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MALAWI NATURAL RESOURCES MANAGEMENT ASSESSMENT

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MALAWI NATURAL RESOURCES MANAGEMENT ASSESSMENT

Executive Summary

As one of the most densely populated countries in Africa Malawi is faced with urgent development challenges not yet faced by other countries in Southern Africa. Rapid population growth the resulting land scarcity have contributed to soil erosion, soil fertility decline, deforestation and the loss of biological diversity throughout Malawi. Continued degradation of the natural resource base increases the country's emerging food security problems and jeopardizes the agricultural production potential needed by future generations. This report examines some of Malawi's critical natural resource issues -- population pressure and land scarcity, food security, deforestation, estate sector growth, soil erosion and soil fertility decline, and loss of biological diversity.

Fortunately, Malawi has had the foresight to establish institutions, infrastructure and mechanisms to address these development problems. A large and well developed system of forest plantations, protected forest and wildlife areas, agricultural and forestry research centers, training institutions, a well developed agricultural extension system, and good working relations with donor agencies and between government ministries all form part of the foundation upon which efforts to preserve and improve the natural resource base can be built.

Through field observations and interviews the Natural Resources Management Assessment team identified many promising natural resource improving initiatives being implemented by farmers and villagers throughout Malawi. These initiatives included: conservation catchments to control soil erosion, nurseries to increase tree planting, agroforestry and field tree plantings, development of community and individual woodlots, and mixed farming with diverse crop and tree species. The description of these farmer-initiated activities provide the basis for developing natural resources management strategies. This "grass roots" or "bottom up" approach can form the basis for sound programs, policies and projects that consider both the needs of rural people and the goal of preserving and improving the natural resource base.

Based on the team's observations, the Assessment proposes six different types of strategies for conserving and improving Malawi's natural resource base. They include: 1) developing multiple use buffer strips around protected areas, 2) soil erosion control and water conservation initiatives on customary land, 3) soil erosion control and fuelwood production on tobacco estates, 4) agroforestry, mixed farming and species diversification, 5) fuelwood from natural forest management, community forestry and forest plantations, 6) Lake Malawi fish, shore and watershed management.

It is recommended that a detailed Action Program and Action Plan to protect and improve the natural resources of Malawi be developed. Many ongoing government of Malawi, USAID, and other donor projects and programs will fit into the strategy ideas mentioned above and should be considered integral parts of the implementation of the strategies.

GLOSSARY

ADD	Agricultural Development Districts
ADMARC	Agricultural Development and Marketing Corporation
ART	Adaptive Research Team
CIAT	International Center for Tropical Agriculture
CIDA	Canadian International Development Agency
CIMMYT	International Center for the Improvement of Maize and Wheat
CITES	Convention on International Trade in Endangered Species
DA	Development Area
DAR	Department of Agricultural Research
DNPW	Department of National Parks and Wildlife
ECLG	Ecological Consultative and Liaison Group
EPA	Extension Planning Area
FAO	Food and Agriculture Organization of the United Nations
FRIM	Forestry Research Institute of Malawi
GOM	Government of Malawi
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (FRG)
ICRAF	International Council for Research in Agroforestry
ICRISAT	International Center for Research in the Semi-Arid Tropics
IITA	International Institute of Tropical Agriculture
IUCN	International Union for the Conservation of Nature and Natural Resources
LHO	Land Husbandry Officer
MK	Malawi Kwacha
NCE	National Committee for Environment
NGO	Non-governmental Organization
NORAD	Royal Norwegian Ministry of Development Cooperation
NP	National Park
NR	Natural resources
NRM	Natural Resources Management
ODA	Overseas Development Administration
PNRM	Plan for Supporting Natural Resources Management in Sub-Saharan Africa
PVO	Private Voluntary Organization
RDP	Rural Development Project
SADCC	Southern Africa Development Coordination Conference
SSRA	Sahel Sub-Regional Assessment
STA	Smallholder Tea Authority
SUCOMA	Sugar Company of Malawi
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WHO	World Health Organization
WWF	World Wildlife Fund

MALAWI NATURAL RESOURCE MANAGEMENT ASSESSMENT

1. Introduction to Natural Resource Management

Natural resources management, biological diversity, tropical forests - the complexity of these three issues, especially in developing countries, has often excluded them from development assistance programs. Increasingly, however, development professionals are realizing that the basic needs of food, health, shelter and employment are inextricably tied to the diversity and sustainability of a country's natural resource base.

In much of Africa, increased human and animal population pressure, a breakdown of traditional systems and a lack of alternative sources of rural income generation have forced people to deplete their natural resource base to meet basic needs. Thus threatening their long-term food security and economic development.

2. Background of the Natural Resources Management Support Project

The Natural Resource Management Support Project's (NRMS) concept of "successful" follows the general intent of the Africa Bureau's Plan for Supporting Natural Resources Management in Sub-Saharan Africa (PNRM) and the specific guidance of the Sahel Sub-Regional Assessment (SSRA). Specifically, success may be indicated by: improved or maintained soil fertility; improved water use or water quality management; increased vegetative cover, particularly with plants that have a variety of benefits; improved or maintained biological diversity; saved or positively reorganized human energies. Other elements of success include improvements in: land tenure security, family planning, farmer participation and organization, extension effectiveness, etc.

Some of the principal findings from the Sahel Sub-Regional Assessment (SSRA) are that: 1) intensive application of human energy regenerates degraded land and creates productive microenvironments; 2) successful "farmer-innovators" provide powerful role models; 3) public policy changes increase incentives for more rational natural resource management by small farmers; 4) successful resource management initiatives improve the climate for subsequent efforts; 5) successful initiatives involve both technical improvements and socioeconomic incentives; 6) successful initiatives which provide immediate benefits bring about smallholder participation; 7) it may take twenty years for impacts from successful programs to become visible on a large scale; and 8) providing increased opportunity to local populations plays an important role in successful efforts to maintain biological diversity.

This report will not attempt to reiterate the extensive documentation already available on the status of Malawi's natural resource base and the problems associated with its management. Rather, it will focus on promising initiatives in natural resources management and the background against which they are being carried out. In addition to descriptions of successful initiatives, this report contains a brief description of Malawi, describes key government institutions involved in natural resource management, training, research and extension, and identifies priority natural resource issues.

3. Introduction to Malawi

3.1 The Physical Setting

Malawi is a long, narrow country in south-eastern Africa, bordered by Mozambique, Tanzania and Zambia (see figure 1). It is a country of great natural beauty with high mountains and plateaux, unique forests and magnificent lakes. Like many African countries, the great majority of Malawi's rapidly increasing population depends on the natural resources base to provide for their needs. Ninety-percent of Malawians live in rural areas. Lacking significant mineral deposits, the entire economy depends upon agricultural and natural resource commodities such as tobacco, tea, fish and environmental tourism.

There are three main agroecological zones in Malawi: 1) the Shire Valley and Lake Malawi shoreline savanna grasslands and thickets, 2) the miombo woodlands of the medium plateau, and 3) the high altitude grasslands. The soils in the Shire Valley and along the lakeshore are fertile alluvial soils. Most of the remaining soils in the country are heavily weathered with low to medium fertility, except some soils of the Lilongwe Plains and Shire Highlands which are more fertile.

Lake Malawi, which is the third largest lake in Africa, is the dominant natural feature in Malawi and occupies 20% of Malawi's surface area. Running along the eastern border of the northern two thirds of the country, it provides 75% of the animal protein for Malawi's people. It is a unique habitat with many fish species that exist nowhere else in the world.

Agriculture plays a very important role in both the subsistence and export economies of Malawi. The major staple food crop grown by smallholder farmers in Malawi is maize, which occupies 768,000 hectares. Other important smallholder crops include: groundnuts, tobacco, cotton, cowpeas, pigeon peas, beans, millets, grain sorghum, cassava, rice, sunflower, fruits and vegetables. Intercropping of maize, groundnuts pulses and cassava is very common. Smallholder farmers keep most of the cattle, sheep and goats in Malawi, although dairy cattle and some sheep are kept by estates.

Tobacco, tea and sugar are the major exports of Malawi. The estates and plantations involved in these activities are major employers, while the smallholders and small estates involved in export crop production are important employers of local and seasonal labor.

3.2 Critical Issues

Malawi is the fourth most densely populated country in Africa and has the second highest crude birth rate after Kenya (see figure 2). Rapid population growth has led directly to land scarcity that results in shortened fallows, cultivation of marginal lands and deforestation. Four critical natural resource management issues in Malawi are related to population growth and land scarcity: soil erosion, soil fertility decline, deforestation and fuelwood scarcity and loss of biological diversity.

Another form of population growth that affects the natural resource base is the influx of refugees from Mozambique. Of Mozambique's approximately one million displaced persons, 700,000 are in Malawi - and more arrive daily. Although these refugees are being provided food by international donor agencies, their need for fuelwood and land for housing has a negative impact on the scarce forest and land resources of Malawi.

Food security is an area of growing concern for many Malawians. Seventy-five percent of farmers cultivate 1.0 hectare or less and cannot meet their basic subsistence food needs every year. Per capita maize consumption ranges from 136 to 198 kg per year and is 0-30% below the WHO recommended amount. In general, overall growth and improvements in agricultural prices and policies do not to reach the large proportion of the rural poor who face extreme land and capital constraints.

4. Institutions

The two key ministries involved in natural resources management in Malawi are the Ministry of Agriculture and the Ministry of Forests and Natural Resources. Within the latter ministry are found the Department of Forestry, the Department of National Parks and Wildlife, the Department of Fisheries and the Department of Mining. Attached to the Office of the President and the Cabinet is the Environmental Secretariat and the Ecological Consultative and Liaison Group which have general responsibilities for environmental concerns.

The Forestry Department is divided into five sections. In the field, the Department has regional forestry officers in the north, south and central regions, District Forestry Officers and foresters and forestry assistants at the RDP level. The extension system, which will be discussed further below, includes foresters, forestry assistants, forest guards and patrolmen and the nurserymen.

The Department of National Parks and Wildlife (DNPW) is responsible for managing protected areas as well as for managing wildlife found outside of these areas. It has a total staff of 309, including game scouts, management, research, and environmental education personnel. The operating budget for the Department is approximately MK 1,118,000 or US\$ 400,000. Malawi is the SADCC Coordinator for wildlife management and national parks.

The Ministry of Agriculture has several sections which are charged with implementing natural resource management activities; these are: The Land Husbandry Branch, the Department of Agricultural Development and its eight Agricultural Development Districts, and the Land Resources Evaluation Unit. Most of the Ministry of Agriculture's natural resource implementation activities are carried out through the ADD's under the National Rural Development Program.

5. Natural Resource Research, Training and Extension

5.1 Research

The Department of Agricultural Research (DAR) of the Ministry of Agriculture conducts research at the main research station at Chitedze, near Lilongwe, as well as eight principal stations and 20 sub-stations and sites throughout the country. The research, which is handled by National Coordinators, includes several natural resource management related areas: crop and variety testing, livestock and pastures, agroforestry, soil fertility, soil and water conservation and management, agricultural engineering and land use.

