpower in the country. Besides supplying timber, firewood and non timber products, the forests act as watershed areas, provide habitats for wild animals and provide a wide range of cultural, spiritual and recreational sites.

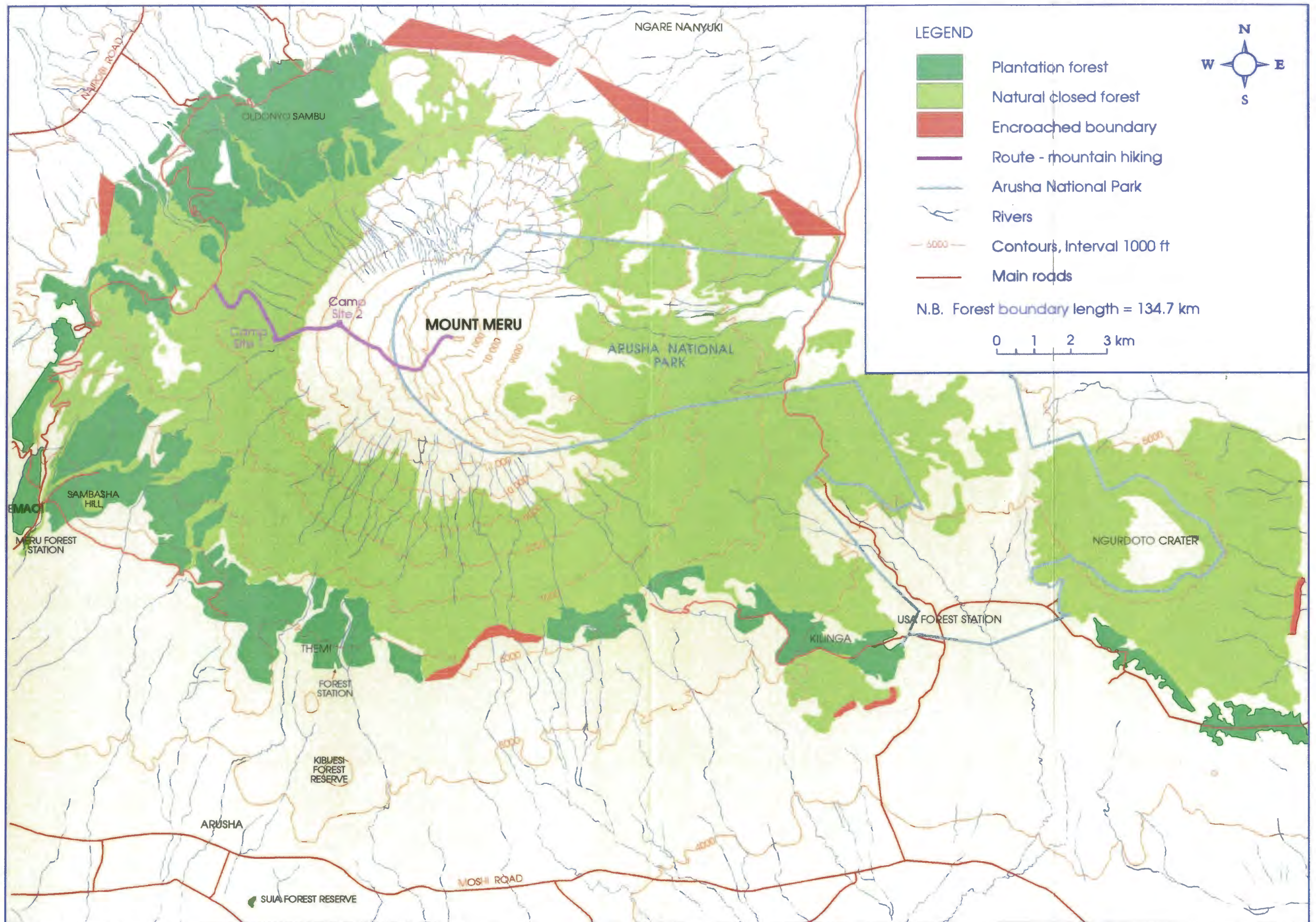
In recent years due to an increase in population growth, widespread poverty, limited land for cultivation, charcoal burning, woodfuel harvesting, bush fires and harvesting for industrial wood, there has been a decrease in the total forest land (Ahlback, 1986; MLNRT, 1989). As a result of such pressure on forests, between 350,000 and 400,000 hectares of forests are deforested annually while the afforestation efforts are only 20,000 hectares per annum. The consequence is forest degradation. The cause of forest degradation in Tanzania is shown in Map 1.1

MAP 1.1 FOREST ZONES OF TANZANIA



SOURCE: Modified from TFAP, 1990/91 - 2007/08

MAP 1.2 MOUNT MERU FOREST RESERVE



1.6.1 The study area

Mount Meru is situated in northern Tanzania between latitude 3° 12'S to 3° 25'S and longitude 36° 32'E to 36° 38' E within the Arumeru district of Arusha region. It is the second highest mountain in the country and the fifth highest in Africa with an altitude ranging from 1500 to 4556m. The Mount Meru forest is a tropical montane rain forest, with an area of approximately 34,445 hectares. It is both a forest reserve and a game reserve, bordered to the east by Arusha National Park. Environmental goods and services obtained from this protected area include protection of watershed, soil conservation, preservation of biodiversity, aesthetic and option values. The area of study is as shown in Map 1.2

Mount Meru is an extinct volcano. The rocks are volcanic, varying from coarse vesicular grey lavas, to fine grained basalts. These are overlain by deep soils originating from volcanic ash, i.e. **andosols**. As a consequence the soils erode easily and have low bearing strength. Moreover, these soils are very loose when dry, and when loosened by feet, hooves or wheels and can easily be eroded if disturbed. During the dry season the surface layers become extremely powdery and dusty. However, when undisturbed, the soils have very high water holding capacity and high stable organic matter suitable for permanent crops.

The rainfall is bimodal and considerably higher on the southern and south-eastern slopes than on the western and northern slopes. The long rains fall between March and May and minor peaks in November - December. The indigenous people of this area are the Waarusha on the western and southern slopes and Wameru on the eastern side. These people are mixed farmers i.e. agriculturalists and pastoralists.

Meru forest was gazetted as a government forest reserve vide government notice No. 232 of 1920 with an initial total gazetted area of 44,799.7 hectares (MNRT, 1981). This area was reduced subsequently with the government establishment of a softwood forest plantation and Arusha national park vide G.N. No. 242, 546 and 84 of 1960, 1964 and 1967 respectively (MNRT, 1981). With the establishment of the softwood forest plantations and Arusha national park the area covered with natural catchment forest is approximately 26, 444 hectares.

In the early 1950s, the natural vegetation on the lower slopes of the south western side of the mountain was cleared and replaced with a commercial forest plantation of exotic monoculture tree species. To start with, *Cupressus lusitanica* and *Pinus radiata* and later *Pinus patula*, *Grevillea robusta* and *Eucalyptus spp.* To date *Pinus patula*, *Eucalyptus maidenii* and *Cupressus lusitanica* remains the main plantation exotic tree species covering an area of 6885 hectares.

The current main objectives, set by the Forest Division for the management of the forest plantations, are to manage the plantations to:

- satisfy the forest division policy regarding afforestation in Tanzania;
- tend the existing plantations so as to maintain good stands for the production of good quality timber;
- utilize the wood resources as they become available in a regulated and economic manner;
- sustain the yield of wood by replanting clearfelled plantations immediately;
- take protective measures against soil erosion and preserve or improve vegetation cover for better regulation of water supply;
- provide employment particularly to the local population.

The natural vegetation on the mountain varies with orientation and slope. The lower slopes of the south and south western side of the mountain, where the plantations were established, were covered by evergreen associations including; *Albizia gummifera*, *Aningeria adolfi-fredericii*, *Chrysophyllum gonungosanum*, *Croton megalocarpus*, *Entandrophragma excelsa*, *Ekebergia capensis*, *Ficus thonningii*, *Myrianthus holstii*, *Polyscias fulva*, *Schefflera spp.*, *Syzigium guineense*, *Teclea simplicifolia*, *Ficus exasperata*, *Buddleja polystachya*, *Hygenia abyssinica*, *Ethrina sp.*, *Maesa lanceolata* and *Euclea kellen*.

In open areas tree species such as *Albizia schimperana*, *Cordia abyssinica*, *Croton macrostachys*, *Dombeya goetzenii*, *Neobontonia macrocalyx* and *Rauvolfia inebrians* are common.

On the drier ridges *Juniperus procera*, *Podocarpus gracilior* and *Olea capensis* are common. Above 1700m the natural vegetation includes *Podocarpus milanjanus*, *Prunus africana* with

patches of *Arundinaria alpina*. Above 2500m the forest degenerates into ericaceous woodland with species such as *Erica arborea*, *Haegenia abyssinica*, *Philipia trimera*, *Rapanea rhodondroides* and *Stoebe kilimandischarica*.

The value to society of the forest reserve can be measured and expressed in terms of economic, cultural and social benefits, and these include water supply, fuelwood, employment, seasonal farms, traditional medicine, sacred areas, and minor forest products such as honey and ropes. There are also a myriad of intangible benefits which include provision of research and educational opportunities, conservation of biodiversity, aesthetic and option values. However, these values are deteriorating with time due to human induced actions on the forest reserve, as will be discussed.

1.6.2 The problem

In recent years forest destruction and forest land degradation has been observed in Mount Meru forest reserve. Annual forest fires, over-grazing, and poor land management practices are among the problems persistent in the forest reserve. As a consequence of these, soil erosion and land degradation have been of great political, social and environmental concern to both the indigenous communities around the forest reserve and to the nation at large. The causes of forest destruction and forest land degradation vary both in magnitude and significance.

Exotic monoculture plantations contribute to the deterioration of natural forests in the tropical forest lands (Carpenter, 1981). In addition, topographical and geological factors in Mount Meru forest reserve make soils vulnerable to soil erosion.

Quareshi (1979) in a study done in the north-western Himalayas, found that the management of forest vegetation of the hotter and steeper southern slopes was difficult because of severe climate and aspect; and was intensified by coincidence with adverse geological factors. However, it has been further found in India (Pandey, 1979) and in Pakistan (Quareshi, 1979) that the vulnerability of a forest ecosystem is not only due to physical limitations but is also due to human interference, social and economic systems which include: forest encroachment; overgrazing; illicit cutting; fire; mining and quarrying; and rights, concessions; and free grants.

On the other hand, it has been argued (Mather and Chapman 1995) that human beings and their environment are inseparably linked; their welfare is directly dependent on the stability and the proper functioning of their surroundings. This means human beings depend on the resources available within their environment for their day-to-day survival; which is also the case with the indigenous people around Mount Meru forest reserve. Such pressures have contributed significantly on the forest destruction and forest land degradation on the Mount Meru forest reserve. Sargent and Brass (1992) and Johns (1992) conclude that extreme human disturbance can cause a catastrophic breakdown of the forest's ecological processes, and the forest cannot regenerate.

1.6.3 Statement of the research problem

The Mount Meru forest reserve requires proper planning and special management to reduce human impacts. Sustainable use of the forests and the forest land should therefore be introduced in the forest management procedures before socio-economic human actions change the landscape patterns in response to pressure of the moment.

This study will focus on:

- i) effects of the exotic monoculture forest plantations on the forest reserve; and
- ii) human impacts on the forest and forest land.

Effects on the Arusha National Park will not be considered. This study will nevertheless have implications for this area.

1.6.4 The general aim of the study

The **general aim** of this study is to investigate the human induced causes of environmental degradation in Mount Meru forest reserve and to propose ways to improve environmental management so as to attain sustainable development.

1.6.5 Specific objectives of the study

The **specific objectives** of this study are to:

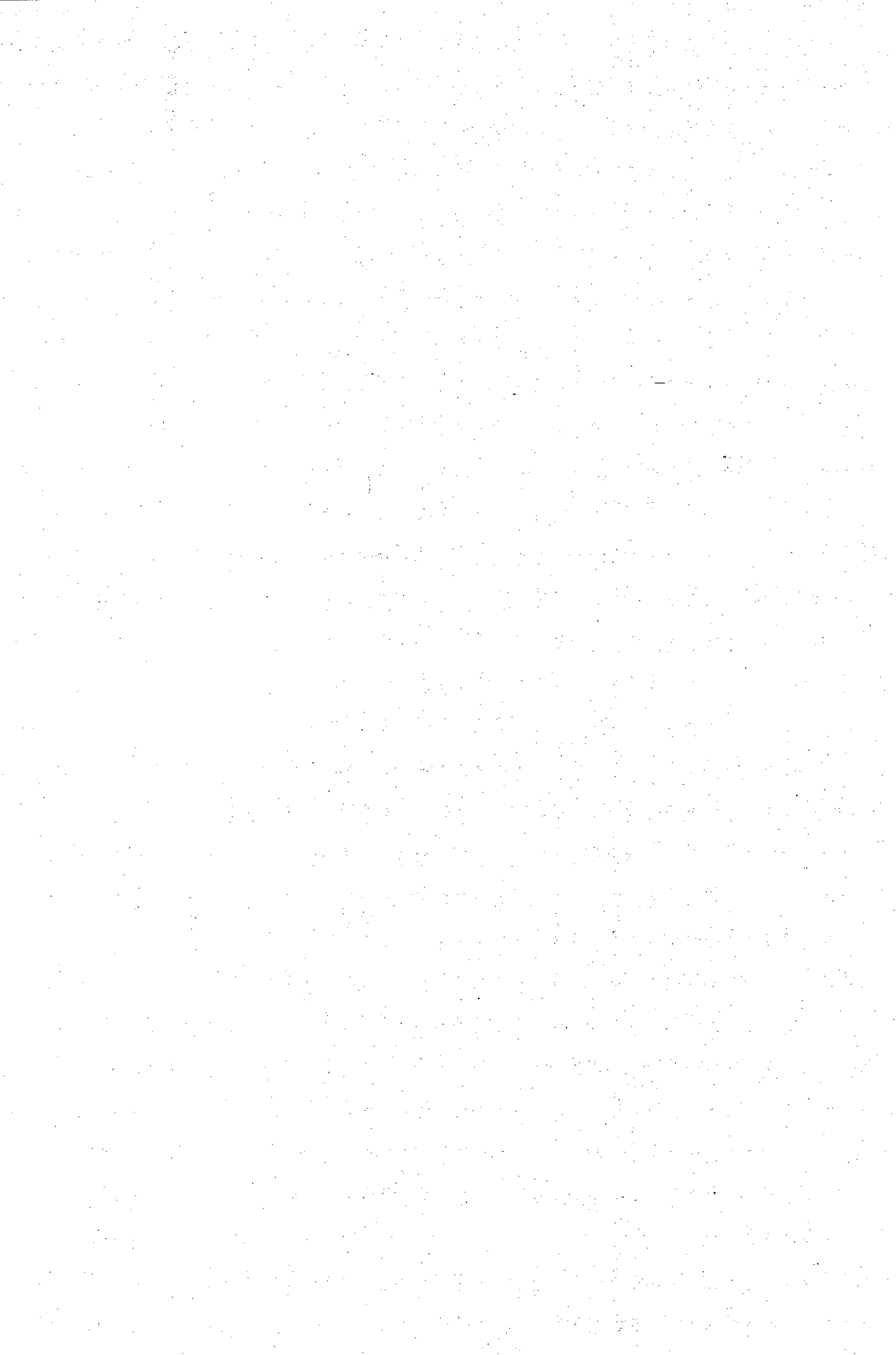
- study the influence of human activities on the Mount Meru forest reserve.
- undertake a review of relevant national and local initiatives for the management of the forest resource and evaluate their implications for Mount Meru forest reserve.

- propose initiatives for future environmental management of Mount Meru forest reserve.

1.7 SUMMARY

The overview of the general trends and characteristics for the Tropical forest lands addressed in this chapter show that the tropical forest lands are under threat due to pressure from human actions. It is also seen that although forests are resilient ecosystems, they cannot withstand human pressures beyond certain limits. The forest benefits both consumptive and non-consumptive are myriad. But these should be conserved and managed under sustainable basis if they are to be produced in perpetuity. Decisions for the management of forest ecosystems are shown to influence the feature of forest lands. However, the extent, significance, importance and reasons for such influences are believed to vary according to locations (Shepherd, 1992). Basing on the general aim and specific objectives determined to be achieved in this case study, it is believed that the insight of the factors influencing forest management and thus causing forest destruction and forest land degradation in Mount Meru forest reserve can be addressed. In addition, the remedial measures suggested during the study are expected to contribute to the improvement of knowledge and decision-making for the management of Mount Meru forest reserve and other such related areas in the country.

In order to be able to attain the study objectives, social research methods have been adopted. These are used as research tools for methodology, analysis and interpretation as outlined in the following chapter.



CHAPTER 2

RESEARCH PROCEDURE AND METHODOLOGY

2.1 METHODOLOGICAL FRAMEWORK

Before outlining the particular research methods employed, it is necessary to outline the theoretical conceptions which have led to the choice of the methods used in the analysis of this study. The philosophical approaches to analyzing and interpreting problems, human needs and aspirations which determine social spatial outcomes have been developed by human geographers (Sayer, 1992). Until 1950s social philosophers (Lacey, 1976) believed in the supremacy of science as the only method of investigation. Facts were established by casual observation in the field through scientific observations (Smith, 1977; Johnston, 1986). However, the establishment of cause and effect, particularly when guided by determinism, which was found to be inherent in this method, produced some erroneous findings. For this reason several other philosophies were suggested (Johnston, 1986). These include; positivist or quantitative, humanistic or qualitative, structuralist and currently participatory approaches.

2.1.1 Positivist or Quantitative approach

According to the positivist approach in the quantitative analysis, science must not only have certain aims, but must also have agreed procedures. Assumption of positivist approach was that some aspects of human behaviour are subject to the operation of laws of cause and effects which can be studied according to the positivist conception of science. The positivist attitude conceive that application of the methods of natural science involves a particular concept of explanation: that any event can be accounted for as an example of a class of events (Johnston, 1986).

However, there were concerns on this discipline in that it was failing to respond to major contemporary social issues. Context-dependent actions or properties such as attitudes, pollution, poverty, hunger, racial discrimination, social inequality or injustice, and the exploitation of colonial territories by the governments and business of capitalist nations could not be explained (Prince, 1971; Smith, 1977; Sayer, 1992). It was therefore found necessary to shift from analysis by means of formal models to narrating in order to capture the openness, contingency, qualitative change and novelty that characterize social systems (Sayer, 1992).

2.1.2 Humanistic or qualitative approaches

This is an approach which describe people in the world that they create as thinking beings (Sayer, 1992). According to this approach, peoples' intentionality creates a world within which they act (Johnston, 1986). The theoretical basis of humanism was that human behaviour in the pursuit of needs and wants is the prime source of social relationships, political institutions and modes of production (Smith, 1977).

In its idealist view, the humanistic approach believes that people build their own pictures and theories of the world, within which their actions are predicated and guided. Such guidance includes the direction of future thinking, the interpretation of perceptions, and the nature of decision-making. Central to this idealism, therefore, is its coherence theory, which includes: a definition of truth; an account of the nature of reality; and a criterion of truth (Ewing, 1934 as cited by Johnston, 1986). According to Ewing (1934) coherence implies a systematic view of the world that:

- a) everything is causally determined;
- b) everything is directly or indirectly, causally connected with everything else, so that there is no series of events in the universe which is causally independent of all events outside that series;
- c) the relation of causality involves a relation of logical entailment, so that whatever is causally impossible is also logically impossible relative to the rest of the causal system.

Collingwood (1965) recommended the system of developing theories of past events, assimilating new knowledge and applying a coherence theory and its criterion of truth as the method of assessing interpretations. It seeks to understand why people did what they did, and do what they do in terms of their personal theories (Outhwaite, 1975; Giddens, 1976). It presents a view of the world as it is perceived by the subject (Johnston, 1986).

2.1.3 Structural approaches

The characteristic feature of structuralist approach is an axiom that explanations for observed phenomena must be sought in general structures which underpin all phenomena but are not identifiable within them. The basic feature of work in this type is a belief that cultural phenomena - language, kinship rule, myths, taboos, etc. - which appear extraordinarily diverse when observed are in fact transformations of basic structures which are universal to the human

mind (Johnston, 1986). The focus is not on people and what they do but rather on the structures of the societies of which they are part and which provide the necessary conditions for their activity (Bhaskar, 1979). It argues that the individual cannot exist without society (so superstructure is dependent on the infrastructure) but in addition society can neither exist nor be continually re-created without the activities of individuals. Chouinard, Fincher and Webber (1984) have thus summarized the characteristic features of the structural analysis and interpretation methods in the realist world situation as follows:

- 1) The causal mechanisms are real structures that exist independently of any knowledge of them.
- 2) Although those mechanisms exist, only their effects can be observed.
- 3) Social scientists cannot guarantee any particular outcome. They cannot predict, and so knowledge of the mechanisms can be gained only theoretically, not empirically.
- 4) The mechanisms themselves are not fixed, but are social products created by societies as means of organizing the reproduction of human life. They can be changed, and so further prevent the possibility of predicting empirical outcomes.

As argued further by Sayer (1992) realist social science cannot assume constant conjunctions, for two reasons. First, the contingent conditions through which the general tendencies of the mechanisms are filtered are continually changing. Memories (individual and collective) that exist among human societies influence the present interpretations of the mechanisms (decisions on how to act). Secondly, the tendencies themselves may be influenced by the empirical outcomes, as part of a feedback from superstructure to infrastructure.

However, Gregory (1978a) claims that the concept of structuration is taken directly from Marxist theories which refers to a dialectic between people and nature rather than people and structure. Marx's writings still represent the most significant ideas that can be drawn upon in seeking to illustrate problems of agency and structure (Giddens, 1979). The problem with much structuralism is that too little attention is given to the role of human agency (Sayer, 1992).

2.1.4 Participatory approaches

The 1980s and early 1990s have been years of management and planning (Mikkelsen, 1995). Detailed planning with a focus on results and physical output has tended to counteract flexibility

and people's participation. The participatory perspective maintains that "problems" are not to be defined by "experts", but should be based on "dialogue" through "action research". Action research approach aims to involve all persons concerned by the practical problem in a collaborative effort to change the situations according to shared aspirations (Altrichter, 1991). Lund (1990) as cited by Mikkelsen (1995) describes the logic and strategies of the participatory approach that, it will have to begin with the people who know most about their own livelihood system. According to this approach elaboratory trips into the field, into existing studies and into a variety of local documentation, can help to focus the dialogue with parties concerned with regard to relevant research problems (Mikkelsen, 1995).

The emerging participatory development "paradigm" suggests two perspectives. The first of these consists of substantively involving local people in the selection, design, planning and implementation of programmes and projects that will affect them, thus ensuring that local perception, attitude, values and knowledge are taken into account as fully and as soon as possible. The second is to make more continuous and comprehensive feedback on integral part of all development activities (Jamieson, 1989). The two major alternative uses of participation centres around participation as an end in itself or as a means to development. They represent "transformational participation¹" and "instrumental participation²" and may appear in different combinations in a given project.

As an end, participation entails empowerment, i.e. everybody's right to have a say in decisions concerning their own lives. Thus interpreted participation is an instrument in the promotion of ideological or normative development goals such as social justice, equity and democracy (Chambers, 1992). In the alternative form participation is interpreted as a means to efficiency in project management - i.e. participation is a tool to implement development policies. It implies a management strategy through which the state attempts to mobilize local resources.

However, one of the limitation of this approach is that the concept of "participation" is so widely and so loosely used, like many other catchwords in development jargon, that the meaning of the concept has become rather blurred (Mikkelsen, 1995). This provides challenges for quality

¹ Instrumental participation is when participation is viewed as a way of achieving certain specific targets - the local people participate in the outsider' project.

² Transformational participation is when participation is viewed as an objective in and of itself, and is a means of achieving some higher objective such as self-help and/or sustainability (Mikkelsen, 1995).

assurance of social research method which follow this approach. Another limitation is that misconceptions about the context of knowledge can distort social scientists' views of both object of study and their own activity. But, it has the potentials to support for the paradigm shift towards decentralization and empowerment of the poorer. However, participatory development is currently a new frontier and a global definition is yet to be developed (Mikkelsen, 1995) so it is likely to be misinterpreted.

2.2 RESEARCH METHODOLOGY FOR THIS STUDY

Johnston (1986) and Mikkelsen (1995) suggests that human societies are unique and complex. There are many laws and theories operating, a large proportion under very restricted circumstances and interacting with many others (Johnston, 1986). Following this understanding, the geopolitical and participatory approaches discussed above are all used as analytical and methodological tools in this study. Each approach has a valuable contribution to make in understanding the social-geographical issues in Mount Meru forest reserve as shown below. To select only one approach will be undermining the potential for the other approaches.

The participatory approach have been adopted in this study because of three specific reasons. Firstly, because of the current increasing government transparency and greater need for public participation in decision-making processes. Secondly, the method is believed to create a means of evaluating the role of "actors" in the real world situation (Werlen, 1993). Thirdly, although it has been argued that many concepts such as sustainability, capacity building and participation are unscientific (Arnfred and Bentzon, 1990), the concepts can be used to describe issues that are widely recognized to be relevant even if they are hard to operationalize (Mikkelsen, 1995). As mentioned further by Mikkelsen (1995), the objective is to illustrate how selected current issues can be addressed at the micro level and, in particular cases, linked with the macro level. The complexities and the relationships between the state as a structural organ and the needs, wants and aspirations of the indigenous communities around the Mount Meru forest reserve is believed to be able to be analyzed and interpreted through this approach.

Geopolitical analysis have been included as an analytical and methodological approach to this study because of two specific reasons. Firstly, it can illustrate the contribution of the political actors (individuals, institutions, organizations) in shaping and influencing the environmental

outcomes. It is therefore expected that the contribution of the forest management as an institution and individual decisions on the management of the forest can be explained and actions interpreted. Secondly, social impact assessment which is believed to provide the insight of communities' intentions, attitude, needs, wants, aspirations and the basis for frustrations can be done through this approach. According to Burdge *et al* (1995) social impact assessment can:

- provide a comprehensive description of the social reality under consideration. This means desaggregating the local population, identifying divisions and potential sources of conflict, and showing the logic whereby different attitudes and opinions are formed;
- alert all participants to anticipated and unanticipated changes.

2.2.1 Data collection and analysis

Quantitative and qualitative methods of data collection and assessment have been used in this study. These include, a review of secondary data sources, semi-structured interviews (on key individuals), direct observations, group discussions, diagramming, construction and analysis of maps, ranking and scoring, and scenarios on possible futures.

2.2.1.1 Review of secondary sources

A conceptual framework through which the study could be analyzed was constructed through the acquisition of the secondary data. As mentioned by Sayer (1992) in trying to understand the world, we use existing knowledge and skills to work upon other raw materials. The review of existing knowledge involved a review of the relevant literature on a number of subject issues including literature on general forest management, reports, topical and area-specific articles from journals and newspapers, research and other official and non-official studies, area-specific statistics, archives and files, aerial photos and maps. This was important in order to get the insight of the study and to achieve the second objective of the study, i.e. to undertake a review of relevant national and local initiatives for the management of the forest resource and evaluate their implications for Mount Meru forest reserve.

In addition, social theories and public participation subjects were surveyed in detail. These were important to enable the researcher streamline the methodological and analytical social research methods used in this study.

Folklore - Mythology, oral tradition, local and topical stories and proverbs were also accessed during the interviews in the communities. This was important to understand the traditional values of the forest to the indigenous people; cultural and social relations between the communities and the forest resource base.

2.2.1.2 Semi-structured interviews

Both interview schedule prepared prior to the interview, and open-ended questions, have been used (Appendix B). The interview schedule was administered by the researcher. Unexpected, relevant issues were followed up with further questions or probing and recording done in a data collection form (the data collection form model is attached in Appendix C). Interviewees were key individuals and focus groups. The use of key individuals and focus groups was adopted from Mikkelsen (1995) who recommended key informants/individuals and focus groups as a source of special knowledge about issue in question.

Key individuals: these were people anticipated to have particular insight or opinion about Mount Meru forest reserve. Almost all the participants were from Arusha region and in particular from Arumeru District where Mount Meru forest reserve is located. The population included high level regional and district administrative authorities, forestry specialists, traditional leaders and the indigenous people from the communities around the forest reserve. The population comprised both men and women to avoid the bias of asking one group only.

The adoption of interviews in this study has been based on the theory of post-structuralism. It assumes that knowledge is constructed and expressed in terms of the concepts available in a language and we seek intersubjective confirmation of the propositions through communicative interaction (Sayer, 1992). The theory argues further that the social world is a world of ideas, icons, linguistic signs, representations, symbols, and discourse which can be accessed through communicative interactions. Anthropologists prefer this approach because interviews can do justice to the varieties of behaviour, to their context, and their meaning (Bryant and White, 1982). Specific objective of the interview was to elicit information about the problems that exist in the forest reserve, their relative causes and communities' suggestions on the possible remedial measures according to local experience and knowledge. The information obtained during the interviews formed a basis for describing the realities and meanings of the forest resource to the society.

The villages visited were selected according to wards for administrative purposes. The wards visited (Map 2.1) were:

- **OldonyoSambu** which was represented by Maziwa, Oldonyowas, OldonyoSambu villages.
- **Kimunyak** which was represented by Olevolos village.
- **Ilkiding'a** which was represented by Olgerino, Ilkiding'a, Shiboro villages.
- **Olkokola** which was represented by Lemanyatta, Olkokola juu and Ilkuruotu villages.
- **Sokon** which was represented by Ngiresi village.

All participants were given the same questions. However, some topics were more familiar to one group of people than another; for example, a forestry specialist could respond better to forestry issues than a normal person from the community who has little information on how the forest operations are conducted. By the same token, traditional leaders and the community could respond better to traditional issues and had more insight on hidden forest problems, their causes and possible solutions, than either the forestry specialists or administrative leaders. However, all responses were given equal weight during data processing and analysis.

2.2.1.3 Group discussions

These were conducted with homogenous groups of individuals. Group discussions were conducted with:

- a) a group of 10 forestry specialists as one session;
- b) a group of 5 - 9 traditional leaders in each of the 5 wards visited. This makes a total of 5 group discussions with the traditional leaders; and,
- c) two groups, each with 5 - 9 people from the community in each of the 5 selected wards. This makes a total of 10 different group discussions conducted with the communities.

The selection of the optimum size for group discussions was based on the recommendations given in the guidelines for scoping (Department of Environment Affairs, 1992). For effective discussions, the guidelines for scoping recommends an optimum size of 5 to 7 people and not more than 20 to 25 participants. A group discussion with more than 20 to 25 people is difficult to manage (Mikkelsen, 1995).

The questions used in the group discussions were the same as those developed for the interview schedule. Important notes, weighting of issues and the conclusions to the discussions were recorded by the researcher during the discussions.

The purpose of these discussions was to verify survey results, supplement objective information obtained from the individual perceptions in the semi-structured interview and gain a deeper appreciation of the knowledge, understanding and perceptions of the participants. As recommended by Sayer (1992) this interaction with the participants allow a system of meaning of results to be developed through feedback.

2.2.1.4. Direct observation.

This was the observation of physical structures, social differences, behaviour, action and symbols by the researcher. As suggested by Babbie (1973) researchers attempt to observe all major events taking place to immerse themselves in the totality of the phenomenon under study. These observations have been important in making value judgements and for understanding and coding of data acquired in the interviews. The method have been adopted in this study on the basis that casual observations in the field would lead to an accumulation of objective facts (Babbie, 1973; Smith, 1977; Johnston, 1986; Sayer, 1992). Though it is blamed of being theory laden (Johnston, 1986; Sayer, 1992), it is assumed that facts are there to be gathered and the objective scientist can collect them, arrange them, explain and predict (Sayer, 1992).

2.2.1.5 Diagramming

During the interview participants presented diagrams to summarize empirical and analyzed information. Examples of such diagrammatic representations included:

Trend analysis - to emphasize changes in ecology, climate, water quality and quantity downstream and forest quality in general.

Venn diagrams - which involved placing circles or lines of different sizes in symbolic relationships to each other to depict the participants' sense of relations between institutions.

2.2.1.6 Ranking and scoring

During individual interviews and group discussions, respondents were requested to give weightings to their responses. A response card was issued to respondents before an interview to show possible choices for their responses. The cards which were later coded and ranked for further assessment. The participants were asked to respond as shown in Appendix D.

An issues-respondent summary sheet was prepared. Respondent weightings for each issue were coded and the issues ranked as shown in table 2.1.

Table 2.1 An example of a preparatory table for data analysis.

Identified Problems	RESPONDENTS						Total score	Ranking
	A	B	C	D	E	F		
(Identified problems listed in this column) for example:								
logging	5	4	5	3	2	4	23	a
grazing	3	4	3	5	3	2	20	b
cultivation	2	3	4	1	3	4	17	c
hunting	0	2	1	1	0	1	5	d

Source: Modified, after Theis and Grady 1991, in Mikkelsen B. 1995. *Methods for Development Work and Research*. p. 121.

a - being the most important problem according to this ranking system, while, d - is the least important problem.

However, during data analysis ranking according to the total score proved not to be the only measure of the importance of identified issues. Other parameters included **percentage response** and **average weight** to measure the **sensitivity** and the **popularity** of issues among the individual participants and groups.

a) Percentage response was calculated as follows:

$$\text{Percentage response} = (\text{TC}/\text{N})/100$$

Where: TC = Total Count, which is the total number of respondents for the parameter.

N = Sample population.

b) Determination of standard error and confidence interval

From the percentage responses, the standard error and the level of confidence under which the findings are discussed have been determined as suggested by Babbie (1973). Details on the calculations are attached in Appendix E. From tables 3.1; 4.1; 8.1; 8.2 and 8.3 it will be found that as the number of participants responding to an issue increases, the standard error decreases.

The standard error was found to range between ± 0.01 and ± 0.12 . The lowest standard error of ± 0.01 has been found among the responses where a large number of participants responded. Such issues include the “lack of supervision and monitoring” issue where 71 participants responded (Table 4.1). This low standard error justifies as positive (99.9 per cent confident) that the response is within the true feelings and attitude of the population. Decentralization and in-service training issues had the least responses i.e. 2 in each. These gave the highest standard error of ± 0.12 thus giving a lower confidence interval. This method has been developed to provide a way of measuring participants’ appreciation and awareness of issues which they identified during the interview.

The adoption of different methods for data analysis in this study has been according to Enderud (1984) as cited by Mikkelsen (1995), who justified that standardized methods of data analysis in qualitative research studies are rare. Methods of analysis are formulated during the process, tailor-made for the study.