Forestry research is carried out at the Forestry Research Institute of Malawi (FRIM) in Zomba. FRIM's traditional focus was to support the government's industrial pine plantations in terms of breeding and genetics, disease control, and silvicultural techniques. The Institute is now called upon to conduct research on a wide variety of topics, including: eucalyptus provenance testing, natural forest management and agroforestry. Keeping up with these new research areas has been difficult due to severe staff and financial limitations.

The Social Research Center, located at Chancellor College in Zomba, conducts research on the sociological aspects of land use and natural resource management.

5.2 Training

The main natural resource related training centers in Malawi are: Chancellor College in Zomba, Bunda Agricultural College in Bunda, the Natural Resources College near Lilongwe, the Malawi College of Forestry at Dedza and the Land Husbandry Training Centre in Zomba.

The Natural Resources College trains about 10 students each year in its Parks and Wildlife Program. This two-year certificate program provides practical training to prepare the graduates to manage Malawi's national parks. The graduates are normally employed by the DNPW as Technical Assistants. There is also a Scout training course held at Kasungu NP from time to time.

Training and education in forestry is carried out at a two-year certificate level at the Malawi College of Forestry in Dedza. Foresters receive two to three years of training and Technical Assistants receive a two-year certificate. Forest guards, patrolmen and nurserymen normally receive four to six weeks of training, however, in practice many guards work for some time before receiving training.

Technical training in agriculture is carried out at the Natural Resources College. This training, which has a practical orientation, leads to a two-year certificate. Most of the approximately 100 yearly graduates are employed in the agricultural extension programs of the Ministry of Agriculture.

Bunda College of Agriculture in Bunda and Chancellor College in Zomba, both part of the University of Malawi, offer four year B.Sc. degrees in natural resource related disciplines such as: agronomy, range management, biology and botany. In recent years it has become increasingly difficult for B.Sc. graduates to find employment, but those who find work are usually employed as civil servants in government ministries.

The Land Husbandry Training Centre in Zomba offers 6- and 12-week short courses in land evaluation, land husbandry and farm planning. Most of the participants in the courses are employed as Land Husbandry Officers in the Ministry of Agriculture and the short course serves to upgrade their skills or provide additional training in selected areas.

5.3 Extension

The Agricultural Development Districts are the main day-to-day implementers of Malawi's National Rural Development Plan. The ADD's are sub-divided into Rural Development Projects (RDP's), which are the main headquarters for the subject matter specialists and the sites from which the overall extension activities for an area are administered. Each RDP has several Extension Planning Areas (EPA's) from which local extension activities are planned and administered. Each EPA is divided into sections which are the last level of the extension system. It is from this level that frontline extension workers are deployed and expected to visit the block extension units regularly.

The focus of agricultural extension, and the funding resources, are in areas, like the Northern region, that have underdeveloped agricultural production potential. The program tends to reach those farmers who have the resources to follow the Ministry of Agriculture's recommendations. Testing and adapting the research to the needs of small farmers is handled through the eight Adaptive Research Teams - one in each ADD. The ART's, along with extension training and publications, are the main conduits for research information to flow through the extension system to the farmers.

In addition to the mainline extension workers, called Field Assistants, the ADD's and RDP's have Land Husbandry Officers who are Subject Matter Specialists in soil and water conservation, land use, crop husbandry and other natural resource related crop production and land use activities. The LHO's train extension workers in land husbandry practices, and work with individual farmers to develop land use plans.

The Forestry Department has a very limited extension network of forestry assistants, foresters, guards, patrolmen and nurserymen. These people are required to assist farmers in establishing woodlots, planting trees and dealing with forestry problems. At the same time they must patrol forest reserves, plantations and customary lands to collect fees for wood cutting and fine offenders. The Ministry of Agriculture is involved in forestry related activities in the emerging area of agroforestry and in forestry extension. The Forestry

Department depends a great deal on working with agriculture extension agents as agriculture has a more extensive and better staffed extension network.

The Department of National Parks and Wildlife does not have an extension service in the strictest sense of the term. However, the Park Rangers are in contact with the public, and they serve as educators on wildlife conservation, as well as managers for the conservation activities within the protected areas.

6. Donor and Non-governmental Organizations

Unlike many other African countries, non-governmental organizations do not as yet play a significant role in natural resource management. There have been some efforts involving school woodlots and refugee agencies are beginning to enter the area of fuelwood and energy conservation, however, these efforts have been on a very small-scale. There are a few Malawian wildlife organizations and clubs that carry out various activities in education and awareness raising.

According to the most recent UNDP Development Cooperation Report, there were six major donors that were involved in the forestry sector. Many of these activities were institutional support of a general nature. The World Bank through its Wood Energy Project, is the major donor agency involved in forestry. This multi-million dollar project works through the Forestry Department and provides support to a large number of activities from research to extension to charcoal production. Other major donors in natural resources management are UNDP, FAO, USAID, CIDA and GTZ. NORAD finances a large SADCC project, Blantyre City Fuelwood project and other Scandinavian donors have been involved in natural resources off and on.

The donors and international organizations most involved in agricultural development in Malawi include: USAID, World Bank, FAO, UNDP, GTZ, ODA and CIDA. The International Agricultural Research Centres with programs in Malawi, which are funded by donor organizations, include: ICRISAT, ICRAF, CIMMYT, CIAT, and IITA.

7. Aspects of Land Use Related to Natural Resources

7.1 Types of Land Tenure

There are three main types of land tenure in Malawi: customary, private, and public. The largest proportion of the land, 67%, is held by customary tenure, which is allocated and controlled by the village headmen and chiefs. Public land occupies about 23% of Malawi and is mostly in game reserves, national parks and forest reserves. Privately held land occupies 10% of Malawi's land area and is divided into three types: 1) deed registered, 2) public lands with multi-year leases to individuals and corporations, and 3) customary lands which have become private through registration. Table 1 shows the land use categories and acreages in Malawi.

Table 1. Land Use Categories and Hectarages in Malawi

	<u>(million ha)</u>	<u>% of total land area</u>
Land under Agriculture	2.0143	21.4
Nucleated human settlements	0.0885	0.9
Nature Conservation/Reservation (Forest Reserves, National Parks Game Reserves)	1.18151	19.3
Major Infrastructure	0.0556	0.6
Vacant Land:	5.4539	57.8
Usable but unutilized	2.4681	
Dambo's and steep slopes	2.9858	
Total Land Area	9.4274	100.0

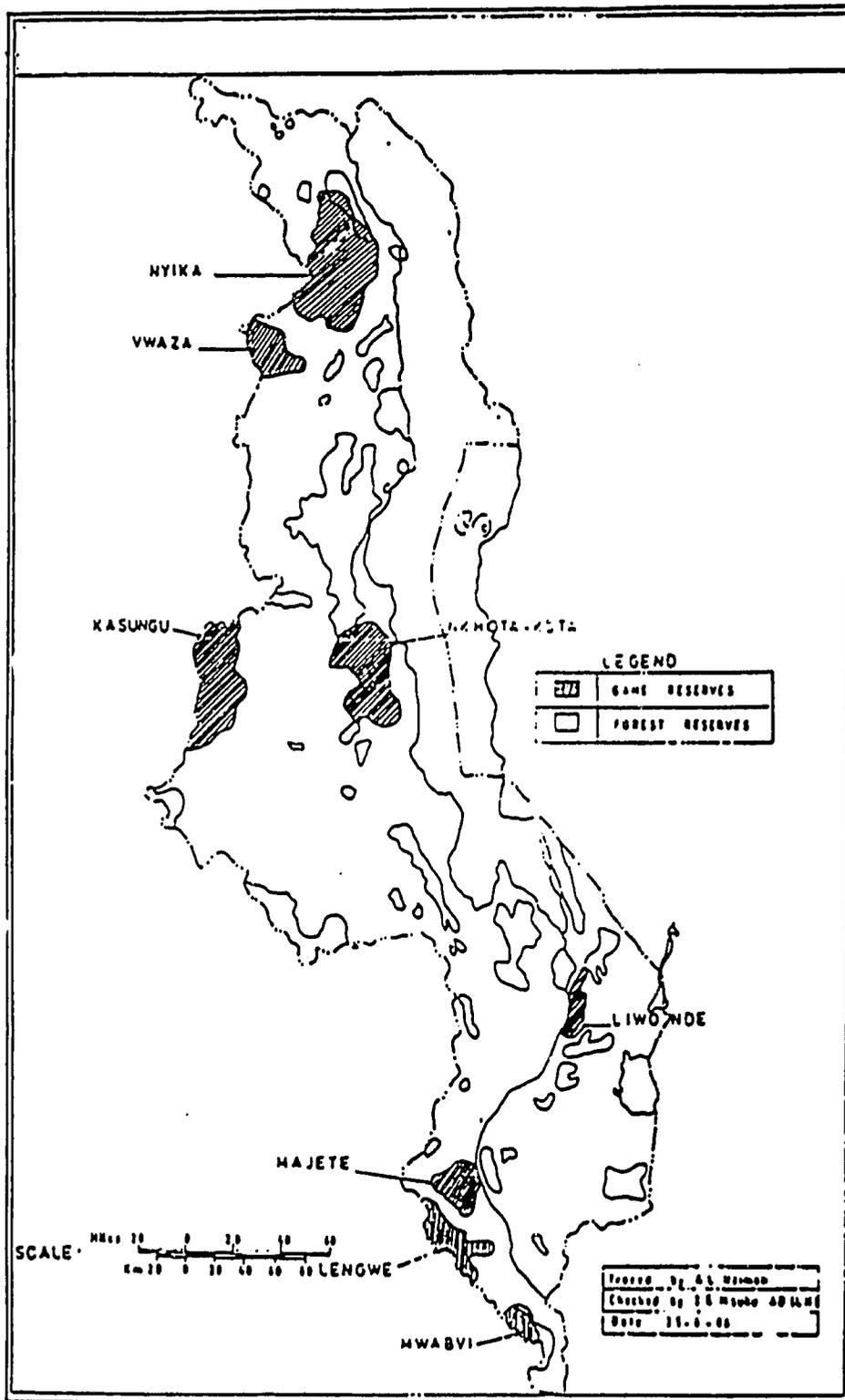
(Source: National Physical Development Plan, 1983. Department of Town and Country Planning, Government of Malawi. Protected areas and Forest Plantations

7.2 Protected Areas and Forest Plantations

The Government of Malawi has taken important steps to conserve the biological diversity of the country and protect the natural resource base through the establishment and development of a protected areas system (see figure 3). This system consists of five National Parks and four Game Reserves which together comprise almost 11,000 sq km, or approximately 11% of the country. Few countries have protected such a large percentage of their area.

Forest Reserves, which cover 980,000 hectares, have been established to protect watersheds and fragile areas, particularly areas subject to erosion. In total, Malawi has legally protected 20% of its total area, a significantly greater percentage than the world average of 3%.

Figure 3. National Parks and Game Reserves of Malawi.



Note: Legend for Game Reserves includes both game reserves and national parks.
 Source: Minae, S. and I.R. Msuku

Protected areas are controlled by the government and managed for their protective function. Given Malawi's often hilly topography and the importance of watershed protection for drinking water, agriculture, industrial uses and fisheries, these areas are critical to the maintenance of the country's environmental and economic well-being. In some circumstances, controlled use of these areas is permitted. In forest reserves, for example, there is some fuelwood collection permitted and national parks are beginning to experiment with activities like beekeeping as a way to help the local populations benefit from the parks.

The protected area system includes examples of all major landscapes and most biotic communities found in Malawi. These areas contain numerous plant and animal species, many of which are endemic, i.e., they are naturally found nowhere else on Earth. The existence of detailed master plans for each protected area is indicative of the Government's serious commitment to conserve its biological resources.

Forests in Malawi fall into one of five classifications: forest reserves, plantations, forests on customary land, national parks, and forests on leasehold or estate land. Forest reserves, industrial and fuelwood plantations and forests on customary land all fall under the management of the Forestry Department. Forest reserves and national parks have been discussed above.

Industrial plantations, primarily of Pinus spp., are managed for timber, and, to a small extent, charcoal production. In the south, where population densities are higher, industrial plantations also provide fuelwood from waste wood. Government-managed fuelwood plantations, primarily of Eucalyptus spp., range in size from a few hectares to several hundred hectares and are managed for the production and sale of fuelwood and poles.

7.3 Estate Sector

Of the land available for cultivation estate land occupies approximately 691,000 hectares (32%). The main use of this land is production of cash crops, primarily tobacco, tea and sugarcane. Only estates are permitted to grow burley tobacco, the country's major cash crop. The estate sector in Malawi, particularly tobacco estates, has grown rapidly over the last few years and presents unique challenges for natural resources management, particularly in terms of biological diversity, deforestation, soil conservation, food production.

7.4 Customary Land

Customary land is by far the greatest percentage of land in Malawi. It accounts for 56% of forest cover, is home to more than 90% of the population, and provides the base for most of the food crops production in Malawi, as well as a growing number of cash crops like groundnuts, tobacco and chili peppers. Customary land is controlled by the Traditional Authority and, under him, the Village Headman. These two officials have the power to allocate land to individual farmers and to various land uses such as communal woodlots. Land that is not specifically claimed by a farmer is owned and used communally for grazing,

fuel and construction wood, and collecting wild foods and medicines. Traditional authorities must also approve the registration of estate land from customary land under their jurisdiction.

Although a farmer works land that is theoretically "owned" by the community, his or her usufruct rights to that land and the resources thereon are clear and are passed on to sons and daughters. As land pressures from a growing population have increased, traditional authority to allocate and control land has been eroded in many areas resulting in de facto sales of customary land. Nonetheless, Traditional Authorities and Village Headmen are the recognized leaders when it comes to management of customary lands.

Until recently, local authorities had control over forests on customary lands. In 1985, however, given the increased clearing of land for agriculture and the deteriorating fuelwood situation, the Forestry Department became responsible for all forests on customary lands. Theoretically, this also means the Forestry Department is responsible for trees on farmers lands. In practice, however, farmers are free to use and sell trees from their own land that they have planted. With eucalyptus this is not generally a problem because it is widely grown by farmers and there would be little ambiguity about its origins. For indigenous trees, however, farmers need to get a permit from the Forestry Department, and if the tree is one of 11 protected trees, pay a fee (see table 2). This can be an extremely time-consuming process involving trips to the nearest forestry office and a wait for permit approval.

8. Critical Natural Resource Issues

8.1 Population Pressure and Land Scarcity

Land scarcity is a direct consequence of Malawi's rapid population growth rate. Farmers on very small acreages, no matter how marginal the land may be, cannot afford to put part of their land into trees or practice effective fallow. A study of the rural communities affected by the Blantyre City Fuelwood Project provides insight into the way that land is viewed by smallholders:

Unfortunately, land is land, whether it is poor or not. One therefore has the problem of trying to convince people they are not going to be worse off without it. Even poor land produces some food, so its loss will be felt.

At 843 inhabitants per 1,000 hectares, Malawi is the fourth most densely populated country in continental Africa. With approximately 50% of the population under the age of 15 the situation can only become more serious. The population density is lowest in the North and highest in the South in the Shire Highlands. Parts of the Shire Highlands have population densities in excess of 300 persons per square kilometer. The projected land requirements presented in table 3 emphasize the seriousness of future land scarcity.

Table 2. Protected Trees on Customary Land

Botanical Name	Vernacular Name
<u>Adina microcephala</u>	Mwenya, Chonya, Mgwenya, Mung'ona, Mwina, Mungwina
<u>Azelia quanzensis</u>	Mkongomwa, Msokosa, Mnangaliondo, Msambamfumu, Mkongwa, Chidunda, Ipapa,
Mpapa, Mpapadende	
<u>Borassus aethiopum</u>	Mvumo, Mdikwa, Makoma, Mulala
<u>Bridelia micrantha</u>	Msopa, Chisopa, Mpasa, Mlewezi, Msongamino, Mwisya
<u>Burkea africana</u>	Mkalati, Kalingut, Kawidzi, Kawidzu, Nakapanga
<u>Colobospermum mopane</u>	Tsanya, Sanya, Ntsano, Mopani, Mpani
<u>Cordyla africana</u>	Mtondo
<u>Hyphaene crinita</u>	Mgwalangwa, Mkomakoma, Makoma, Mulala
<u>Khaya nyasica</u>	Mbawa, Muwawa, Bulamwiko
<u>Pterocarpus angolensis</u>	Mlombwa, Mtumbati, Mbira, Nawazi
<u>Terminalia sericea</u>	Napini, Nyapini, Mpini, Nalinsi, Mkodoni, Mpululu, Njoyi

Table 3. Projected Land Requirements for Different Uses in Malawi.

Fertility Assumption	Percent of Land Vacant in 1985 Needed by 2000 for Growth in:			Percent of Land Vacant in 1985 Needed by 2015 for Growth in:		
	Food* Production	Tobacco* and Wood**	All uses	Food* Production	Tobacco and** Wood	All uses
Constant Fertility Standard	41	29	70	121	57	178
Decline Accelerated	37	28	65	85	48	133
Decline	29	26	55	53	37	90

*Assuming no improvement in current levels of food intake.

**Assuming high-yielding plantations, increased efficiency of fuel wood use on tobacco estates, and also that additional land for expansion of tobacco production will be able to produce sufficient fuel wood for the increase in production.

In addition to high population density, Malawi has one of the highest population growth rates in Africa. The high estimated growth rate of 3.2% per year combined with a high percentage of rural dwellers, places considerable pressure on Malawi's scarce land resources and natural resource base and are of primary concern to natural resources management in Malawi.

The Fort Lister Gap area near Mulanje mountain in the South provides a "worst-case" illustration of the results of extreme land scarcity. Farmers in this area were so short of land for crops that they moved into the forest reserve on Mulanje Mountain. They began to plant crops under the eucalyptus trees of the Reserve, girdling the trees to kill them and provide more light for their crops. Disputes between the Forestry Department and the farmers soon followed. Eventually the land was given to the farmers, however the government was forced to establish a police station in the area to prevent further encroachment.

The serious consequences of land shortage and ends to which farmers can be driven in their quest to feed their families is brought to light in the Fort Lister Gap example. Hunger, poverty, starvation, loss of confidence in government, bitter feelings towards government officials, and great costs to government are only a few of the problems that accompany land shortages.

Land shortages have resulted in a decrease in average farm size in Malawi. The average farm size for the smallholder sector is 0.73 ha and it has been estimated that at least 75% of those farms are not able to meet their basic food needs. With the current rate of population growth and its attendant degradation of the social, economic and production environment of the smallholder the types of land problems mentioned above may become a recurring problem for Malawi.

Until population issues are addressed, little of long-term significance will be accomplished in the area of sustainable agriculture and natural resources management. The need for a population policy has only been raised as an issue by the government very recently. The National Seminar on Population and Development which was recently held at the University of Malawi was a very encouraging step forward in this direction.

8.2 Food Security

It has been estimated that 650,000 people in Malawi suffer chronic malnourishment and that up to 1/2 the population experience food insecurity during part of the year. This is not surprising considering that most farms in Malawi have less than one hectare under cultivation and that about 50% of farms have only 0.55 hectares cultivated. Overall only 20% of smallholder farmers produce a surplus of maize, their principal staple crop. One study shows that more than 70% of smallholder families in the Blantyre ADD run out of food by January and then must buy maize until harvest in April or May.

Female headed households, 42% of which cultivate less than half a hectare, are most often not visited by the extension service and have less access to agricultural credit. This same group is seldom able to implement extension advice at the recommended levels because they often require high cash investments in fertilizer and hybrid seed.

8.3 Deforestation

The primary cause of deforestation, rapid population growth, has put agricultural land at a premium and forced people to push farther and farther into marginal areas. One can see fields far up on steep hillsides in many parts of Malawi. These hillsides, which once provided fuelwood for the community, are gradually being cleared of forests, and in some cases are used for food crop production. Today, only the hills that are protected as forest reserves have much tree cover, and in some areas even this important cover is being reduced.

In the search for more land on which to produce food and more wood with which to cook it, rural households have had to mine their resource base. Deforestation is estimated at 150,000 ha or 3.5% a year, the second highest rate in Africa. According to government sources, Malawi experienced a wood deficit of 1.6 million cubic meters in 1983 which is projected to grow to a deficit of 7.6 million cubic meters by 1995. These figures are conservative. Other sources cite deficits of over four million cubic meters in 1984. Some of the discrepancy may be due to inclusion of forest reserves and national parks in the lower figure: areas which are not and should not be available for exploitation. Encroachment on forest reserves and other protected areas in search of fuelwood is common and extremely difficult to prevent. Farmers in all regions, but particularly in the south, are lopping mango trees, and burning maize stalks and cattle dung for fuel.

8.4 Growth of the Estate Sector

Between 1970 and 1988 the number of estates grew from 78,000 to 267,000. Most of these new estates were small, ranging in size from 5 to 25 hectares. About 95% of these estates produce tobacco, and because of price increases for tobacco and changes in the types of tobacco being grown by small farmers, the trend of growth in this sector is likely to continue.

There are some serious concerns about this growth. Virtually all of the small estate holdings have come from customary land that was in bush fallow or being cropped. This has resulted in less land being available for the rapidly growing number of small holders on customary land. If this pattern continues, the desire for land and the resentment over landlessness may build to the point where, like the situation in Fort Lister Gap, it may get out control.

It has been estimated that about 40% of estate land is unused. One reason for this is because tobacco land must be fallowed for two years out of four, but there are even some indications that the estate sector does not use land very efficiently. Reduced availability of customary land, additional acreages of non-food cash crops, rapidly increasing human population, and the high proportion of fallowed land in the small estate sector have

all combined to make less land available for food crops. This trend has serious negative consequences for land tenure attitudes, food security and natural resource improvements.

The expansion of the estate sector, particularly tobacco estates, has also caused considerable deforestation. The production of flue-cured and fire-cured tobacco requires large quantities of fuelwood and burley and sun-air cured tobacco require poles to build drying sheds. Although required by law to put 10% of their land into tree plantations to supply their wood needs, in practice it is universally agreed that this has not been done. Consequently, estate lands have placed extreme pressures on forests in two ways. Most directly, they have cleared large areas of indigenous forest both for tobacco establishment and for wood for tobacco curing. In 1985/86 tobacco estates consumed 300,000 tons of wood - only 40% of that came from plantations, and this does not include the amount of forest land cleared by new estates.

The estates seem to be making some recent efforts to establish the required tree plantations, improve their processing efficiency and explore alternative fuels such as charcoal from the Viphya plantation. A recent concession in the Viphya granted to General Farming may be an important step to full utilization of this enormous resource and reduced pressure on natural woodland.