2.3 CRITERIA FOR THE CHOICE OF THE STUDY PARTICIPANTS

A total of 198 key individuals with particular insight of the topic have been used in this study as the sample population. These included officials from Mount Meru forest reserve, regional and district officials, indigenous communities and forest specialists.

The **officials from the Mount Meru forest reserve** were included because they are involved in the forest management, they were anticipated to have detailed information on the forest management initiatives and of the current problems facing the forest.

Regional and District administrative officials: included because of their positions in the region and in the district respectively. They are directly involved with various development and community conflicts in the region and in the district, including the conservation of Mount Meru forest reserve. These officials were anticipated to hold wide views and have current knowledge of public concerns.

Key individuals from the indigenous communities. The mountain is surrounded by about 28 villages in 13 wards. In this study five wards were selected for data collection. The selection was based on population density, distribution of plantation forest and natural forest, and the degree of dependence on the forest by indigenous communities. These wards were identified and selected with the assistance of the district and ward administrative officials. In each of the

five wards, 50 key individuals from different villages were identified by the ward official and from these the researcher selected 20 individuals using probability sampling. The 20 individuals included traditional leaders. These 20 key individuals participated in the individual interviews, and later in the group discussions for each selected ward. A group discussion with the traditional leaders explored trends in traditional laws and norms and their contribution to forest protection.

Forest specialists. Tutors from the Forestry training institute were interviewed as they were considered to be neutral and were expected to have an insight into what is happening in the forest reserve. The choice of particular tutors was based on their specialized subjects. Tutors teaching forest management, forest economics, community forestry, forest protection and forest policy and law have been selected.

2.3.1 Probability sampling

The selection of the sample from the communities was based on probability sampling. Estimation of the probability of selection was determined according to Babbie (1973) on Probability Proportionate to size (PPS) Sampling. The following formula which indicates a given element's probability of selection in a PPS sample was adopted from Babbie (1973):

$$[\text{Element Probability}] = [\text{Number of clusters selected}] \times [\text{Cluster size/Population size}] \times [\text{Elements selected per cluster/Cluster Size}].$$

$$\begin{aligned} \text{In this case, the probability of selection} &= \text{Sample size/Population size} \\ &= 100/72618 = 0.001. \end{aligned}$$

N.B.: 72618 was estimated to be the 1997 population size of the 5 wards selected for this study (basing on projections of the population census data of 1988).

Therefore the probability of selection of the key individuals from the community was 0.001. These relationship shows that the number of people from the community who could be interviewed in relation to the population size is very limited.

2.4 PRE-TESTING

Pre-testing refers to the initial testing of one or more aspects of study design before the researcher can indulge himself/herself in the actual field data collection process (Babbie, 1973). Pre-testing may include aspects such as the interview schedule, the questionnaire, the sample

design and a computer program used for analysis. The main objectives of this process as summarized from Babbie (1973) are to:

- save time, money and considerable effort which can be wasted on a faulty research design;
- allow early discovery of research problems which may result into failure to achieve research objectives due to some unforeseen errors;
- uncover hidden problems of definition and decisions which could not be recognized in advance. This situation will ensure that the decisions are more carefully considered and the researcher will be able to ensure that those decisions are acted upon consistently throughout the final study.

2.4.1 Pre-testing the interview schedule

In this study pre-testing of the interview schedule was done with the main aim of ensuring useful data. Persons similar to the population to be sampled in the study were interviewed. This was done to allow modification of the interview schedule so that the questions matched the intent of the study. Questions' clarity and format, variance in responses, and the internal validation of items were among the problems which were uncovered and modified.

2.4.2 Pre-testing of data processing

This was done to check the effectiveness of the format of the weighting and data coding procedures. It was initially done by using hypothetical data and later with a completed pre-test interview. This process provided an opportunity to consider whether the data processing could be done concurrently with data collection so as to save time and provide early detection of the trends of the results.

2.5 LIMITATIONS

Most of the data used in this study is obtained from face-to-face interviews. Limitations of such interviews are that, they are:

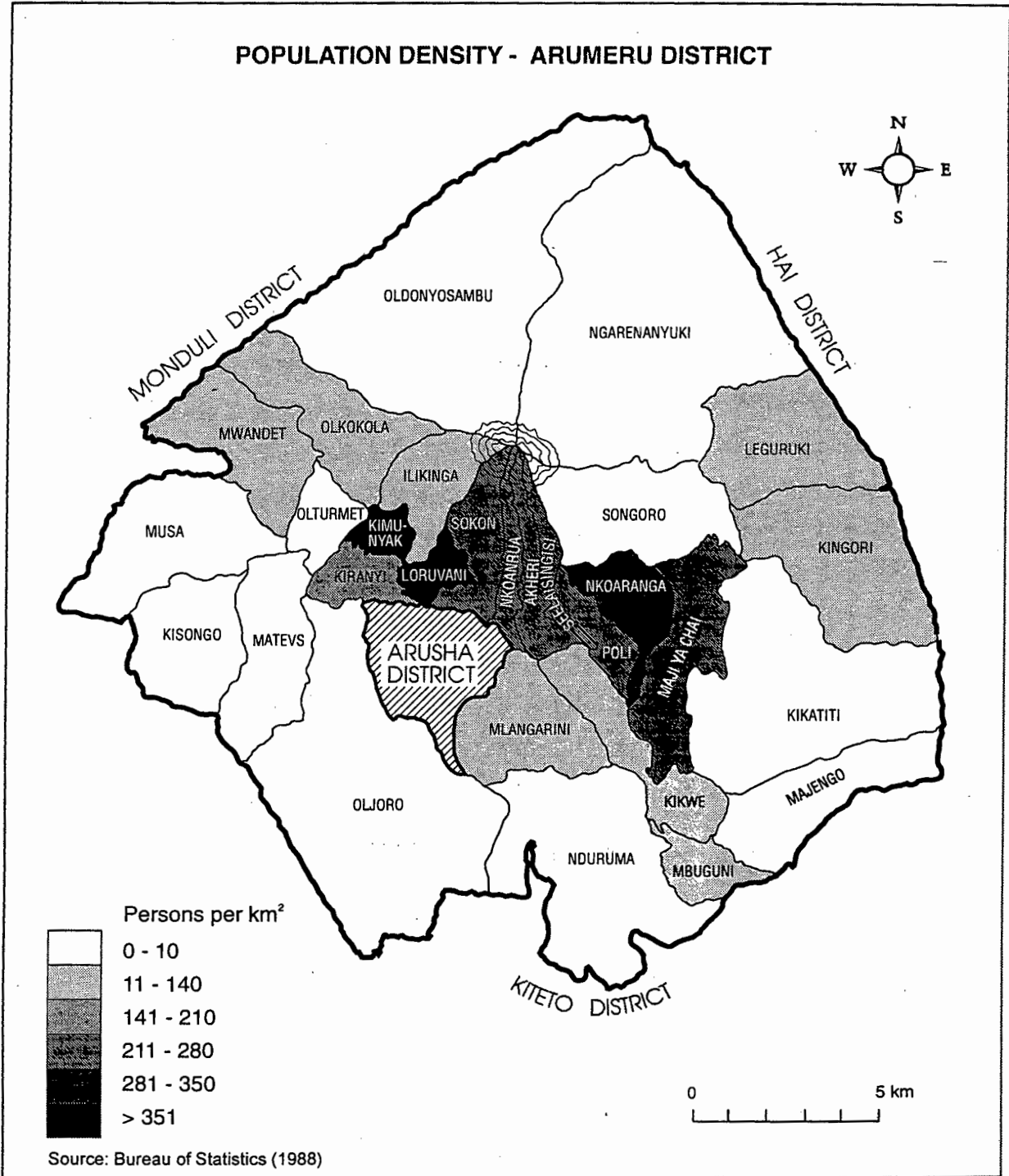
- 1) expensive and time consuming and only a limited number of people can be interviewed;
- 2) susceptible to interviewer bias: inaccurate/distorted perception and interpretation or preconceived ideas/conceptions on the part of the interviewer.
- 3) susceptible to bias caused by selection of informants.

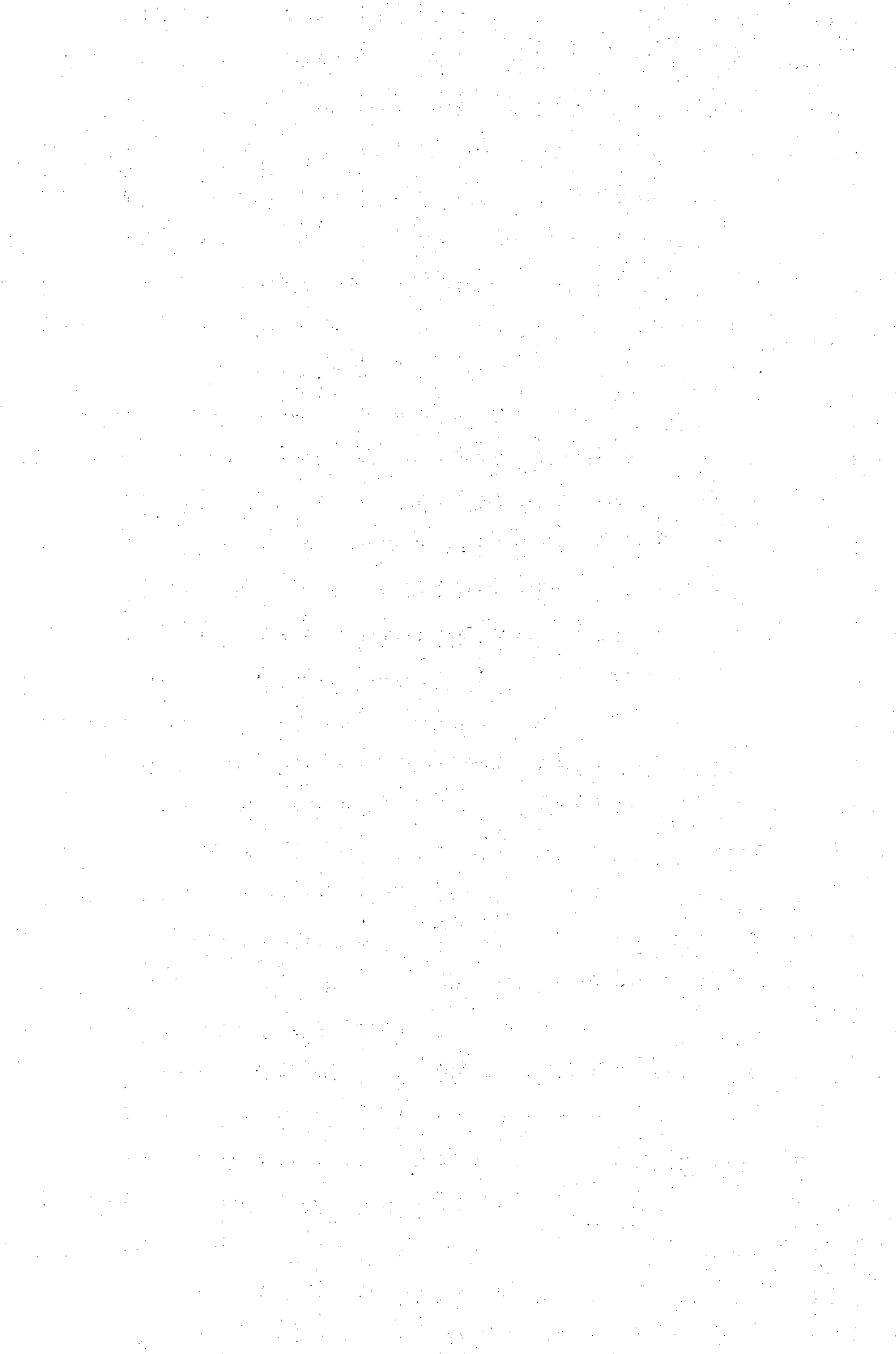
2.6 SUMMARY

This study is therefore based on responses to interviews conducted amongst a total of 198 people involved directly with Mount Meru forest reserve in Tanzania. A pre-tested interview schedule and analysis procedure was applied in OldonyoSambu ward and in Maziwa and Lemong'o villages. The results of this survey, which was conducted in the months of April and May of 1997 form the basis for the discussion given in the subsequent chapters.

MAP 2.1

POPULATION DENSITY - ARUMERU DISTRICT





CHAPTER 3

IMPACT OF FOREST PROBLEMS ON THE FOREST ECOSYSTEM

Table 3.1 gives a list of the forest problems and the response distribution, in order of importance in influencing forest destruction on the Mount Meru forest reserve, as perceived by respondents during the survey. These problems, as indicated by the respondents, are wide spread in both the forest plantations and the water catchment forest, although some problems are much more pronounced in one area than in others. Arguments presented on their contribution to forests and forest land destruction include their effects on:

- biological diversity through extinction of species;
- soil erosion and land degradation;
- water quality and quantity downstream; and
- Mount Meru forest reserve's value to future generations.

Table 3.1 Response distribution: identification of forest problems

Forest Problems	Total score	Ranking level	Total Count	% response	Average response
Killing of wildlife	44	19	25	20	2
Destruction of water sources	460	4	102	83	5
Soil erosion	422	7	103	84	4
Land degradation	84	16	19	15	4
Forest fires	560	1	123	100	5
Grazing by the community	543	2	122	99	4
Taungya cultivation	484	3	113	92	4
Extinction of species	241	10	61	50	4
Monoculture plantation	204	13	62	50	3
Cedar poles cutting	389	8	102	83	4
Open gaps	424	6	86	70	5
Squatter population growth	234	11	64	52	4
Illegal timber harvesting	353	9	83	67	4
Wildlife tree damage	88	15	25	20	4
Plantation timber harvesting techniques	453	5	95	77	5
Illicit brewing	204	12	54	44	4
Young age eucalyptus trees harvesting	49	18	11	9	4
Tree diseases and pests	81	17	19	15	4
Forest encroachment	108	14	35	28	3

The set of problem cases presented in table 3.1 as identified by the respondents form the basis for discussions in all sections of this chapter.

3.1 FOREST FIRES

In the survey forest fires were shown to be a highly significant and highly sensitive problem: among 100 per cent of the total responses. In the problem ranking, forest fires ranked first. Annual forest fires were found to have been a common phenomenon in the Mount Meru forest reserve in recent years. It was found that the most significant fires occurred in:

- August - September, 1983 around Nadeng'oro - OldonyoSambu area which destroyed about 300 hectares;
- November - December, 1990 in the ericacious and heath land which destroyed about 1000 hectares;
- September, 1991 in Nadeng'oro area which destroyed about 200 hectares;
- November - December, 1993 in the Ngarenanyuki area which destroyed about 300 hectares; and
- September 1996 - March 1997 which occurred in several locations within the mountain forest and destroyed about 3200 hectares of the natural forest. This fire as described by the respondents, started in September at one location and by October 1996 it had spread to five localities within the forest.

a) Biophysical implications

Forest fires were considered to have severe ecological, biophysical and economic implications by all the respondents. This was based on the argument that if such fierce fires continue to occur in the mountain forest then they will destroy all the forest vegetation cover. The respondents found this happening to be calamitous to the inhabitants around the forest reserve, the people in the Arusha municipality, and the nation at large. They mentioned the importance of forest cover in the amelioration of climate, for protecting water sources and for preventing disastrous floods on the plains. In keeping with these concerns, Grigg (1970) and Goudie (1986) argue that the removal of forests by fire increases the rate of the loss of soil humus and this can be a potent contributory cause to soil erosion.

b) Ecological implications

The respondents were also concerned about the disappearance of valuable tree species which they all depend on for traditional medicine, and that even if the forest regenerates in future, a different species may replace the present valuable species. The respondents also were compassionate to the large number of wild animals which die in fires either because they are caught unaware or they are too slow to escape the fast moving fires. This was said to be morally unacceptable.

c) Economic implications

Uncontrolled fires in the forest plantations were related to economic losses. The fires cause detrimental effects to the trees; some trees are burnt completely and for those which remain, they have big scars caused by fire. The scars, according to a group discussion with the forest specialists, become an entrance point for micro-organisms which cause internal decay in the affected trees. This reduces wood quality for utilization in either construction or furniture making. Plantations affected in this way suffer high economic losses due to reduced prices or unacceptability in the timber markets.

3.2 ILLEGAL TIMBER HARVESTING

In this discussion illegal harvesting incorporates the ecological effects due to illegal timber pit-sawing, charcoal burning, harvesting for firewood, and cedar pole harvesting in the natural forest. Illegal timber harvesting and cedar pole cutting were all identified as significant problems among 67 and 83 per cent of the total responses respectively. These results indicate that the problems are widespread and sensitive among the respondents.

a) Ecological implications of illegal timber harvesting

It was a concern among the respondents that illegal timber harvesting and cedar pole cutting activities are done through selective felling, which was described as being very destructive to the natural closed forest. It contributes to forest destruction because large trees (of diameter larger than 30 cm.) are selected for felling. Such selective logging is accompanied by a great deal of indiscriminate felling. The tree which is cut down crashes against adjacent trees and brings them down too. Often the trees topple in groups, because they are effectively laced together by vines and lianas, so that one felled tree pulls the rest down. This in effect creates a large working area

as shown in plate 3.1, for the tree fellers to either do pit-sawing to produce lumber or chop the tree into pole size bits ready to carry down-slope for either personal use or sale.



Plate 3.1: A photograph taken in the closed natural forest of Mount Meru forest reserve showing the influence of cedar pole cutting on the closed natural forest.

The large open gaps were described as a source of soil erosion originating from the natural forest.

Another concern by the respondents is that this selective logging has been quite intensive in recent years and they have witnessed most of the valuable timber tree species disappearing. The identified timber species which were suspected to be near extinction are *Juniperous spp.*, *Podocarpus procera* and *Olea africana*. This concurs with the argument by Johns (1992) that the effects of intensive selective logging are normally spread over all tree taxa, with damage essentially random, and all rare species susceptible to depletion. Following such selective logging, the diversity of the forest may be enhanced by the rapid germination of pioneer tree species (which include many Euphobiaceae in South-east Asia; *Cecropia spp.* and *Vismia spp.* and some legume, such as *Inga*, in the Neotropics; *Albizia*, *Trema* and *Musanga* in Africa) (Johns, 1992). According to Rogers and Hall (1986), Hamilton and Mwashia (1989b) and Bjorndalen (1992) illegal selective logging has also been found to disturb the natural balance between species and inhibit regeneration.

It was revealed during the survey that the forest is also being cut for firewood, a major energy source for the people around the forest reserve. According to Park (1992) firewood gathering becomes important in forest habitat degradation because when the firewood near the forest boundaries is exhausted people penetrate into the interior of the forest in search of firewood. This will thus subject the forest to subsequent clearance which will lead to forest habitat degradation.

3.3 SPECIES EXTINCTION AND BIODIVERSITY DEGRADATION

Species extinction was identified as a significant problem among 50 per cent of the total responses. It was found that collection of herbs, tree bark and roots for traditional medicine is popular among the Waarusha and Wameru communities.

a) Social implications of species extinction and biodiversity degradation

Different kinds of medicinal plants and herbs are widely used to cure various human and animal diseases. The communities have strong belief in these traditional medicines for their curative ability of different kinds of diseases. It was also found that respect for these traditional medicines has extended to neighbouring communities and countries.

b) Ecological implications of species extinction and biodiversity degradation

The problem as identified in the survey is not the collection of the traditional medicine from the forest *per se*, but the mode of collection used, which contributes to the death of the subject trees. Tree roots and bark are the parts of the tree which are normally collected. This involves uprooting trees and tree debarking, to take of most of the root and bark. The trees which are subjected to this mode of traditional medicine collection may die if the action is followed by heavy drought. The disappearance of these tree species from the forest was revealed not to have only ecological implications but also economic implications due to the increased rates of medical treatment - which most of the indigenous people cannot afford.

It was also revealed during the survey that the uprooting of trees creates large holes and piles of soil in the forest. Soil which is susceptible to soil erosion. There are concerns among the indigenous people that if the present trend of traditional medicinal collection is left unchecked

most of the indigenous tree species will disappear within a few years because the collection is now done in large quantities, as identified in the local market and shown in plate 3.2

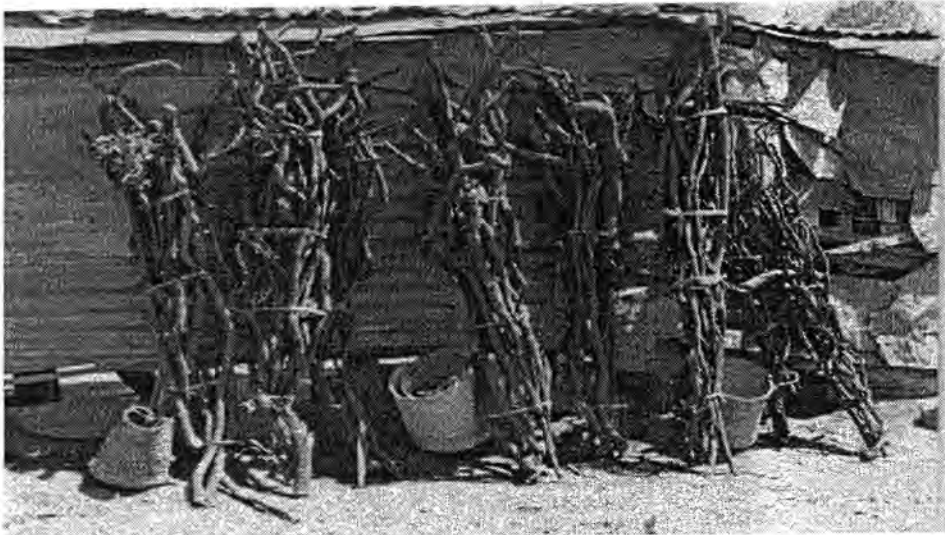


Plate 3.2: A photograph taken in Ngare-mtoni local market showing the intensity of the traditional local medicine business.

3.4 DESTRUCTION OF WATER SOURCES

Destruction of water sources was identified as a highly significant problem among 83 per cent of the total responses. Popular wisdom insists that water is the source of life. In this survey this notion was also reinforced by the respondents. Together with creating large open gaps in the closed natural forest, timber logging has extended along the river banks and water streams. This is exemplified by a photograph taken along Makumira river as illustrated in plate 3.3



Plate 3.3: A photograph taken along Makumira river on the slopes of Mount Meru forest reserve showing illegal timber cutting along river banks.

a) Biophysical implications

Timber cutting operations along the river banks and water sources was argued by the respondents to have reduced the quantity and quality of water downstream. This concurs with the findings by Sarmett and Faraji (1991) which showed that together with other effects, timber cutting along rivers also caused rivers and tributaries with earlier all-year round water flow to dry up in dry periods in Kilimanjaro Mountains.

b) Economic implications

As revealed during this survey the important and permanent rivers from the forest reserve include Maji ya Chai, Makumira, Tengeru, Nduruma and Themí. These rivers flow towards southeast direction to join Upper Ruvu River to Nyumba ya Mungu dam. Together with other rivers from Mount Kilimanjaro, the rivers are source of water for Pangani River and Hale hydropower station which provide electricity for most of the parts in the country. The Pangani River basin also contains the important traditional irrigation activities for subsistence agriculture.

Other rivers originating from the catchment forest reserve include Engare-Olmotonyi, Selian and Narok on the southern slopes of the reserve. These flow to rich agricultural lands on the southern slopes of the mountain. Ngarenanyuki river flows towards the Northern direction and ends in the flatter areas between Mount Meru and Mount Kilimanjaro. As revealed during the survey, during dry seasons, the water levels in the rivers become very low and sometimes dries out. The lowering of water levels in the Pangani River was found to affect electricity power supplies during the dry season.

3.5 ILLICIT BREWING IN THE FOREST RESERVE

Water quality was also found to be highly reduced by the brewing of local brew activities (an illicit brew commonly named “gongo”) which were found to be located beside rivers within the forest reserve. The problem of illicit brewing inside the forest reserve was identified as a significant problem among 44 per cent of the total responses. Periodic dark colouration of water flowing down streams to Engare-Olmotonyi river was said to be a clear indication of water pollution caused by the raw materials and residuals from these brewing activities along the river.

Social implications of illicit brewing

The illicit brew as identified by the respondents in this survey does not only cause water pollution problems but also has dreadful social implications. The social implications include killing and/or reducing considerably the life expectancy of the young people who could be productive to the society. According to the respondents most people drinking this brew are between the ages of 25 and 60 when they are most productive in the society.

3.6 GRAZING BY INDIGENOUS PEOPLE

Domestic animal grazing in Mount Meru forest reserve was found to be a complicated problem with both ecological, biophysical and social implications. In this discussion all these implications will be addressed. Domestic animal grazing in the forest reserve was identified as a significant problem and found to be highly sensitive and important to the respondents among 99 per cent of the total responses. Respondents were concerned about the haphazard and uncontrolled over-grazing by large stocks of domestic animals. This is wide-spread in all the forest reserve. Permanent cattle "bomas" were also described to be inside the natural forest at high altitudes (about 2600 m.a.s.l.). Domestic animals identified to be grazing in the forest reserve include; cows, goats, sheep and donkeys.

a) Soil erosion

Because of the nature of the soils in Meru forest reserve, over-grazing leads to soil erosion and land degradation on the mountain slopes. Soil is loosened by animal hooves and during the dry season the soil is turned into powder and dust which is eventually driven downslope and into the rivers and streams during the rainy seasons. This causes heavy storm floods and siltation of rivers because almost all the rain water is subjected to run-off instead of soaking into the soil to join the ground water cycle. Land degradation signs can also be seen in the collection of large deposits of sand in the rivers. These deposits are good indications of weathering of the bed rock (i.e. basalt rock) at high altitudes. Sand collection from the rivers has in recent years developed into good business. However, as argued by Miller and Donahue, (1995), the natural process of soil erosion is increased greatly by human activities, such as overgrazing.

b) Fire

Grazing of domestic animals is under the control of young boys "Laiyoni", aged between 7 and 10 years. These young boys carry fire with them, in small tins, to keep themselves warm in the cold high altitudes. Sometimes they make bigger fires in the forest to warm themselves or to roast maize and potatoes. On occasions the young boys forget to extinguish the fire after they have finished using it, or the fire runs out of control. When the fire gets out of control, the boys run away together with the animals, leaving the forest burning: this brings about all the ecological consequence of forest fires.

c) Economic implications of grazing

The domestic animals include grazers and browsers which feed on tender shoots, buds and leaves of young trees. When the shoots of the young trees in the plantation are eaten by animals, the tree develops axillary buds which may result into the growth of forking trees, which are of poor quality and jeopardize the objective of producing good quality timber. Goats browse on the bark of the trees, debarking the lower part of the tree trunk. This action creates wounds which then permit entry of tree disease micro-organisms and fungi. Such affected trees are subjected to decay and heart rot, reducing the timber quality during harvest.

Associated with grazing is the habit of herd boys to walk with sharp weapons such as bush knives (pangas) and spears which they use, intentionally or unintentionally, to destroy the plantation trees. This is done by cutting and creating scars on the lower part of the tree trunk. Herd boys also debark the lower part of the large cypress trees to use the bark for sheltering against rain. These activities have subjected the trees in the plantation to different insect pests and to disease micro-organisms. This is particularly prevalent in the compartments neighbouring the villages. Though the effects of grazing are found in all of the forest plantation the most severely affected compartments were found to be in the Narok and Olmotonyi ranges. It was reported that the subjected trees have been severely affected by *Oemida gahani*. These tree borers have caused decay and heart rot in most of the cypress trees. Visual assessment of standing trees to assess heart rot or decay has failed (ZOFOMO logging officer - per. communication). In most cases *Oemida gahani* borers and secondary fungi infestation have affected trees which would otherwise be assessed as sound, especially in cypress. Because of this standing tree assessment failure, forest produce customers must consistently ask for rebates

for unsound timber. The production of unsound timber from logs bought by customers from Mount Meru forest plantations has created a very uncomfortable situation between the customers and the Forest Division staff.

d) Social implications of grazing

The survey also found that the communities around the forest reserve blame the Forest Division for allowing grazing in the forest reserve. This is because young boys of age between 7 and 10 years of age are being deprived of basic education by their parents/guardians. The respondents argued that if it were not for uncontrolled grazing which hides young boys in the forest, the parents/guardians would not be allowed by the community leaders to have the young boys loitering around without going to school. In 1995 two young boys of age 7 and 8 years, namely Lukoko Muitivoi and Murani Muitivoi respectively, both from Sambasha village of Ilkiding'a ward lost their lives in a fire which was lit for food preparation and warmth. According to the respondents, the deaths of these (and others whose records could not be accessed) would not have happened if grazing was controlled in the forest.

3.7 WATER POLLUTION

Reduced water quality in rivers and streams was found not to be only due to illicit brewing as discussed earlier, but also due to grazing. Cow dung and other animal residuals are washed into rivers and streams during the rainy season, or when animals are drinking. Pollution caused by animals has been identified as one of the major factors leading the indigenous people to state that river water from Mount Meru is of such poor quality that it is unfit for human consumption.

a) Effects of poor quality water supply on community health

Community health has been threatened by microbial diseases in Muklat and Kimunyak wards in recent years. Incidences of cholera, typhoid and dysentery around TPRI villages were found during the survey. Pollution of the Engare-Olмотonyi river from slaughtered animal residuals, excreta reaching the river from latrines along the river banks was also identified. The survey also revealed that though senior politicians (and professionals from different fields involved in environmental affairs) are aware of what is happening, and the laws are there to stop such incidences, the issues have not been addressed. As a result health hazards are affecting the populace. According to a World Bank report (1995), since 1973, water related diseases have

become a menace in Tanzania. The report states further that causative organisms of cholera and typhoid have a tendency of remaining for months in the body of the host without it necessarily showing any symptoms. It is well documented that, for every one proved case of cholera, there are about fifty symptomless carriers in the community harbouring the organisms (World Bank report, 1995).

b) Social and cultural implication of poor quality water

During the survey it was revealed that in 1995 people from Likamba village of Muklat division were unsatisfied with the water quality downstream. They believed that the illicit brewing activity was contributing to this problem. In their traditionally organized groups, the Likamba people removed the drums of the illicit brew from the rivers in the forest. The action which created a social conflict between the communities around the forest reserve and those in the lower slopes. The conflict resulted in reported deaths. It was also revealed that since the beginning of this water conflict in 1995 until the time of this study, Likamba people had not been able to access their water source in the forest reserve.

3.8 SOIL EROSION AND LAND DEGRADATION

Soil erosion was identified as a significant problem among 84 per cent of the total responses. This response shows that the problem is very popular among the respondents. Land degradation was identified as a significant problem among 15 per cent of the total responses. The two parameters are discussed jointly here because by definition land degradation is an advanced stage of soil erosion where gullies or deflation are developed (Miller and Donahue, 1995) as is the case in the Mount Meru forest reserve.

Arguments on the biophysical problems caused by soil erosion were: the increased rates of storm water from the mountain into the lowlands which were suspected to have caused a number of flood incidents; development of gullies in the forest plantations which indicate land degradation; and, siltation of rivers and streams which had caused water pollution downstream.

Gully erosion

Gully erosion was visible on different sites in the forest plantations. Some of these gullies had extended into the public land. Serious floods occurred in April, 1997 on the lowlands in Muklat

ward with storm water believed to have originated from a gully based in the forest plantations. Plate 3.4 shows the gully around SUA¹ which was believed to cause these serious floods in Muklat ward on the lowland.



Plate 3.4: A photograph taken in the Mount Meru forest plantations around SUA residences to illustrate the extent of the gully inside the forest reserve.

These floods left about 500 people homeless with one death (local newspaper - Uhuru, 21 April 1997). Although a number of flood incidents were reported from all over the country during this period, the villagers believe that the identified gully accelerated these floods on this particular area.

Accelerated soil erosion and land degradation as will be shown later, were found to have resulted from: intensive clearfelling of trees which had created open gaps; poor choice of tree species on different forest sites which had increased run-off; poor forest road construction techniques; taungya cultivation; and poor logging techniques. The effects of which had extended to the lowlands because as mentioned during the survey, floods knows no political boundaries.

3.9 OPEN GAPS IN THE FOREST RESERVE

Open gaps in the forest plantations was identified as a highly significant problem in the forest reserve among 70 per cent of the total responses. In the natural forest the open gaps were identified as being created due to cedar poles harvesting, illegal timber logging and traditional medicine collection. In the forest plantations, open gaps were said to be caused by mainly intensive timber harvesting which was not followed by an equal tree replanting activity of the clearfelled areas. It was found that the communities believe forest trees stabilize soils and

¹ SUA, Sokoine University of Agriculture training station.

reduces soil erosion, therefore, reducing floods from the mountain forest. In addition, they believe that removing trees exposes soils to high temperatures and heavy rainfall intensities. The respondents argued that high temperatures which occur during dry seasons make the soil dry and powdery. In cases of strong winds the soil is easily blown out and the whole forest is covered with dust. During rainy seasons, rivers are filled with storm water and silt, an indication of intensified soil erosion on the mountain slopes. The respondents argued that the frequent incidents of wind and water erosion are bad signs of land degradation which cannot be accepted in the forest land.

These arguments concurs with the findings by Hamilton (1988) that popular wisdom insists that planting trees will prevent erosion and that removing trees *per se*, results in drastic erosion leading to land degradation. Hamilton (1988) argues further that trees, particularly trees in forest stands do indeed reduce the amount of erosion, and conventional wisdom does coincide with proven effects. Findings by Salat and Vose (1984) showed that forest canopy protects soil from the impact of intense tropical rainfall, and the litter layer on the forest floor protects the soil from rain splash, and once forest cover has been removed, soils are very prone to leaching and erosion.

However, findings by Lal (1983) shows that substantial erosion can occur in undisturbed forest on unstable slopes. But, reports by UNESCO/UNEP/FAO, (1978) also shows that soil erosion under dense natural humid and seasonally humid forest is usually less than one ton per hectare per year. According to Miller and Donahue (1995) highly erodible land can have erosion levels which exceeds 90 tons/acre/year. This level must have erosion reduced to a predetermined tolerance level which is normally 4 to 5 tons/acre/year, the maximum rate of annual soil loss that will permit crop productivity to be obtained economically and indefinitely (Miller and Donahue, 1995). However, the large volumes of soils carried downslope from Mount Meru forest reserve during the rainy seasons every year, according to the respondents could exceed 90 tons/acre/years though the actual data was not available.