8.5 Soil Erosion

Soil erosion is a serious problem in most farming areas of Malawi. There are several trends which are resulting in soil erosion and topsoil loss. These trends which are often related to population pressure and land scarcity include: 1) increased cultivation of steep lands (slopes greater than 12%), 2) shorter fallow periods, 3) increased amount of continuous maize or other row crops, 4) increased acreages of crops like tobacco which do not protect the soil, 5) reduced intercropping and crop cover, 6) failure to construct or maintain contour marker ridges, 7) overgrazing, 8) deforestation, 9) lack of farm planning services for farmers, especially those growing tobacco, and 10) lack of regulations and capability for enforcement of better land use and soil conservation practices.

The beneficial effect of protecting land against soil erosion does not stop with maintaining the productivity of the land. The reduction of siltation of fish spawning grounds, irrigation and hydroelectric dams, and increased stream flow are all important additional benefits of soil erosion control. Protection against siltation in the Bua river spawning grounds of the Mpassa or Lake Salmon, a commercially important fish species in Lake Malawi, is one of the important protection functions of the Nkhotakota Game Reserve. Many other non-protected rivers, which formerly were spawning grounds of this fish, no longer support the species as a result of siltation, overfishing, or dams which prevent fish from going up river to spawn.

8.6 Soil Fertility Decline

Because of increased population pressure and land scarcity the amount of land for bush fallow has been decreasing steadily. It has reached the point where very few farmers are clearing and utilizing land that has been fallowed for the fifteen years or more needed to restore soil fertility and tilth. Because this important way of restoring soil fertility is gradually being lost, smallholders must apply increasing amounts of increasingly expensive chemical fertilizers to maintain the yields of their staple food crops.

Continuous intensive cultivation of crops like tobacco and maize, which draw large amounts of nutrients from the soil, combined with a decrease in intercropping and the use of legumes in cropping rotations, which improve soil nutrient status, have resulted in steady declines in soil fertility. Some of the fertility decline has been hidden by the increased use of chemical fertilizers.

The increased rate of soil erosion and the subsequent loss of fertile topsoil and organic matter have aggravated the problem of soil fertility decline in Malawi. Because the acid and highly weathered upland soils do not have a high native fertility and nutrient supplying capacity they are not able to sustain crop production when subjected to moderate and high rates of topsoil erosion.

8.7 Loss of Biodiversity

Biological diversity is commonly defined as the variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be considered at the genetic, species, and ecosystem levels, although it is most commonly discussed at the species level. Maintaining diversity at all levels is critical to sound ecosystem functioning.

Due to intense land pressures throughout much of the country, most of Malawi's natural biological diversity is now found only within reserves. Much of the future success of conserving biological diversity in Malawi is, thus, dependant on the maintenance of established protected areas. Malawi has succeeded in protecting many of the critical watersheds on which its agriculture-based economy depends. It has also succeeded in conserving numerous plant and animal species endemic to the area as well as many that are rare, threatened or endangered, and has done this with very limited resources.

There is growing concern about the loss of genetic and species diversity within the forestry sector. The early plantations in Malawi were planted largely with one species - Pinus patula. Large areas of indigenous, and more diverse, forest were cleared for the establishment of these monocultures. More recently, the Forestry Department has focused its efforts almost exclusively on the production of Eucalyptus spp. for planting in its fuelwood lots, in community woodlots and for smallholder farmers. Government tree nurseries are usually stocked with about 90% eucalyptus. Initially, indigenous forest was cleared for the establishment of these plantations. Now, the Department tries to avoid clearing indigenous woodland whenever possible.

A similar loss of biodiversity has occurred in the agricultural sector. Although only a fraction of the maize crop in Malawi consists of hybrids, farmers are encouraged to grow one or two varieties of hybrid maize. An excessive reliance on a few varieties makes the food production system more vulnerable to losses from diseases to which those varieties are susceptible. The extension service has promoted monoculture, particularly of maize and tobacco, which has reduced both the varieties of each crop and types of alternative food crops grown by farmers.

8.8 Grazing Land Degradation

While the Team did not have the opportunity to assess the situation with the grazing lands in Malawi, it is evident that they are deteriorating. Land scarcity, decreased lengths of grass fallows, reduced grazing in forested areas, poorer quality fodder, overgrazing, and soil erosion are all contributing to the degradation of grazing lands. The dry season fodder provided by croplands and dambo grazing is reduced as increased amounts of grazing lands are taken up by winter vegetable gardening in the dambos. The land scarcity issue is forcing a trade-off between cropland and grazing land.

9. Field Observations and Case Studies of Selected Natural Resource Improving Initiatives

A key component of the approach taken in the Natural Resources Management Support Project is the identification of successful natural resource activities undertaken by farmers and villagers. Broader programs, strategies and policies that are based on proven successful initiatives implemented by farmers have a far better chance of success than unproven ideas and theories. This "bottom up" approach responds to farmer and villager needs and concerns and implements their solutions rather than those imposed from above.

The sections that follow make observations about problems and describe successful or promising initiatives relating to natural resource improvement in agriculture, forestry and biodiversity. Because Malawi is in the early stages of implementing many initiatives, several of the case studies should be viewed as promising rather than proven successful efforts.

9.1 Chigumula Conservation Catchment Area

With a growing population and the ever increasing need for small farmers to increase food production, the loss of soil and subsequent decreases in sustainable food production are critical. It is important that all landholders protect their soils, conserve moisture and improve their food production base. Protection is especially critical for the smallest landholders. The Chigumula Catchment Area is an excellent example of the kind of successful soil conservation effort that needs to be repeated by small farmers all over Malawi.

The Chigumula Conservation Catchment Area is near the Chigumula Village in the Blantyre-Shire Highlands RDP. The project was initiated under the supervision of the Land Husbandry staff of the Blantyre ADD. The deep and fertile soils of these steep

slopes are intensively cultivated with food crops - maize, bananas, sweet potatoes, cassava, and pigeon pea. However, because of high rainfall, steep slopes and exposure from tillage these soils are very susceptible to water erosion.

The soil conservation efforts in this 124 hectare water catchment area were started by the farmers and Land Husbandry staff in 1981. It took about two years for the 123 families in the area to become involved. The project fostered farmer cooperation from the very beginning. Meetings to explain the objectives and activities of the project were held at the start with the village Headman, local leaders, Malawi Congress Party officials, and ADD staff. These early meetings, which proved to be key components of project success, established a cooperative base with farmers and villagers and resulted in successful implementation of technical improvements.

With the strong support of the Headman, local leaders and farmers the RDP Field Assistants were able to teach farmers about soil conservation and supervise the construction of marker ridges (contour ridges) on the farmers' steep slopes. The farmers cut the stakes for marking the location of the ridges and, with family labor, mounded the soil to form the contour ridges. All of the crops are grown on ridged beds parallel to the marker ridges. This approach required very little change from the farmers' traditional practices.

As the field work of the project got started - staking the contours and building marker ridges - a few farmers did not participate. These farmers were not forced to participate and, with continued encouragement from extension workers and local authorities, most farmers began to install the marker ridges. By the end of two years most farmers in the catchment area had completed their ridging.

Originally farmers were told to plant Napier grass in the ridges. But, they preferred to plant bananas since it is both a food and cash crop that does well on these soils. The farmers prefer a dwarf banana variety that has small leaves that do not shade the adjacent maize fields. The Land Husbandry Section's modification of their standard recommendation of a "grass" marker ridge to a "food" crop like banana was an important step towards the adoption of marker ridges. By finding a compromise between permanent ridges of Napier grass, which was considered the "best" for ridge stabilization, and the cultivation of annual crops like cassava, sweet potatoes, maize and sorghum, which was considered the "worst" ridge crop, the Land Husbandry Section demonstrated an understanding of the strong desire of farmers for food and cash crops on every possible part of their land and a willingness to compromise with farmers to find a workable solution.

In addition to building marker ridges the Chigumula farmers have elevated many of the footpaths that went from their homes to the streams. Because of continued foot traffic and rain water concentration severely eroded gullies were forming near these paths. The elevation of the paths has reduced the most serious gully erosion. Where gullies had formed in the past farmers have started planting grass and bananas. These efforts have resulted in the protection of susceptible areas, gradual reclamation of severely eroded areas, and an increase in productive land within the catchment area.

The farmers have been able to see several benefits from participating in the Chigumula Conservation Catchment Project. They mentioned that the water in the stream does not dry up in the winter as it used to and that the stream water is clearer. In areas where there were gullies they are now reestablishing food crops. The farmers who have installed the marker ridges and conservation structures feel that they are losing less soil and that the food production base for them, as well as their children, is more secure.

The Overseas Development Unit of Hydraulics Research made measurements of sediments in the streams in both protected and unprotected near Chigumula over a four year period. Their research, which confirms the views held by Chigumula farmers, shows that the installation of soil conservation structures like those at Chigumula reduces the soil loss from more than 10 T/ha to less than 3 T/ha per year.

An important part of the Land Husbandry Section's strategy is to overcome the negative attitude that farmers have towards soil conservation. The term "marker ridges" is being used by the Land Husbandry Section to avoid the negative attitudes that farmers associate with the word "contour bunds". During the colonial period, the administration forced farmers to make contour bunds and plant their crops parallel to the slope. It has taken farmers a long time to forget this forced approach towards soil conservation and see the benefits of protecting the soil. The approach of "encouragement" rather than "coercion" and the willingness to compromise "technical" objectives to achieve "farmer" objectives are important components of the program.

The key features for the success of this initiative include:

- An approach of encouragement rather than coercion
- Well organized local community with strong leadership
- Workable technical approaches
- Technical assistance and support from government
- Ability of technicians to compromise with farmers

9.2 Government Trees versus Farmer trees

In the natural resources sector there are different ways that success can be measured. In forestry, as in other areas, the traditional measure of success has often been biomass produced or preserved. This has been characterized by seedlings produced and distributed and acreage planted (or protected). This definition of success in terms of production still has its place, for example in the estate sector, industrial wood production and, in the case of protection, in forest reserves and national parks.

Emphasis on production alone, however, leads one to overlook the process by which that production is obtained and its quality, usefulness and sustainability. It is also a less useful guide for an evaluation of forestry in the smallholder sector. This sector is only indirectly and passively affected by large-scale plantations and protection schemes managed by government. The traditional government approach of production and protection is no longer sufficient when land becomes a major constraint, smallholder financial resources to

purchase government-produced wood are extremely limited and people have no other fuel options than to burn wood and charcoal.

In the last few years in Malawi there has been a reexamination of this traditional approach and a sincere effort within the Department to balance production and protection with social and community approaches to smallholder needs. This has resulted in a shift of emphasis in government policy towards a more "farmer oriented" approach. The Department of Forestry now emphasizes the need to work with local leaders, traditional authorities and farmers to help them establish trees on their farms, whether in woodlots, boundary plantings, or as part of agroforestry systems.

On the farmer side there is a widespread realization of the problems of deforestation and wood scarcity. In many places and on many farms this has translated into tree establishment - both with and without the help of government.

The social forestry approach -- working with farmers to encourage them to grow trees -- takes time; more time than the traditional approach of government-established plantations. It also takes different skills and resources. Production forestry concentrates on growing trees - there is no need for extension agents. Social forestry concentrates on helping people to grow trees - it cannot succeed without trained extension people.

Rapidly growing populations, extreme poverty and malnutrition, refugees from Mozambique - all these factors place such high and increasing demands on forest resources that a crisis attitude is often unavoidable. The temptation to resort to the most straightforward, familiar approach (i.e. government managed plantations) is very strong. Given the urgency of the situation some people feel that government plantations, despite their expense, are necessary to fill the fuelwood gap as farmers begin to produce trees. The economic strategy is to have the government raise fuelwood prices to full cost recovery. Then, individuals will find it financially attractive to raise fuelwood for sale and the Department can concentrate its efforts on extension, nurseries and industrial plantation management.

Hard questions must be asked of this line of logic. In order to recover the cost of fuelwood production the government would have to raise its prices approximately seven-fold. Currently, one district forester estimated that the equivalent of a cubic meter of eucalyptus wood which the government sold at MK 3.50, sold for MK 60 in Blantyre city. This forester expressed the opinion that if government prices were raised the increase would be passed on to the consumer. Given that the poor are already switching to alternative fuels such as maize stalks, dung and lopping from mango trees one has to question the presumption of a ready market for such high-priced wood.

Another issue that is rarely addressed is the issue of manpower. With a limited budget and an extremely limited number of trained staff, the Forestry Department cannot be all things to all people. Additional effort given to establishment, maintenance, management and protection of fuelwood plantations will often be effort that is not available for extension and protection. Even collecting the nominal sum now charged for plantation wood (not to mention illegal cutting on customary land) is difficult given the shortages of

staff, the distances farmers must walk to obtain licenses and the inability and unwillingness of many farmers to purchase what was formerly a free good. If wood prices are raised, the need for policing action will become even more critical.

In certain circumstances and in some areas, such as those heavily impacted by refugees, it may be necessary for government to manage afforestation activities. In the long run, however, donors, the GOM and the Forestry Department and farmers will be best served if the government's new efforts at social and community forestry (described below) are even more vigorously pursued. Helping farmers to grow their own wood, rather than provide it for them at a fee, will be less expensive and more sustainable in the long-term. And these efforts must be pursued now, not put off for some time in the future when wood needs are less pressing. Malawi has faced a wood deficit since the 1970s, it is highly improbable that will change overnight.

Some of the key points observed in this situation were:

- Realization of the need for a balance between production forestry and social forestry approaches.
- Lack of training in extension techniques hinders extension efforts.
- Dual role of extension workers - policeman and extension agent - makes it difficult to build farmer trust.
- Continued reliance on expensive, government produced fuelwood in the face of crisis atmosphere.

9.3 Community Woodlots

Outside of Zomba we talked with Mr. Rabson Tambe in the Kuntumanji Traditional Authority area. He was helping to organize and manage a community nursery and woodlot. The Forestry Department had provided training (in the form of a week long training session for a few farmers), seeds (Eucalyptus spp.) and polyethylene tubes to get the nursery started. Villagers have provided all the labor for the initiative. Although participation was limited initially, villagers became more interested over time and now labor is not a problem. The woodlot has expanded every year to its current size of 2.5 ha. and was still expanding. Initiated in 1985, participating farmers have already benefitted from free poles for home repairs.

Villagers in this area have an average holding of 0.5 ha. Many are unable to find fuelwood (much less building poles) and have resorted to lopping mangoes and burning maize stalks and cattle dung. Wood produced from the woodlot is allocated by the village headman on the basis of need. Currently wood from the woodlot is not being sold. Although some may be sold in the future the primary intent is to produce construction and fuelwood trees for the participating villagers. Proceeds from wood sales would go to the Traditional Authority to be used for community events and projects.

Villagers were also very interested in receiving free seedlings from the nursery to plant in their own farms or compounds. So far a few seedlings have been given out to workers, however, the Forestry Department has not yet defined a policy in this area so free

seedling distribution from village nurseries is limited. Mr. Tambe said that villagers would be very interested in fruit trees and in species other than eucalyptus.

This village woodlot, although small in size, was nevertheless helping to satisfy important community needs for construction material (and in the future some fuelwood) that they would otherwise have to buy, or do without. The only inputs from the Forestry Department were the time of the extension worker with the villagers, initial training session for the village headman and the provision of seeds and plastic tubes.

Another example of a community woodlot was pointed out to us between Dedza and Ntcheu at Ntanda Hill. Although we were not able to speak with any villagers we did get some information from the extension worker and the District Forestry Officer. The woodlot was established on a bare hill near the village that was unsuitable for growing crops. Although it had taken some time to get villagers to agree to establish the woodlot, interest had grown and labor was not now a problem. Forestry Department input was the same as the case above. Pine was used initially for this woodlot. Although the extension worker acknowledged that pine was not a good species for woodlots since it did not coppice, it was the only species available at the time. Eucalyptus is now being planted.

At one point during the process the villagers heard of a project down the road where the Department was establishing a woodlot using paid labor. They wanted to be paid for the work also. The extension worker explained that the woodlot in that area would not belong to the people and they would have to pay for the wood produced. This apparently convinced the villagers and they have continued to expand their woodlot every year.

In an area of very small landholdings, communal woodlots on marginal lands may very well be the most affordable way for villagers to establish enough trees to satisfy their needs. Although it requires labor for nursery management and woodlot establishment, cash-poor villagers do not have to pay for the poles and fuelwood produced.

Dr. L. Musukwa at the Center for Social Research in Zomba, expressed his opinion that community woodlots held considerable promise because they build on strong Malawian traditions of communal land ownership and leadership in the form of village headmen. In most parts of Malawi village headmen still have considerable influence and communities are used to working with their headman. Forestry Department workers also emphasize the importance of working through the local authorities. This is one reason why their training programs often start with village headmen.

Community woodlots are not universally practical, however. In other African countries they have been total failures, often because of a lack of community involvement in their planning or ambiguity regarding tree ownership. Malawi certainly cannot be considered a total exception to this and many instances were found in which community woodlots were not a viable strategy. As mentioned above, in areas of extreme land scarcity, the authority of village headmen and traditional authorities is eroding. In areas around Mulanje the forestry assistant told us that people were not interested in community woodlots because they were not sure they would receive the benefits of the wood. In these areas villagers opted to divide a communal area for planting, like a bare hill, into small,

individual plots. In some areas around Mulanje and Blantyre there were instances where village headmen used the free seeds and seedlings for their own profit.

The Forestry Department needs to establish policies regarding the availability of seedlings from community nurseries. Beneficiaries from the sale of wood need to be identified at the beginning. In areas where people either do not trust the Traditional Authority or are anxious to manage their woodlot for the direct benefit of their community the Forestry Department should work with them to find an acceptable system of allocating benefits from wood sales.

Communal woodlots are also not immune from the problem of land scarcity. In the first example, one of the village's major problem was the lack of land on which to expand their woodlot. Technical problems and lack of materials such as watering cans and wheelbarrows for the nurseries are also a constraint.

Some key issues are:

- Communal woodlots on marginal lands may be viable where arable land is very scarce.
- Communal woodlots build on Malawi traditions of village leadership through the headman or chief.
- Uncertainty or dissatisfaction with the distribution of benefits makes villagers in some areas reluctant to invest in communal woodlots.

9.4 Individual woodlots

The team was shown two examples of individual woodlots and observed many more such woodlots during our travels. Both woodlots (one in the Mulanje district and one in Zomba district) were established by men on very rocky hills that were unsuitable for crops.

Mr. Subeli, an older, single man had about ten hectares outside of Zomba. He became interested in growing trees in 1986 and went through one of the Forestry Department's training sessions. The Department has provided him with seeds and tubes for his nursery. He raises his own seedlings and produced 1,300 seedlings last year. Given that much of his land is unsuitable for maize and that he has no family to help him cultivate, trees are a very suitable crop. He stated that it was much easier to raise trees than to try and raise maize. He does have some maize and bananas for food and he grows quite a bit of sisal as a cash crop.

Mr. Subeli has not sold any of his production, either seedlings or wood, even though he has had neighbors ask to buy his seedlings. He will begin to sell poles and firewood soon and may begin to sell seedlings when he has enough for his own planting needs.

The District Forester did mention that they brought farmers to Mr. Subeli's woodlot whenever possible to show them what was possible and to talk directly to Mr. Subeli. He said that there was quite a bit of interest on the part of farmers.

In Mulanje district we were shown another individual woodlot, but we were not able to speak directly with the owner. Our conversation with the extension agent revealed that the owner was a merchant who lived in town. He had heard about the wood energy program and had asked the village headman for some communal land on which to plant trees. The land the woodlot occupied was an extremely rocky hill that had been deforested and, for the most part, was unsuitable for crops. He had established a eucalyptus plantation, with the help of paid labor, and was doing a good business in poles at 90 tambala to MK 1.50 a pole. Government produced poles were selling at about 50-90 tambala.

Apparently a very good pole market has developed in areas of high concentrations of refugees. Many people involved in refugee assistance stated that poles were one of the most critical limiting factors in construction of housing and pit latrines. I asked the extension worker if he thought the owner could continue to get these prices if there were no refugees. He thought that, although the market might not be quite so good it would still be profitable.

Pole plantations appear to be a profitable business in Malawi as they are elsewhere in Africa. Although they require some initial investment in terms of labor and cash for seedlings, and a three to four year delay until harvest, they can turn wasteland into profit and require very little labor inputs after initial establishment.

We found this to be true throughout Malawi, even in the North. A survey conducted by the Forestry Dept. in 1982 found shortage of poles to be the major forestry related concern among the men they interviewed (the survey noted that poles were a particular concern for men and that women might have expressed other concerns). Even at this time poles were in short supply and often had to be bought. Most private pole producers can get higher prices for poles than the government prices. Interestingly enough, however, some of the smaller farmers we talked to were producing poles primarily for their own consumption. Production for sale was often of secondary concern.

There are a couple of factors that will limit the growth of individual woodlots. One is the ever present land scarcity issue. Although there will always be some farmers and merchants who have access to marginal land, there are many more that do not. Another factor is the potential cost of buying enough seedlings to stock a woodlot. With seedling prices rising from one to three tambala per seedling poor farmers may be unable to invest in woodlots.

Key features include:

- Profitability of polewood plantations.
- Seedling costs and land scarcity could prove to be constraints to individual farmers, particularly poor farmers.
- Refugee areas provide good pole market.

9.5 Farmer Training Sessions

The examples of community and individual woodlots point out the success of the government's farmer training sessions. Training sessions are either day courses or, in the case of the above examples, week-long courses held at residential training centers and conducted by District Foresters, foresters and forestry assistants.

The training sessions aim to give farmers basic skills in nursery management, woodlot establishment and maintenance and some environmental education on the importance of trees and the problems of deforestation. Participants are given seeds and polyethelene tubes to start their own community or individual woodlots. Follow-up is also an important part of this process and helps to reinforce the original messages, identify problems and encourage farmers.

Although they try to include both men and women, the emphasis on training village leaders, who are predominantly men, leads to a focus on training men. These training sessions can serve dual purposes if they provide a forum for discussion, not just delivering a message to farmers. There is an overemphasis on "educating" farmers with little attention paid to learning from farmers about their needs and practices.