3.10 TIMBER HARVESTING TECHNIQUES IN THE FOREST PLANTATIONS.

Timber harvesting techniques were identified as highly significant problems among 77 per cent of the total responses. Timber harvesting is associated with mechanized timber logging and road building operations. Timber skidding and forwarding happen by using farm tractors through ground skidding. The conventional ground skidding system was identified as the cause of soil erosion and soil compaction on skid trails and on the timber logging sites. Indications of the occurrences of soil erosion and land degradation on skid trails were identified to be common as shown in plate 3.5



Plate 3.5: A photograph taken in Mount Meru forest plantations to illustrate the effects of skid trails on soil erosion and land degradation.

The eroded soils according to this survey are carried into water streams and river valleys as flood storms. Consequently, the storm water pollutes water downstream, reducing its water quality. This is in keeping with the arguments by Castilon (1990) that erosion and water quality problems are usually the result of poorly located logging roads and skid trails associated with commercial timber harvesting.

Intensified soil erosion and land degradation problems were mentioned to have been as a result of a 9 kilometer road constructed in 1987 and 1988 between Olmotonyi to Nading'oro ranges. The road, according to the respondents have poor drainage systems which direct storm water from the road haphazardly into the plantations thus creating rill, sheet and gully erosion on the culverts' and other points of side drains outlets.

3.11 CHOICE OF TREE SPECIES' SITES.

The problems of soil erosion and land degradation were also associated with the choice of plantation tree species planted on different forest sites. The problem of species choice was found to be earmarked on plantation sites where eucalyptus and cypress tree species had been planted on steep slopes (sometimes at slopes greater than 30 per cent). The respondents argued that these tree species do not allow undergrowth's. They argued further that in the closed unthinned cypress stands only bare soils are found on the forest floor. This becomes the cause of accelerated soil erosion on steep slopes.

On the other hand, it was revealed that the communities around the forest reserve have high beliefs that eucalyptus tree species drain water from the soil. A popular rumour, which accuses eucalyptus tree species of having the potential to disrupt the normal functioning of the hydrological cycle. Eucalyptus, an indigenous tree species in Australia, has been widely adopted as a plantation tree species in many parts of the world (Kaale, 1984). This outcry by the public require research to justify and remove public doubts on the adoption of eucalyptus tree species on an important water catchment area like Mount Meru forest reserve.

3.12 TAUNGYA CULTIVATION IN THE FOREST PLANTATIONS

Taungya cultivation was identified as a significant problem but very popular and sensitive among 92 per cent of the total responses. The taungya system was found to be used as a silvicultural technique in the Mount Meru forest plantations establishment. In principle, the taungya system consists of planting plantation trees with annual crops (Hamilton, 1988; Gomez-Pompa and Burley, 1991). According to the survey, it was found that the taungya system involves allocation of clearfelled areas to farmers which they use to grow annual crops for some years before the trees are planted. The farmers continue with their crop production even after the trees have been planted until the canopy of the trees closes, when they are allocated to do the same thing in another taungya area. The farmers in return have the duty of tending the tree crop by weeding, first pruning and protecting trees against illegal cutting or grazing. The respondents showed their appreciation of the system in the improvement of the welfare of the people, on the grounds that it was a source of income and source of food to alleviate hunger. However, they were concerned about the negative implications of taungya cultivation. Taungya cultivation was described to have predominant biophysical, ecological and social problems.

a) Ecological problems of taungya cultivation

The ecological implications of the system as mentioned by the respondents occur when the areas are left under cultivation for long periods without tree planting activity. This makes the farmers to put the land under cultivation for more than the desired period. Sometimes the farmers abandon the lands before trees are planted because the land is found to be no-longer productive due to soil nutrients depletion. According to an example given by one of the respondents from Kimunyak ward, he was given a plot to practice taungya in 1982 (Compartment A15 - according to the plantation map of 1983) and until the time of this survey, the plot had not been replanted with trees. Most farmers had abandoned their plots in this area and currently, wild *Datura* and *Solanium weeds spp.* have colonized it.

Wildlife loss was associated with the taungya system. Farmers get easy access to the animals and hunt them for food. According to the survey this was identified as a somewhat of a problem among 20 per cent of the total responses. In a group discussion during the survey, the respondents complained of the high rate of the disappearance of the natural beauty of the forest. Colobus monkeys (protected), Blue or Sykes monkeys, the red forest duiker, baboons and a variety of birds were said to be a natural beauty of the forest. The respondents explained the extra beauty of the forest provided by these wild animals as being very beautiful “maridadi kabisa²”. They complained that most of these wild animals have disappeared in recent years. The disappearance was claimed to be due to hunting for food by farmers who stay inside the forest reserve. In keeping with these findings, Gomez-Pompa and Burley (1991) argue that a major disadvantage of taungya system is the danger of losing species of animals and plants from forest ecosystem - a major decrease in biological diversity. In addition, the respondents also claimed that the disappearance of these wild animals as being due to the unfavourable environmental conditions created by the monoculture tree species. They believe that most of these animals might have moved to other areas where they could find a variety of food and hiding places in the most natural areas of the forest. These concerns are in keeping with those of Tisdell (1991) who noted that a forest managed under commercial exotic monoculture plantation is a less suitable habitat for much wildlife than the original vegetation.

² “maridadi kabisa” an expression in Kiswahili language which shows and emphasizes an individuals' sense of appreciation of extra beauty.

b) Economic problems of taungya cultivation

It was a major concern by the respondents that a large number of trees planted were normally destroyed by the farmers to avoid tree canopy closure and create more space for crop production. This in effect lower the stand tree density and enable the farmers to put the land under cultivation for longer periods. It was also noted that the destruction of planted trees by the farmers had reduced the stand stock and the trees found in isolation on these large created spaces had high tapering boles, and large branches. Large knots on timber trees according to forestry specialists in this survey, produce poor quality timber for construction, also trees with high tapering boles give low wood recovery during timber sawing.

c) Biophysical problems of taungya cultivation

Other problems mentioned to be associated with taungya system were: its high influence on soil erosion and land degradation; and pollution of water downstream through siltation. It was found during this survey that soil erosion control measures in taungya cultivation was minimum and the trashes on the contour bands were not sufficient enough to prevent soil erosion on the steep slopes. An example of trashes on contour bands to prevent soil erosion in taungya cultivation is shown in plate 3.6



Plate 3.6: A photograph taken in Mount Meru forest plantations showing trashes on contour bands to prevent soil erosion in taungya cultivation.

In keeping with these arguments, Mather and Chapman (1995) suggested that if the removal of trees from a forest can have significant environmental effects, so also can their replacement in forest plantations. They argued further that in addition to the ecological changes resulting from the near monoculture of plantations, ground preparation operations such as ploughing can trigger subjects of accelerated erosion and silting.

3.13 YOUNG AGE EUCALYPTUS TREE HARVESTING.

The problem of harvesting young age eucalyptus tree stands was identified as a significant problem by relatively few individuals who had detailed knowledge of forest management in Mount Meru forest plantations. It was argued that Eucalyptus stands of age between 4 and 5 years were clearfelled and sold as poles to support the flower industry. These few respondents were highly concerned about: future procurement of eucalyptus poles; vast unplanned areas cleared in a short period of time; revenues accrued in relation to the real value of the produce; and the sustainability of the forest. These concerns were both ecological, economic and social concerns as discussed below.

a) Ecological concerns on young age clearfelling of eucalyptus trees

The ecological concerns were based on the area cleared in a short period of time thus increasing the amount of the open gaps in the forest plantations. It was argued that an area which could basically be harvested for a period of 3 months or more was cleared in one week. This was claimed to accelerate and increase the amount of open gaps in the forest, which would consequently, lead to increased rates of soil erosion.

b) Economic concerns on young age clearfelling of eucalyptus trees

Respondents were questioning about selling the poles. They said that the forest staff were selling the poles on a volume basis. This principle of selling small young poles by volume was condemned by the respondents on the basis that it is not a profitable undertaking to the government, but only benefits customers. Forest staff were being blamed of not being faithful and trustworthy to their employer i.e. the government, instead they gave high profits to the customers.

However, it was found that the flower growers had given slightly higher prices for poles (the price difference could not be determined during the survey). But the concerns were even more serious among the forest specialists in the survey, who argued that the extra prices does not justify harvesting the forest pre-maturely. They argued further that:

“ a good manager would spot good market whenever chances arises, even planting - one could plant more or less than indicated on the management plan as long as this does not exceed the requirement and create undue change from the normality”

In addition, if the market is favourable i.e. prices are good, one can cut more than specified and then compensate in the following year. In view of this provision, forest specialists in this survey said:

“this provision does not allow haphazard cutting as done in Meru plantations! maximization of economic returns should not be done on the expense of jeopardizing the normality of the forest and creating irreversible environmental hazards”.

c) Social concerns on young age clearfelling of eucalyptus trees

Another serious concern from the respondents was that with the present trends of eucalyptus poles harvesting, a future loss will be noted in services provided by TANESCO³. This was argued on the basis that TANESCO will run short of enough and good quality electricity transmission poles due to low supply from the local markets (if all the eucalyptus stands in the country are tended the same way as the case in Meru). This was shown as a factor which would force the government through TANESCO to import electricity transmission poles from abroad, the action which would inflate electricity rates. In this regard, a poor rural farmer would not be able to afford electricity and his living standards will continue to remain low.

3.14 EFFECTS DUE TO THE INTRODUCTION OF EXOTIC MONOCULTURE TREE SPECIES.

Tree disease and pests, and wildlife tree damage are included in this survey as human induced problems because these problems were found to have serious implications in the human introduced exotic monoculture forest plantations. Wildlife damage was found to basically originate from the human action of introducing the exotic monoculture plantations within an area which is originally a natural habitat for wild animals. This has been considered therefore as human interference with the natural ecosystem which eventually brings about destruction of valuable investment in the plantation forest by these natural inhabitants. The fact that exotic monocultures are associated with risks of diseases and pest have been justified in the literature, as summarized (Madoffe and Day, 1995):

- Plantations usually consists of one species and this will make an enormous food source and ideal habitat for an adapted insect and population will thus increase;
- The uniformity of species and closeness of tree, allow more rapid colonization or spread of infestation among the trees;
- Forest plantations grows on one site for many years. This allows a pest or disease to build up over a period of time which is very different from a farm crop which is harvested at short intervals;
- Most exotic species have a period of relative freedom from organic damage, but it does not last indefinitely. Many of the natural agencies controlling pests could be missing.

³ TANESCO - Tanzania National Electrical Company, a parastatal organization which deal with electricity supply in the country.

Carpenter (1981) also argued that monoculture exotics may offer high payoff in rapid production of high volumes of usable material, but they also present unusual risks in terms of pest outbreaks and diseases.

a) Tree diseases and pests

Tree diseases and pests was identified as a significant problem and sensitive among 15 per cent of the total responses. During the survey information on the incidents of tree diseases and pests was revealed from Mount Meru forest plantations office records. Cypress dieback was found to be reported to occur in the forest plantations since 1987. Cypress aphid, *Cinara cupressii* was found to attack through feeding most of the cypress trees in the plantations. The attack was distributed to cypress trees of all ages. Feeding habits of the aphid was reported to cause desiccation of tree stems and progressive dieback of heavily infested trees which caused death to the trees.

In response to this infestation, short-term resolutions which focused on scavenging the remaining cypress stands were made in 1987. Accelerated harvesting of cypress stands happened since then. This was found to be associated with installation of a number of mobile sawmills inside the forest plantations. Consequently, large areas were clearfelled in a short period of time. The incident which have created open spaces in the forest because no alternative tree species was specified to replace cypress. Instead, *Eucalyptus* tree species have been used to replace cypress especially on most of the lower slopes; and *Pinus patula* is planted wherever possible while most of the areas remain unplanted. The respondents estimated the open unplanted areas in the forest plantations to be between 1500 and 2000 hectares out of 6885 hectares of the total plantation area.

Eucalyptus stands comprises about 30 per cent of the total forest stands along the middle slopes of the forest area, while pines and cypress comprises 70 per cent (Tarimo, 1995). In view of the area planted with eucalyptus, the villagers think that this is more than enough on a water catchment area such as Mount Meru. As also mentioned earlier, the communities around the forest reserve have high perception that eucalyptus stands drain water from the ground and have the potential to drying-up water sources. They perceive further that as a result of planting eucalyptus on Mount Meru forest plantations, the water catchment area has been deprived of

ground water supply and the quantity of water from the streams and rivers has been lowered considerably. The communities have a feeling that planting of eucalyptus tree species in the forest plantations has contributed to water shortages in Arusha municipality and in the lowlands in recent years.

b) Wildlife Tree Damage

Wildlife tree damage was identified as a significant problem and was popular among forest specialists with 20 per cent of the total response. Elephants and monkeys were identified as wild animals which are currently causing significant tree destruction, though buffaloes were also reported to be a problem in the early years of forest plantations establishment. Elephants damage trees during feeding, and when seeking pleasure they browse on trees debarking most of them. This happens in pine and cypress species especially in compartments bordering the natural forest. The debarked parts of the tree create wounds through which fungi and other disease micro-organisms enter and attack the tree.

3.15 FOREST BOUNDARY ENCROACHMENT.

Encroachment of the forest boundary including the "buffer zone" by the people from neighbouring communities was identified as a relatively significant problem among 28 per cent of the total responses. The respondents argued that the forest land was gradually been reduced through encroachment. The identified encroached natural forest areas were found to be planted with coffee, maize, beans, potatoes and banana crops. Some areas have been subject to permanent settlements.

Together with reducing the forest land, the respondents argued that the encroached forest land in Ngarenanyuki as indicated on Map 1.2, on the western side of the mountain slopes were no longer productive for subsistence crops as they used to be in the previous years. The soils are already depleted. In keeping with these arguments, Park (1992) and Hunter (1996) argue that although the natural rainforest is a luxurious, highly varied and highly productive type of vegetation, the underlying soils are inherently infertile. Most of the nutrients are contained in the living vegetation and the thick layer of decomposing matter on the forest floor (Timberlake, 1988; Whitmore, 1990). Park (1992) argues further that the tropical forest soils are poor in nutrients and they soon lose fertility. It is usually difficult to replenish the soil nutrients with

artificial fertilizer: the high levels of iron and aluminium in many tropical forest soils tend to “lock up” phosphate fertilizer in a chemical form which plants cannot use (Timberlake, 1988).

3.16 SUMMARY

The forest problems identified in this chapter were shown to have broad ecological, biophysical, economic and social impacts. The utilization of the forest resource base has been directed mainly to accruing consumptive benefits such as timber exploitation, grazing and agriculture. Although most of these activities are considered to be illegal (according to the forest ordinance) they are still practiced at the expense of forest conservation. During the survey the causes of forest destruction were found to be based on a number of issues which include: the forest resource regime; conventional methods of forest protection; socio-economic and institutional factors. These are more fully discussed in the chapters 4, 5, 6 and 7.



CHAPTER 4

FOREST RESOURCE REGIME, HISTORICAL BACKGROUND

4.1 PRE-COLONIAL PERIOD

Traditionally, before the German colonial period commenced in Tanzania in 1885, Mount Meru forest was under traditional land tenure and the utilization of forest resources was controlled by the traditional laws and norms. Some people were also residing inside the forest with their cattle. Exploitation of building poles, firewood for domestic use and medicinal plants happened free of charge but was for local use only. According to the traditional laws, nobody was allowed to graze his animals along the river banks or in streams and springs. Streams were used as recreational areas and for traditional ceremonies.

Fires rarely occurred in the forest and in case it happened that fire occurred, joint efforts of all the people from the community were used to suppress it. After fire suppression, a group of women had to take a sheep, uniform in colour, and slaughter it under a ficus tree inside the forest as a kind of sacrifice and apology to the ancestors who were believed to have been wronged by man. They had a strong belief that the mountain and the forests were God's properties and when human beings set the forest on fire the action really angered God and as a punishment God would not give them rain for the growth of vegetation for fodder and farm crops for human survival.

If anybody contravened the traditional law, he was fined a goat and 40 litres of local brew for the old people to eat and drink. If the same person repeated the offense, he was fined a bull and 80 litres of local brew which according to them is still the highest fine traditionally. In cases where the offender had no bull in his cattle heads, this man was whipped severely by two strong traditional soldiers commonly known as "moran" in front of a big crowd. This was considered to be a very humiliating punishment which everybody wanted to avoid, so people were actually afraid to break the law and the forest was sustainably utilized.

4.2 COLONIAL PERIOD 1885 - 1961

During the German colonial rule in Tanganyika (Tanzania mainland), the Germans exploited the forest to get timber for export and for boat making. The tree species which was highly susceptible was *Olea capensis*. After World War 1, the British took over from the Germans. In 1920 they found that the forest had been highly degraded due to timber over-exploitation by the previous regime and declared the forest a reserve with the objectives of water and soil conservation.

This degradation started in 1888, when the German colonial government started exploiting the forest. Degradation became intensified in 1920 when the British colonial government declared the forest a forest reserve. The declaration required all the indigenous people who were living inside the forest with their cattle to leave the forest premises and reside on the public land. This declaration is said to have angered the people who were forced out of the forest with their cattle. Some of them were reported to have been depressed to the extent that they committed suicide. As revealed during this survey the indigenous people perceived that the government had deprived them of their rights for the use of the forest reserve so that the forest benefits could be solely available to the government. This is because the indigenous people were barred from the forest but the government opened it for timber concessionaires and pit-sawyers who were exploiting indigenous trees mainly *Podocarpus spp.*, *Juniperus procera* and *Olea capensis*. Sawmills whose remains are said to still be visible to date, were located inside the forest reserve. In this regard, the indigenous people concurrently went on grazing their animals illegally in the forest, cutting building poles, timber for construction and furniture and collecting traditional medicine from the forest. This multiple use by the government and the indigenous people resulted in over-exploitation and depletion of the forest resource-base in Mount Meru forest reserve.

Therefore, in 1930 the British government decided to introduce fast growing exotic tree species to replace the timber which was being removed from the forest. The over-exploited part of the forest around Narok range (A12- according to the plantation map of 1983) was cleared and planted out with Cypress tree species as pilot plot. The tree planting area was cleared up by cultivators mainly the Kikuyu tribe from the neighbouring country - who planted irish potatoes in return. Areas cleared-up by cultivators were found to give better results of well established

trees and reduced government forest establishment costs. The process of land preparation for forest plantation establishment was adopted in 1950.

4.3 AFTER INDEPENDENCE, 1961

After independence in 1961, the independent government inherited the forest reserve from the previous British government. In 1976 Arusha Catchment Forest Project was officially established and the natural forest, part of Mount Meru forest reserve, was separated from the forest plantations to be managed under the Catchment forestry project (CFP) of which the Arusha project forms part. However, the over-exploited areas of natural forest continued to be cleared and replaced with exotic plantations mainly cypress, pines and eucalyptus tree species until 1984. Though few cultivators, for example, Kikuyus (from the neighbouring country) and Safwas (from southern highlands - Tanzania) existed, prisoners were mainly used for forest establishment during this period. At the same time timber exploitation by the government was still taking place through timber concessions and pit-sawing until 1984. Also illegal grazing and forest exploitation for various activities by the indigenous people was still happening in the natural forest.

4.4 FOREST RESOURCE CONSERVATION AND MANAGEMENT SINCE 1984 TO DATE

4.4.1 Government initiatives

The importance of the natural forest in all its functions, particularly the social and non-monetary benefits were well recognized by the government and the Ministry of Natural Resources (MNRT, 1979). Due to the recognition of their importance even at the political level, there was intense pressure from politicians as well as the general public to intensify protection, preservation and management of these forests (MNRT, 1986). During September 1984 the natural forest was closed for exploitation of any forest product so that the forest could be protected exclusively as a water catchment forest (MNRT, 1986)). Forest patrolling was intensified and grazing, collection of building poles, construction timber and firewood by the community were illegal and therefore prohibited. The Swedish government, within the bilateral agreement with the Tanzanian government agreed to support Mount Meru catchment forest activities in 1986. In addition, the Norwegian Agency for Development (NORAD), within the same bilateral agreement framework, started supporting catchment forests in four potential

regions (including Mount Meru) in Tanzania since 1988 to date, under the Catchment Forestry Project (CFP). The objective of the CFP as financed by NORAD is to effectively manage and utilize catchment forest cover on a sustainable basis. According to NORAD's management approach, environmental protection of forest tree cover, soil and biodiversity is a basic element while efficient catchment of water and economic forest production are more tangible parts of the objective.

Currently the government of Tanzania has given natural forest management including catchment forestry top priority (MNRT, 1996). There is also a strong political desire to safeguard the natural forests and the general environment in the whole country. His Excellency Benjamin William Mkapa, the President of the United Republic of Tanzania (1996), expressed this desire in his opening speech to a workshop organized by The Wildlife Society of Tanzania on 'Putting environment on the national agenda' held in Kilimanjaro Hotel on 24th July, 1996. He emphasized the objectives of the "Chama Cha Mapinduzi" (CCM) ruling party Manifesto to the protection of water catchment forests that:

"... Those areas covered with natural forests, sources of water, and mountains will be protected against human encroachment. In addition, CCM will restrain those responsible for environmental pollution, unnecessary bush fires, and uncontrolled cutting of trees..."

The approach as outlined in the Tanzania Forestry Action Plan (TFAP) is conservation for development (MLNRT, 1989). The emphasis is on local utilization of the forests which allows the government to reconcile the socio-economic and conservation goals of its forest policy, with forest production as a more tangible part of the objective. The administrative organization for the project is the structure of the Catchment Forestry Sub-Structure in the Forest Division with an expatriate project coordinator. Although the government has a strong intention to save catchment forests and there are clear management objectives set under TFAP and the Donor agency which are straight forward, implementation of these objectives in Mount Meru catchment forest (including other catchment forests in this programme) has been met with a number of set backs as identified during this survey. These will be discussed later under the causes of forest problems in the subsequent chapter.

During the early 1970s, plantation timber harvesting through thinning started and some revenues could be accrued by the government from the forest plantations. In the early 1980s most of the plantation stands had reached their rotation age i.e. 25 and 30 years old for pinus and cypress tree species respectively. This standing wood could not be harvested because of lack of accessibility to the harvesting sites (MNRT, 1986). The government took an initiative to request Swedish funding for the development of the forest plantations at that stage, especially for road-building and forest logging.

4.4.2 Foreign aid for forest management

Within the framework of the joint Tanzania-Swedish Forestry Sector Support Programme, a Logging and Road Building Project was started at Olmotonyi under a Zonal Forest Management Office (ZOFOMO), initiated in 1986 to cater for three forest projects in the northern zone i.e. Meru, West Kilimanjaro and Rongai forest plantations. With the Swedish assistance, timber harvesting and road building were highly mechanized. Road building using bulldozers i.e. Caterpillars, Traxcavators, excavators, and motor graders was introduced to access harvesting areas. Timber harvesting was intensified with power saws in timber felling, farm tractors in timber skidding and forwarding.

A special account, Logging and Miscellaneous Deposit Account (LMDA) was introduced in late 1987. The account was introduced under a special accounting system whereby some resources accrued from silviculture, logging and roads could be retained by the project to be ploughed back in the same forest activities under the supervision of ZOFOMO. However, as revealed during the survey the administrative role of ZOFOMO on the management of forest plantations is unclear. As pointed out (Kowero and Lundell, 1989) the mixture of ZOFOMO authority and forest plantation activities in the present ZOFOMO set up provides an unclear and incoherent goal structure which hampers efficiency as well as business orientation.

Nonetheless, with mechanized road building and timber harvesting activities, large forest areas were opened. The open areas were all put under taungya cultivation. With increased areas for cultivation, the few Safwas who were involved in taungya cultivation brought their friends and relatives from the southern highlands into the forest plantations to do farming. Since then the Safwa population have increased steadily in the forest reserve.

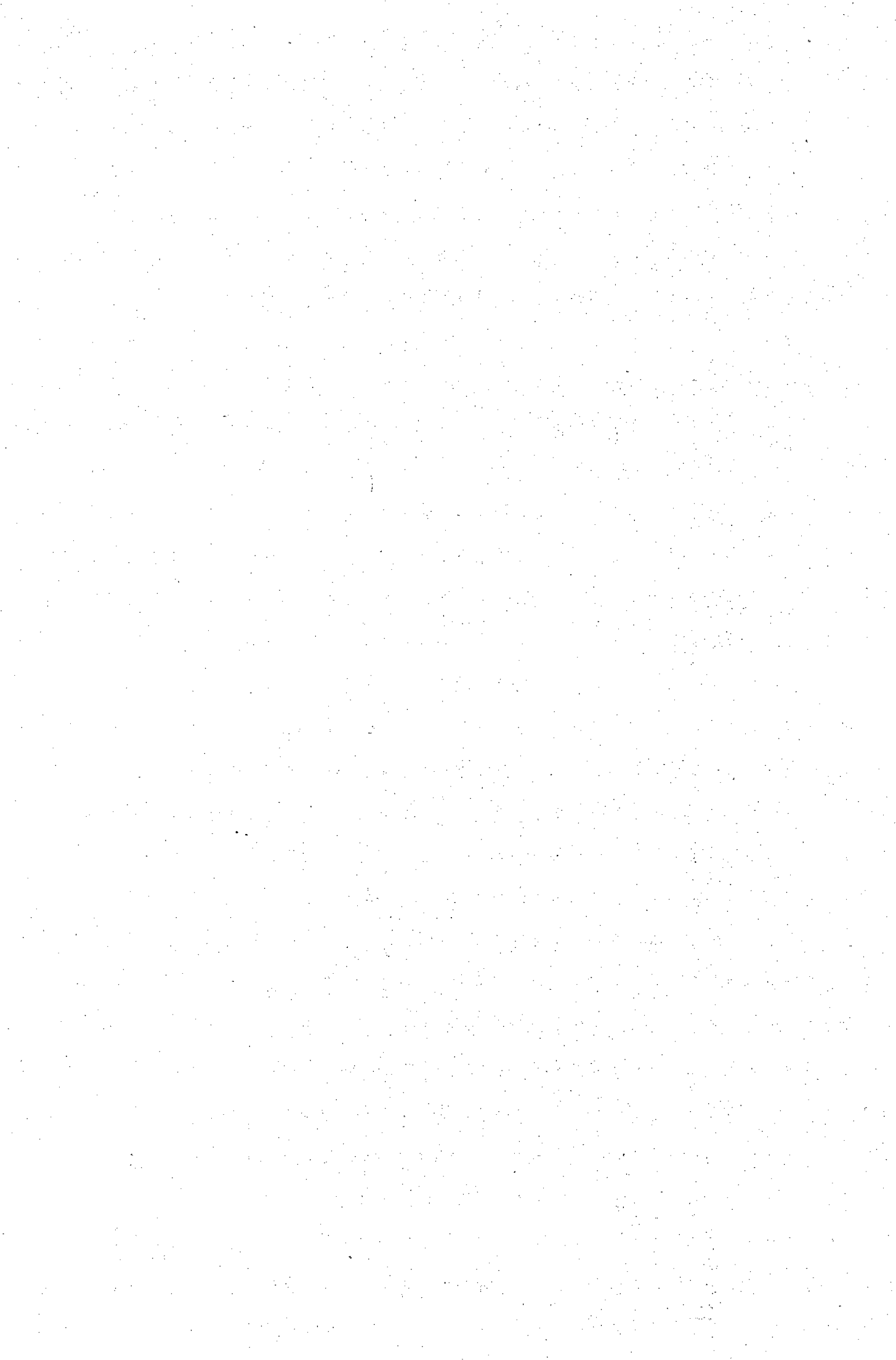
Forest staff also became involved in taungya cultivation to get food and supplement their income. On the other hand, in the community, agriculture had increasingly become recognized as more important than livestock keeping in alleviating hunger. Land shortage in the public land coupled with increasing population meant that a search for an alternative source of land was inevitable. So the communities around the forest reserve flocked to the forest plantations and became involved in taungya cultivation.

4.5 SUMMARY

The community believe that the forest reserve belongs to them. They find it very unfair when they see the government harvesting timber from the forest plantations getting money, forest staff cultivating, Safwas cultivating and residing in the forest reserve, while intensified patrolling of the forest has been introduced to prevent them from grazing and getting their traditional benefits from their own land. The basic causes of forest destruction and forest land degradation as identified in this survey, were described by the respondents to have originated from these grounds. This will be seen in the discussion of the causes of forest problems presented in Table 4.1. The contents of table 4.1 forms the basis for the discussions in the subsequent chapters 5, 6 and 7.

Table 4.1. Response distribution: identification of causes of forest problems.

Causes of forest problems	Total score	Ranking levels	Total Count	% response	Average weight
Squatters residing in the forest reserve	246	6	58	81	4
Taungya cultivation	315	2	68	94	5
Corruption by the forest staff	265	4	60	83	4
Inadequate choice of tree species on forest sites	142	17	34	47	4
Lack of working tools and equipment	41	30	13	18	3
Weather conditions i.e. drought	60	25	14	19	4
Business in traditional medicine	224	7	49	68	5
Cedar poles cutting for business	182	11	42	58	4
Inadequate funding for govt. work	34	32	13	18	3
Lack of incentives for forest staff	53	27	15	21	4
Low government salaries	42	28	11	15	4
Lack of alternative wood source	206	10	48	67	4
Population pressure from the public land	72	24	16	22	5
Honey hunting	125	18	34	47	4
Large cattle stocks in the villages	247	5	53	74	5
Hunting for wild animals for food	8	36	2	3	4
Haphazard entry to forest reserve	150	16	40	56	4
Poverty in the communities around forest	175	13	44	61	4
Arson i.e. intentional destruction	87	22	22	31	4
Brewing of illicit brew on water streams	76	23	18	25	4
Lack of formal employment for natives	38	31	17	24	2
Lack of soil conservation in taungya	92	21	24	33	4
Development of flower industry	101	20	23	32	4
Too many sawmills depending on Meru	122	19	30	42	4
Land shortage in the public land	218	8	48	67	5
Decentralization policy of the government	10	34	2	3	5
Stagnant policy reforms	41	29	12	17	3
Weak forest ordinance	173	14	54	75	3
Lack of supervision and monitoring	322	1	71	99	5
Lack of public involvement	157	15	35	49	5
Poor forest management practices	273	3	60	83	5
Lack of coordination and relationships	29	33	6	8	5
Lack of in-service training	5	36	2	3	4
Lack of extension services	179	12	49	68	3
Lack of forest protection activities	213	9	51	71	3
Poor research activities		26	13	18	3



CHAPTER 5

FOREST PROTECTION

Forest protection in this context will consider fire protection and fire fighting, control of illegal harvesting, control of illegal grazing and prevention of forest boundary encroachment. Also reference is made to the response distribution of the causes of forest problems as identified by the respondents and presented in Table 4.1. During this survey lack of forest protection activities was identified as a relatively important cause of forest destruction but was also identified as a sensitive and popular cause of forest destruction among the respondents in 71 per cent of the total responses. As revealed during the survey, implementation of forest protection activities in Mount Meru forest reserve has relatively decreased in current years. It was also revealed that traditional protection policies, weak forest ordinance, socio-economic and cultural factors have contributed to making forest protection difficult to implement. Effects of the conventional forest protection policies on the control of illegal grazing, illegal timber felling and fire fighting as revealed during this survey are discussed below.

5.1 CONVENTIONAL GRAZING CONTROL

Grazing and its control is shown to contain a number of complications among both the community and the forest staff since 1984. During this time the order to prohibit cattle and cutting of trees from the forest reserve was effectively implemented. Two identified cases will be presented to illustrate the implications of the implementation of conventional forest protection policies.

i) Case one

It followed that on 15 September 1984 a group of cattle from cattle bomas¹ in the natural forest were impounded by the forest staff in collaboration with the northern zone anti-poaching unit² who were armed. A total of 94 cows, 15 goats and 3 donkeys were found and impounded during that day. Two owners of the animals were also requested to join the group with the animals downslope to the forest station. When they were about twelve kilometres from the forest station,

¹ cattle bomas - cattle sheds

² anti-poaching unit - a game patrolling unit under the Wildlife Division of the Ministry of Natural Resources and Tourism. The patrolling groups are trained and armed soldiers.

they realized that the information about the impoundment of these animals had already reached the community. A group of about 50 young men, traditionally known as “morán” (traditional soldiers) came armed with spears, bush knives, clubs and stones. More traditional soldiers joined in until the number had increased to about 250. The traditional soldiers started attacking the forest staff and the anti-poaching armed soldiers, who tried to fire their ammunition into the air to scare the traditional soldiers, but still these traditional soldiers advanced. In this incident, one traditional soldier from Sambasha village of Ilkidin’ga ward was killed. The whole group dispersed after the killing, taking away with them the animals. This incident created some discomfort to the government staff who participated in that particular operation. Among other things it resulted in harassment of the anti-poaching soldier who fired at the traditional soldier (the anti-poaching soldier had to appear before the court of law). The incident also created hatred and bad relationships between the community and the forest staff. It resulted in a lot of tension among these groups of people. It was revealed during this survey that this hatred and tension was noted by the Forest Division and it found it necessary to transfer those forest staff members who participated in the operation to other parts of the country for their safety and security purposes.

ii) Case two

Another case involving grazing control as identified during the survey took place in 1991. The animals impoundment were found to develop some multiplier effects when:

- the case was turned against a forest guard;
- a number of claims for traditional rights on the forest reserve were put forward;
- plaintiff claiming to have suffered damages during the action of animals’ being impoundment; and
- a pledge was put forward by the plaintiff for the forest institution to recover the damages as will be specified under the court of law. A copy of the case is attached (Appendix A).

When forest staff enforce forest protection they are protected by the forest ordinance Cap. 389 Part V and Part VII. In this case, grazing control section 15(4) of part V of forest ordinance states that:

"If any livestock are found grazing, or depastured in, or entering any forest reserve such livestock shall be presumed, unless the contrary is shown, to have been grazed, depastured or allowed to enter by the authority of the owner and of the person, if any, actually in charge of such livestock".

According to this case, the law does not specify what will happen with claims put forward (whether true or unfounded) by the plaintiff, for example, if it is shown that the livestock have not been grazed or depastured or allowed to enter in the forest reserve. Referring to the claims put forward by the plaintiff, the traditional rights for the use of the forest reserve are not addressed during the implementation of this law. During this survey, weak forest ordinance was identified as a relatively important cause of forest destruction among 75 per cent of the total responses. Revision of the forest law was suggested by the respondent. But it was found that delayed revision of the law was caused by stagnant policy reforms inherent in the forestry sector. This was identified as a relatively important cause of forest destruction and forest land degradation among 17 per cent of the total responses. The percentage response on weak forest ordinance indicates that there is a need for the Forest Division to revisit the forest ordinance and where relevant rectify the law to remove loop-holes which can be used by the offenders and make the law ineffective. Consequently, a constant review of the forest policy to ensure the accommodation of relevant social and economic changes was seen to be important.