Important observations:

- Efforts to include women in training sessions should be further strengthened
- Training sessions should also serve as discussion sessions to learn from farmers as well as education sessions.

9.6 Smallholder Tea Authority, Thyolo

The Smallholder Tea Authority (STA) farmers produce about 12.5% of the tea in Malawi. Most of their farms are on customary land holdings, although there is some production on small pieces of private land. The main production area is on the southern slopes of Mt. Mulanje with the remaining one third being around Mt. Thyolo. The farmers have holdings which range in size from 0.5 to 3.0 hectares with the average smallholder having about 1.0 hectare of tea. Smallholders weed, fertilize, spray and pluck their tea bushes and sell their tea to the STA.

In addition to their role as a buying, selling and processing agent, the Authority makes both short- and long-term loans to farmers. They provide seedlings, fertilizer, and technical assistance to help farmers establish their tea plantations and get their tea bushes into production. Tea bush establishment mainly involves planting the tea bushes and ridging and mulching the soil to prevent erosion. When tea production starts, usually after four or five years, the farmers repay their long-term loans. Short-term credit, which must be paid back throughout the tea season, is provided to purchase inputs, mainly fertilizer and insecticides. Loan payments are deducted from the 12 tambala per kilo price farmers receive for their tea.

STA also provides technical assistance to farmers to teach them how to establish and maintain their plantations, conserve the soil, as well as instruction on how to pluck the tea leaves. This training is through farm visits by extension agents and two-day sessions held at training centers. The Authority also has a monthly newsletter which informs farmers about training events, tea prices, new cultural practices, production targets, etc.

We traveled to visit two smallholder tea farmers on the steep slopes of Mt. Thyolo. While traveling from the STA center to Mt. Thyolo we passed through several large tea estates and had a chance to observe large estate tea production. A comparison of the large and smallholder tea production systems provides some interesting insights into sustainable production and the use of the natural resource base.

The production systems for both smallholders and the large estates include, plant establishment, mulching, box ridging for soil conservation, leaf pruning, bush downpruning, spraying, and, of course, tea leaf plucking. The large estates hire both permanent and occasional laborers to handle these operations, while smallholders rely on a combination of family and hired labor. Smallholders with larger areas devoted to tea often hire one or two permanent laborers.

In this area of nearly 2000 mm annual rainfall it was especially encouraging to see the effort that the estates made to keep their soil covered with a crop. Bare areas in fields where tea bushes had died or wouldn't grow were seeded to Guatemala grass. Rock outcrops or large gullies were planted with eucalyptus, pine or grass, while low lying wet areas were usually seeded with Guatemala grass. The Guatemala grass is grown to improve the soil and is also cut and used as a soil mulch. The tea bush downprunings are used both as firewood and soil mulch. In many estate fields we saw *Grevillea*, a leguminous tree, planted as plot boundary markers.

The Thyolo landscape is a "carpet of green", and it is unusual to see bare red soil. The smallholder tea fields have crop cover that nearly equals that of the estates and their tea bushes looked cared for. The gullies and low lying areas of the smallholder area were generally not systematically cleared and planted to eucalyptus and Guatemala grass. However, the smallholders often left the gullies in native trees or grass. The only cash crop diversity noted in the large estates was the cultivation of coffee, tung and macadamia. These were being grown in monoculture plantation systems.

Smallholders generally have about half of their land planted to tea. The remainder is planted to maize, bananas, cassava, sweet potatoes, and other minor crops. They also have fruit trees - avocado, citrus and mango - around their homes. Smallholder cropland, as compared to their fields under tea, has less cover and more bare soil. However, the use of marker ridges and planting parallel to the contour is widespread. On many smallholder fields bananas were being grown to stabilize the marker ridges. The diversity of food crops grown by smallholder tea farmers is similar to that of other small farmers in Malawi and adds much to the biological diversity of the agricultural system of the region.

The large estates, some of which were established nearly sixty years ago, have most of their land planted to lower yielding local varieties of tea. The smallholders, most of whom established their bushes 15-20 years ago, use the newer large leafed polyclonal tea varieties. The higher quality, higher yielding polyclonal tea bushes have helped smallholders to make up for some of the management and resource constraints that they face. The yield and quality of their tea is believed to equal or exceed that of the larger tea estates.

Interviews with two tea farmers highlighted the importance of crop diversification for smallholders. One farmer had about 1/4 of her land in food crops, with the remainder in tea, while her neighbor had all of his land (less than one hectare) in tea and had to purchase all of the food needed for his household. When tea prices dropped sharply three years ago, the farmer who produced no food crops was very hard pressed to feed his family, while the woman who grew enough for most of her basic food needs was more easily able to cope with reduced cash income from tea. Laborers who work for the large tea estates, and who have completely given up food crop production in favor of wage employment face similar difficulties when the large estates are forced to reduce their labor force.

The high value of the tea crops and higher net returns to growers create an economic environment that allows both large and small tea growers to make investments in protecting the soil with mulching, ridging and in some cases terraces. This investment is especially important in the early years when the tea bushes are getting established and are not large enough to cover and protect the soil surface. The structure of the Smallholder Tea Authority and their long-term loan program are key features which assist small growers in making the initial investment to conserve the soil and establish sustainable tea production. The technical assistance in providing improved tea bushes and training in cultivation practices are also essential elements for farmers growing this crop for the first time. The biological and economic diversity evident on smallholder farmer's fields are desirable features of the STA approach and important components that should be included in similar approaches for other crops.

Key Features:

- High value crop which pays for conservation investments
- Sustainable production system
- Mixed cash and food cropping (in the case of smallholders)
- Technical assistance and support from STA

9.7 Government Nurseries and Subsidized Seedlings

Another successful government program which is tied to the Wood Energy Project is the expansion of government tree nurseries and subsidized seedlings. These nurseries currently produce an average of about 100,000 seedlings per nursery and sell approximately 90 to 100 percent of their production. Seedlings are sold for one tambala each, a price that is within reach of most farmers. Although about 90% of their production is eucalyptus, there were some other exotics and some indigenous species. Farmer demand for indigenous species, with the exception of Acacia albida and Khaya nyasica, was typically

low. Nurseries are now expanding their production to include fruit tree seedlings for which there is a very high demand. Nurseries also serve as a center for demonstration woodlots and extension advice.

In the 1989/1990 growing season the government will be raising the price of seedlings to three tambala each - full cost recovery. Subsidized seedlings will no longer exist. Additionally, the government, through the Wood Energy Project, will be introducing a bonus incentive scheme. Every farmer that buys 100 seedlings or more will be eligible to receive five tambalas per surviving seedling after two years.

Clearly these changes will have some affect on smallholder tree planting in Malawi. What remains to be seen is if the 200% increase in seedling price makes it difficult for poor farmers (those most vulnerable to wood scarcity) to buy seedlings, if poor farmers are able to take advantage of the incentive bonus scheme (high capital outlay and land requirements) and how well the Forestry Department is able to monitor the scheme. Extension workers are already unable to collect fees and fines for wood harvesting, counting trees would be just one more responsibility requiring time and transportation.

Land scarcity and lack of money to purchase seedlings may be just as important as the long-term pay-off of investments in forestry. The fact that more trees are planted per capita in the north than in the south (1.92 seedlings per capita versus 1.69), and that seedling sales experienced a significant jump the year the Carlsburg competition came in (in Zomba district seedling sales doubled) suggest that lack of financial incentives are not the only limiting factor in small farmer wood production.

9.8 Refugee areas

Mr. Kaliyozi, assistant headman in an area of large refugee populations, discussed his plans to start a small tree nursery with seeds he had collected from a few eucalyptus on his land. This area was almost entirely deforested. Many people bought fuelwood from refugees who gathered it across the border in Mozambique. The only alternative to purchasing fuelwood was lopping mango trees and they were in increasingly short supply.

Mr. Kaliyozi did not seem particularly interested in selling fuelwood, even though he could have gotten a fair price for it in this area, but was quite interested in producing it for his own use. He had at least 15 acres of land some of which was not good for food production and this is where he was going to establish his nursery and woodlot. He had not had any contact whatsoever with the Forestry Department.

The refugee situation in certain areas in the south presents a very difficult challenge to the Forestry Department. While relief agencies are providing refugees with food, they do not provide them with the fuel with which to cook it. This has created perhaps the most serious deforestation problem in the country. On the one hand there are acute land shortages due to this influx of people. On the other hand there is a desperate need to provide refugees and Malawians, with fuel - but where to grow it?

The Department's thrust to reforest bare hills of marginal productivity is a logical approach to this problem and as such can be considered at least a partial success. As mentioned above, bare hills are often the site for communal and individual woodlots. They are also the sites often proposed for government fuelwood plantations. The United Nations High Commission for Refugees is providing some funds for the Department to undertake these plantings to provide fuelwood for refugees and to arrest and reverse environmental degradation.

The impact of refugees on agriculture has been minimal. Although the refugees on the Malawi border do return to Mozambique to cultivate lands occasionally, they are usually not involved extensively in agriculture. Most of their food needs are provided for by the international relief agencies. Thus, other than the land occupied by villages, the refugees do not have a large impact on the crop production system in Malawi. There were some comments about the effects that the refugee's cattle may have on grazing lands, but the team was not able to pursue that issue.

Key Issues in Refugee Areas:

- More direct government intervention may be necessary to provide refugees with fuelwood (reforesting bare hills)
- Forestry Department needs to make greater effort to assist Malawian farmers in these areas to grow fuelwood
- High potential for profitable wood production

9.9 Tobacco and Maize Farming on Small Estates As Compared to Mixed Farming and Bush Fallow on Customary Land

9.9.1 Exhaustive Tobacco Farming

Mr. S. C. K. Phiri is a small estate holder. He has about 30 ha of land that he farms about 10 km south of Kasungu. He is fairly typical of many small estate holders in the region. He grows mainly tobacco and maize. Mr. Phiri previously grew air cured and some dark fired tobacco. More recently he has been growing Burley tobacco because he feels it gets a better price.

In addition to his main cash crop of tobacco he grows maize for sale, home consumption and to feed some of the people who work for him. Mr. Phiri practices a crop rotation typical for tobacco in this region: one crop of tobacco followed by a maize crop which is followed by two years of fallow. He uses fertilizer mainly on his tobacco, but some is used on maize. By planting maize after tobacco he uses some of the residual fertilizer from the previous tobacco crop to fertilize the maize.

We noticed that many of Mr. Phiri's rows were running up and down the hill instead of the recommended practice of running parallel to the contour or with a 2% slope. The explanation for following this practice, which exposes the soil to severe water erosion, was that it removed the water from the field faster which was better for the tobacco. There

was no evidence of intercropping, legume crop rotations, the use of manure or other soil improving practices on Mr. Phiri's tobacco and maize fields.

Mr. Phiri had very limited amounts of other crops such as: groundnuts, cowpeas, pumpkins, sweet potatoes and dry beans. We saw no fields of these crops and noticed only a few patches here and there that were planted to sweet potatoes or beans. When asked about them initially Mr. Phiri didn't mention that he had them. When asked a second time, he admitted having these crops, but dismissed them as being "decorative". Clearly his main interest is in cash cropping tobacco and maize. Additionally, extension workers discourage intercropping tobacco and pumpkins or other crops.