In this case, it was found that Michael Megiroo, a permanently employed forest guard from the community, led the grazing control operation during this particular operation. The case was then later turned against him personally. It was also found that in this grazing control operation, a number of other animals which belonged to other people in the community were impounded and the action reported to the nearest magistrate (the Emaoi primary court magistrate) the same day after the animals were impounded.

It was also revealed that most of the animals' owners could pay the fines as specified, but the plaintiff in this case came up with claims after paying the fine and taking away his animals. According to this survey, the plaintiff in this case was actually grazing his animals in the forest reserve but he wanted to be covered by the traditional rights for the use of the forest reserve. Though the case was eventually nullified, such actions are said to have created tension and stress on the affected persons and scared other forest staff from becoming involved in intensive grazing control activities.

5.1.1 Haphazard entry into the forest reserve - trespassing

Trespassing as identified by the respondents is pervasive and needs control. The effects on soil erosion and land degradation can be exemplified as shown in plate 5.1, a photograph taken in the reserve within the plantation forest.



Plate 5.1: A photograph taken in the forest plantations showing the impacts of trespassing in the forest reserve.

Difficulties in the implementation of the forest ordinance as identified in this survey was also said to restrict the forest staff in controlling haphazard entry in the forest reserve. It was argued by the respondents that since the traditional rights are not clearly stipulated in the forest policy and law, it might be difficult for the forest staff to control the haphazard entry of animals and people into the forest reserve. However, haphazard entry into the forest reserve was identified as an important cause of

forest problems among 56 per cent of the total responses. This response indicates that haphazard entry into the forest reserve has contributed greatly to forest destruction and forest land degradation and thus needs to be controlled.

5.1.2 Shortage of land in the public land

Protection against overgrazing was found to be difficult due not only to the conventional protection policies, but also to lack of grazing land in the public land. Land shortage in the public land was identified as a highly significant cause of forest problems among 67 per cent of the total responses. It was revealed that land shortage had a negative effect on the increasing population, intensive agricultural practices and livestock keeping.

5.1.3 Large cattle stocks in the villages

On the other hand, it was revealed during this survey that the people around the forest reserve own large numbers of cattle while the grazing land in the public has considerably decreased. Most of the indigenous people on the western and south-western slopes believe that a man's wealth is defined by the number of cattle he owns. Though this traditional attitude is fading out on the southern and south-eastern slopes, some people still own more than 50 heads of cattle. Large cattle stocks in the villages as identified was identified as a highly important cause of forests and forest land degradation among 74 per cent of the total responses. As these high responses to forest destruction due to land shortage and large cattle stocks in the public land show, it is inevitable that the forest will continue to be destroyed by grazing unless measures are taken to find alternative grazing areas. Destocking would also reduce pressure on the forest.

5.2 PROTECTION AGAINST ILLEGAL TIMBER HARVESTING

5.2.1 Government initiatives

In September, 1984 tree harvesting in water catchment forests for areas of watershed value³ was prohibited all over the country including Meru forest reserve (MNRT, 1986). The forest order as stipulated in the forest ordinance Cap. 389 section 30(3) states:

“It is hereby prohibited to cut or remove any tree or forest produce from any area of catchment or of watershed value by any person or persons, institution or parastatals for any use except where such act is done for purpose of forest management of catchment or watershed value”.

As revealed during this survey, this order by the government did not pass unchallenged by the communities. On 9 June 1987 the King'ori and Muklat communities wrote to the Director of Forestry on behalf of the communities living around the forest reserve. According to this correspondence, the communities challenged the order for the following reasons:

- the communities around the forest reserve see no value in the forest if they cannot use it for their basic needs;
- firewood is the main source of energy in this area. Women have had difficulties in securing wood for cooking and they have started cutting green wood from family farms. This action

³ In this order Catchment Forests for Areas of Watershed value means all forested land which form the sources of springs, streams and rivers.

has created severe social problems in the families i.e. uncooked food and depletion of scarce wood resource in farmlands especially in the drier areas around King'ori;

- most of the people from the indigenous community are poor and cannot afford block houses so they use poles from the forest for building purposes. With the closure of the forest reserve and intensive protection by the forest staff it means the poor majority of the people and especially the young generation which need to have their own homes now, cannot build houses for themselves;
- construction and furniture timber is very expensive in the market and the poor people cannot afford to buy it.

As mentioned earlier, the people around the forest reserve believe that the forest belongs to them as is evidenced by this letter to the Director of Forestry:

“... we the inhabitants around the forest reserve, if we have been prohibited from using the forest, when are we going to benefit from our forest? Is this forest not meant for our benefit and for the benefit of the future generations of these communities?”

Nevertheless, these arguments could not reverse the order because pressure for the conservation of water catchment areas in the Forest Division had necessitated reinforcement of forest protection and prohibition of tree cutting in such areas. In addition, further pressure was placed on the Forestry sector because of an electricity shortage in the country. A popular rumour, as revealed during this survey, claimed that the shortage was due to cutting trees on water catchment areas.

While these prohibitions are aimed at conserving the forest, they have resulted in negative effects where the forest, as reported by respondents in this survey is haphazardly harvested and encroached upon. Though the forest is under strict laws, uncontrolled harvesting is continuously taking place. Cultural beliefs towards the indigenous wood, lack of alternative wood source for building and increased timber business in Arusha municipality were mentioned by the respondents as the major reasons for increased incidents of illegal timber harvesting in the forest reserve.

5.2.2 Cultural belief towards indigenous tree species

The community has a high regard for indigenous tree species, for example, the wood is strong and durable. They therefore prefer to use wood from indigenous tree species for building and other uses rather than the exotics. As further evidenced of their interest in indigenous wood, it was found that although the forest plantations are just adjacent to the villages, the villagers would prefer walking long distances inside the natural forest searching for cedar poles to collecting eucalyptus poles from the plantation.

5.2.3 Lack of alternative wood source in the villages

Together with the fact that the community prefer indigenous tree species better than the exotics, illegal timber felling (when needed exclusively for local building purposes) in both plantations and natural forest was found to take place intensively due to low income and lack of alternative source of wood in the public land. According to this survey, lack of alternative source of wood in the public land was identified as an important cause of forest destruction among 67 per cent of the total responses. This response shows that illegal timber harvesting in both natural forest and the forest plantations will continue to be a problem so long as the people around the forest reserve do not get an alternative source of wood for their wood needs.

5.3 FIRE PROTECTION AND FIRE FIGHTING ACTIVITIES

During this survey arson was identified as an important cause of forest destruction and forest land degradation among 31 per cent of the total response. Arson was said to be the cause of most fierce and destructive forest fires. It was found that in past years, forest fires were few and seldom. Whenever smoke was identified in the forest, the villagers would be on the spot even before the forest staff knew what was happening. Fires were suppressed free of charge by the communities in collaboration with the forest staff. However, in recent years food and soft drinks have consistently been supplied by the government through the Forest Division for fire fighters. In cases where food and drinks had been supplied, it was explained during the survey that there was unequal distribution of these supplies which ended up in the villagers not getting their share. Also forest staff and other people who went to fight the fire had transport which could take them from their offices/homes up to the point where motor transport was limited by gradient. But the villagers had to walk all the way from their homes up to the fire area and back home without any transport facility while they were the ones who (according to them) could fight fire better than

any of these people who had transport. It was then realized that, according to the Forest Ordinance, community fire fighters should be paid in money, but this remuneration never actually occurred.

The respondents were very skeptical about the remuneration of people who participate in fire fighting operations. They therefore commented that the reasons behind these malicious fires could be based on payment for forest fire fighting operations. The respondents referred to the Forest Ordinance of 1957, Cap. 389 Part V in which according to section 16 (1) it is stated that:

“It shall be lawful for any forest officer, police officer, administrative officer, forest manager, or any local authority fire brigade office to require any person who is within a reasonable distance of any forest reserve to assist in averting or extinguishing any fire in or threatening to enter on affect such forest reserve, or in securing any property within the forest reserve from loss or damage arising from fire”.

and sub-section 3 continues to say that:

“Any person other than a government officer or an employee of a local authority who has been required by one of the persons mentioned in subsection (1) to assist in averting or extinguishing any fire, shall be entitled to receive payment for such work at such rates as the Area Commissioner in whose district the forest reserve is situated considers adequate, regard being made in the case of unskilled labour to the rates for such labour customarily prevailing at the time in the district within which such forest reserve is situated.”

According to the respondents, when this remuneration became well-known among different individuals they used it to destroy the forest reserve. Some representatives of this study from the community went to the extent of doubting the forest staff. As quoted from a traditional leader from Olkokola ward:

“these fierce fires are occurring in this forest every year and we are not informed of any culprit caught in association with the cause of the fires, I think the forest staff are involved. They might be sending the forest guards to light these fires so that they use us free to suppress the fires and put into their pockets the fire fighting funds set aside by the government to do fire fighting while reporting to the government of the fire incidence with payrolls for fire fighting”.

A general comment given by all respondents from the community was that the way in which the government had been making them participate in forest reserve activities was comparable to the imposition of age old slavery system which would no longer be acceptable because people are now aware of their rights.

According to this survey the awareness of remuneration in the Forest Ordinance has made the communities understand their rights in forest fire fighting. It was further revealed that the communities understand that by not being paid in the previous forest fires the government had been mis-using them or the forest staff had been taking the remuneration for their own benefit. This attitude of the community, coupled with the fact that the forest had been prohibited for the procurement of their traditional benefits, has resulted in a number of uncontrolled forest fires. Efforts to suppress fires have currently been left to the forest staff and few cultivators who reside inside the forest reserve. Such alienation by the indigenous communities from forest fire fighting was found to result in a prolonged fire fighting operation of the fire which took place from September, 1996 up to March, 1997, setting on fire an area approximately 3200 - 3500 hectares of the natural forest.

However, as identified during this survey, arson is not the only cause of forest fires in Mount Meru forest reserve. Other factors will be discussed later under socio-economic factors which contribute to forest destruction. The spread of fire was also reported to be because of unpreparedness of the forest reserve management on fire fighting plans and strategies.

5.4 SUMMARY

The two cases of forest protection used by forest staff illustrates that the conventional methods of forest protection are ineffective. Instead, the methods create disastrous outcomes and hatred between the forest staff and the communities. This in effect reduces the relationship and coherence within the society. It was also found to accelerate forest destruction and forest land degradation. In addition it was found that people no longer respect the law. As revealed during this survey people are working for survival (the law cannot be tolerated or respected in this case). Human survival will be discussed in chapter 6 on the influence of socio-economic factors on forest destruction and forest land degradation.

CHAPTER 6

SOCIO-ECONOMIC FACTORS

The causes of forest problems as identified during the survey include socio-economic factors. In this chapter, these factors are discussed. They include: population density; employment; traditional beekeeping; wild animal hunting; and, low salaries for forest staff.

6.1 POPULATION DENSITY

Population pressure in the public land was identified as a highly important cause of forest destruction and forest land degradation among 22 per cent of the total responses. This factor was identified by a few members of the sample group in the survey. Although population pressure was not a popular cause among the sample population, it was a very sensitive issue to those who identified it as will be seen in the following discussion.

Based on the last Tanzanian population census data (Bureau of Statistics, 1988) Arumeru District had a total population of 321,898 people. The population's annual growth rate was estimated to be 3,8%. Based on projections, therefore, the District is now estimated to have a population of 431,987 people with an average population density of 147 people¹ per sq. km which is one of the highest population densities in the country.

As revealed during the survey, due to an increase in population, farmlands shrinking in size and becoming less productive and the notion that forest lands are more fertile and productive than farmlands, there has been pressure on taungya cultivation in the forest plantations and boundary encroachment around the forest reserve.

6.1.1 Forest boundary encroachment

Forest boundary encroached areas in Mount Meru forest reserve are shown in Map 1.2 According to this survey, the most affected areas include: Ngarenanyuki; Kilinga; Leguruki;

¹ the population density as will be seen in Map 2.1 is not evenly distributed within the district. Around the forest reserve the population density is even higher.

Ndoombo (around Themí range); and Olkokola ranges. Details of forest boundary encroachment are shown in table 6.1

Table 6.1. Areas identified for forest boundary encroachment

Forest range/beat	Distance from boundary (m)	Boundary length (m)	Beacon Nos.	Type of activity operating
Ngarenanyuki (area approx. 700 ha)	-	-	231 - 243	potatoes, beans and maize crops.
Kilinga	50	2000	2 - 17	banana and coffee crops.
Leguruki	100	3000	260 - 263	permanent residences, coffee and banana crops.
Themí (Ndoombo)	60	4000	83 - 97	Maize, beans and potatoes.
Olkokola "Mlima wa Hazina"	4000	1000	209 - 213	Traditional thatching grass, maize and beans.

6.1.2 Pressure on taungya cultivation

It was also revealed during this survey that in taungya cultivation, cultivators have gone to the extent of cultivating on water sources, destroying trees in order to extend their period of cultivation on a plot and even bribing the forest staff to be allocated a cultivation plot. In 1997, Arumeru district was also among the districts in Tanzania which received food aid through a national food aid programme due to low subsistence crop productivity, which was exacerbated by drought resulting in food shortage. Poverty was identified as an important cause of forest destruction among 61 per cent of the total responses. Land shortage in the public land was also identified as a highly important cause of forest destruction as well as forest land degradation among 67 per cent of the total responses. The high percentage total responses identifying poverty and land shortage as important problems in this area indicates that land shortage in the public land has a remarkable influence on the destruction of the forest resource base. Population increase coupled with land scarcity, if there are no initiatives to provide alternative food sources or extra land for crop production, will actually lead to poverty, as exemplified by this case. The alternative source of crop land for most of the indigenous population has been the forest land through taungya cultivation and through forest boundary encroachment.

6.2 LACK OF FORMAL EMPLOYMENT

Lack of formal employment for the community was identified as a somewhat important cause of forest destruction and forest land degradation among 24 per cent of the total responses. During the survey it was found that unemployment was associated, among other things with: illegal timber cutting; trade in medicinal plants; struggle for taungya cultivation plots in the forest plantation; community involvement in illegal activities in the forest reserve; sand mining in rivers and illicit brewing in the forest reserve. The effects of these activities on forest resource management are discussed below.

6.2.1 Pressure on taungya cultivation

As quoted from one young man from Olkokola in his response to this survey:

“most young people of my age nowadays do not drink beer, do not leave the village for town life, or loiter around looking for properties to steal; we are involved in taungya cultivation in the forest which is saving our lives as most of us do not own land”.

From this comment and responses from other respondents, it was found that lack of formal employment causes most of the young people to become self employed in agriculture. Land scarcity prevents development of intensive agriculture in the public land, so as an alternative, these young people try to get a cultivation plot in the forest plantation. Such land pressure from the public caused by lack of alternative formal employment has intensified corruption in the allocation of taungya cultivation plots, cultivation on water sources and steep slopes.

6.2.2 Involvement in illegal activities inside the forest reserve

Lack of formal employment for the community was also found to cause most of the people to become involved in illegal timber cutting of indigenous trees which also include timber pit-sawing, charcoal burning and firewood collection. It was found that indigenous timber has had an active market in Arusha municipality and the neighbouring country in the recent years. Such good timber markets coupled with increased population with no formal employment have increased pressure on illegal timber cutting in the forest reserve.

It was also revealed that women employ themselves in the firewood business. The market for firewood was found to have increased with decreased income and increased population. On the

western and north-eastern slopes, charcoal burning was found to have turned into a good business.

It was also revealed that people do not respect the law. They are fighting for survival. According to this survey, if an alternative livelihood for these people is not found by the government in the near future, illegal timber harvesting will cause a disastrous crisis: the forest will be destroyed; and the forest staff who are implementing the current forest protection policies will be at risk.

6.2.3 Involvement in trade on traditional medicine

Lack of formal employment was also found to cause the indigenous people to trade in traditional medicine. According to the survey traditional medicine prescribed by the Waarusha has gained popularity in the neighbouring regions within the country and across the national boundaries. Traditional medicine collection, instead of being a localized traditional benefit, has become a big business where tree roots and bark are transported in large quantities to the neighbouring country. Here, it is said to be exported to the Far East. It was revealed further that the business has become so well-established in recent years that it could lead to the extinction of these important tree species on which the indigenous people depend for medication. While providing an alternative source of work for these people, this situation calls for initiatives for biodiversity preservation to save the subjected tree species and an intensive education programme to advise people on the effect of excessive exploitation of specific tree species over a long time. However, details on the remedial measures for such forest problems are discussed in chapter 8.

6.2.4 Trade in cedar poles

Cedar pole harvesting in the natural forest was identified as a source of income for a number of young people. Cheap house construction in the growing small towns in Oldonyo Sambu, Ngarenanyuki and Engare-mtoni is exclusively done by using cedar poles. In this regard, cedar poles are being exploited from the natural forest to cater for this increasing market demand together with the local utilization in building animal sheds and traditional houses. Timber house construction for home dwellings was also found to be common on the eastern parts of the mountain slopes.

Illegal activities inside the forest reserve, have therefore increased in magnitude and significance in recent years due to low income and poverty brought about by lack of employment, among other factors. As pointed out (Rodgers, 1996) when you are poor you have no alternative but to cut down forests for charcoal, or mine sand in the rivers because your first priority is to survive.

6.2.5 Illicit brewing in the forest reserve

Lack of formal employment for the communities has not only resulted in trading in illegally harvested timber as identified above, but also in the brewing of illicit beer inside the forest reserve. This local beer is brewed illicitly for income generation though it has been known to cause a number of social problems. Illicit brewing in the forest reserve was identified as an important cause of forest destruction and forest land degradation among 25 per cent of the total responses. The respondents identified illicit brewing as one of the important factors contributing to forest fires and destruction of water sources. It was also revealed that the local brew, commonly known as “gongo”, is widely used by low income people because they cannot afford the expensive legal market beer. In this respect the business was said to be prospering due to its cheap prices and wide demand .

6.2.6 Involvement in sand mining in rivers

During this survey it was revealed that young people on the mountain slopes also involve themselves in sand collection from the rivers for sale. According to the respondents the business has been able to create employment for a number of unemployed young people. However, it was of much concern to the respondents that if this sand mining activity is left unchecked, it may create irreversible environmental problems which include accelerated soil erosion and decrease of water quality and quantity downstream.

6.3 TRADITIONAL BEEKEEPING

Honey hunting was identified as an important cause of forest destruction among 47 per cent of the total responses. It was revealed that traditional beekeeping is an important source of food and income for the indigenous people. It was also revealed that honey is used concurrently with traditional medicine to cure different diseases in a traditional way. It is also used to make traditional brew used for special traditional ceremonies.

The traditional beekeepers use barrel hives which they hang on trees in the natural forest. The traditional beekeeping is said to involve fire during honey harvesting. Some of these fires are said to be not fully extinguished when the honey harvesters leave the sites. Consequently, such fire remnants can develop into large forest fires.

6.4 HUNTING FOR WILD ANIMALS

During this survey it was found that according to the Waarusha and Wameru traditions, wild animal meat is unacceptable. However, it was revealed that with the dynamic changes of the traditional laws and norms due to poverty, increased population and new ideologies from incoming immigrants, the mode of life has changed. Wild meat has been widely used in recent years.

Hunting wild animals was identified as an important cause of forest destruction and forest land degradation among 3 per cent of the total responses. Although the percentage response was low, the weight given by the few respondents to wildlife hunting as a cause of forest problems justifies giving it some consideration in this discussion. According to these few respondents in the survey, animal hunting was associated with the cause of forest fires. Hunters make fires in the forest to confuse the animals so that they can be caught easily. In addition, hunters roast wild meat in the forest. The fires spread and cause forest destruction when they run out of control of the hunters, who flee leaving the fire burning the forest.

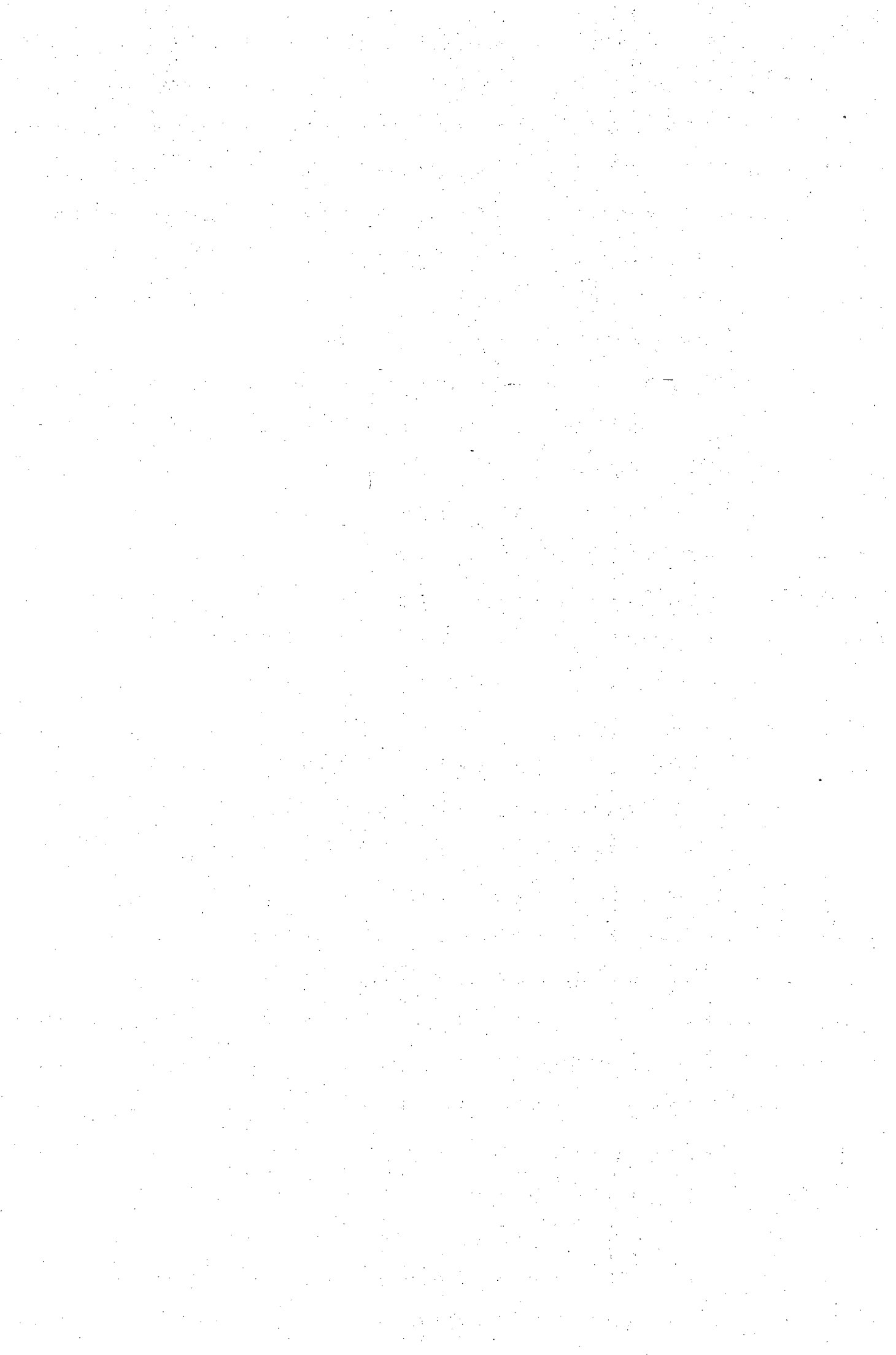
6.5 LOW GOVERNMENT SALARIES AND LACK OF WORK INCENTIVES

According to this survey, low government salaries was identified as an important cause of forest problems among 15 per cent of the total responses. Lack of incentives for forest staff was also identified as an important cause of forest destruction and forest land degradation among 21 per cent of the total responses. The respondents were skeptical about the low salaries which the government pays to its employees in all government sectors. It was mentioned during the survey that the basic salary of 30,000 T. shs. (US \$50) per month, paid to the government employee enables him live at about 1.6 US \$ per day. And yet, such a low paid government employee is entrusted with a wealth forest.

It was also revealed that the low government salaries have encouraged corruption and theft in all government sectors including the forestry sector. Non-conducive working environment, low salaries with no incentives coupled with difficult working conditions, for example; and lack of any transport facility to enhance forest patrolling were found to be among the main factors which have intensified corruption by forest employees in Mount Meru forest reserve. Poor remuneration causing an exodus of competent government staff from the government sector was also revealed as a cause of lack of competent and committed senior staff to man the high supervisory work in the forestry sector including the Mount Meru forest reserve.

6.6 SUMMARY

In view of the above findings and discussion, it is seen that socio-economic factors contribute considerably to the destruction of the Mount Meru forest reserve. It can also be seen that the contribution of the government in providing an alternative source of livelihood for its people, providing formal employment for the communities and increasing the public sector salaries may change the situation. However, the capacity and capability of the government to meet these requirements so as to save the forest is a question which cannot be answered in this short survey. Nevertheless, other remedial measures were identified during the survey as will be discussed later in chapter 8.



CHAPTER 7

IMPLICATIONS OF INSTITUTIONAL MANAGEMENT AND ADMINISTRATIVE STRUCTURE

In the previous chapter, socio-economic factors were shown to contribute to forest destruction and forest degradation. In this chapter, the role of institutional management and the administrative structure of the forest sector in the country are discussed. These were found to be partially linked to the socio-economic factors as will be seen in the discussion. The institutional factors were found to include: forest extension services to the community; public involvement in forest management; forest research activity; working tools and equipment; in-service training for the forest staff; and forest management based on individual decisions. The administrative structure of the forestry sector in the country and the management of donor support systems are also discussed to show their impacts on forest management.

7.1 FOREST EXTENSION SERVICES

According to this survey, lack of forest extension services in the communities around the forest reserve was identified as a relatively important cause of forest destruction and forest land degradation among 68 per cent of the total responses. The respondents based their arguments on the need for the Forest Division to educate the public on the importance of the forest to them and the role of the public in forest conservation. They claimed that the public was ignorant of the importance of the forest reserve and needs to understand the following issues:

- the meaning of the law that prohibits them from procuring their timber needs from the forest;
- the reasons why they should participate in forest activities without being paid when the forest does not belong to them - it is government property;
- the reasons why forest ownership should not change to community ownership when it has been clearly found that the government has failed to manage and conserve it;
- why they should not graze their animals in the forest reserve when they know that it is the place where healthy and good pasture can be found;
- the role of different forest management institutions for the same forest reserve;
- the role of the community in forest conservation and management; and

- reasons why an exotic monoculture forest plantation should continue being of importance in the forest reserve. The whole water catchment area should be covered by indigenous forests including the area under the forest plantations.

Lack of forest extension services was claimed to be the reasons why the communities were ignorant of the above mentioned issues. This was said to have created a gap of knowledge between the forest staff and the communities. Consequently, the communities believed that the forest staff were ignorant of their importance in forest conservation.

7.2 PUBLIC INVOLVEMENT IN FOREST MANAGEMENT

Lack of public involvement in forest management activities was identified as a highly important cause for forest destruction and forest land degradation among 49 per cent of the total responses. Among the important public that should become involved were mentioned the communities around the forest reserve. Public involvement in forest management activities was described to include planning, implementation of the forest management plans and decision-making processes. When the respondents were asked to give their comments as to why the communities have not been involved in forest reserve management activities if community involvement was considered to be so important to them, a number of reasons were realized as follows:

1. Policing system

It was argued that the government has always used a policing system to successfully protect its forest reserves. Reasons for this success were said to be based on the fact that for a long time there was low population in the public land and therefore there was enough land to sustain the population. Respect for government regulations and laws has recently changed due to increased population. This has created pressure on the forest reserves for forest land and forest produce. The laws are no longer respected by the people because it is an issue of survival.

2. Short-term plans

Though forestry as an investment was appreciated to be a long-term investment, the plans and strategies for management were said to not take into consideration the long-term social and environmental effects. The respondents argued that the issue of public involvement was overlooked by the national forest policy because only short-term plans were considered and long-term sustainability of the forest and forest management were not considered. In addition, foresters were said to lack skills and awareness on how to involve the public in forest

management due to the highly specialised training that they receive. On the other hand, public participation has been a major requirement in national and donor agency policies. Therefore, because of pressure from the public and political positions in the country, and a requirement by the donor agencies to involve communities in forest activities, foresters have been practicing public participation in different ways. This kind of practice was said to cause confusion and mis-understandings in the implementation process were found to be likely to arise.

3. Traditional forestry approach to forest management

A stereotyped way of thinking about forests was mentioned as an important reason for non-involvement of communities in forest management. The traditional ways of forest management were found to have confined forestry occupation to foresters. It was argued further that the government was ignorant of the indigenous knowledge in the management of the forest reserve. The community urged the government to change this attitude because indigenous knowledge was found to contribute a lot to forest management. It was argued that when indigenous knowledge is inco-operated in the scientific forestry knowledge, forest management could be improved in the process.

7.3 IN-SERVICE TRAINING FOR FORESTRY STAFF

Lack of in-service training for the forestry staff was identified as an important cause of forest destruction and forest land degradation among 3 per cent of the total responses. The participatory rural appraisal (PRA) approach provides guidance on how the community can become involved in forest management (Bryant and White, 1982; Mikkelsen, 1995). According to this response PRA approaches should be part of in-service training for foresters. It was revealed that the traditional training on forest reserve management inherent in most of the forest staff has not exposed them to community involvement approaches. In this regard, the management of the forest reserve has not been able to involve the communities in forest management activities. However, the respondents commented that with the increasing current trends towards the need to involve communities in forest management, it was important that all forestry staff at different levels be exposed to the participatory approaches to ensure active participation of communities in forest conservation. Such involvement was found to reduce conflicts and social chaos within and around the forest reserves.

7.4 FOREST RESEARCH ACTIVITY

Inadequate research activity was identified as a relatively important cause of forest destruction and forest land degradation among 18 per cent of the total responses. The respondents claimed inadequate research activity to be important for forest destruction. They based their arguments on the delayed recommendations on the type of tree species to replace the cypress tree species after the infestation by the cypress aphid, *Cinara cupresii*, in the forest plantations. It was claimed that the decision to plant any other tree species should be made through research and then implemented through the Forest Division.

Due to this infestation it was found that the cypress tree species was no longer replanted in the forest plantations. According to the forest plantation management (personal communication), failure of research and the Forest Division to describe the type of tree species to replace the cypress species has resulted in a dilemma on what should be replanted on the clearfelled areas. This has consequently resulted in slow replanting activity, leaving large open gaps in the forest plantations.

7.5 WORKING TOOLS AND EQUIPMENT

Inadequate working tools and equipment was identified as a relatively important cause of forest destruction and forest land degradation among 18 per cent of the total responses. But it was also revealed during the survey that there are a considerable number of fire fighting tools and equipment in the Forestry Training Institute which are normally used for fire fighting in Mount Meru forest reserve through local arrangements. In addition, with NORAD and SIDA support in both Catchment forest project and plantation forests respectively, equipment such as uniforms, measuring tapes, knives, compasses, calculators, fire beaters, sleeping bags, altimeter, watering cans, spades, hoes, slashers, axes and hose pipes have been provided.

However, while appreciating the provision of these tools and equipment the respondents were skeptical about the kind of tools and equipment, which they said were important for fire fighting in Mount Meru forest reserve. An example was given of fire fighters on the high slopes of the mountain. It was said that these fire fighters throw away food that they are carrying because they feel it is too heavy for them to carry uphill. Fire beaters, axes and hoes were said to be even heavier and thus not taken to the fire site for fire fighting. Instead, fires were fought with tree

branches which cannot suppress the fierce fires of Mount Meru forest reserve. As an example, a photograph taken during fire fighting in Mount Meru forest reserve in January 1997 is presented in plate 7.1 to illustrate the impact of fire fighting tools.



Plate 7.1: A photograph taken during the 1996 - 1997 forest fire in Mount Meru forest reserve to show the importance of improved fire fighting tools.

In view of these circumstances during fire fighting, the respondents suggested the reinforcement of fire towers to assist in detecting early fires so that they could be suppressed before erupting into bigger fires. In addition, because of the steep slopes to the fire fighting sites the respondents suggested provision of a helicopter equipped with fire extinguishing devices which would frequently fly over the forest during the dry season to spot and suppress any fires before they exploded into large destructive fires.

7.6 FOREST MANAGEMENT PRACTICES

Poor forest management practices was identified as a highly important cause of forest destruction and forest land degradation among 83 per cent of the total responses. Haphazard harvesting of forest in the forest plantations without immediate replanting was mentioned as an indication of poor forest management. In addition, low and poor quality nursery productivity was also identified as the cause of low tree planting achievements in the forest plantations. This was reported to have resulted in large open areas, causing accelerated soil erosion.

7.6.1 Implications of nursery practices on forest management

In view of these complaints from the respondents, a short tour of the Olmotonyi forest plantation nursery was made. A random sample of six nursery attendants found in the nursery was interviewed on the nursery performance. It was revealed that the pine seedlings had been in the nursery for a period of 2.5 to 3 years and were only 10 to 12 centimetres high and stunted. The seedlings were anticipated to be planted during the long rains in April - May 1997 (the time of the visit). Same pine seedlings at the Forestry Training Institute (a neighbouring forest institution about 100 metres apart) nursery were found to be 12 to 13 months old and 30 to 35 centimetres high and healthy. It was revealed that at the forest plantation nursery, during nursery soil preparations, cow manure, sand and NPK were not added. The normal nursery soil mixture for *Pinus patula* for 12 to 13 months in the nursery was found to be:

- 10 parts forest soil;
- 5 parts cow manure;
- 3 parts pine litter (mycorrhizae);
- 3 parts cypress litter;
- 1 part sand;
- 28 gms NPK per tin of soil should be added.

In addition, pine needles were used in the nursery soil preparation instead of a mixed top soil pine litter to ensure enco-operation of mycorrhizae in the nursery soil mixture. It was further revealed that the development of mycorrhizae in the soil mixture was not given a chance because the soil was not left to weather after making the mixture. This meant that mycorrhizae was not added. Mycorrhizae association on nursery soil mixture for raising pines was vital for seedling survival and subsequent tree establishment (Munyanziza and Maganga, 1995). According to Bowen (1980), as cited by Munyanziza and Maganga (1995), the benefits of mycorrhizal association are multiple and include increased nutrient and water uptake by the host.

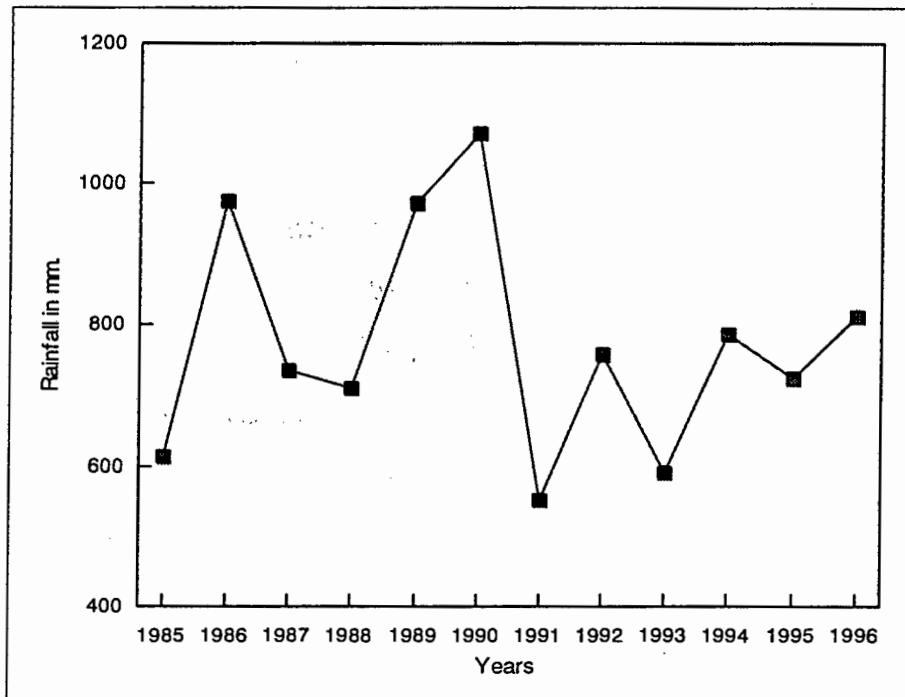
Furthermore, it was revealed that tree seeds were directly sown in pots. Forest specialists in this survey argued that the kind of soil mixture prepared in Meru could not allow proper seed germination because it was too heavy for direct seed sowing. The nature and composition of the nursery soil mixture was suspected to be one of the important reasons why: seed germination was found to be initially poor; and seeds were described as being sown several times before a

substantial number of seedlings could be raised. Low nursery production was therefore found to contribute to low tree replanting activity. This in effect rendered open most of the clearfelled areas with all its consequences.

7.6.2 Effects of weather conditions on forest management

Drought was also found to contribute to deaths of planted seedlings in the field in the recent years. Persistent droughts in the recent years was exemplified by the annual rainfall totals obtained from a nearby research station and presented in chart 7.1

CHART 7.1 THE ANNUAL RAINFALL TOTALS



Source: Tropical Pesticide Research Institute - meteorological department.

From chart 7.1 above, the available annual rainfall has been low in the recent years. Low rainfall was accompanied by long droughts. Such weather conditions coupled with poor quality seedlings from the nursery stock resulted in poor survival of the planted tree stock in the field. This, in effect, has contributed to the increase of open areas in the forest plantations. In this case, though an increase in the area planted in the year 1995 was found, it was also found that almost none of the planted trees survived.

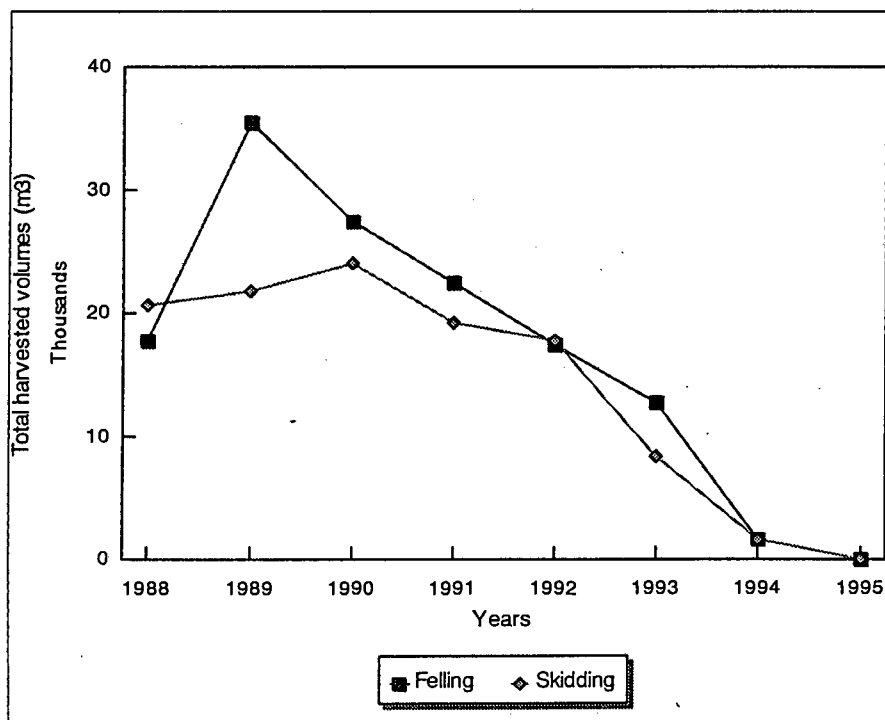
7.6.3 Timber harvesting practices and forest conservation

Haphazard timber harvesting in the forest plantations was identified as a forest problem caused by poor forest management practices. It was found that timber harvesting operations had recently been delegated to timber concessionaires. Timber concessions were followed by reduction of Forest Division logging crews' activities. Consequently, timber harvesting through timber concessions was found to accelerate the impacts of forest destruction and forest land degradation as discussed below.

7.6.3.1 Forest Division logging crew

Forest Division logging crews' productivity was found to have decreased with time and in 1995/96 the crew was discarded and dispersed. This is illustrated in chart 7.2

CHART 7.2 FOREST DIVISION LOGGING AND SKIDDING ACHIEVEMENTS
FOR THE PERIOD 1988 - 1995.



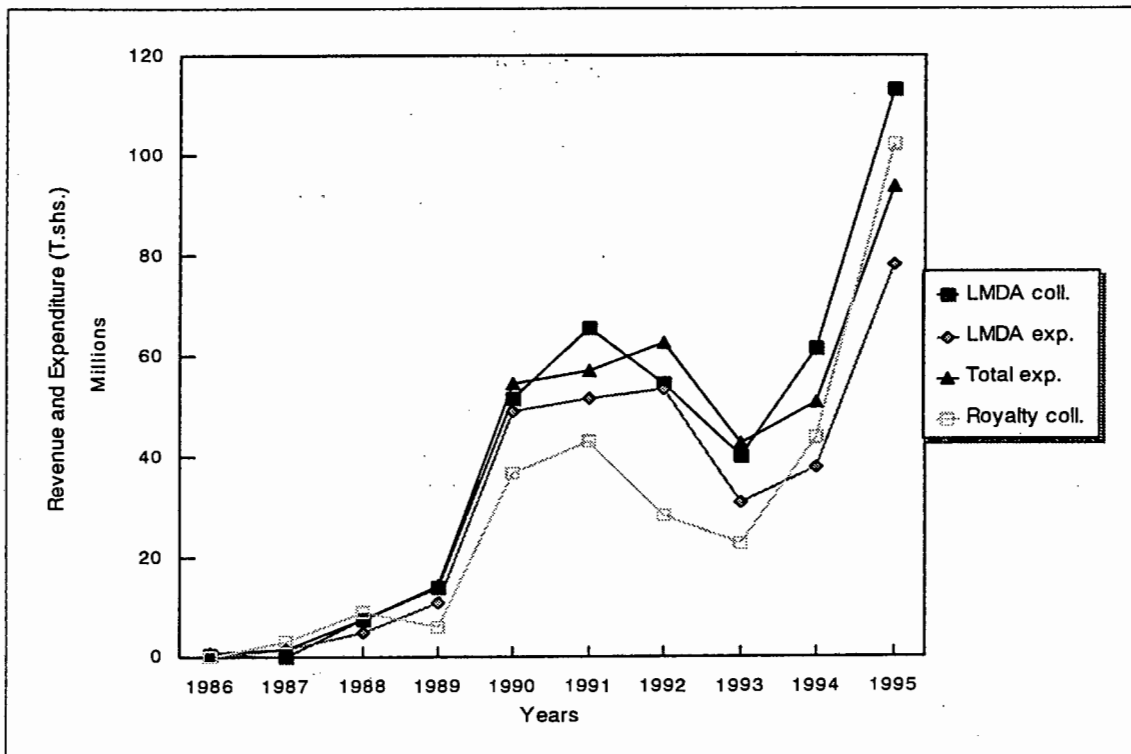
The respondents in this survey were very skeptical about the delegation of the forest harvesting operations to timber concessions and commented that it has accelerated the effects of forest destruction and forest land degradation. In the group discussions it was argued that timber

concession had been delegated to people who were not technically oriented in timber harvesting on steep slopes, thus resulting in haphazard timber harvesting and unplanned strip roads in the forest. Consequently, soil erosion has been intensified and large areas have been harvested without prior plans for replanting.

7.6.3.2 Effects of timber business in the Arusha municipality

Potential for timber business was also found to have increased in the Arusha municipality during recent years. Up to the end of March 1997 there were about 26 sawmills in Arusha, all depending on wood material from Mount Meru forest plantations (including big customers like Kibo Match Moshi and Fibreboards Africa Limited). The increased number of sawmills which depended on wood from Mount Meru forest plantations was identified as an important cause of forest destruction and forest land degradation among 42 per cent of the total responses. The effect of the increase in the number of sawmillers and timber concessions due to this increased timber business was reflected in the increased revenues collected from timber sales as shown in the LMDA revenues and expenditure in Chart 7.3

CHART 7.3 REVENUE AND EXPENDITURE FOR THE PERIOD 1988 - 1995



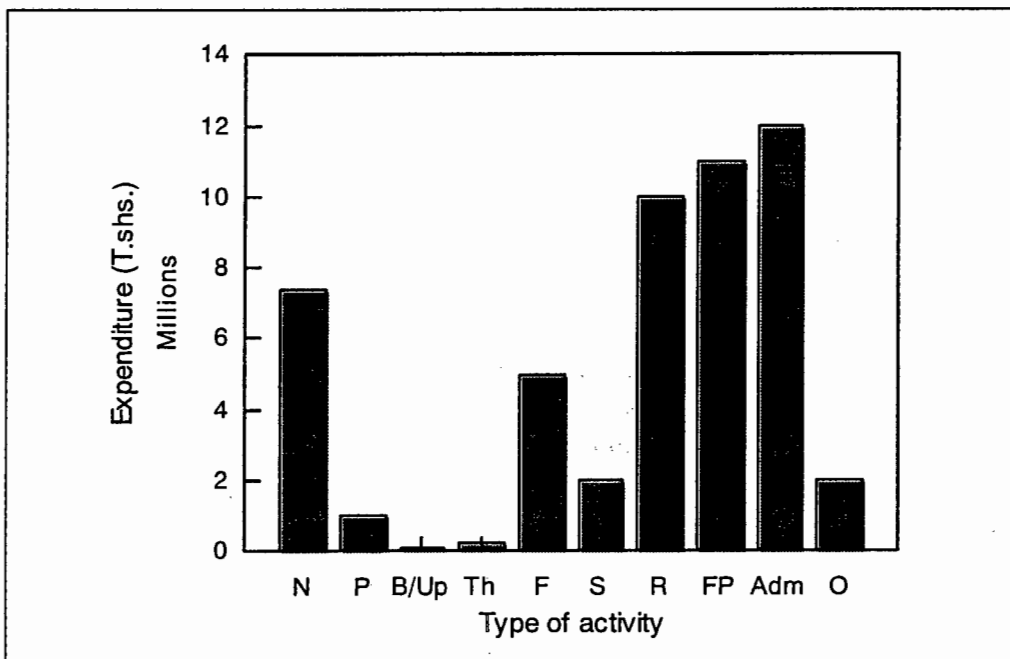
From Chart 7.3 it will be seen that though much revenue was accrued, almost equal amounts were expended. Silviculture was found to be an important forest activity whose implementation

regulated the normality of the forest. In this respect, in the following sub-sections, the allocation of revenues for replanting as a silvicultural activity will be compared to that of administration, roads and protection to illustrate the weights given on this important activity in decision making for allocation of resources in forest management.

7.6.3.3 Silvicultural activity and total expenditure

It was found during the survey that silvicultural operations received less attention in comparison to administration, road maintenance and protection activities. For example, expenditure for the period 1994/95 shown in Chart 7.4 shows high administrative, protection and road maintenance expenditures and low expenditures on silvicultural operations i.e. planting, thinning and beating/up activities.

CHART 7.4 EXPENDITURE DISTRIBUTION FOR THE YEAR 1994/1995



Source: Tarimo, T. G. 1995. "Management of plantations; realities and problems in implementation of management plans: Meru Case Study". In Chamshama, S. A. O. and Iddi, S. (Eds.) 1996. *Management of forest plantations in Tanzania*. p.184.

Legend: N = Nursery; P = Planting; B/U = Beating/up; Th = Thinning; F = Felling; S = Skidding; R = Road maintenance; FR = Forest Protection; Adm = Administration; O = Others.

LMDA funds were collected from roads, silviculture and harvesting fees. These funds according to the LMDA formulation agreement were supposed to be ploughed back into the same forest activities.

However, it was further revealed that until 1986 all the timber harvesting revenues in the forest plantations were sent to the government treasury where allocations of money for forest activities were then made. But from 1978 when timber harvesting started (according to the management of the forest plantation records), up to the time when LMDA was developed, there were low funds allocated for silvicultural activities. For example, in 1986 the requirements for forest trees replanting activity was 1,200,000 T. shs. and only 300,000 T. shs. were provided from the government treasury (MNRT, 1986). Consequently, less areas than planned were replanted. It was revealed further that such limited allocation of funds for silvicultural activities created a big unplanted backlog. The unplanted backlog together with the low allocation of LMDA funds for replanting were found to have increased the open areas in the forest plantations considerably.

7.6.3.4 Administration and protection costs

It was said that administration costs were to be provided by the government through the government treasury. From the forest management reports, it was revealed that treasury funds have always been low and could normally cater for permanent employees' salaries and office stationary. On the other hand, administration and forest protection costs were reported to involve a number of unforeseen and unplanned forest management costs which included overheads and transaction costs for forest protection. Government failure to provide enough funds for administrative activities was said to revert in the use of LMDA funds instead. This was explained by the forest management officials in this survey, as being a big hindrance to the achievement of other forest activities. In this case, Forest Division was advised to find ways in which these costs could be reduced or funds provided by the government.

7.6.3.5 Road maintenance costs

Forest road maintenance costs were found to be high. From forest plantation administration reports, it was found that forest roads needed regular maintenance because of the nature of the soils, topographical features of the mountain slopes and the illegal grazing going on in the forest reserve. The regularly disturbed soil texture and structure required regular road maintenance to allow accessibility, thus resulting in high average costs per annum. This increased forest road maintenance costs which in turn meant extra expenditures from the silvicultural activities.

It was, however, found that both forest protection and road maintenance activities were important for forest management. In addition, forest administration costs were found to be

important, but included too many overheads which could be avoided with proper planning. However, the respondents argued that unless a means of reducing these excessively high costs in administration, protection and road maintenance could be found, silvicultural activities would continue to be of less priority in decision-making for forest management.

7.6.4 The role of taungya cultivation as a silvicultural system

The taungya system as a silvicultural system is a kind of shifting cultivation which is used in the establishment of plantation forests in most of the developing countries (Hamilton, 1979). The system has been widely used to reduce plantation establishment costs and alleviate hunger in highly populated areas (Hamilton, 1979). According to this survey, taungya cultivation was identified as a highly important cause of forest destruction and forest land degradation among 94 per cent of the total responses. It also ranked second after lack of supervision in terms of ranking for important causes for forest destruction and forest land degradation.

The respondents argued that during the previous years, taungya cultivation plots were issued free of charge to the cultivators, while the cultivators in turn tended the trees. But in recent years, the forest staff were selling cultivation plots and at exorbitant prices. A 0.25 hectare plot was sold at 20,000 to 35,000 T. shs. (US\$ 33 to 58) depending on the site class. This was revealed to be illegal selling which was associated with corruption and bribery.

Most of the villagers from the communities were said to be selling cattle in order to get money to buy cultivation plots in the forest. The number of cultivation plots that one could obtain was found to depend on the amount of money one had. In this case, only the wealthier people from Arusha municipality and from the community could afford the cultivation plots. The poorer villagers and other forest workers (who were not involved in cultivation plots' allocation) negotiated with the forest guards for low price plots left along the river banks, around water streams and steep slopes. In addition, the issue of taungya cultivation was found to be intensified and became more serious after a licensing system was introduced by the government in 1996 (G.N. No. 463 published on 13/12/1996). According to this government order, third schedule, Part C and item 4 (b), license to cultivate annual crop in a forest reserve was T. shs 10,000 (US \$ ~17) per hectare per season. The forest staff who were previously selling

cultivation plots in secret, found this as an authority to advertise and intensify their business even with no government receipts.

As noted earlier, the communities were not involved in the management of the forest reserve, therefore there was no close relationships or co-ordination between the communities and the forest authority. The link between the forestry sector and the communities was found to be the forest guards and forest rangers. With the poor relations brought about by the implementation of the traditional forest protection discussed earlier, and lack of initiatives to educate the communities on the actual meaning of this licensing order, conflicts were found to be inevitable. The communities perceived the licensing procedure as an authority to allow the forest staff to continue exploiting them on their own land. From the same perceptions, the respondents argued that by allowing people to buy cultivation plots in a forest reserve, the government had lost control of the cultivators as regards the care of the forest crop. They argued further that with this order, trees would continue to be uprooted to give more space for subsistence agriculture; soil conservation measures would not be obeyed by the cultivators; cultivation would be more pronounced along the river banks, water sources and steep slopes because nobody would be able to control the cultivator on the land that he had paid money for.

7.6.5 Timber selling policy

During this survey, corruption by the forest staff was identified as an important cause of forest destruction and forest land degradation among 83 per cent of the total responses. This was not only identified in the allocation of taungya cultivation plots described above, but was also rampant in the use of a tariff system used in calculating standing timber volumes. The tariff system as developed by foresters was said to be a very good and efficient system of estimating standing timber volumes when properly executed. It was found to have been ill-used by untrustworthy forest staff in Meru forest plantations. They under -invoice the standing volumes which were sold to the concessionaires. The big diameter classes were reduced to smaller diameter classes during the computation of total standing timber volumes, reducing the actual timber volumes considerably. The difference was said to be shared between the timber concessionaires and the forest staff who do the volume computations. In this regard, much of the government revenues were diverted into peoples' pockets and the actual timber value was not accounted for.

Unaccounted volumes were also envisaged in the lots of wood which were left on the logging sites uncollected by the concessionaires. In view of this, the respondents had a feeling that the volumes might have been highly under-estimated during stand volume measurements and computation, thus giving lots of material to the concessionaires for free. In their comments on the wood left uncollected on the logging sites, the respondents said that if the volumes were correctly computed, there would have been no single log left.

The management practices in Meru forest plantations were criticized by all the respondents. They argued that practices such as corruption, bribery, and diversion from the professional forestry ethics in nurseries and in logging plans could have been prevented earlier through advice from communities, forest professionals from the region/district and proper supervision and monitoring from the directorate of forest's office. But it was found that such advice, supervision and monitoring could not be possible due to the poor relationships and co-ordination that existed within the forestry sector in the country. This is discussed below to show its impact on forest resource management.

7.7 CO-ORDINATION AND RELATIONSHIPS: IMPLICATIONS FOR FOREST CONSERVATION

Lack of co-ordination and relationship between different management and administrative levels for the management of the forest was found to be a highly important cause of forest destruction and forest land degradation in Mount Meru forest reserve among 8 per cent of the total responses. A number of cases where co-ordination and relationships were found to cause forest destruction were identified as shown below.

Lack of co-ordination, according to the respondents, had resulted in poor monitoring and supervision of forest work implementation by different forest administrative levels. This was said to result in lower level forest staff assuming greater powers in the field. In addition, lack of co-ordination and relationships was also found to be the prime source of poor relations between the forest management and the communities around the forest reserve, which have resulted in poor monitoring of forest activities and alienation of the communities from forest protection activities.

The administrative set-up of the forestry sector indicated that Mount Meru forest reserve, like other forest reserves in the country, was directly under the Director of Forestry. It was revealed during the survey that there was no administrative relationships between the regional or district forestry and the forest reserve officials. Only technical relationships existed. Regular divisional and ministerial meetings were said to be the only means in which this relationships could be regulated. Also in the previous years, regular contacts between regional and district authorities were possible through meetings such as the Regional Development Committee (RDC) meetings.

The above-mentioned administrative structure in the forestry sector, coupled with the socio-economic problems discussed earlier, have contributed to a large extent to forest destruction and forest land degradation. This has been manifested in the roles of forest staff at different forest management levels discussed below.

7.7.1 The role of forest guards and forest rangers

The link between the forest reserve administration and the community was found to be the forest guards and the forest rangers/beat in-charges. During the time of the survey it was revealed that around the forest reserve the forest guard distribution was as shown in Table 7.1.

Table 7.1 Distribution of forest guards in Mount Meru forest reserve

Range/Beat	Number of permanently employed forest guards		Number of temporarily employed forest guards	
	Plantations	Natural forest	Plantations	Natural forest
Olmotonyi	2	2	4	-
OldonyoSambu	3	-	5	-
Ngarenanyuki	-	2	-	-
Themii	1	1	-	-
Narok	-	-	-	-
King'ori - Leguruki	-	1	-	-
Nading'oro	-	-	1	-
Usa	-	3	-	-
Total	6	9	10	-

The area to be patrolled by these 25 forest guards was estimated to be 34,445 hectares (natural forest under catchment forest project and the forest plantations). This means, if areas were equally distributed for patrolling, each forest guard was supposed to patrol an area of about 1378 hectares every day. The forest guards were described as doing their work ineffectively because the areas were not visited daily. Therefore illegal activities were taking place in the forest reserve regardless of their presence. It was also revealed that in some parts of the forest, such as those harbouring "cattle bomas" in the natural forest, no forest guard visited them because of long distances and security problems. From these bases a number of allegations were made, associated with the forest guards. These included: allowing grazing in the forest, allowing cultivation on the water sources and allowing the use of fire for land preparation in taungya cultivation.

According to this survey, the forest guards were found to be forest employees from the community or people from other tribes, but who had day-to-day close contacts with the communities around the forest reserve by the nature of their work. As can be noted from table 7.1, a forest guard is supposed to patrol vast areas alone in the forest wilderness. His life security depends on his relationships with the people from the communities around the forest reserve whose well-being depends on the illegal or legal benefits from the forest. At the same

time, the work security of this forest guard depends on how much he can satisfy his employer that he is doing his job well.

The forest guard was found to be supervised by the forest ranger or beat in-charge. But during the survey it was found that the forest rangers in the forest plantations were the ones who allocated taungya cultivation plots in collaboration with their respective forest guards. The cultivation plots, as identified earlier, were the prime source of corruption and bribery due to land shortage and population pressure on the public land.

It was revealed that the forest guard, in order to maintain his good relations with the communities, decides to allow the procurement of some forest benefits from the forest on whatever terms they would agree upon amongst themselves. On the other hand, the forest ranger was found to be unable to monitor the forest guard because the forest guard was aware of the ranger's misdeeds. It is natural that the forest ranger would not like misdeeds such as receiving bribes and selling of cultivation plots to be disclosed to the top forest officials. This would have an adverse effect on his work security. In this case, the forest guards and the forest rangers were found to share the same secrets and could not reveal the reality of what was happening in the field to any interested and affected persons. This in effect, has had overriding effects on the reporting system of forest performance both from the field, management office and at national levels as described below.

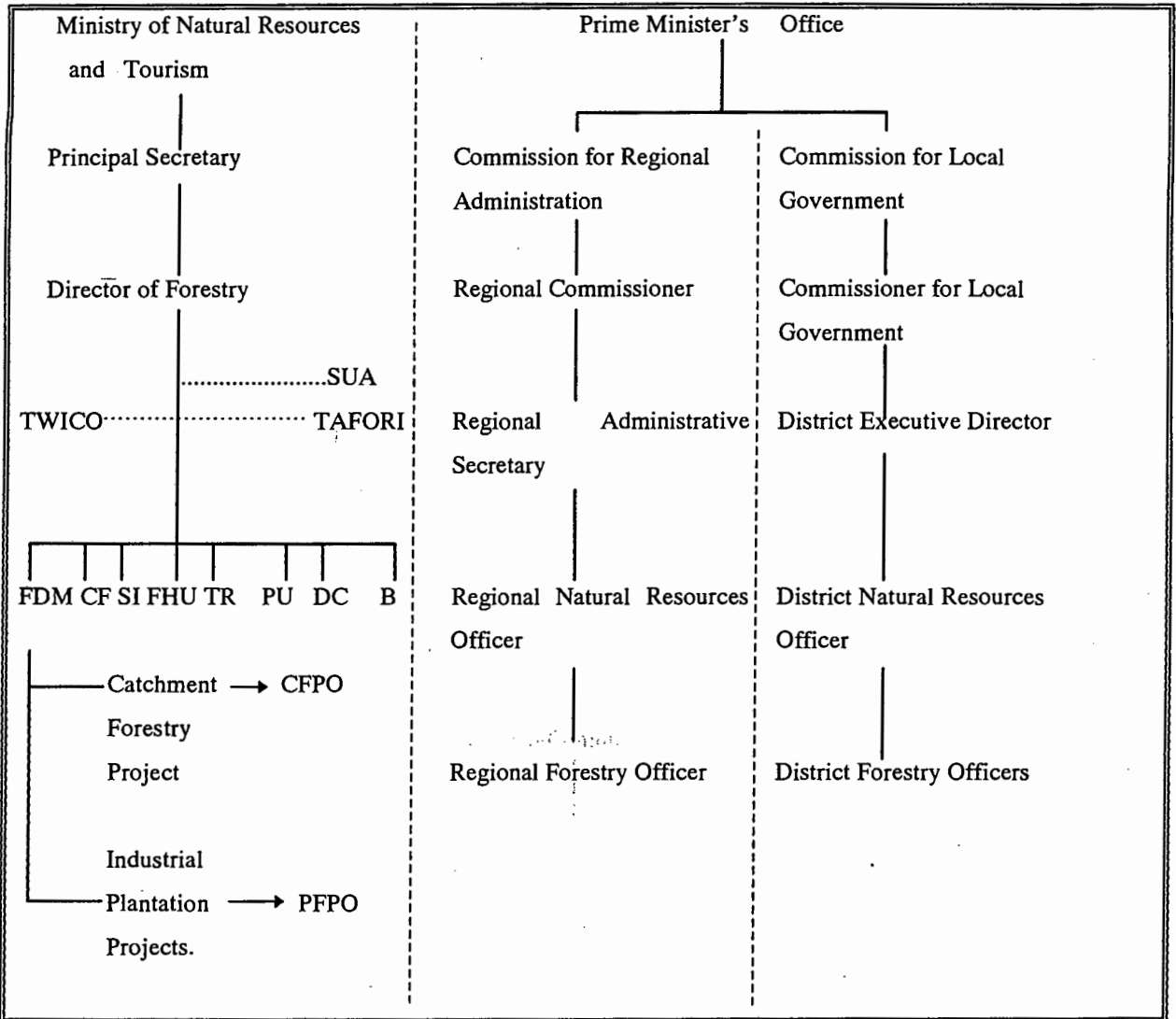
7.7.2 The role of the forest manager

During this survey, it was revealed that in the forest institutional office the forest manager, while believing that everything was proceeding well in the field, relaxed in the office waiting for field reports from the forest rangers. The forest rangers in their respective areas, together with the forest guards while safeguarding their jobs, produced sweetheart reports for the manager. According to the respondents, the contents of these reports were quite far from the reality. These unreliable reports from different forest rangers were compiled by the forest manager to produce monthly, quarterly and annual reports which were subsequently presented to the Director of Forestry for his attention. The Director of Forestry, while believing the sweetheart reports, concentrate on other areas of the country which had been reported to require more of his attention.

The impressive sweetheart reports received in both the offices of the forest manager and the Director of Forestry have been identified during this survey to have colluded the whole forest supervision and monitoring system. As a result, lack of forest work supervision and monitoring by the forest authorities was identified as a highly important cause of forest problems among 99 per cent of the total responses.

In keeping with these findings Panayotou (1987) argues that state ownership of forests does not necessarily mean effective state management. Mather and Chapman (1995) argue further that in many cases where traditional forest management has been replaced by the state, a management vacuum has developed. After appropriation by the state, local traditional management is replaced by remote state control, and often a sense of alienation sets in. As a result forests have been run down, unmaintained and even vandalized (Panayotou, 1987). What has previously been a common-property resource becomes an open-access resource as a free-for-all situation develops (Pearce et al., 1989; Panayotou, 1987; Norgaard, 1992). This is exemplified further in Figure 7.1 which shows the administrative set-up in the Tanzanian forestry sector.

Figure 7.1 ADMINISTRATIVE SET-UP IN THE FORESTRY SECTOR IN TANZANIA



Source: Ministry of Tourism, Natural Resources and Environment (1994). *TFAP, 1994 (in draft)*. pp. 70 - 71.

Legend: no administrative jurisdiction beyond these bounds only technical relationships exists.
 _____ direct administrative relationships.

7.7.3 Regional and District administrative co-ordination and relationships

According to the administrative set-up of the forestry sector in the regions and districts, it was found that the forest officials at these levels could give technical advice to the forest reserve management, but it was at the liberty of the forest reserve management to take it or discard it. It was also found that the forest manager regarded himself/herself as being directly under the Director of Forestry and the regional or district authorities had no administrative jurisdiction over the forest reserve. However, the administrative set-up of the forest sector in the country was found to justify this fact, as shown in Figure 7.1

The regional and the district forest officials' role on the public forest reserves in their regions or districts was said to be that of "eyes on hands off", as quoted from one senior forest officer in this survey. From Figure 7.1, it was clear that there existed no administrative relationships between the forest reserve management and the regional and district technical forest staff or administrative authorities. To stress this point, the respondents commented that if any relationships existed, then "it had been hidden in the cabinets in all those years of forestry service in the country."

However, political leaders know no jurisdictions where professional hierarchy is concerned. As a result, on 14 February 1997 when the Prime Minister visited the forest reserve at the request of the community administrative leadership, the regional natural resources officer, who was also the regional forest officer, was given a stern reprimand for inefficiency (according to a local newspaper, Sunday News -16 February 1997).

In view of all the above discussed repercussions, the respondents in this survey argued that the centralised system of forest reserve (which was also found to be true for all forest reserves in the country), has created uncomfortable relationships and unco-ordinated activities between the communities, regional and district administration, technical officials and other related institutions in the regions. This was further exaggerated by a statement given by some traditional leaders in this survey, who were quoted as saying: "The forest reserve is just like an island between people".

This kind of co-ordination and relationships in the forestry sector was said to be the consequence of the government's decentralization and centralization policy of 1972, which was claimed to have fragmented the forestry sector since then (MNRT, 1986; MLNRT, 1989; Mtuy, 1992;1995). While decentralization of the forestry sector on the regional and district levels has been blamed for fragmenting the forestry sector in the country (MNRT, 1986; MLNRT, 1989; Mtuy, 1992;1995), centralization of forest reserves according to the findings of this study has equally presented serious administrative problems in the management of Mount Meru forest reserve. The involvement of different stakeholders such as the regional and district administration, technical staff and the communities does not exist in this centralised forest management system. This has resulted in forest reserve management working in isolation in the

field. The gaps that existed between the officials in Dar-es-Salaam and the field were found to be too wide for any efficient forest management monitoring and supervision. As commented by one traditional leader in this survey from Oldonyo Sambu ward, he was quoted as saying,

“Yes! nowadays, forestry leadership has laid its trust on forest rangers, the forest rangers with their low education, low work security in the government service, low wages and work incentives have used the opportunity quite well to make themselves rich. A forest ranger is a person who should work under close supervision and not a person to be entrusted with national wealth like what is happening in Meru now”.

However, respondents presented the centralized management of the forest reserve as a serious problem which needed to be streamlined and revisited if Mount Meru forest reserve is to be conserved in future.

7.8 DONOR SUPPORT FOR FOREST RESERVE MANAGEMENT

Financial support for forest management as identified earlier has been received from SIDA and NORAD. The respondents showed much appreciation of such support. However, some shortcomings in the donor support system were identified. In the case of the catchment forest, these include: late release of funds and lack of technical advice in the field to ensure maximum work proficiency for sustainable development as planned in the donor support objectives. In the case of the forest plantation part of the forest reserve, too short term for donor support was identified as a shortcoming which has contributed to the forest management's achieving few of the objectives of donor support. These are discussed below.

7.8.1 Funding for forest activities in the catchment forest

During this survey, inadequate funding for proper implementation of the set targets of the forest activities was identified as a relatively important cause of forest problems among 18 per cent of the total responses. It was revealed that the catchment forest receives forest activity funds through NORAD support and some funds from the government through the retention scheme of the Forest Division. However, it was also revealed that there has been no clear means of financial inflow though the project is being supported by NORAD. According to the catchment forest management and the reports from the NORAD review missions (MTNRE, 1991) and (FBD/MNRT, 1996), late release of funds, inadequate technical advice in the second phase of the

project and emphasis on the conventional forest activities were identified as the major drawbacks of the project.

a) Late release of funds

Late release of funds from the treasury to the project site has been a major snag related to funds (FBD/MNRT, 1996). The delays, which as reported in this review have lasted about 3 months at the beginning of every financial year, have caused some planned activities for the period to stagnate. During the survey it was revealed that boundary surveys, protection activities and nursery operations are highly affected by these delays. According to the catchment forest management report it was found that these activities which are to be implemented at the beginning of the financial year are delayed or not implemented because they cannot be started in time to fit in with the seasonal weather rotation of the year. For example, nursery operations should commence at the beginning of every financial year so as to get healthy plantable sized seedlings during the rainy season. When such periods elapse then raising nursery stock later means producing seedlings which will not be ready for planting in the field during the rainy season.

b) Lack of technical advice in the field forest stations

Major problems in the implementation of the project arose in the second phase of the project (i.e. 1992 - 1996) due to an over-centralized approach to project implementation (FBD/MNRT, 1996). The concentration of the project co-ordinator on written reports from the field decreased the time required for field work supervision and monitoring of the implementation of the project objectives. Due to this deficiency it was revealed that most of the project objectives lacked technical advice and moral support for implementation. Therefore they were only partially achieved or not implemented, for example; involving the communities in the management of the forest reserve. As reported by the Catchment project review mission (FBD/MNRT, 1996), through failing to involve communities the project has failed to grasp the opportunity to test and put in place cheaper and more effective strategies of forest reserve management.