Mr. Phiri has several tenants who live on his estate, many of whom are women. They live in temporary shelters and care for the tobacco and maize during the growing season. During the rest of the season, they return to their homes and villages. They are paid at the end of the season after he has sold his tobacco crop. The tenants did have a few small parcels of land where they grew maize. Tenant farmers must spend much of their time caring for the tobacco and maize crops of the landlord, do not have permanent parcels of land, have very small land areas where they can grow some maize, little or no access to cash for inputs, and limited contact with extension workers. In short, they do not have many options for improving their production, their livelihood and their natural resource base.

9.9.2 Sustainable Mixed Cropping

Mr. Nashua Phiri is a medium size farmer on customary land. He has about 15 ha of land; about 6 ha is farmed while the rest is in bush fallow. He and his two wives worked the farm. In contrast to many farmers in Malawi, land was not his major constraint. He cited labor as his principal constraint.

Mr. Phiri's homestead and farming approach was very different from that of the farmer growing cash crops of tobacco and maize. We were particularly impressed with the diversity and number of crops grown. During our short visit we saw: maize, groundnuts, cowpeas, cassava, pumpkins, pigeon peas, guavas, bananas, oranges, sweet potatoes, dry beans, mango, and papaya. Mr. Phiri also had small plantings of gmelina and eucalyptus for poles and fuelwood, as well as numerous shrubs and grasses for edible green leaves, medicines and herbal tea. In addition to the cultivated crops, members of the family collected thatch grass, wild foods, edible greens and wild vegetables, as well as fuelwood from his farm. In several places Mr. Phiri set aside small areas near the compound for thatch or saved useful wild fruit trees as land was brought into production.

Crop cover and soil conservation was also impressive. We saw good crop ridging as well as mulching to conserve soil moisture. Mr. Phiri practiced relay cropping and intercropping of guava and maize, cassava and banana, banana and maize. He was experimenting with a dozen leucaena trees for fodder for his two cows. He had gotten the seeds for leucaena and his other tree crops from friends and relatives. He has started to expand his cash crops; he has built a small tobacco shed and is helping his father to grow tobacco. Mr. Phiri is clearly quite an innovative farmer. He enjoys having a diversity of

crops and activities on his farm and is able to sell many of his fruits and produce at the market in Kasungu.

There are great differences between the two farming systems described above. The exhaustive cash cropping of tobacco and maize on the first farm is not sustainable and will continue only until soil erosion, organic matter loss, pest buildup and soil fertility depletion make it more profitable to abandon that land for another location. In contrast, the second farm is very diverse and includes multi-storey cropping, relay cropping and intercropping in combinations and soil protection that result in both intensive and sustainable land use.

Key features for the mixed farming model include:

- Diversity of crops which provide income throughout the cropping season
- Nearby market for a wide variety of farm products
- Individual initiative of the farmer
- Sufficient land to allow a portion to be in fallow
- Interest and initiative in tree planting without government help or financial incentive

9.10 Agroforestry Potential in Mixed Farming

We visited farmers in the Makuru Village near Bolero in the Rumphi North Mzimba RDP about 12 km from Rumphi on the road to Chitipa. We joined an agroforestry survey team from Chitedze Research Station and ICRAF that was conducting surveys throughout the country. The survey team was especially interested in the use of trees by farmers. The initial introductions were carried out with six farmers in a group. Later the farmers, four men and two women were interviewed separately using two survey teams.

After the initial introductions one farmer was asked to speak about the kinds of field trees that farmers in that area used. He specifically mentioned trees used to increase soil fertility and was able to immediately mention five species commonly used by farmers: *Acacia albida*, *Acacia polyantha*, *Albizia harveyii*, *Khaya nyasica*, and Mzuzu (local name).

The first interview was conducted with Mrs. S. Gondwe and her daughter. Together they farmed nearly nine acres. Their principle food crops included maize, groundnuts, pumpkins and sweet potatoes. Their main cash crops were tobacco and maize. The two of them were the principle farmers, although they did hire extra labor at certain times of the year. With five acres of hybrid maize and three acres of local maize they feed their household of nine and have large amounts of maize to sell every year. In some years they also have groundnuts to sell.

In addition to staple food crops they also have numerous mango trees around their land, as well as bananas, lemons and guava in the dambo. They also grow dimba (garden) crops in the low areas near the river. Their diet is supplemented by collecting some wild fruits, vegetables and edible leaves in the wooded hillsides surrounding the valley.

Mrs. Gondwe and her daughter belong to a farmers club and get credit with which to purchase fertilizer and hybrid maize seed. Although the exact fertilizer rates she uses were not measured, the estimated rates show that she is applying close to those recommended by the extension service. The maize field that we saw, which was where the interview was conducted, looked like it would yield nearly 2.5 T/ha. She also uses fertilizer on her crop of Oriental tobacco.

Mrs. Gondwe does not own any cattle. She used to have cattle but gradually sold them to provide cash for school fees and other family needs. She mentioned that she really can't keep livestock because of the family's cash needs. If she were to get some livestock, she thought that she would prefer sheep or goats. Despite not having cattle she is able to get some farmyard manure from her neighbor. She applies the manure to her dimba crops and occasionally to her maize.

Mrs. Gondwe does not have any fencing on her farm. There is little problem with cattle eating the crops in the area because those who have cattle use herders to keep them away from the cropped area. Crop damage from stray cattle is not even a problem in the winter grown dimba crops in the dambos.

The land that she has is quite fertile and she does not allow it to go back to fallow. If she sees that maize yields are declining she usually follows with a crop of groundnuts. She is expanding her cultivated land area by clearing land and applying fertilizer and crop rotations to keep yields from declining. She did not know of any trees which were indicators of soil fertility other than Acacia albida, which was a sign of good fertility. She did mention that the grass Rhynclentrum repens was an indicator of infertile soils or declining fertility. She also mentioned that darker colored soils are more fertile.

Mrs. Gondwe does not have a woodlot on her farm. She prefers to use her land for food and cash crops. She says that she collects firewood from the forested areas on the surrounding hillsides. She does have a few boundary trees planted on her farm which she uses for fuelwood and building. On her farm we saw eucalyptus and gmelina - for fuelwood and building, Acacia albida, Acacia polycanthra - for soil fertility improvement, and Mitawa (local name) - used for fibre. She also mentioned that they prefer to use gmelina as a shade tree near the house.

The Acacia albida in her fields is not very densely spaced. When asked about this she mentioned that she did not plant it on purpose. The trees in the field were those that had been kept as they were clearing the land from the bush. She knew that A. albida were beneficial but had not thought about planting them in her fields. If given the seedling she said that she would plant them. She knew of several other field trees that were valuable, including: Mavila, Matwatwa, Nchiwka, Mafutu and Vibuyu (Adonsonia digitata). She also mentioned that guava was used for medicinal purposes.

For fuelwood Mrs. Gondwe listed six trees as useful: Muhana, Nipyoka, Muzguzgu, Miteta, Msukum, and Gmelina. She pointed out that the last two were not very suitable for fuelwood because they burned very quickly. She said that she would not set aside land to plant fuelwood, but would put trees along her boundaries. They would be willing to

plant A. albida in their fields, but not other trees. She also mentioned that she worried about having too many fields trees because they provide a place for monkeys to hide and make it easier for them to destroy crops. Mrs Gondwe ranked her interested in the use of trees in the following order: fruit trees, fuelwood, fodder, and soil fertility improving trees.

This particular farmer has the capacity to adopt a wide variety of agroforestry interventions. Border plantings of trees for fuelwood and poles, Acacia albida, or possibly leucaena (or a similar hedgerow species) to improve soil fertility and reduce the use of chemical fertilizer, and fruit trees are a few of the agroforestry approaches that could be used by this farmer. Tree planting in the area is common and many households are interested in fruit tree production.

9.11 Low Resource Mixed Farming

While driving on the road from Ntcheu to Blantyre we noticed a farmer that had a few trees planted around the house. There was nothing special about the house or the fields, but since it was close to the road, we stopped to see if we could talk to the farmer.

Mrs. Banda farms with her husband and eight children; however, she does most of the work because the children are small and the husband is usually occupied working as a builder locally. They have only a small amount of cultivated land, it appeared to be less than one hectare. In addition there was a dimba garden nearby and they used grazing lands farther away for their two cows.

As we walked along the path to the house we could see that several crops were grown, including: pigeon peas, bananas, sweet potatoes, pumpkins, maize. We later found out that Mrs. Banda also grows cassava, groundnuts, grain sorghum, finger millet, tomatoes, chinese cabbage, pineapple, and chile peppers. The chile peppers and some of the other vegetables and fruits are sold at the local market.

With seeds she had collected herself, she had established a windbreak of indigenous trees all along one border of her farm. She was also growing mango and guava trees and had tried to establish leucaena from seeds that an agriculture worker had given her husband. A couple seedlings near her house had survived and she showed us how to use them for mulch. Other seedlings she had planted in her field had not survived and the agriculture worker had never come to the farm. She had no contact with the Forestry Department.

Mrs. Banda grows a local variety of maize and does not use fertilizer. She knows about the fertilizer clubs but does not want to get fertilizer from them because of the danger that they will take the maize you need for food if she can't pay back the fertilizer loan at the end of a poor season. Also, she likes local maize because it tastes better, is less susceptible to attack by grain weevils, is heavier (and therefor brings a higher price), and is easier to grind and prepare.

Mrs. Banda and her husband do not have a steady cash income. They receive some cash from selling fruits, vegetables, chili peppers, and maize hulls. Her husband receives money for his occasional building jobs. Sometimes they sell maize to pay for school fees. However, when they do this they often have to buy maize later to feed the family. They have just started keeping cattle and are hoping to be able to sell them when they need cash.

Key features are:

- Farmer has already established diverse cropping
- Farmer is interested in innovation
- Farmer is interested in planting trees

10. Recommendations on Priorities and Strategies in Support of Success

The wide variety and number of promising initiatives described above show that small farmers can implement natural resource protecting and sustaining practices within their farming systems. The protection of biological diversity, soil fertility improvement, soil erosion control, water conservation, and improvement of forest cover are activities that can be taken up by small farmers. The key to implementing these successes over a larger area is to foster the types of institutions that will assist farmers in this effort.

The Natural Resources Management Assessment Team encountered a wide array of improved farming, forestry and agroforestry practices which have been implemented by farmers or are in the final stages of being tested by researchers and farmers. Included amongst them are:

Soil erosion control and soil moisture conservation:

- Marker ridges
- Buffer strips
- Grass waterways
- Elevated footpaths
- Gully reclamation
- Marker ridge stabilization
- Bench terraces
- Tied ridges
- Mulching

Soil fertility improvement:

- Use of *Acacia albida*
- *Leucaena* hedgerows and fodder gardens
- Use of manure
- Intercropping and relay cropping maize with legumes

Reforestation and improved vegetative cover:

- Community woodlots
- Planting fruit trees
- Individual pole woodlots as a small enterprise
- Farmer tree nurseries
- Tree planting for near houses and along field boundaries for shade and windbreaks, poles and fuelwood
- Agroforestry
- Bare hill planting
- Increased availability of tree seedlings

Biodiversity:

- Use of several varieties of the same crop in the same or different fields of a farm
- Utilization of bush fallow and natural forest for gathering wild fruits and medicines
- Cultivation of local maize varieties
- Village Forest Area program of Forestry Department

The above list shows that there are technologies that can be implemented through existing local and external supporting organizations to protect, conserve and improve the natural resource base vital to Malawi's rural people. An important ingredient needed to bring about these changes is to identify a set of strategies that will accomplish natural resource management goals and to outline action programs and plans that need to be undertaken by government and donor agencies to move towards these goals.