According to the joint agreement between the Norwegian and Tanzanian governments, two phases of catchment forest development were implemented. Expatriates were asked to train the

local staff but little was done during the second phase (i.e. 1992 - 1996) of the Catchment Forestry Project.

7.8.2 Too short time for donor support

In the plantation forest the respondents commented that there were remarkable developments as a result of the Swedish donor support. It was also appreciated during the survey that a number of development initiatives were developed during the Swedish support period. The "Integrated System Approach", oxen-skidding of logs and development of LMDA were among the important issues that the respondents were reminded of this specific support. But the respondents thought that the period in which the aid operated was too short i.e. 1986 - 1989. The respondents were of the opinion that the Swedish support should have lasted longer. The respondents commented that the longer period is important for:

- identification of problem areas during project implementation phase;
- development of mitigation measures to reduce impacts of any course of action; and,
- identification of alternative course of action in cases of irreversible impacts of the project.

However, it was revealed during this survey that the support was too short for any sustainable management initiatives in the forest plantations. This is in keeping with the comments by TFAP (MLNRT, 1989) that development in forestry should be understood as a long-term endeavour by both parties. Furthermore, it is commented in TFAP (MLNRT, 1989) that the involved donors sometimes have very short planning horizons (3 to 5 years), while they should be prepared to stay sufficiently long periods (up to 20 - 25 years) to ensure the desired development.

7.9 SUMMARY

The institutional management and administrative structure of the forestry sector discussed in this chapter have been found to have much influence in the management of the forest resource base. Silvicultural activities were found to be important for sustained yield of the forest. But poor forest management practices and the limited importance of silvicultural activities in the allocation of resources were found to intensify forest land degradation and affect the normality of the forest plantations. Forest protection and administrative activities were also found to be important, but could be reduced through proper planning. The centralised policy of the forest reserve management was found to affect both forest work supervision and monitoring. This was

said to be an important issue which needed to be revisited by the Forest Division to ensure intensified forest conservation through proper management and administrative structures. Nevertheless, a number of remedial measures to curb the situation in Mount Meru forest reserve were suggested by the respondents during the survey. These are widely discussed in chapter 8.

CHAPTER 8

SUSTAINABLE FOREST MANAGEMENT

According to the survey the prevailing situation of forest destruction and forest land degradation in Mount Meru forest reserve cannot be left unchecked. Several remedial measures to curb the situation were therefore suggested by the respondents during the survey. The response distribution of identified remedial measures for the forest problems are presented in Table 8.1. These identified remedial measures forms the basis for the discussions in this chapter. The discussion is divided into six sections to cover all the suggested remedial measures. These include: community involvement; educating the communities; good governance; funding system; workable forest management plan; institutional development; environmental conservation and policy developments.

Table 8.1 Response distribution: identification of remedial measures for forest problems

Suggested solutions	Total score	Ranking level	Total Count	% response	Average weight
Technical Capacity building	39	18	8	7	5
Reinforce protection activities	417	2	102	95	4
Animal destocking in the villages	119	10	25	23	5
Agroforestry programmes	35	20	7	7	5
Participatory programmes	369	5	99	93	4
Stop beekeeping in the forest	40	17	10	9	4
Follow professional ethics	327	6	68	64	5
Introduce licensing programs	91	11	25	23	4
Stop taungya system	20	22	4	4	5
Eliminate plantation forest	41	16	10	9	4
Use traditional and forest laws	141	9	31	29	2
Enforce forest boundary	41	15	9	8	5
Improve monitoring	413	3	91	85	5
Improve supervision	492	1	107	100	5
Introduce heavy fines in offense	79	12	17	16	5
Revenue collected to be ploughed back	385	4	83	77	5
Give proper incentives to forest staff	29	21	6	6	5
Govt. give alternative livelihood to people	53	13	13	12	4
Soil conservation techniques in taungya	19	24	4	4	5
Stop grazing in the forest	148	8	37	35	4
Educating the communities	323	7	86	80	4
Review of forest law and policy	38	19	9	8	4

8.1 COMMUNITY INVOLVEMENT IN FOREST RESERVE MANAGEMENT

This section covers the following suggestions which are presented in table 8.1. These are initiation of participatory programmes for community participation in forest management activities and licensing programmes to intensify forest protection and conservation.

8.1.1 Participatory programmes

The introduction of participatory programmes for forest reserve management was identified as a feasible solution for sustainable forest resource management in Mount Meru forest reserve among 93 per cent of the total respondents. The respondents argued that today because of

increased pressure on forests, it is no longer a question of forests i.e. trees and management, but it is a question of forestry i.e. resource management. It was further argued that forest resource depletion has diverse effects at local, national and international levels so there should be deliberate efforts made to involve the communities in the forest resource management. Other reasons for community involvement were identified as:

- democratic norms;
- a measure to alleviate conflicts;
- a legislative mandate; and
- the realities of the current politics.

It was also revealed that with increasing human populations, pressure on forest resources will also increase. This was shown to result in forest utilization interests which conflict with the prime objectives of forest resource management. Individual institutional efforts were found unable to fight such conflicts. Therefore, combined efforts of the general public were suggested as the only means in which such forest problems can be alleviated. The communities around the forest reserve were found to be interested in being involved in the management of the forest reserve. This was said to be the involvement of the communities in the whole framework of forest management starting from **planning, implementation and decision-making** processes.

The respondents argued that the kind of participation that is required is not that of changing the forest management objectives nor that of enabling the public to have a common access to the forest. **Collaborative or joint forest management** system was argued to be the main objective for participation to ensure sustainable utilization of forest resources and prevent abuse of the forest resource by a few greedy individuals, a group of individuals or institutions. Criteria for community involvement were also suggested as indicated below.

8.1.2 Criteria for community involvement

It was revealed during the survey that for the communities to participate in forest reserve management, Forest Division should give motivation and incentives for community participation. Such incentives and motivation were identified as:

- benefit sharing;
- lower prices for forest products;

- compensation for forest work;
- involvement of the communities in forest management planning and decision-making; and
- community empowerment.

Each of the above suggested criteria for community participation is discussed below.

8.1.2.1 Benefit sharing

The respondent urged the Forest Division to share the forest benefits with the communities around the forest reserve. Some ways in which Forest Division could share the forest benefits with the communities were developed as follows:

- contributions to community development projects, for example, road building, schools, dispensaries and other self-help community projects;
- a percentage of the sales of forest materials to be given to the villages for community development;
- forest reserve management institution to participate and support agroforestry programs in the villages; and/or
- supply water for cattle outside the forest reserve - water reservoir for rain or stream water harvest.

8.1.2.2 Lower prices for forest products

It was suggested that arrangements should be made for those villagers who need forest products for individual home use i.e. for house construction in the villages, to be able to purchase these products at lower prices. Respondents said that the justification for individual timber use should be obtained through certification by the community leaders and any other reliable documents as will be planned and agreed upon between the parties.

The respondents argued that lower prices are important to them because they would:

- act as an incentive for the communities to change their taste and preference for indigenous tree species and use softwood which is available in the forest plantations; and
- encourage the people to be involved in the forest conservation and protection activities.

However, it was suggested that the indigenous people should be paid as forest guards when used for forest protection.

8.1.2.3 Compensation for forest work

It was revealed during the survey that compensation for forest work could be either **in kind** or **in cash**. Respondents said that the community should learn to accept payment in kind because:

- of the option values of the forest to the community that one gives to the forest;
- every citizen is duty bound to protect the forest as government property; and
- of the appreciation of the good relationships and arrangements made between the forest management and the communities.

Included among the forest activities mentioned as falling in this category are forest fire fighting, land preparation and forest protection. The feasibility of these activities being executed by the communities is discussed below.

a) Compensation in kind

1) Forest fire fighting

Forest fire fighting was among the forest activities mentioned which could be executed by the communities under the terms of compensation in kind. In addition, the respondents suggested motivation and incentives for people who participate in forest fire fighting. The Forest Division through the forest institutional management was urged to give these facilities which were identified to include:

- transport from the village or ward offices to the fire site; and
- food and other supplies during fire fighting which should be distributed equally and fairly among the involved parties.

2) Introduction of licensing programmes

During the survey, introduction of licensing programmes was identified as a feasible solution for sustainable forest resource use among 23 per cent of the total respondents. It was suggested that controlled licenses should be introduced for grazing, beekeeping and traditional medicine collection for the communities. The respondents suggested the types of forest activities where licensing system could be used. These include: tree planting and tending through taungya cultivation; and forest protection. The ways in which the controlled licensing system could be feasible for implementation are discussed below.

Licensing taungya cultivation

During the survey 4 per cent of the total respondents suggested stopping of taungya cultivation in the forest plantations as a highly feasible solution for forest resource conservation. The rest of the respondents i.e. 96 per cent suggested taungya cultivation should continue, but under close supervision and monitoring system. Close supervision by the forest staff was suggested as a measure to ensure soil conservation. The continuation of taungya cultivation was suggested as a measure to alleviate hunger in the villages (where land shortage and high population density prevails) and to reduce forest plantation management costs.

Silvicultural activities such as forest land preparation, weeding and first pruning were identified as the forest activities which could be performed free of charge by cultivators through the taungya system. In order for the cultivator to be able to perform these activities honestly, while caring for the tree crop, it was recommended that the cultivation plots should also be issued free of charge. The respondents suggested further that when the cultivation plots are issued for free, the forest staff would have powers to monitor and charge the cultivator with the persecution of the forest land and the trees. It was argued further that when there is payment involved the cultivator would have more powers over the land. The respondents suggested cultivation licenses should be issued for purposes of identification and forest management administration. Modalities for improved taungya supervision in taungya cultivation were also suggested by the respondents as follows:

- if the planted tree stock is reduced on any cultivation plot accidentally, the cultivator has to report to the forest ranger to get seedlings for replacement;
- where a plot is found to be understocked, stern action should be taken against the cultivator, including confiscation of the cultivation plot; and
- such action should not only be according to government regulations, but also in accordance with the community laws and regulations.

It was argued by the respondents that such a licensing system could contribute to improved forest soil conservation, reduce conflicts between the forest staff and the communities and improve the tending/survival of the planted forest trees.

Licensing system for grazing.

During the survey 23 per cent of the respondents suggested licensing of grazing in the forest reserve as a feasible solution for sustainable forest resource management. Grazing licenses according to these respondents were said to be important for:

- the provision of grazing areas for domestic animals which do not have any other place to graze because of land shortage in the public land; and
- the benefit of the forest because the grazers will do climber cutting and safeguard the trees against illegal cutting and damage by illegal grazing.

35 per cent of the total respondents suggested zero grazing in the forest reserve. The arguments for this option were that:

- 1) the current situation of the forest cannot withstand any more disturbance. And that to have animals grazing in the forest would intensify forest destruction and forest land degradation. In this regard, the introduction of grazing licenses would be feasible in future only if the current situation improves.
- 2) worries that intensified drought in the recent years has been enhanced by cutting of forests prevailed among the respondents. The drought was said to cause low farm productivity which resulted in poverty in Arumeru district and other parts of the country in 1996/1997. Such an experience could not be tolerated again.
- 3) disastrous floods in the lowlands are believed to originate from the degraded uplands.

In order to arrest grazing in the forest reserve the respondents recommended purposeful initiatives of integrated management approach. This approach would include: community leadership, forest, agriculture and livestock officials at both district and regional levels. It was suggested that the initiatives should be based on educating and advising the communities on better animal breeds and the insecurity of land over-exploitation by over-grazing. In addition, the forest reserve management should support agroforestry services which are currently rendered by Soil Conservation and Agroforestry Programme in Arumeru district (SCAPA) so as to intensify the provision of alternative source of animal fodder in the communities.

Introduction of licensing in beekeeping

Efforts to stop beekeeping in the forest reserve was suggested among 9 per cent of the total respondents as a feasible solution for sustainable forest resource management. However, during group discussions it was revealed that if traditional beekeeping methods could be supervised and monitored, beekeeping could still continue in the forest reserve under the licensing system.

Beekeeping extension programs to promote modern beekeeping techniques were suggested. Licensing beekeeping activities and the promotion of modern beekeeping methods was said to be beneficial to both the beekeepers and the forest resource on the following basis:

- increased productivity in bee products through the use of modern beekeeping techniques would increase the total income for the beekeeper; and
- beekeepers would be locked in the forest protection activity, thus intensifying forest protection activities and reducing the costs for forest protection.

Monitoring and supervision of beekeeping activities in the forest reserve could happen through the implementation of the government notice in Cap. 389 of the forest ordinance (i.e. G. N. No. 331 published on 15/6/1961) which states that,

“...Permits must define clearly the responsibilities of the permit holders, as to the use of fire in harvesting, damage to any form of forest produce, the pollution of water sources, and the disturbance of wildlife living within the respective reserve...”

Licensing traditional medicine collection

The respondents suggested that traditional medicine from the forest reserve could be monitored and supervised if the traditional medicine collectors were licensed under special agreements. According to these suggestions, all traditional medicine collectors would be identified by the community leaders. They would be urged to register their names with the forest reserve management.

It was suggested further that the registration would not be a warrant or a certificate for medicine collection. In addition, other modalities would include:

- acquisition of a permit from the forest officer each time the medicine collectors need to enter the forest for medicine collection;

- reporting back to the forest officer after they have left the forest. This, it was said, would ensure that collectors would not leave a fire in the forest behind them.
- educating the medicine collectors on the pitfalls of excessive uprooting and debarking of trees.

This kind of licensing and monitoring was said to reduce fire hazards by locking the traditional medicine collectors in the forest protection process. In addition, it would reduce biodiversity extinction through killing of trees by excessive uprooting and debarking of trees.

3) Protection of water streams

The respondents suggested that all water springs and streams inside the forest reserve should fall under the guidance of community leadership. They proposed to have such areas declared out of bounds to any human activity except students and researchers of academic issues or indigenous people during cultural/traditional ceremonies. According to the respondents, the adoption of this kind of protection on sensitive areas would intensify protection of water sources and biodiversity conservation.

4) Identification of forest boundaries

During the survey, it was revealed that the elders in the communities could participate in identification of encroached forest boundaries. The respondents argued that these people have been living within these areas for years and they are aware of forest boundary alterations that have taken place either through government or individuals initiatives. Due to this knowledge of the forest, these people could identify areas of forest boundary encroachment. The respondents recommended that the identification of forest boundaries should happen through the community leaders in collaboration with the forest reserve management staff.

In addition, it was recommended that people should be employed to consolidate forest boundaries in regular boundary cleaning and maintenance. The respondents also suggested that the indigenous people bordering the forest reserve should be given the task of:

- safeguarding the forest against forest fires which originate from the public land;
- being accountable for any encroachment on the forest boundary neighbouring their land; and
- regularly monitoring the forest boundaries (to be done by the village chairpersons in their respective villages in collaboration with the forest staff).

The respondents argued that the above mentioned amalgamation in forest boundary protection would ensure adequate supervision and monitoring of forest boundary encroachment and reduce fire incidences in the forest reserve.

b) Compensation in cash

Provision of employment for the community

The respondents suggested that the forest management should consult the community leadership when creating employment for forest work. This was found to be feasible to ensure rational distribution of employment in the villages. The importance of formal employment for the communities was emphasized as a means of reducing forest destruction. This collaboration was said to improve the relationships and co-ordination between the forest staff and the community leadership. In addition, it would improve forest protection because the community leaders would be able to ensure effective forest protection by the forest guard employed under their influence. (The contrary was said not to happen because the communities have high respect for their traditional norms and leadership).

In summary, therefore, the involvement of communities around the forest reserve in the above mentioned protection activities would help to intensify and enforce forest protection. During the survey, reinforcement of forest protection activities ranked second in line as a feasible solution to prevent forest destruction among 95 per cent of the total responses. Implementation of the suggested strategies would contribute to the lessening of the forest protection problems.

8.1.2.4 Involvement in planning and decision-making

The respondents suggested the communities, through their leadership, should be involved in the formulation and implementation of the forest management plans. They recommended transparency between the forest staff and community leadership as a means by which community involvement in forest planning and decision-making could be successfully implemented. Transparency on the part of the forest staff was urged concerning:

- forest activities;
- forest laws and regulations;
- available funds for each forest operation;
- accountability and evaluation procedures; and

- objectives and aims of the Forest Division for the management of the forest reserve.

On the part of the community leadership transparency was found necessary concerning:

- specifications regarding forest activities where the community could actively participate either in kind or in cash;
- traditional laws and norms associated with forests and forest land conservation including penalties to offenders;
- objectives and aims of participation in forest reserve management; and
- community accountability, monitoring, supervision and evaluation procedures for the forest reserve.

It was said that such transparency would make the two parties work as partners and friends. The respondents argued that the relationship which incorporates sufficient transparency between the parties would be beneficial to the involved parties and the forest conservation processes because the communities would:

- understand the importance of forest management;
- have confidence in the forest staff; and
- know that the Forest Division recognizes and appreciates their contribution to forest conservation.

On the other hand, the forest staff would be ensured of their work security through improved public relations. This was said to improve work implementation done by forest guards and forest rangers who were found to be few in extensive forest areas (as shown in chapter 7). Work supervision and monitoring by these few forest staff members would be possible regardless of extensive areas and the forest wilderness. It was believed that improved relationships due to this transparency between the community and the forest staff would alleviate conflicts between the forest management and the communities; create harmony and peace in the society, and intensify forest conservation.

8.1.2.5 Community empowerment

In order for the community to be involved in the implementation process of forest conservation, the respondents suggested that environmental advisory committees be formed at the ward level. These committees were suggested to comprise of four elderly people from each ward surrounding the Mount Meru forest reserve. The role of these committees was to:

- alert the forest management and the community on the envisaged environmental problems;
- advise on the remedial measures that could be taken to prevent further destruction; and
- promote environmental awareness among the communities.

Extra seminars on forest laws and forest protection were also suggested for community leaders. This was found to be important to enable these key leaders to enforce the forest law and educate the rest of the community.

8.1.3 Drawbacks for community involvement

The respondents recommended that the introduction of community participation approaches should be introduced with care. They commented that though community participation could be introduced for very good reasons, it could lead to abuse of the forest resource-base and the law of the nation. The comment evolved from a number of drawbacks of community participation in forest management realized during this survey. The realized drawbacks were described as follows:

- Communities may have high expectations of getting immediate benefits from the forest reserve. Lack of procurement of these benefits could lead to misunderstandings and intensified forest destruction;
- Lack of patience by both involved parties could result in despair around continuing with the initiatives. It was cautioned that participation is a process. It is a slow process that needs patience and commitment by both involved parties;
- Efficient and effective planning and strategies are needed. If not well planned with properly stated strategies, the communities might think that they have been provided with an opportunity to utilize the forest reserve. This may ruin the forest through over-grazing and over-exploitation of wood both for business and local use;

- A high level of transparency and sincerity is needed. The communities may take sole mandate over the forest land and forest produce and decide negatively against the intended national forest conservation objectives;
- Stakeholders need to be closely supervised and monitored. The Forest Division needs a committed and well remunerated forest staff to cope with the situation;
- A constant flow of funds for work implementation is required. If there are inadequate resources to enable management to proceed smoothly and jointly implementation of the forest management plan may be jeopardized, thus demoralizing the involved parties;
- Inadequate forest management skills on the side of the community may result in contradicting management interests; and
- The communities may claim more rights than are feasible from the forest plantations.

In view of these drawbacks, the respondents made a number of suggestions to alleviate their negative influence on the forest resource. They suggested that the influence of these drawbacks could be reduced or even completely controlled through preparations made prior to the commitment to community involvement. The preparations include:

- Strong agreements between the Forest Division and the community to ensure accountability and responsibility;
- Proper plans which include short-term and long-term strategies to ensure smooth running of the forest management plan;
- Workable forest management plans to indicate the limits of responsibilities by the community;
- Timely revision of the forest management plan to accommodate changes; and
- Less responsibilities (in comparison to the responsibilities of the Forest Division) concerning management of the forest reserve should be given to the community.

8.2 EDUCATING THE COMMUNITIES

However, the respondents argued that before the communities could be involved in forest activities the Forest Division has to take responsibilities and initiatives to educate all the people in the communities around the forest reserve through planned public meetings. It was suggested that the education programme should target on the following issues:

- objectives and goals of the forest management as prescribed by the government;

- benefits that could be obtained by the community and the nation at large when the forest is conserved;
- problems that could prevail locally, nationally and internationally when the forest disappears; and
- the role that the community could play in preserving the forest and the forest land.

The respondents suggested that the education programmes should be a process and not a one day occasion. Therefore, public meetings and forest extension services were emphasized as participatory tools.

In addition, forest staff committed to the forest and forest land conservation was found to be an important incentive for community acceptance and appreciation of forest conservation. In view of this, the respondents suggested that technical capacity and capability building should be promoted among forest staff. Institutional development was thus suggested as a way in which this could happen.

8.3 INSTITUTIONAL DEVELOPMENT

It was revealed during this survey that, a number of anomalies which have occurred in the forest and forest land were a result of low work incentives, technical capacity and capability building for the forest staff. According to the respondents, it was argued that if the forest staff had been given high enough salaries, they would not have involved themselves in corrupt activities.

Technical capacity and capability building for the forest staff was realized to include among other factors, in-service training and adequate salaries. According to the survey technical capacity and capability building was suggested as a feasible solution for improved forest management among 7 per cent of the total responses. Proper motivation and incentives for the forest staff were also identified among 6 per cent of the total responses. In addition, the respondents argued that motivation, technical capacity and capability building for the forest staff are important for increased work efficiency and effectiveness. The following suggestions for work incentives, technical capacity and capability building for forest staff (to be given by the Forest Division and the government in general were identified:

- acknowledgement of good work and constructive criticism of bad work;

- training at different levels to upgrade forest knowledge;
- provision of seminars and frequent sectoral meetings which incorporate forest staff at different levels to enable professionals interchange;
- new publications and ideas on forest resource management to be availed from Forest Division and/or forest research institutions to update knowledge in forest management;
- in-service training courses as a tool to update knowledge; and
- provision of lunch or night allowances when out in the field for forest protection activities.

Work efficiency and effectiveness portrayed by the forest staff in the field was argued to set an example of the government's commitment to forest and the forest land conservation. Such exemplified character in the field, when positively portrayed, was argued to be an incentive for the communities to collaborate in forest conservation process. On the other hand, when the forest staff set a negative example to the communities, it was argued by the respondents to accelerate forest destruction by the communities. It was also found that lack of incentives and motivation among forest staff were associated with governance for forest management, as will be discussed below.

8.4 GOOD GOVERNANCE

Issues of governance were identified in forest work supervision, monitoring and adherence to professional ethics during work implementation. These areas were shown to require improvement.

8.4.1 Improved supervision and monitoring

Improved supervision and monitoring was revealed to be one of the most important objectives for forest reserve management set by the Forest Division (MLNRT, 1989). The respondents urged the Mount Meru forest reserve management to implement this objective in order to improve forest work implementation. Improved supervision and monitoring were suggested to be greatly required in the following areas:

- soil conservation in taungya cultivation;
- revenue collection and timber volume calculations;
- allocation of taungya plots in the field (evaluation of reports and complaints by the public on the implementation in the field and remedial measures);

- forest patrolling activities to ensure that the forest guards are actually doing their work; and
- timber harvesting techniques.

According to this survey the need to improve supervision of forest activities was identified as the most feasible solution for sustainable forest resource management. It was ranked first in the list among 100 per cent of the total responses. The need for forest management to improve monitoring of forest activities was identified as a feasible solution among 85 per cent of the total responses. These responses indicate that currently there is a deficiency in supervision and monitoring of forest activities in Mount Meru forest reserve, which needs immediate improvement.

The respondents described monitoring as an internal follow-up of the activities. It would make the management aware of what is going on and enable them to adjust the management of such activities accordingly. The forest management was therefore urged to improve not only the forest work performance, but also monitoring some of the impacts and influences of some forest activities on the forest ecosystem. Such monitoring was suggested to include social, cultural, ecological and biophysical changes that are taking place in the forest systems.

The respondents argued further that although written reports from the field are important, the forest manager should also make time-to-time field visits. It was felt that such visits would:

- enable the forest project manager to compare written reports and field work implementation;
- improve decision-making;
- enhance active problem solving;
- increase cohesion and relationships between the field staff and top management of the project; and
- encourage new innovations, especially where field observations are compared with the existing knowledge and experience.

8.4.2 Professional ethics

During this survey, the respondents argued that forestry working ethics need to be re-emphasized in the execution of most of the forestry activities in Meru forest plantations. This need was presented among 64 per cent of the total responses as a highly feasible solution for improved

forest management practices. Examples of areas where professional working ethics were suggested to be re-emphasized include:

- the execution of nursery operations;
- soil conservation in taungya cultivation to ensure the establishment of soil conservation structures;
- supervision and monitoring of timber harvesting regimes;
- immediate replanting after timber harvesting;
- on-site work inspection and problem solving intensified by field visits; and
- updating the forest management plan.

According to this survey, if the above mentioned anomalies are rectified, there will be a considerable positive effect on the achievement of the objectives of sustainable forest resource management in Mount Meru forest plantations and the forest reserve as a whole.

8.5 FUNDING SOURCES FOR FOREST ACTIVITIES.

During the survey it was revealed that the current funding system for the forest activities could not be sustainable in the long-run. However, the respondents had a very positive opinion of the LMDA funds. They argued that with effective revenue collection, supervision and accountability, LMDA funds could be quite sustainable in the long-run. Nevertheless, various sources of funding for sustainable forest management and development were suggested by the respondents. These are provided in table 8.2 below.

Table 8.2 Response distribution: identification of funding sources

Funding source	Total score	Ranking level	Total Count	% response
Timber harvesting fees	317	1	69	96
Government subsidies	175	2	68	94
Community support	124	4	26	36
Donor support	136	3	65	90
Contributions from wood industries	14	7	5	7
Introduction of water charges	27	6	9	13
Other fees e.g. orienteering, licensing and fines	80	5	24	33

8.5.1 Timber harvesting fees

Timber harvesting fees were identified as a highly sustainable forest funding source for forest reserve management. According to the respondents, use of timber harvesting fees as a sustainable funding source for forest management ranked first among 96 per cent of the total responses. However, it was revealed that the LMDA funds had not been ploughed back into the predetermined forest activities. Instead, most of the LMDA funds have been used for administration, forest protection and road maintenance activities. In view of this, the respondents suggested the funds to be strictly utilized as specified in the forest management plan and according to the objectives of the LMDA agreements. They argued further that there would be no reason whatsoever to look for additional funding sources if the current LMDA fees were not properly collected, supervised, monitored and accounted for.

On the other hand, some respondents suggested selective timber harvesting programs would expedite fund raising for forest management. However, most of the respondents proposed a restriction of timber harvesting in the natural forest until proper **forest inventory and mapping** is done; and a **proper natural forest management plan** is prepared. Instead, they suggested that the natural forest part of the reserve should be managed under the same management as the forest plantations. Revenues accrued from timber harvesting in the forest plantations could therefore be used together with donor aid and government funding to support the whole forest

reserve conservation process. Respondents said that this would ease responsibility and accountability of forest environment conservation.

8.5.2 Government subsidies

Government subsidies in forest activities was identified as a relatively sustainable source of funding for forest activities in Mount Meru forest reserve. It was ranked second in the list among 94 per cent of the total responses. As revealed during this survey, almost all of the water used in the Arusha municipality is tapped from the springs of Mount Meru. It was revealed further that Arusha was the second most important tourist town after Dar-es-Salaam in the country. In addition, the water streams and rivers from Mount Meru forest reserve form part of the sources of a larger river in the country i.e. the Pangani River. Pangani River was found to contain a large dam, the Hale dam, which provides electricity for most parts of the country. The river was also found to provide water for large scale irrigation schemes for agricultural developments in the lowlands. In view of this, the respondents argued that the importance of Mount Meru forest reserve in these contexts should be realized by the government and thus given more support to intensify forest reserve conservation. A **trade-off** on whether to lose the water resource and/or preserve it for these diverse local and national interests should be the basis of incentive for the government to contribute more to the conservation of the forest reserve as a water catchment forest.

It was however revealed during this survey that the government has consistently contributed to the management of the forest reserve through fund allocations from the government treasury. In addition, recently, funds have been allocated from the Forest Division through a retention scheme developed since July 1995.

8.5.3 Donor support

Donor support was identified as the third sustainable funding source for the management of Mount Meru forest reserve among 90 per cent of the total responses. The respondents argued that the main objective for donor support is to assist in attaining sustainability in the long-run. They argued that this objective could be achieved if implementation of the agreements signed by the donors and the recipient country could be effectively implemented. This was ascertained on the grounds that when such agreements are implemented it would be possible to attain

sustainability with time, because the importance of forests would have penetrated to the rural populace and they would know exactly how to use the forest resource sustainably.

However, the respondents while appreciating the donor related assistance, commented that national efforts in forest conservation should firstly be promoted by the government to show the desire for forest conservation. This was said to be the basis for the donor agency to assess any reason for the support of such efforts. Therefore, it was suggested that donor support should be used in association with the timber harvesting fees, government subsidies and community efforts if long-term sustainability of the forest resource is to be determined.

8.5.4 Community support

Community support as a source of forest funding ranked fourth in the list. It was identified as a highly sustainable funding source for forest management among 90 per cent of the total responses. Involvement of the communities in forest activities either in kind or in cash was argued by the respondents as the way in which they could contribute, which would in turn reduce forest management costs.

It was therefore revealed during group discussions that the contribution of the communities would be realized in the following participatory activities:

- in forest management activities, e.g.: in preventing illegal timber harvesting, controlling grazing, full participation in fire protection and fire fighting, and preventing forest boundary encroachment. This would reduce government costs for these forest protection activities; and
- when the community is empowered, there would be increased awareness of forests among the general populace. In this respect, incidents of forest destruction would be reduced and the forest would regenerate. Consequently, pressure on the need for intensified forest management would be reduced which would in effect reduce administrative costs.

8.5.5 Contributions from wood industries

The respondents suggested that wood industries could contribute to forest conservation activities to ensure the security of future procurement of forest materials. It was suggested that forest industries should invest in activities such as replanting the clearfelled areas. However, according

to a timber customer of Mount Meru forest plantations, there have been complaints among the timber customers that the logs have recently been too expensive. They argued that there have been too many unco-ordinated charges imposed on the wood dealers. Such charges were identified to include: royalty charges; LMDA fees; cess for Arumeru district and income tax. In view of these complaints, the respondents suggested that timber charges should be co-ordinated in the Forest Division. In addition, frequent meetings between the Forest Division and the timber dealers were suggested to review the charges so as to ensure that both interests, including those of the timber end-users, are met.

The respondents also suggested that timber market prices should reflect the costs of forest conservation. This would involve a kind of **compromise** to prevent unnecessary strain on the timber end-user. A further **compromise** was urged on the setting of prices in LMDA revenue collection, that silviculture fees should be rated to an extent that could cater for soil and water conservation costs.

8.5.6 Water charges

Introduction of water charges was identified as a relatively feasible funding source for sustainable forest resource management among 13 per cent of the total responses. It was argued that TANESCO and the Department of water development should be involved in sharing the costs for forest reserve management. It was argued further that other institutions which charge for domestic and industrial water supply either directly or indirectly in the Arusha municipality should also be involved in the protection of the water sources. In view of these arguments, the respondents proposed that the Ministry of Natural Resources and Tourism should consult and collaborate with these institutions for a compromise on water resource conservation. This proposal was associated with the proposal for the management of the forest reserve within the framework of a holistic approach of a watershed area. Watershed management approach, will however, be discussed later in this chapter, under the suggestions for environmental development.

8.5.7 Other funding sources

Other funding sources were also suggested as relatively feasible sources of funding among 33 per cent of the total responses. Among the suggested funding sources included in this category were: eco-tourism and fines for forest offenses. These are discussed below.

a) Development of eco-tourism

The respondents argued that the development of recreational areas inside the forest reserve could be a good incentive to encourage the already established eco-tourism activities in the area. Hand crafts among the communities was identified to be a source of good income when sold to tourists and other visitors in the local markets around the forest reserve. Mountain hiking, camping, scouting, and picnic activities were among the recreational activities which were identified to be taking place currently inside the forest reserve for free or sometimes at low government charges for orienteering fees. Suggestions for improvement of such eco-tourism activities were given by the respondents. They suggested the improvement of the route for mountain hiking shown in Map 1.2 (i.e. through Nading'oro range) to increase the number of mountain hikers. Development of infrastructure such as hiking route maintenance and camp sites was suggested to accrue revenues for forest management activities from eco-tourism.

b) Use revenue collected from fines on forest offenses

As revealed during the survey, revenues collected from fines for forest offenses are collected as government royalties and sent to the government treasury. However, the respondents suggested that the government should have these revenues retained in the forest institution to intensify forest protection activities. The respondents argued further that currently, meagre funds are available for forest activities and that the forest needs urgent action for rehabilitation. In this respect, other initiatives to ensure successful conservation of the forest were also suggested. These included suggestions for a reduced number of forest activities to develop a workable forest management plan. Forest activities identified to receive immediate attention are presented in table 8.3

Table 8.3 Response distribution: identification of important forest activities

Type of activity	Total score	Ranking level	Total count	% response
Fire protection	148	2	36	100
Control illegal timber harvesting	116	7	30	83
Curb illegal grazing	143	3	36	100
Forest boundary consolidation	121	6	33	92
Manage taungya cultivation	137	4	30	83
Professional logging	86	8	19	53
Replanting of open areas	174	1	36	100
Boundary planting	64	10	14	39
Extension programmes	124	5	34	94
Forest Mapping and inventory	26	12	6	17
Preparation of forest management plans	55	11	13	36
Nursery operations	82	9	21	58

The suggested forest activities presented in table 8.3 form the basis for the following discussions on the development of a workable forest management plan.

8.6 DEVELOPMENT OF A WORKABLE FOREST MANAGEMENT PLAN.

The importance of each activity for the proposed forest management plan was emphasized. This emphasis is shown by the response distribution during identification by the respondents. The subsequent discussions in this section describes the importance of each activity in forest management as regards the achievement of the objective of sustainability.

8.6.1 Fire protection

100 per cent of the responses suggested plans and strategies for fire protection and fire fighting. They ranked second in the list of important forest activities identified as forming a workable forest management plan for Mount Meru forest reserve. This response indicates that fire protection and fire fighting plans and strategies are much required in the future forest management plans.

8.6.2 Control of illegal timber harvesting

Control of illegal timber harvesting was identified as an important activity among 83 per cent of the total responses. Respondents suggested it will require the preparation of plans and strategies for community involvement in forest management. Such plans and strategies were found to be important in order to streamline the possibilities of community participation and enable the communities to collaborate with the forest staff in dealing with illegal timber harvesting. Law enforcement was suggested to be imposed in cases of illegal timber harvesting.

8.6.3 Curb illegal grazing

Suggestions for initiatives to curb illegal grazing in the forest reserve were given among 100 per cent of the total responses as an important activity in the proposed forest management plan. Plans to control illegal grazing in the forest reserve were found to require the involvement of community leaders. It was suggested that community leaders in collaboration with the forest staff hold meetings with the communities to educate them. In addition the communities were advised to make by-laws which would control grazing in the forest reserve.

8.6.4 Forest boundary consolidation

Consolidation of the forest boundary was suggested as an important activity among 92 per cent of the total responses. The respondents suggested initiatives to identify and certify the forest boundary. Identification of the forest boundary was suggested to be executed by forest staff in collaboration with the community leadership. It was proposed that a live forest boundary should be established around the forest reserve. This was said to be important in preventing future forest boundary encroachment under the pretext of ignorance. In addition, the live boundary could be used as evidence before the court of law in cases of malicious future forest boundary encroachment. The Forest Division was urged to provide funds for the establishment of the live boundary and forest boundary cleaning and maintenance.

8.6.5 Management of taungya cultivation

The need for immediate initiatives to manage taungya cultivation was suggested among 83 per cent of the total responses. Management of taungya cultivation was found to involve close supervision by the forest staff. In addition, it was suggested that construction of effective soil

conservation structures and prohibition of cultivation on steep slopes and along river banks and water streams should be implemented during taungya management.

8.6.6 Professional timber logging

The need to intensify professional timber logging was suggested among 53 per cent of the total responses. The respondents urged the Forest Division to re-institute the timber logging crew whose activities were terminated in the financial year 1994/1995. They argued that minimum timber concessions (if necessary) could continue with a few parastatal organizations who have well trained logging crews. But timber concession activities would still require monitoring and supervision by the trained forest staff.

8.6.7 Replanting gaps

Replanting of open gaps in the forest plantations was suggested as being an important activity among 100 per cent of the total responses. It ranked first on the list of important activities to form the proposed management plan. This response distribution of the respondents shows that the need to cover open gaps in the forest plantations is a highly sensitive problem which needs immediate action by the stakeholders. The respondents urged the Forest Division to set aside adequate funds for replanting the current open gaps in the plantations. They argued further that there would be no reason to continue with timber logging activities in the forest plantations when there are no initiatives for replanting. In addition, it was suggested that enrichment planting should be developed in gaps along the river banks and water streams.

8.6.8 Extension programme

The need for a forest extension programme was suggested among 94 per cent of the total responses. The extension programme was suggested as an important activity for the proposed forest management plan as a way to sensitize the public to the importance of forests locally and nationally. In addition, the extension programme was found to be an important tool for the achievement of the community participation process (as identified earlier).

8.6.9 Forest mapping and inventory

The importance of this activity in the proposed forest management plan was identified among 17 per cent of the total responses. The respondents argued that a forest inventory was important for

the production of a viable and realistic forest management plan. It was revealed that issues such as: the extent of the current destruction; standing timber stock in both the natural forest and the forest plantations; and areas requiring intensive management are difficult to estimate without the assistance of data from forest mapping and inventory.

8.6.10 Nursery operations

Efficient nursery operations were suggested as an important activity in the proposed forest management plan among 58 per cent of the total responses. The respondents argued that the forest nursery should be managed in such a manner that it would be possible to produce enough health seedlings to cover the open gaps in the forest plantations. It was argued further that seedlings of indigenous tree species should also be produced to fill gaps along the river banks and water sources. However, the respondents required the Forest Division to be specific about the kind of tree species to replace cypress stands in the forest plantations, which have been affected by cypress aphids. They argued that intensified tree planting in the forest plantations cannot be possible when the forest staff are not certain of the types of tree species to raise.

The respondents recommended the above mentioned activities in view of the arguments that:

- the forest needs fast regeneration therefore the activities should be few and realistically manageable;
- the current meagre funds cannot allow too many activities (as mentioned earlier almost all the revenues accrued in timber sales are equally expended, thus no savings); and
- there is no timber harvesting in the natural forest, the natural forest management depends on donor support which could reach the project site too late (as discussed earlier).

8.7 DEVELOPMENT FOR ENVIRONMENTAL CONSERVATION

The respondents described the forest reserve as an important water catchment forest for the community and the nation at large. From this argument, the respondents suggested that the forest reserve would have more value when fully maintained for soil and water conservation without the exotic monoculture plantations. They also suggested that the forest reserve should be managed under a holistic approach of watershed management. Arguments given by the respondents for both the elimination of the forest plantations and the management under watershed approaches are addressed as follows.

8.7.1 Elimination of the forest plantations

Suggestions to eliminate the exotic monoculture forest plantations from the forest reserve was presented among 9 per cent of the total responses as a feasible solution for sustainable forest development. The respondents urged for all the areas where softwood was clearfelled to be replanted with indigenous tree species. They claimed that although softwood stands are fast growing and produce large amounts of timber in short periods, the indigenous trees are better for biodiversity and soil conservation. In addition, timber from indigenous tree species was said to be stronger and more durable than timber from softwood such as pines and cypress. The respondents continued to show the relevance of eliminating the forest plantations from the forest reserve by giving comparisons of the importance of indigenous tree species over the exotics on a water catchment area. This comparison was as presented in Box 8.1

Box 8.1 The characteristic features of indigenous tree species compared to exotic monocultures

<u>Indigenous tree species</u>	<u>Exotics</u>
1) longer rotation periods. Normally more than 100 years. Thus less recurrent of human disturbance of the ecosystem which improves water and soil conservation.	1) shorter rotation periods. Normally, 25 to 30 years rotation period for pines and cypress respectively. Recurrent human disturbance for different silvicultural and timber harvesting activities reduce water and soil conservation potentials of the forest ecosystem.
2) allows undergrowths thus reducing the effects of the agents of soil erosion.	2) normally suppresses undergrowths thus subjecting the soil to erosion agents.
3) harvesting normally through selective harvesting which is believed to have lower impacts on soil and water conservation in a forest ecosystem.	3) normally, there is clearfelling at rotation age. Clearfelling with its subsequent replanting have been found to have high negative effects on soil and water.
4) high biodiversity conservation.	4) normally single tree species and low wildlife distribution.

However, it was argued that the plantation forest is also an important capital for the local people and the nation at large. In view of this, the respondents suggested that the environmental

hazards brought about by the logging operations should then be reduced to allow sustainable use of the forest resource. In this regard, the respondents re-emphasized the execution of timber harvesting activities by the Forest Division logging crews. It was further suggested that timber concessions should be kept to a minimum and fall under very close supervision and monitoring. A number of advantages to the benefit of the forest environment due to Forest Division logging were identified. In addition, costs on the environment for the benefits of timber concessions were also identified. Both of these costs and benefits were compared as presented in table 8.4

Table 8.4 Comparison of conservation benefits and costs due to Forest Division and concessions timber logging practices

Forest Division logging: benefits to forest conservation	Timber concessions: cost on forest conservation
<ul style="list-style-type: none"> • Better control of operations related to erosion risks and damages to other tree stands. • Better use of raw material, if sold to different industries i.e. fuelwood, sawlogs, chiplogs and poles could be sold in different assortments with no difficulties thus increasing revenue. • Local markets more easily available resulting in rural development and enhanced relationships between the institution and the communities. • Employment policy: higher level of training and skills when workers are permanently employed thus creating innovations for improved environmental management during timber logging. • Easier scheduling of cutting for maximum timber growth. • New logging techniques which have low 	<ul style="list-style-type: none"> • Profit maximization being the main objective would mean lower logging investment cost to ensure lower production cost. In effect, this results in high environmental costs due to accelerated erosion. • Could create a small difference in logging wages thus depriving the government of the long-time recruited forest logging workers. Their service in timber logging operations could be questionable after the concession period. This results in loss of efficient workers, with consequent effects on reduced efficiency in logging practices. • Better control of raw-material requirement which results into low wood utilization and waste. • Could create own prices for forest produce and sell to petty customers

<p>impacts on forest resource base could be practiced, for example; oxen-skidding.</p> <ul style="list-style-type: none"> • “Intègrated Systems Approach” could be practiced to enhance revenue collection and improve silvicultural activities. • Would be in line with the current trends of multi-party system and trade liberalization in the country. <p>Disadvantages</p> <ul style="list-style-type: none"> • Would mean recruitment of a logging crew. • Would not often be able to satisfy the timber demands for big customers like the Fibreboards Africa Limited. • Would mean securing capital investment for logging and skidding operations. 	<p>who could not meet the concession terms. This could create unpopular relationships between the forest institution and the public thus intensifying forest destruction by the public.</p> <p>Disadvantages</p> <ul style="list-style-type: none"> • Not all usable timber is utilized if not needed. <p>Often not permanently employed workers - which results into low productivity when the temporarily employed workers involve themselves in other activities for example; agriculture during the rain season.</p>
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Although capital investment on logging by Forest Division was revealed as a major drawback for Forest Division logging, the respondents argued that professional Forest Division logging operations would still be favourable for forest conservation. In addition, the respondents suggested that some percentage of LMDA funds, in future revenue collections, should be set aside to account for capital interest and depreciation costs. This was proposed in order to allow for future purchases of logging and other equipment for forest operations.

8.7.2 Watershed area management approach

As mentioned earlier, the beneficiaries of Mount Meru forest reserve range from the communities around the forest reserve to the international community world-wide. These beneficiaries were mentioned by the respondents and are presented in box 8.2

Box 8.2 The beneficiaries of Mount Meru forest reserve

- **The neighbouring communities around the forest reserve.** They obtain firewood, clean water, local medicine, fodder for domestic animals, timber, cultivation plots and employment from forest work. Cultural and option values are also important for the communities.
- **Residents of Arusha municipality.** They obtain clean water from the reserve for domestic and industrial use.
- **Timber dealers.** They get their wood requirements from the forest plantations and sometimes from the natural forest through illegal activities.
- **Forest employees.** They are employed by the forestry sector.
- **The state.** Through collection of revenue in royalty charges and fines for forest offenses.
- **The international community.** Through authenticity value, educational and research values and regulation of climate.

The respondents suggested that the costs of forest conservation should be shared amongst these diverse beneficiaries. They argued that conventional wisdom believes that if one only accrues benefits from a natural resource without feeling the costs it may lead to abuse of the natural resource. From this basis, a watershed management approach for the Mount Meru forest reserve was suggested. The approach was found to incorporate 'soil and water conservation' and 'land use planning' into a broader, logical framework (Brooks, 1993).

Development of a watershed area management approach was also derived from the basis of the motives summarized by Brooks (1993):

- 1) People are affected both positively and negatively by the interaction of water and other resources, and in turn, people impact on the nature and severity of such interactions by the ways in which they use resources and the quantities in which they use them;
- 2) The impacts of these interactions follow watershed boundaries, not political boundaries; water flows downhill regardless of how people define their political boundaries. Thus, what is done in the highlands of one political unit (country, community, or landowner) can significantly affect another political unit occupying a downslope or downstream position within the watershed;
- 3) Since such interactions cut across political boundaries, what may be sound resource use from the point of view of one political unit, may not be sound resource use from a broader, societal

point of view or an international perspective, because of undesirable downstream effects (i.e., what economists call “externalities”). This approach brings such externalities into the analysis by considering watershed, rather than political or institutional boundaries;

4) Given the existence of externalities, ecologically sound management becomes good economics for all concerned only if the costs and benefits are appropriately distributed among the political units, communities, and individuals that carry out watershed management practices and those who benefit from them.

On the basis of the above motivations, it was revealed that **externalities** represent the **real benefit and cost** of a natural resource to society, but they are not included in the decision making process (Pearce et al., 1990; Shepherd, 1992; Brooks, 1993; Mather and Chapman, 1995). Instead, suboptimal decisions regarding the use of the affected resources are often made (Panayotou, 1987). It was found further that when the costs and benefits of watershed management are well distributed amongst the beneficiaries it builds up an integrated management system which ensure efficient resource conservation. This integrated concept of watershed management provides a framework for sustainable development, while watershed management practices provide the tools for making that framework operational (Brooks, 1993). Norgaard (1992) argues further that internalizing the externalities increases efficiency.

Strategic planning which incorporates consideration of ecological, biophysical, social, cultural and economic processes was found to be important for feasible watershed management planning, requiring proficient personnel for efficient and adequate planning. In addition, it was revealed further that the formulation of such integration within a political area would largely depend on political decisions.

8.8 POLICY DEVELOPMENT

A review of government policies was suggested as a feasible solution for sustainable forest resource management among 8 per cent of the total responses. The national forest policy and law was found to require some improvement to allow implementation of its objectives. The national forest reserve’s centralization policy was also identified as an important aspect to be revisited by the Forest Division to improve monitoring, supervision, co-ordination and

relationships in forest management activities. Government policies other than forestry were also found to require change, and are discussed in 8.8.3, below.

8.8.1 The national forest policy and law

The present forest policy was formally proclaimed in the year 1953 and enacted by the General Assembly by the year 1961 (Holmes, 1995). In 1980, due to envisaged political, social and economic changes in the country, it was found necessary to revise the forest policy. Therefore, a revised draft forest policy was initiated and finally presented in 1986. Recently, the development of a multi-party system and trade liberalization trends have necessitated a revision of the current forest policy (FBD/MNRT, 1997). However it was revealed that the policy statements are still based on the forest policy of 1953. In addition, the Forest Ordinance of 1957 Cap. 389 was found to contain loopholes and deficiencies which warrant more effective and adequate revision for objective implementation. Specific areas where the Forest Ordinance and the forest policy were found to require clarity include:

- clear **terms of community participation** in forest reserve management. Though there has been a statement of community involvement in forest reserve management in the new forest policy i.e. Tanzania Forest Policy Paper, 1997 (*in draft*) (FBD, 1997), the terms of implementation need to be specific.
- clear definition of the **community traditional rights** for the utilization of the forest reserve. Case 2 presented in chapter 5 could be taken as a clear example of the need to clearly specify these rights for both domestic animals' drinking and stream tapping for community domestic utilization. It was found difficult for the forest staff to defend the law where water rights are not clearly known. In addition, people using the routes through the forest reserve that join one village to another are considered as trespassers according to the Forest Ordinance. Specific statements are required on such routes to enable the law to be enforced on haphazard entry to the forest reserve.
- provision of clear **guidelines on objective implementation**. The provision of payment¹ for communities in forest fire fighting operations was found to confuse the community, especially when the government was unable to satisfy such promises and aspirations. Clear guidelines and financial commitment were required.

¹ Forest Ordinance Cap. 389 of 1957, Part V, section 16(3).

8.8.2 Centralization policy of the forest reserve

The current co-ordination and organizational structure of the forest sector for the management of the forest reserve:

- isolates the forest reserve management officials from the communities and other related institutions in the field;
- presents unco-ordinated activities in both regional and district administrative and technical levels;
- results in poor supervision and monitoring of both forest management and implementation of forest activities; and
- results in poor relationships with the communities around the forest reserve, thus creating unnecessary conflicts and embarrassments between the two parties.

In view of these consequences of the centralized structure of the forest reserve, the respondents argued that a change of the current attitude towards centralized forest reserves by the foresters is inevitable. It was argued that this change in attitude would be an incentive to encourage change and/or modification of the organizational structure of the forestry sector in the country to alleviate these conflicts and embarrassments.

However, there was no specific organogram provided by the respondents in this survey to illustrate the proposed organization structure for the national forest reserve. However, the respondents argued that Dar-es-Salaam (the national administrative city about 600 km from Arusha) was far away when issues such as protection and community co-ordination were involved. It was suggested that in such cases district and regional authorities would be of better assistance. The respondents therefore suggested that the forest reserve management should have closer relationships with the regional and district authorities. It was suggested further that the work done/plans should be known at the regional and district levels and the answerability be extended to the regional levels.

8.8.3 Policies other than forestry

Policies other than forest policy and law as identified include destocking of domestic animals in the villages and provision of an alternative livelihood to the people by the government. The basis for these suggestions by the respondents are discussed below.

a) Destocking of domestic animals in the villages

Large cattle stocks in the villages around the forest reserve was identified as a highly significant cause of forest destruction and forest land degradation through grazing. Suggestions to reduce grazing impacts in the forest reserve through domestic animals destocking in the villages was given among 23 per cent of the total responses. Implementation of a destocking process was found to require the introduction of a better animal breed to replace the local breeds. This was suggested as a way to reduce large stocks of low productivity animals and provision of fewer high productive animal breeds. Acceptance and change in attitude towards local animal breeds by the communities was found to largely depend on the initiatives by the political and community leaders to educate and convince the people. The government was also urged to support **animal husbandry** programmes to provide better animal breeds for the communities.

b) Provision of alternative source of livelihood for the people

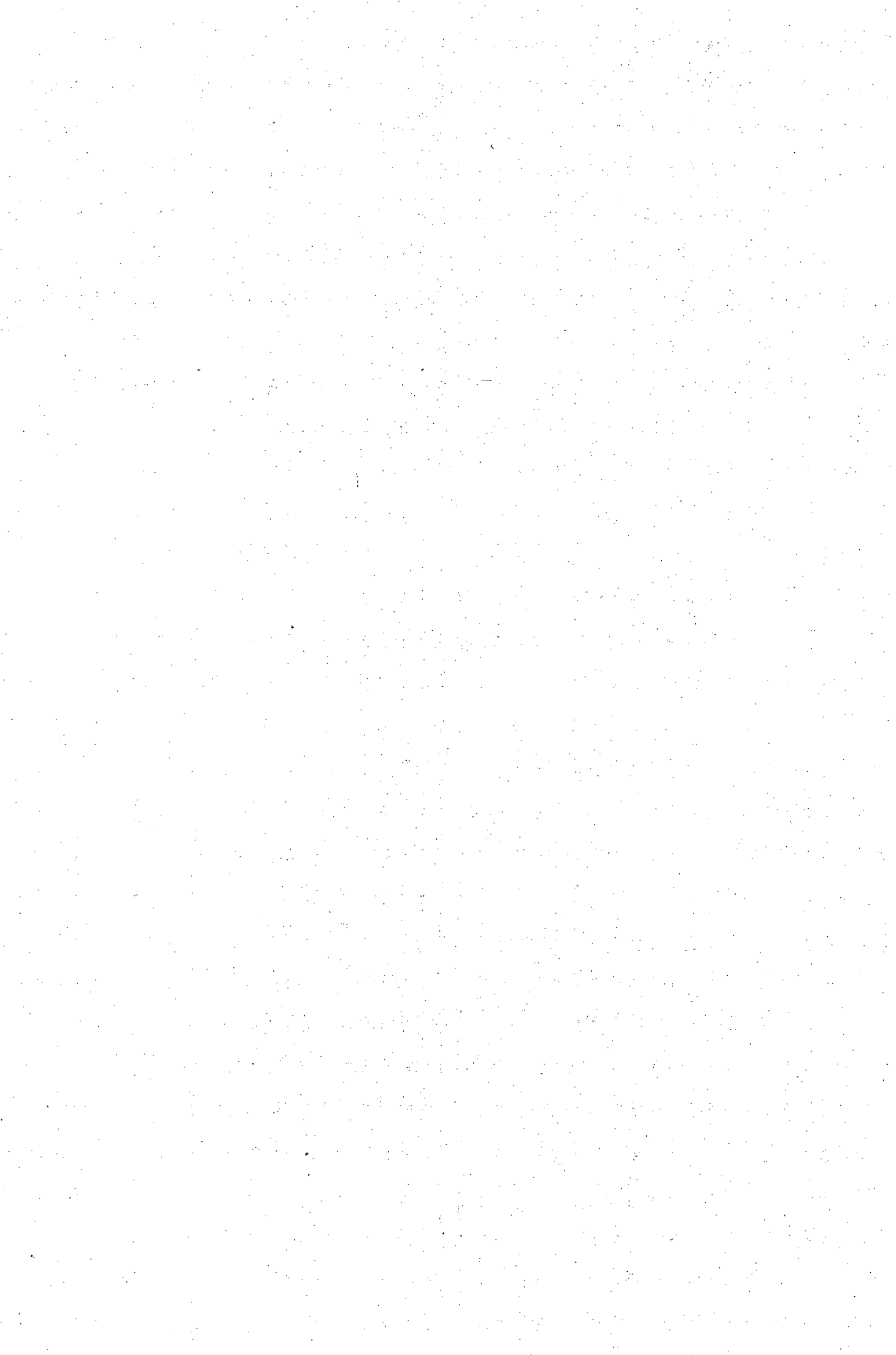
Provision by the government of an alternative source of livelihood for the people was presented as a feasible solution for sustainable forest resource management among 12 per cent of the total responses. In view of the increased population and the need for land for livestock keeping and subsistence agriculture, the need for alternative grazing and agricultural areas was inevitable. In addition, the provision of formal employment to reduce pressure on the forest reserve was found to be important.

The respondents referred with appreciation to the government initiatives in the 1980's to advise people in Arumeru district to move to Kiteto district (a less densely populated area in the lowlands). This was said to be a positive government initiative to solve the land shortage problems in Arumeru district. However, the respondents argued that infrastructure such as dispensaries, schools, market centres and houses in the new areas should be provided for such initiatives to be of any relevance to the poor majority. They added further that pressure on the forest reserve could only be reduced when the poor majority is provided with such incentives and move to these areas, otherwise the problems of forest destruction would still persist.

8.9 SUMMARY

The suggested remedial measures for the forest problems in Mount Meru forest reserve discussed in this chapter are based on the objectives of sustainable forest development.

Community involvement in forest reserve management is found to be feasible for the attainment of these objectives. Drawbacks could be reduced through prior strategic planning for community participatory programme. In addition, government and individual contributions are shown to have remarkable influence on the achievement of sustainable forest development objectives. Government influence on policy and institutional development is found to determine the effectiveness and efficiency of forest conservation. Good governance among the forest staff is also found to be important for improved forest conservation objectives.



CHAPTER 9

CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

In this study, the Mount Meru forest reserve, a national forest reserve under state ownership, is found to be under threat due to forest destruction and forest land degradation. Human induced pressures have been found for various reasons to be the cause. Over-exploitation of the forest resource-base is a central problem.

Although forests should be available to satisfy human needs, they should be utilized sustainably. Socio-economic, institutional and policy factors were found to be responsible for forest destruction and forest land degradation in Mount Meru forest reserve. In addition, high population density around the forest reserve, lack of formal employment for the community, low government salaries coupled with high wood demands from the nearby rapidly growing Arusha municipality had exacerbated the problem.

Protection activities had not been accorded the attention they deserve due to lack of enough staff for protecting large areas; and, the emphasis by the forest staff on conventional forest protection which was found to be ineffective. Forest protection currently depends on low paid and poorly equipped forest guards. Under such circumstances, the forest guards together with their immediate supervisors (forest rangers) were found to fall into the traps of bribery and corruption.

In recent years survival of planted tree stock has been low due to poor forest management practices in the forest plantations. This has been exacerbated by drought due to climatic variation. Timber concessions without immediate replanting activity together with the unplanted backlog in the previous years have resulted in what is estimated to be 2000 hectares of open gaps in the forest plantations.

Lack of work supervision and monitoring in both the forest plantations and the natural forest by the forest authorities was intensified by poor coordination and administrative set-up of the forestry sector in the country. The administrative set-up of the forestry sector emphasizes

centralized management of the national forest reserves. The system was found to place the national forest reserve management in the field in isolation, and hence conflict with the interests of the communities.

Due to lack of coordination and poor relationships between the high authorities in the forestry sector and the communities around the forest reserve the forest guards were found to be the link between the Forest Department and the communities. The Forest Department has been seen as an inefficient custodian in such circumstances because its locus of power is far away and it depends upon the few, poorly paid and poorly equipped forest guards and forest rangers to portray the image of the forestry sector to the public. These low level staff are the prime victims of the socio-economic and institutional management problems which lead to intensified corruption in the forest plantations.

Shortage of public land and increased population density in the villages result in a scramble for cultivation land through the taungya system in the forest plantations. As a result of this scramble, bribery and corruption was found to be manifest in the allocation of these taungya cultivation plots. This has made the forestry sector very unpopular among the neighbouring communities.

On the other hand, the communities around the forest reserve think that though the forest is a government asset, they should be allowed to accrue some benefits from the forest as it used to be traditionally. Benefits to the communities are also expected as the government continuously harvest timber from the forest plantations. The communities believe that they are the real owners of the forest by virtue of their living in the area. Lack of such benefits have resulted in lack of incentives for forest preservation. In this respect, uncontrolled fires, illegal timber harvesting, grazing, and encroachment for various reasons have continued and have reached an alarming rate.

In suggestions to improve the management of the forest, a collaborative or joint management system between the Forest Division and the communities around the forest reserve was proposed by the respondents in this study. The system, as revealed during this survey was found to require

arrangements which give communities around the forest some responsibilities and accountability while accruing some benefits from the forest reserve.

Nevertheless, whilst community involvement in forest reserve management was found to be an improvement on the past regime and fundamentally sound as cost-effective and sustainable conservation, it was found to be problematic with a multitude of challenges. It was therefore suggested that the initiatives for community involvement should be recognized as a dynamic process which needs flexibility, time and opportunity to evolve and to diverge in order to fit different local circumstances and needs. Also as mentioned by Redclift (1992) this satisfies the goals of sustainable development which aims at answering the problems of allocation of resources in time and space. Problems of allocation in time, between 'now' and 'later' between present and future generations, are central to the discourse surrounding sustainability (Redclift, 1992).

The value of seeking the active involvement of local people in forest conservation and management was also found to recognize the importance of training and capacity and capability building of the forest staff. Training of the forest staff in participatory rural appraisal (PRA) approaches was found to be important. As revealed during the survey, most forest staff, while technically well-qualified have not had access to training which would prepare them for dealing with the more general aspects of environment and ecological management, particularly public involvement approaches. According to Fisher (1995) experience indicates that the success of environmental planning and implementation of activities leading to better management of the environment within a given country is determined to a large degree by the effectiveness of the institutional mechanisms established to accomplish these tasks. The mechanisms as revealed during this study would also include adequate funding sources for the planned activities and the preparation of a workable forest management plan.

Other suggestions for improved forest management include the review of government policies to accommodate change. The government have been urged to provide alternative livelihood to the people to reduce pressure on the forest resource. Initiatives by the government for transmigration of people from Arumeru district to Kiteto in the 1980s was acknowledged as a positive idea. However, in order for the initiatives to be effective it was revealed that such

moves require prior strategic planning for infrastructure, such as; schools, dispensaries, houses and market structures in the new areas.

Destocking policy was also suggested, but it needs to be handled with care while intensively educating the people on the importance of having better animal breeds than the large local breeds whose productivity per animal is low. Joint efforts which include the efforts of community leadership, livestock development, forestry and the government at large were suggested in developing initiatives for animal destocking in the villages.

Improved timber logging techniques were suggested for the improvement of environmental management to reduce timber logging impacts. A watershed management approach was suggested as a way of improving the upland management through the management of externalities. However, the formulation of the watershed management plans and strategies were found to depend largely on political will and the availability of proper expertise to develop these plans.

In conclusion therefore, if the suggestions and recommendations given for the improvement of the management of the different forest problems and their relative causes are implemented, the forest could be managed sustainably. However, the capacity and capability of the government to resolve the problems inherent in the socio-economic factors to meet the varying needs and aspirations of its people was a factor which could not be determined in this short study.

9.2 RECOMMENDATIONS

The following recommendations were derived from the suggestions by the respondents and from personal observations during the survey. These include institutional development, capacity and capability building for the forest staff, community empowerment, integrated management and environmental development initiatives.

Institutional development

1) Preparation of a workable forest management plan which includes the involvement of communities in the management process. This should be prepared so as to include feasible forest activities and promote social and cultural considerations in the management of the forest.

2) Development of initiatives to include strategic environmental assessment (SEA) to assess the effects of the participatory programme and any other policies, plans and programs before and during implementation stages. Strategic Environmental Assessment would:

- help to understand the significant environmental issues and implications that would arise;
- help to identify alternative decisions that minimizes cumulative effects of a development activity; and,
- establish a framework against which cumulative effects could be tracked and examined at a later stage.

Through such assessment flexibility in decisions could be acquired, thus meeting different circumstances and needs.

3) A prompt decision is required on the type of tree species that could replace cypress stands which had been affected by cypress aphids. This is an important and necessary decision to be made by the Forest Division so as to allow accelerated tree planting in the open gaps in the forest plantations. Without efficient research guess work is used for replanting open gaps.

4) The natural forest and the forest plantation in Mount Meru forest reserve should have one management body. This will be important for environmental accountability and responsibilities.

5) There should be a partial decentralization of administrative powers to the regional and district levels to intensify coordination and relationships. This is important for improved monitoring and supervision of the forest activities.

Capacity and capability building

6) Training of forestry staff on general aspects of environmental conservation, especially participatory approaches to national forest reserves management, should be emphasized.

7) Provision of motivation and incentives to the forest staff to improve work efficiency is important. This will encourage work performance and reduce temptations for corruption and bribery. It will also portray a good image of civil servants to the public. Which, according to this study, will motivate community participation in forest conservation.

Integrated management

8) Plans and strategies to prevent grazing in the forest reserve should include destocking programmes and encouragement of better animal breeds. However, this must be handled with care and patience by community leaders, political leaders, livestock development, agriculture and forestry sectors to prevent conflicting interests. Such co-operation in problem solving emphasizes the importance for the forest reserve management to integrate with other government sectors to solve environmental problems, thus improving forest management and conservation.

9) Initiatives for the restoration of the gully erosion around SUA must be considered as something which needs immediate action. However, as Hamilton (1988) puts it; the efforts of the forest institution alone cannot restore gullies. Gully restoration needs combined efforts and knowledge of soil conservation engineers and capital from different interested and affected parties. However, the forest institution should take the lead in these initiatives.

Community empowerment

10) Forest extension programmes to educate the people should be developed. Such programmes should be included in the forest management plan implementation process. Forest extension should be emphasized to create awareness and promote public involvement in forest preservation.

Environmental development

11) Research is required into:

- a) Different types of tree species feasible for forest plantations in a water catchment area. This is important to allow species diversification and reduce monoculture in the forest plantations.
- b) Environmental implications of the eucalyptus tree species as a plantation tree species in a water catchment area. This will address the recent outcry from the communities which view eucalyptus as a species which drains ground water thus creating a water deficit in the streams and rivers.
- c) Monitoring of the on-going changes on hydrology and soils is important. This will help to alert management to the changes and/or to develop management models to reduce negative impacts while intensifying the positive ones.

d) Strategic approaches towards watershed area management planning. Forest management needs to be explored because of its importance to water sources. Efficient conservation of these areas will determine human survival, as shown in this study. Intensified research on this topic will disclose a number of issues which will be relevant for improved conservation and will reduce environmental degradation.

12) Environmental Impact assessment of the traditional medicine collection is important. This will allow the assessment of affected tree species, and ecological, biophysical, economic and social/cultural impacts of such collection on the environment. The knowledge of these impacts will contribute to viable decisions on the actions required to be undertaken to conserve tree species and prevent biodiversity extinction.



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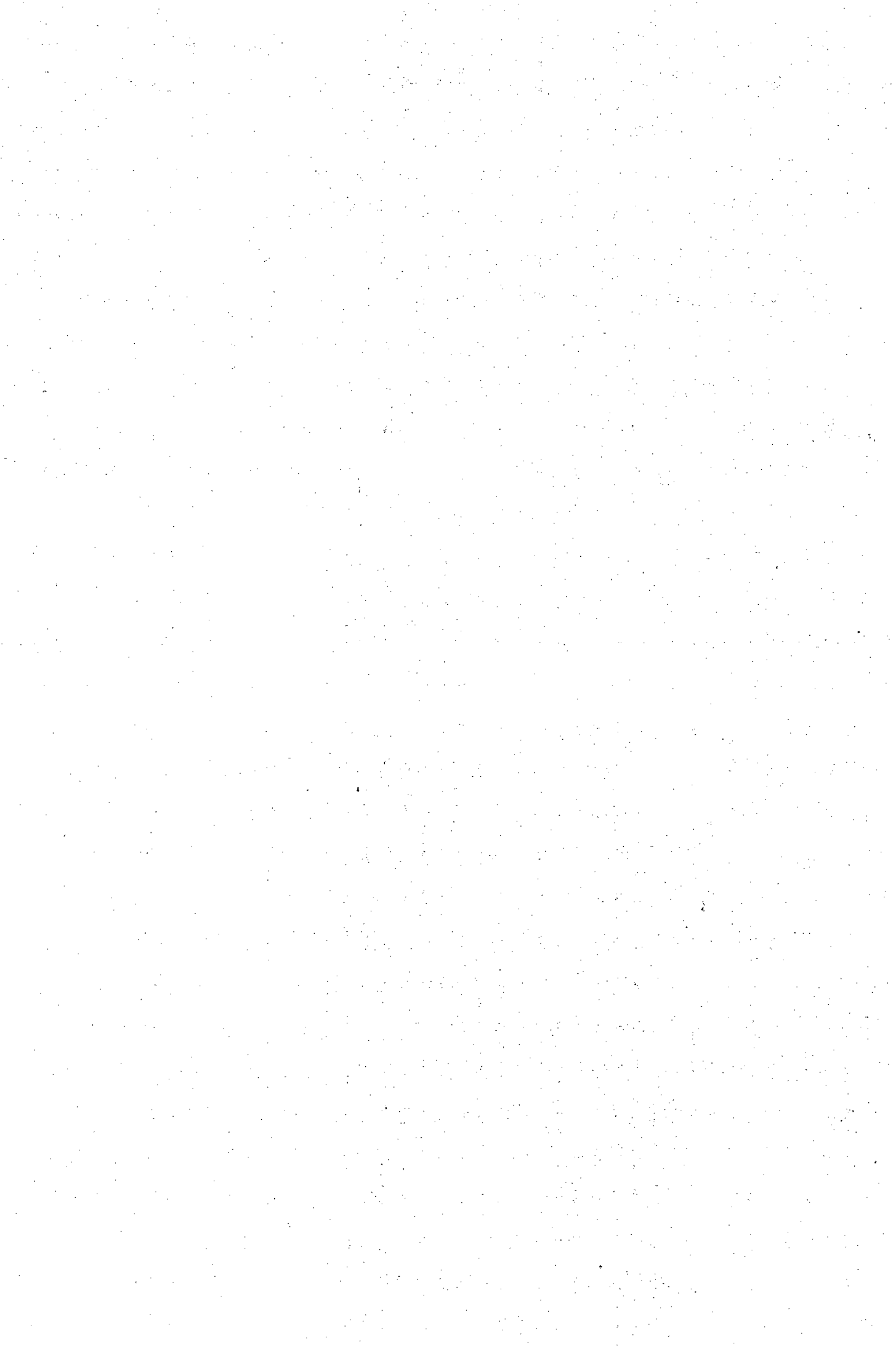
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A copy of a civil case filed in the High Court of Tanzania at Arusha

“IN THE HIGH COURT OF TANZANIA AT ARUSHA

CIVIL CASE NO. 32 OF 1991:

SIKOI LEMITEI _____ PLAINTIFF

versus

MICHAEL MEGIROO _____ DEFENDANT

PLAINT

1. The plaintiff is a peasant-cum-herdsman resident at Kioga, Arumeru. His address for the purpose of this action is in the care of Lobulu & Co., Advocates, ACU Building, Arusha.
2. The defendant is a natural person resident in Arumeru District. His address for service is in the care of the village Chairman, Sambasha village, Kioga Ward, Arumeru.
3. The plaintiff's action against the defendant is in false imprisonment, detinue, false assumption of judicial authority and assault.
4. The plaintiff owns livestock. On or about 14th January, 1991 the plaintiff's 32 heads of cattle, 116 goats/sheeps and 5 donkeys were lawfully being herded to a watering along a traditional and permanent right of way at Lemanyatta village, Arumeru.
5. On the way to watering, the defendant with other persons unknown to the plaintiff but acting in concert with the defendant waylaid the livestock aforesaid and detained the same up till 17.1.91 without lawful warrant or license thus depriving the plaintiff of their use and beneficial enjoyment. The plaintiff thus suffered damages.
6. The defendant after seizure of the livestock caused the unlawful arrest and detention of the plaintiff for three days and prosecuted the plaintiff before the Emaoi Primary Court without reasonable and probable cause. The proceeding terminated in favour of the plaintiff.
7. In the course of the arrest and detention the plaintiff was threatened with violence, molested and he reasonably apprehended violence on his person. The defendant is actuated with malice and the threats, arrest, detention and seizure of cattle were calculated to extort money from the plaintiff.
8. On or about 17.1.1991 the defendant falsely assumed judicial authority and unlawfully coerced the plaintiff into parting with the sum of shillings 79,200/- to the defendant ostensibly a "fine" necessary for the release of the livestock. The plaintiff thus suffered damages.

9. The cause of action arose in Arusha Region within the jurisdiction of this honourable Court.

10. For the purpose of jurisdiction and Court fees the value of the subject matter of the suit exceeds shs 200,000/-.

REASONS WHEREFORE the plaintiff prays for judgment and decree for;

- a) general damages for assault, false imprisonment, malicious prosecution and false assumption of
- b) judicial authority and detinue;
- c) general damages for loss of use of the livestock;
- d) special damages in the sum of shs 79,200/-;
- e) costs of this action;
- f) interest on (a) (b) (c) and (d) above at court rate from 14.1.91 till payment in full;
- g) any other or further relief as the nature of this action may permit.

(Signed)

Plaintiff

VERIFICATION

What is stated herein is of my knowledge true.

Dated at Arusha this 20th day of February, 1991.

(Signed)

Plaintiff

Presented for filling this 20th day of March, 1991.

(Signed)

Registry Officer

Drawn & Filed by:

(Signed)

Lobulu & Co.,

Advocates,

ACU Building,

ARUSHA.”

Interview Schedule

Interview Schedule

Date:

Place:

Name of the interviewer:

Name of the respondent:

Identification number of the respondent:

Statement of purpose:

This interview is being undertaken for the purpose of collecting data for **academic research only**. Nobody communicating information will be identified in the text without his/her permission. The interview schedule is divided into six sub-sections for convenience of information flow, and for compilation by the researcher. The contents of the different interview sections is as follows:

- the first section will be on the history of Mount Meru forest reserve;
- the second section will be on initiatives to manage the forest;
- the third section will be on how the communities around the forest reserve relate to it;
- the fourth section will be on how the forest reserve is related to regional, and district government levels;
- section five will deal with problems facing Mount Meru forest reserve;
- in the sixth section the sustainability of the forest reserve is examined.

The interview

SECTION 1

I would like to know something about the history of Mount Meru forest reserve in general. I do not expect details to be at your finger tips during the interview. In this case, your recommendation as to where such detailed information can be found will be most helpful.

Q.1 When was Mount Meru forest declared a forest reserve? _____ (year).

Q.2 What were the main reasons for declaring Mount Meru forest a forest reserve?

[_____]

Interview Schedule

- [] _____
- [] _____
- [] _____
- [] _____

(Give weighting of the reasons according to their importance as per given card).

Q.3 How is the Mount Meru forest different from other forest reserves in the country?

Q.4 When was the forest plantation established in the forest reserve?

_____ (year).

Q.5 What were the reasons for introducing forest plantations in Mount Meru forest reserve?

- [] _____
- [] _____
- [] _____
- [] _____
- [] _____

(Give weighting to the reasons in terms of importance as per given card).

Q.6 What were the main indigenous tree species which were cut to establish the plantation forest?

- | | |
|-----------|-----------|
| [] _____ | [] _____ |
| [] _____ | [] _____ |
| [] _____ | [] _____ |
| [] _____ | [] _____ |
| [] _____ | [] _____ |
| [] _____ | [] _____ |
| [] _____ | [] _____ |

Interview Schedule

[] _____ [] _____

(Give weighting to tree species according to their importance in value e.g. conservation, medicinal, timber, etc. as per given card).

Q.7 Which species were introduced in the cleared part of the forest for plantation purposes?

SECTION 2

After that short history, I would like to know how the forest is managed.

Q.8 What specific activities are used to manage the forest as a forest reserve (water catchment) and as a forest plantation? (Mark with [X] to specify the purpose of the activity).

Activity	Catch.			Plantation		
	[X]	target	achieve.	[X]	target	achieve.

Q.9 What quantifiable targets and achievements have been set for the different forest activities mentioned above? (can be checked in the existing records if necessary and the answers marked in the table above).

Q.10 What factors do you feel have helped you reach set targets?

[] _____

[] _____

[] _____

Interview Schedule

[] _____

[] _____

(Give weighting to the factors according to their efficiency in helping to achieve the set targets - as per given card).

Q.11 What factors do you feel have hindered your newly set targets?

[] _____

[] _____

[] _____

[] _____

[] _____

(Give weightings to the factors according to their importance in hindering the achievement of the set targets as per given card).

Q.12 Which of the forest activities we have discussed you think are most important for forest land conservation?

1) _____ []

2) _____ []

3) _____ []

4) _____ []

5) _____ []

6) _____ []

7) _____ []

8) _____ []

9) _____ []

10) _____ []

(Give weighting to the activities in terms of importance in forest conservation as per given card).

Interview Schedule

SECTION 3a

Before we continue with what is happening in the forest, could we talk about communities around the forest reserve.

Q.14 Is there any provision for community involvement in the management of the Mount Meru forest?

No

Yes

<p>If Yes:</p> <p>Q.15 What are the reasons for involving the communities in the forest management activities?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.16 In which forest activities are the communities involved?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.17 How are these communities involved in the forest activities?</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>If No:</p> <p>Q.15 Do you personally think there is any need for community involvement in the forest management activities?</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>If No: (move to section 3b).</p> <p>If Yes:</p> <p>Q.16 In which forest activities do you think the communities should be involved?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.17 How do you think the communities can be involved in the forest activities?</p> <p>_____</p> <p>_____</p> <p>_____</p>
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Interview Schedule

<p>Q.18 What are the incentives for community involvement in forest management activities?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.19 Do you encounter any problems in the course of involving the communities in the forest management activities?</p> <p>[] Yes</p> <p>[] No</p> <p>If Yes:</p> <p>Q.20 What problems (if any) do you get in involving the communities in the forest management activities?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.21 What do you suggest as possible solutions for such problems?</p> <p>_____</p> <p>_____</p>	<p>Q.18 What would you suggest as incentives for the communities to participate in forest management activities?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.19 If community involvement in forest management is considered important, why has it not been done? _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.20 What problems (if any) do you think might be encountered in involving the communities in the management of the forest reserve?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Q.21 What would be your suggestions for solving such problems?</p> <p>_____</p> <p>_____</p>
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Interview Schedule

SECTION 3b

In the African context, Africans have been known to respect forests for different traditional reasons. In some places, it has led to the formulation of traditional laws and regulations for forests and forest land uses. In this section I would like to explore whether such traditions exist amongst the communities around Mount Meru forest reserve.

Q.22 Within the communities around the forest reserve, do you think there are any traditional laws and norms or land tenure systems for the control and utilization of the forests and the forest land?

Yes

No (If No: go to section 4)

If Yes:

Q.23 How are the forests and the forest land perceived in the traditional laws and norms?

Q.24 Which traditional laws/norms existed as regards the forests and the forest land?

Interview Schedule

Q.25 Which of these traditional laws/norms are still practiced (if any)?

Q.26 What are the objectives of these traditional laws and norms?

Q.27 What do you think have been the contribution (if any) of the traditional laws and norms to the management of the forest reserve?

Q.28 Do you consider it appropriate to include traditional laws and norms in the management of the forest reserve?

No

Yes

<p>If Yes:</p> <p>Q.29 Why do you think the traditional laws and norms should be included in the management of the forest?</p> <hr/> <hr/> <hr/>	<p>If No:</p> <p>Q.29 Why do you think the traditional laws and norms should not be included?</p> <hr/> <hr/> <hr/>
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Interview Schedule

<hr/> <hr/> <p>Q.30 Which traditional laws do you think should be particularly included?</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>(move to section 4)</p>
<p>Q.31 Which traditional laws and norms are already included in the forest management regulations (if any).</p> <hr/> <hr/> <hr/> <hr/>	

SECTION 4

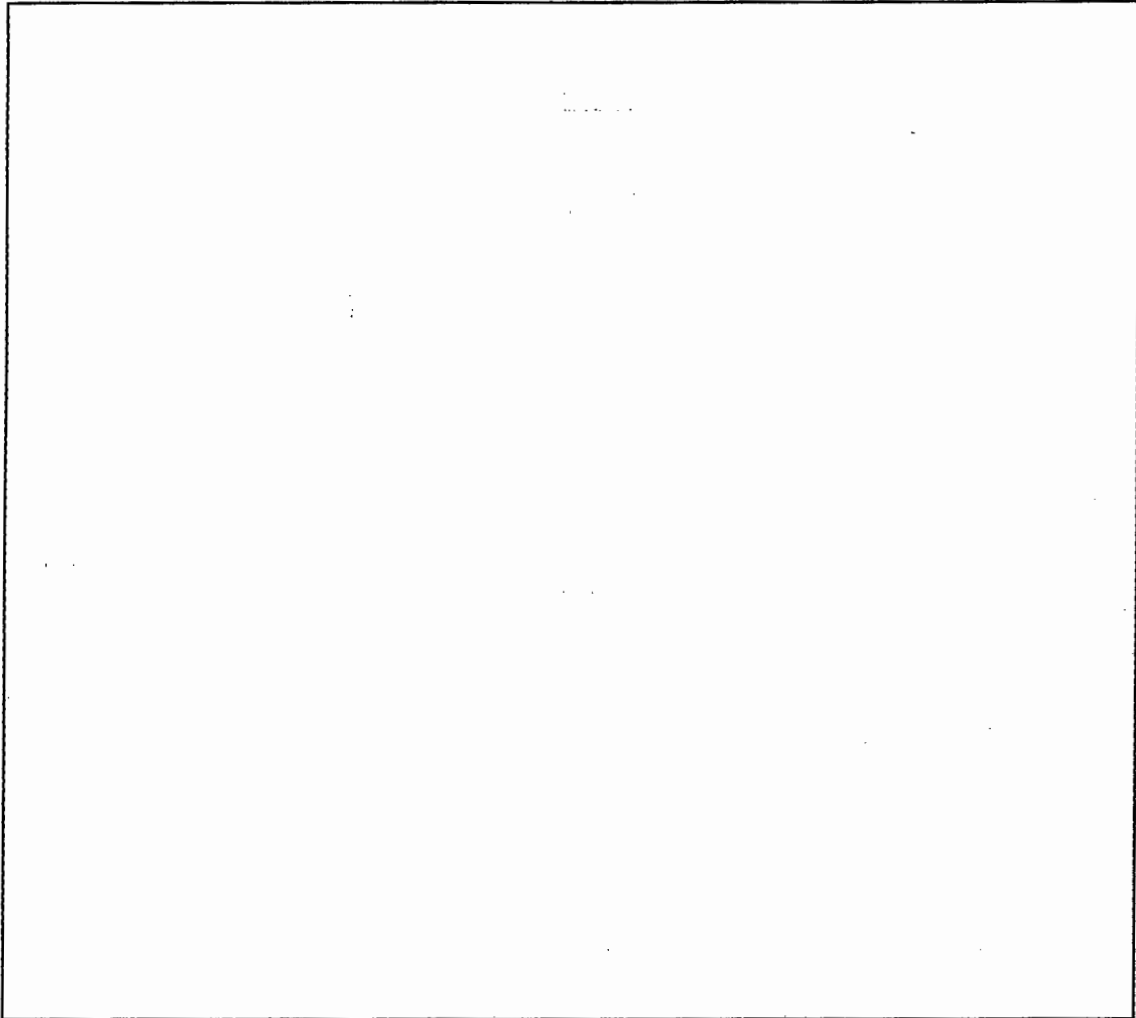
With the government policy of centralization of forest projects under national ministries but, decentralization of regional administration, it is evident that different lines of command and potential for conflict exist.

Q.32 What mechanism or government policy regulates the relationship between the regional and district authorities?

Interview Schedule

Q.33 What is the official relationship between the district and regional authorities and the forest institution? (Provide sketch of organogram on the given frame below).

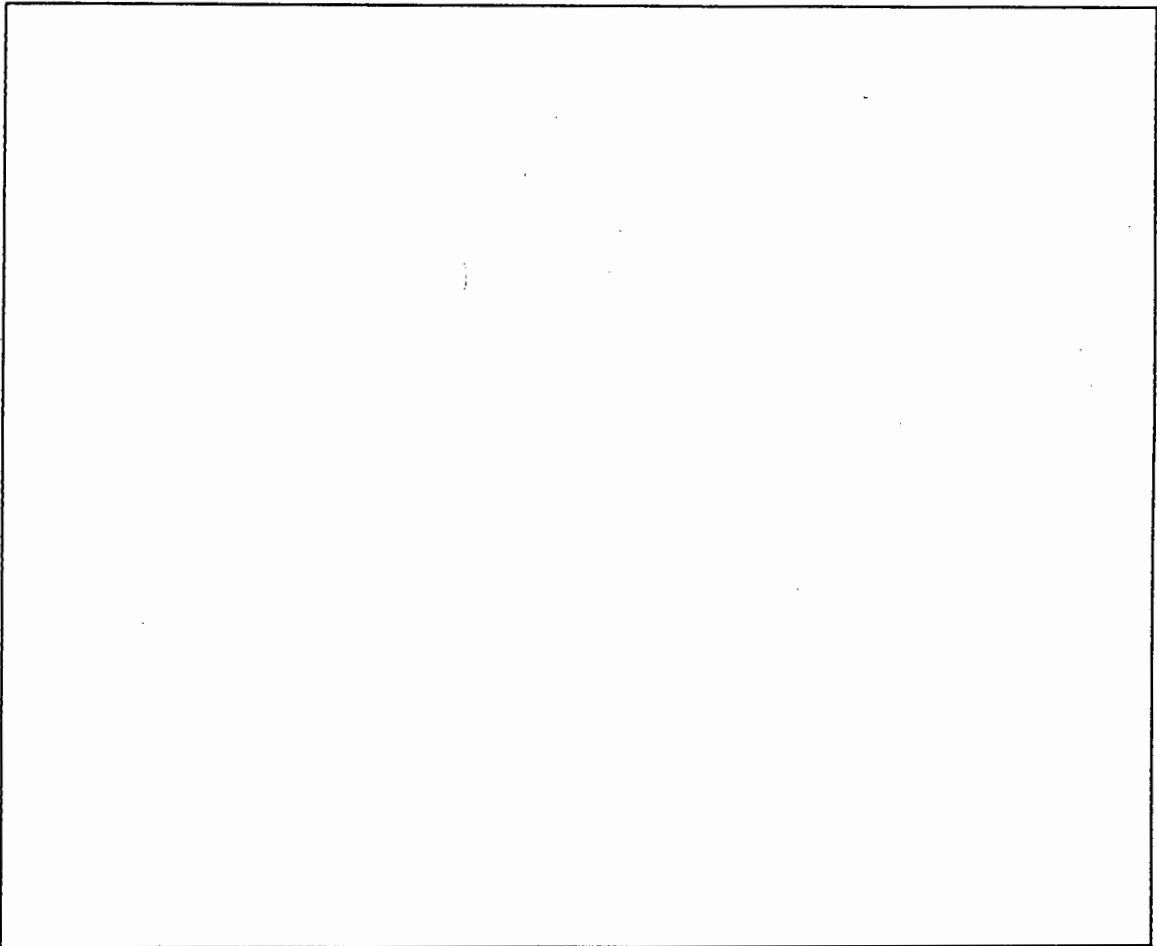
(sketch of organogram)

A large, empty rectangular box with a thin black border, occupying the central portion of the page. It is intended for the respondent to draw a sketch of an organogram showing the official relationship between district and regional authorities and the forest institution.

Interview Schedule

Q.34 What relationship actually exists between the forest institution(s) and the District and/or regional government? (Provide sketch of organogram on the frame and your comments on the space provided below).

Sketch of organogram)



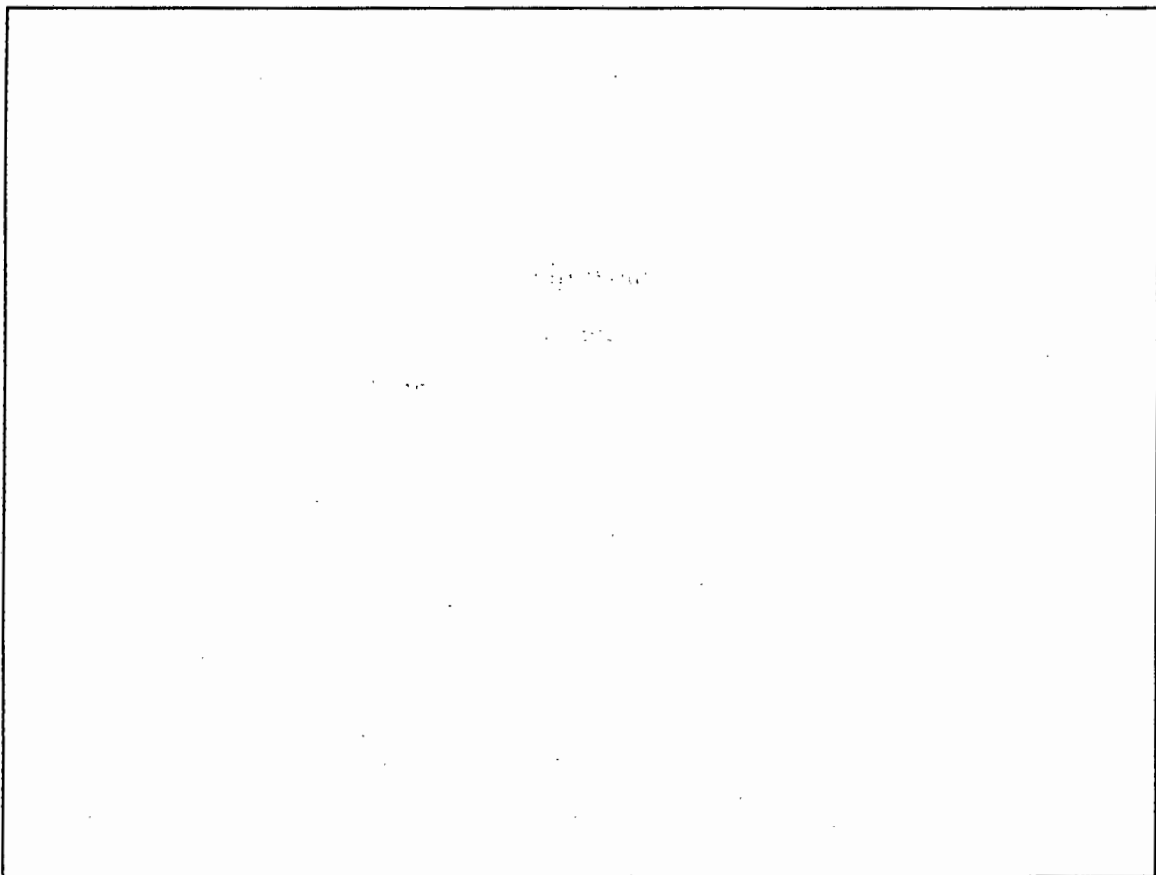
(comments) _____

Q.35 What could you like to see changed to improve this relationship between the regional/district authorities and the forest institutions so as to help achieve the objectives of management in Mount Meru forest reserve?

Interview Schedule

Q.35 What co.-ordination and relationship would you recommend between the regional and district authorities for improved future management of Mount Meru forest reserve? (Provide sketch of organogram on the frame and your comments on the space below).

(Sketch of organogram)

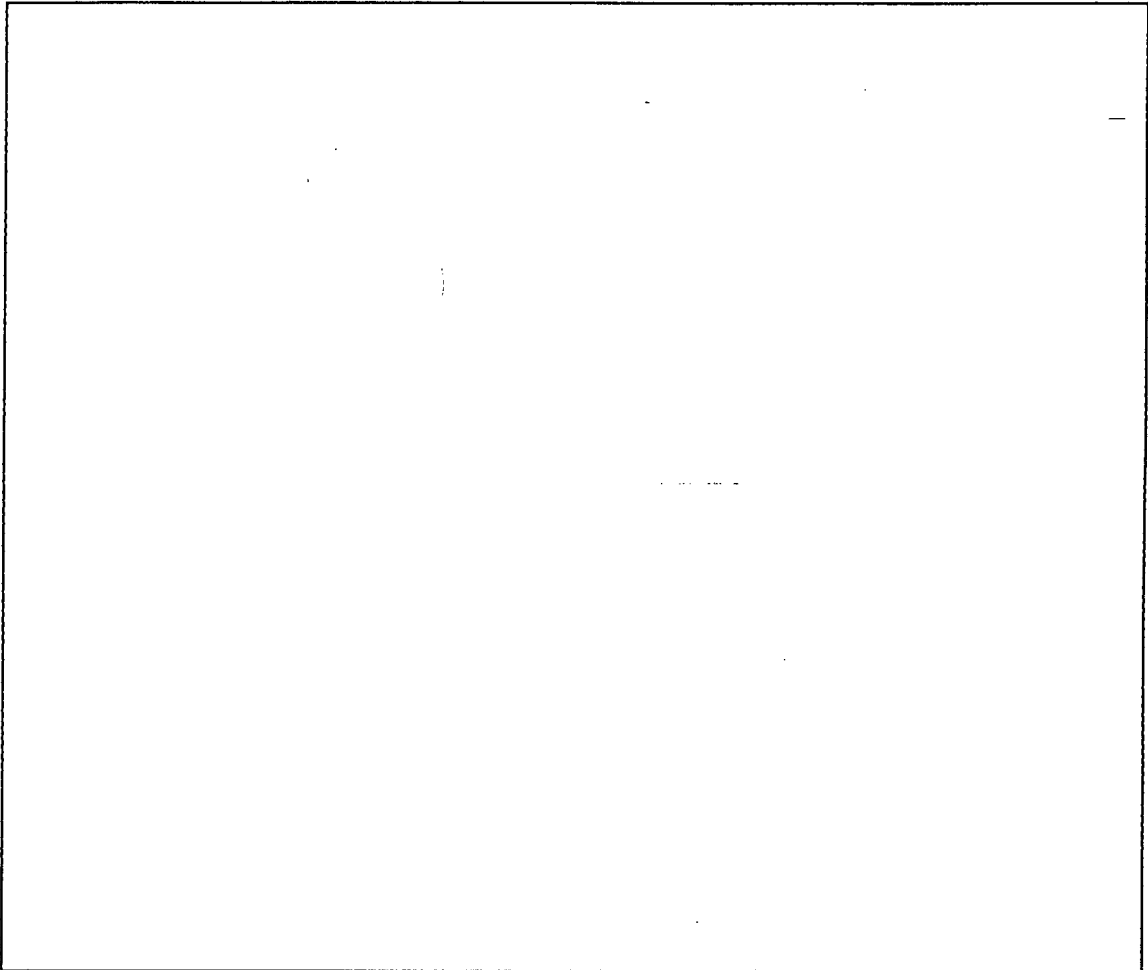


(Comments) _____

Interview Schedule

Q.36 What co-ordination and relationship would you recommend between the national authorities and the forest institutions? (Provide sketch of organogram on the frame and your comments on the space below).

(Sketch of organogram).

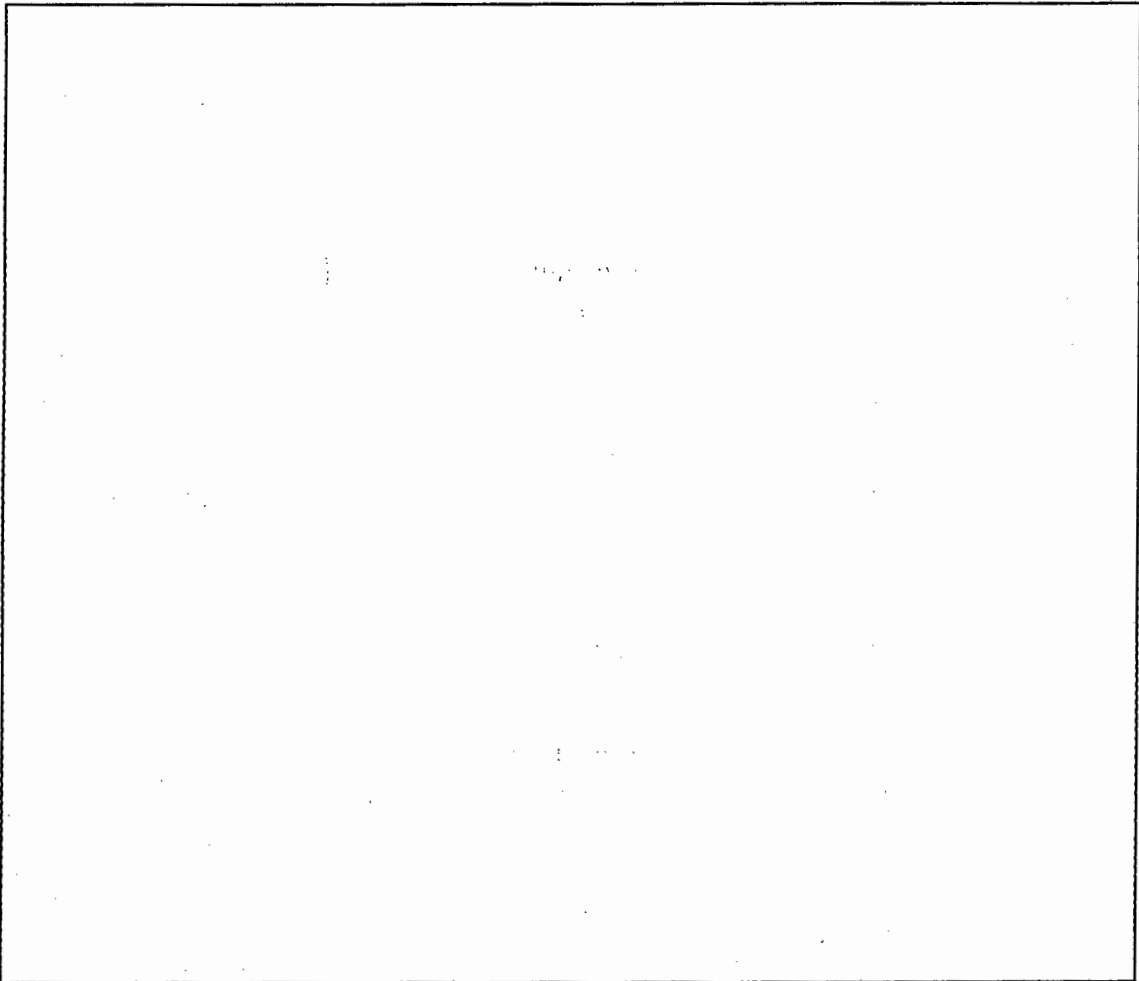


(comments) _____

Interview Schedule

Q.37 What co-ordination and relationship would you recommend between the national authorities and the forest institution? (Provide sketch of organogram on the frame and your comments on the space below).

(Sketch of organogram)



(comments) _____

Interview Schedule

SECTION 6

In this section I would like to ask about the financial sources and the sustainability of such sources.

Q.41 What are the sources of funds for the management of the forest?

Q.42 What are the objectives of the different financial sources' policies?

(additional paper if necessary).

Q.43 Which policies encourage public involvement in the forest management activities?

Q.44 Do you see the present funding sources being sustainable in the long-run?

Q.45 What would you suggest as the best source of funding for future sustainability of Mount Meru forests and forest land?

Interview Schedule

(Give weighting to your suggestions according to their feasibility in solving the forest problems, as per given card).

Q.46 Who do you think benefits most from the forest?

Conclusion

I would like to express my sincere thanks for your commitment in participating in this interview. However, I would kindly request you to attend a group discussion on the same issues which will take place later.

Thank you!!!

Data Collection form

(for extra information which can not be accomodated in the interview space paper)

Topic: Date: Place: Name of the interviewer: Name of the respondent: Page number: Identification No.
--

<u>Headings/Question No.</u>	<u>Information/Contents</u>

Determination of Standard Error and Confidence Interval

Sampling error computation permits the researcher to express the accuracy of his/her sample statistics in terms of his/her level of confidence that the statistics fall within specified interval from the parameter (Babbie, 1973). For example, he may say he is "95 percent confident" that his sample statistics (for example, 50 percent favour issue X) is within plus or minus (\pm) 5 percent points of the population parameter.

According to Babbie (1973) probability theory provides a formula for estimating how closely the sample statistics are clustered around the true value. The variables under consideration would be the attitude towards the issue in question, a binomial variable: approve or disapprove. The formula contains three factors: the sample size, and the standard error (a measure of sampling error).

$$\text{Formula: } S = \sqrt{(PQ)/n}$$

Symbols: P, Q: The population parameters for the binomial;

if 60 per cent of the people approves the issue and 40 per cent disapproves, P and Q are 60 percent and 40 percent respectively.

Note that $Q = 1 - P$ and $P = 1 - Q$.

n: the number of cases in each sample i.e. the total count

(representing the number of participants in the sample population who were concerned about the issue).

S: the standard error.

In the calculation of standard error in this study, by using this formula, results in tables 3.1; 4.1; 8.1; 8.2 and 8.3 have been used.

Data Collection form

(for extra information which can not be accomodated in the interview space paper)

Topic: Date: Place: Name of the interviewer: Name of the respondent: Page number: Identification No.
--

<u>Headings/Question No.</u>	<u>Information/Contents</u>



Issue-respondent cards

The participants were asked to respond as follows:

- current forest problems weighted according to their importance for forest destruction:
 - 5 - highly significant problem;
 - 4 - significant problem;
 - 3 - relatively significant problem;
 - 2 - somewhat of a problem;
 - 1 - minor problem;
 - ? - not known.

- Causes of problems weighted according to their importance in contributing to forest destruction:
 - 5 - highly important cause of forest destruction problems;
 - 4 - important cause of forest destruction problems;
 - 3 - relatively important cause of forest destruction problems;
 - 2 - somewhat of a cause of forest destruction problems;
 - 1 - minor important cause of forest destruction problems;
 - ? - not known.

- Suggested solutions to solving the forest problems weighted according to their feasibility to solve the existing forest problems:
 - 5 - most feasible solution;
 - 4 - feasible solution;
 - 3 - relatively feasible solution;
 - 2 - may possibly be a feasible solution;
 - 1 - least possible feasible solution;
 - ? - not known.

- Suggested different funding sources weighted according to their sustainability to support forest conservation in the long-run:
 - 5 - highly sustainable in the long-run;
 - 4 - sustainable in the long-run;
 - 3 - relatively sustainable in the long-run;
 - 2 - somehow sustainable in the long-run;
 - 1 - least sustainable in the long-run;
 - 0 - not sustainable in the long-run;
 - ? - not known.

- The efficiency of the existing forest laws in protecting the forest:
 - 5 - highly efficient;
 - 4 - efficient;
 - 3 - relatively efficient;
 - 2 - somehow efficient;
 - 1 - least efficient;
 - 0 - not efficient;
 - ? not known.

- Factors contributing to the achievement of the set targets weighted according to their efficiency:
 - 5 - highly efficient;
 - 4 - efficient;
 - 3 - relatively efficient;
 - 2 - somehow efficient;
 - 1 - least efficient;
 - 0 - not efficient;
 - ? - not known.

- Factors contributing to the hindrance of the achievement of the set targets weighted in terms of their significance:
 - 5 - highly significant;
 - 4 - significant;
 - 3 - relatively significant;
 - 2 - somehow significant;
 - 1 - least significant;
 - 0 - not known.

- Forest activities needed for forest conservation weighted according to their influence on forest destruction:
 - 5 - highly significant;
 - 4 - significant;
 - 3 - relatively significant;
 - 2 - somehow significant;
 - 1 - least significant;
 - 0 - not known.



Determination of Standard Error and Confidence Interval

Sampling error computation permits the researcher to express the accuracy of his/her sample statistics in terms of his/her level of confidence that the statistics fall within specified interval from the parameter (Babbie, 1973). For example, he may say he is "95 percent confident" that his sample statistics (for example, 50 percent favour issue X) is within plus or minus (\pm) 5 percent points of the population parameter.

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$$\text{Formula: } S = \sqrt{(PQ) / n}$$

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