It is recommended that an Action Plan and Action Program be developed which contain natural resource management strategies. The Program and Plan should give particular emphasis to fostering farm and village level activities which have proven successful and should serve as a document to help the government and donor organizations to focus and coordinate their efforts and to play supporting roles in natural resource management activities.

An Action Program and Plan should examine not only the different sectors and issues explored in this report but, more importantly, the types of strategies that would integrate these examples of promising initiatives into comprehensive programs. By combining complementary natural resources conserving interventions, such as soil conservation and forest preservation, the total impact will be far greater than if interventions are seen only as single-purpose activities. This will be particularly important in areas of high population density where the pressures on all natural resources are severe.

Refugee-impacted areas are a clear example of areas that need a range of complimentary interventions that would include a special emphasis on conservation of protected areas through buffer zone management, agroforestry and reforestation. The

Mount Mulanje area and the Thyolo area in the south are other areas that the team visited that have significant biological diversity, high population density and, consequently, a great need for strategies to increase food and fuel production and carefully manage protected areas. As mentioned earlier, however, the changing social situation in areas of extreme land scarcity require innovative and flexible solutions. The Lakeshore area is another such high priority area that the team was not able to examine sufficiently. There, the interaction between land-based and water-based activities create a particularly complex situation and demand special attention. This region should, perhaps, be the basis of a separate section in the Action Program/Plan.

This Assessment identifies six areas in which natural resource strategies could be developed. Although the details of the strategies, their components and implementing and supporting institutions, are beyond the scope of this Assessment, the team feels that these areas bear further exploration through the development of an Action Program or similar activities.

10.1 Protected Area Buffer Strips

Although Malawi has protected a large part of its natural heritage, there are increasing problems of encroachment on protected areas as land and fuelwood scarcity grows. At present, the Department of National Parks and Wildlife and the Department of Forestry do not have the resources to develop and implement multiple-use, management plans for buffer strips around protected areas. Such plans are essential to the long-term viability of these important protected areas. Clear management plans need to be developed for the land and resources surrounding protected areas. Local participation in the development, implementation and benefits of these plans will give people a stake in the protection of national parks and reserves. Elaboration of a model plan (as a pilot project) around one or two national parks or reserves could serve as the basis for a national program.

10.2 Soil Erosion Control and Water Conservation on Customary Land

This strategy is directed towards conserving soil and water on customary lands under subsistence crop cultivation. The main focus of the strategy will be to work with farmers, villagers and rural institutions to install and maintain soil and water conservation structures on watersheds. Specifically, this strategy seeks to build on the already successful example of the Chigumula Conservation Catchment Area and extend it to a greater area.

10.3 Soil Erosion Control and Fuelwood Production on Tobacco and Cash Crop Lands

There are a number of laws in place that require afforestation and soil conservation on tobacco estate lands. Unfortunately, there is often little or no provision to help estate owners comply with these laws or for their enforcement in the event of non-compliance. This strategy attempts to address the issue of sustainability of the tobacco and cash crop lands by exploring a variety of institutional, policy, economic and technical incentives and disincentives.

10.4 Agroforestry, Mixed Farming and Species Diversification

The team observed several farms that contained a notable diversity of biological resources - for food, fuel and other products. Diversity in farm produce helps reduce risk from crop failure, maintain soil fertility, provide expensive goods such as construction wood and medicines and provides a more varied, nutritional diet. Many of the current agricultural and forestry technologies and extension messages, however, emphasize a reduction of diversity. The agroforestry and mixed farming strategy focuses on improving the long-term sustainability of food crop production as well as increasing on-farm species diversity. The strategy will focus on introducing agroforestry techniques, crop rotations, intercroppings, and improved farming systems.

10.5 Fuelwood and Poles From Natural Forest Management, Community Forestry and Fuelwood Plantations

This strategy aims at providing for farmers' long-term needs for fuelwood and poles. It recognizes that a combination of approaches is needed to address farmers' diverse needs for forest products. Natural forest management and community forestry techniques, development of nurseries, increasing species diversity, forest extension, as well as some work with fuelwood plantations would be part of this strategy. The strategy would pay special attention to looking at ways to involve local populations in the establishment, management and benefits of forests.

10.6 Lake Malawi Fish, Shore and Watershed Management

This strategy focuses upon protecting Lake Malawi, a crucial source of income, biodiversity, and protein. Regulation of the fishing industry, protection against water pollution, and prevention of soil erosion and spawning ground siltation will be the technical components of this strategy.

It is recommended that a detailed Action Program and Action Plan to conserve and improve the natural resources of Malawi be developed. Many ongoing government of Malawi, USAID, and other donor projects and programs will fit into the strategies mentioned above and should be considered as integral parts of the implementation of the strategies.

11. Summary

The need to reverse the decline of Malawi's natural resource base is becoming critical. A large proportion of the population is involved or directly dependent for their livelihood on agriculture and land based activities. The provision of basic food needs and gainful employment are closely tied to the diversity and sustainability of Malawi's natural resources.

Malawi, like many countries in Africa, has experienced increased human and animal population pressure, a breakdown of traditional systems and a lack of alternative sources of rural income generation. This trend has forced people to mine the natural resource base

to meet their basic needs thus threatening their long-term food security and source of livelihood. Programs are needed which will expand income and production from agriculture and forestry, while at the same time, protecting the soils, vegetation and wildlife that form the base for that production. Directly addressing the needs of the small resource poor farmers and villagers is an urgent need.

Numerous studies, tested technologies, pilot projects and successful farmer initiatives have provided the means and the models for a community based program to improve the rural natural resource base. The training organizations within Malawi, especially the Land Husbandry Training Centre, the Natural Resources College, and the Forestry College, could provide most of the technical skills needed to assist rural communities in this effort. The Forestry College in particular desperately needs financial support to fulfill its critical training function.

In short the means to implement programs to protect and improve Malawi's natural resources are at hand. An important missing link is the lack of a coherent action program which can foster and promote the implementation of activities that protect and improve Malawi's natural resource base.

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13. Itinerary

June 7 - July 5, 1989

The Assessment Team members extend their sincere appreciation to the Government of Malawi and the USAID Mission for their support during the Assessment. We also want to thank all of those whose names are listed in the itinerary below and who took the time to meet with us. We especially want to thank the farmers and villagers for showing us their work.

Wednesday, June 7

Andy Tainsh and David Trotman
Overseas Development Agency

Mr. S. K. Bhargava
FAO Forestry Officer

USAID, Nico House, Box 30455, City Centre, Lilongwe 3

Carol Peasely, Roberta Mahoney, Richard Shortlidge, Steve Shumba
USAID

Thursday, June 8

Ministry of Forestry and Natural Resources, Private Bag 350, Capital City, Lilongwe 3; Department of Fisheries, Box 593, Lilongwe; Department of Forestry, Box 30048, Capital City, Lilongwe 3; Department of National Parks and Wildlife, Box 30131, Capital City, Lilongwe 3

G. S. Z. Jere, Senior Economist, H. C. V. Chavula, Principal Administrative Officer, Mr. Phiri, Mining Department, Henri Nsanjama, Chief Parks and Wildlife Officer, R. W. S. Nyirenda, Assistant Chief Forestry Officer, B. J. Mkoko, Chief Fisheries Officer, G. M. Nongwa, Assistant Chief Fisheries Officer, S. A. Mapila, Principal Fisheries Officer, Dick Day, Program Officer, Stephen E. C. Shumba, Agricultural Program Specialist

W. B. Belo, Assistant Project Coordinator, Forestry Department; R. W. S. Nyirenda, Assistant Chief Forestry Officer; P. E. S. Mwale, Component Head (Plantations); F. Chiumia, Component Head (Planning); E. D. Misomali, Head, Monitoring and Evaluation Unit; G. H. Mtsendero, Forestry Extension and Publicity; M. W. M. Shaba, Principal Forestry Officer

Ministry of Agriculture, Box 30134, Capital City, Lilongwe 3

Dr. Enoch Ntokotha, Assistant Chief Agricultural Research Officer

Friday, June 9

Paddy Gallagher and Mr. Valassa, EEC; Bob Strickland, Save The Children Fund

Saturday, June 10

Kasungu RDP, P. O. Box 17, Kasungu

Mr. Chisenga, Project Officer, Kasungu RDP; Mr. Kasambala, Tobacco Field Officer

Mr. S. C. K. Phiri, small estate farmer

Mr. Nashuza Phiri, farmer on customary land

Sunday, June 11

Mr. Cornelius, Forestry Officer, Viphya Plantations

Monday, June 12

Mzuzu ADD, Management Headquarters, P. O. Box 131, Mzuzu

Joel Mwenechanyana, Project Manager, Mzuzu ADD and McKey Mphepho, Assistant Project Manager

Harry Kandaya, Land Husbandry Officer

Williams Simwera, Assistant Regional Forestry Officer - Mzuzu

Rumphi North Mzimba RDP, P. O. Box 229, Rumphi

Village Headman - Mulela Village, Bwengo

Austin Ng'oma, Head of Farmers Club and farmer planting trees and using manure

Mr. Mkandawiri, farmer with contour ridges

Dr. Alex Saka, Agroforestry Research Officer, Chitedze

Mr. MacMillan Matchere, Forestry Assistant - Rumphi

Smallholder Coffee Authority, Box 230, Mzuzu

Mr. Mbowela, Operating Manager of Smallholder Coffee Authority and Mr. H. Kalua, Division Manager - Mphompha

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Tuesday, June 13

ICRAF Agroforestry Team including: Dr. Alex Saka, Dr. Ngugi and Dr. Maghembe, ICRAF - Makoka

Mrs. S. Gondwe and her daughter, farmers from Makuru Village near Bolero

Nchenachena Training Centre, P. A. Nchenachena, Rumphu

Mr. Nyirenda, Acting Development Officer, Smallholder Coffee Authority - Nchenachena, and Mr. Chipeta, Field Assistant, SCA

Mrs. Esnat Chihana, coffee and vegetable farmer

Wednesday, June 14

Hector Banda, Assistant Parks and Wildlife Officer - Nyika

V. G. D. Mwale, Beekeeping Officer - Nyika

Thursday, June 15

Mr. Hagaman, FAO

UNDP, Box 30135, Lilongwe 3

Mr. Jamie Graves, UNDP

Mr. Rodney Nkaonja, Project Officer, Department of Forestry

Mr. Gottlieb, USAID

Friday, June 16

World Bank, Red Cross House, Box 30557, Lilongwe 3

Mr. Clough, World Bank Agricultural Officer

Sunday, June 18

Mr. Kammadzi, District Forestry Officer - Ntcheu

Mrs. Aleda Brown, customary land farmer south of Ntcheu

Mr. Peter Karenga, customary land farmer south of Ntcheu

Monday, June 19

Mr. Kazembe, Project Manager of Blantyre City Fuelwood Project, P/Bag 511, Limbe

Mr. Joe Muyaya, project Manager of Blantyre ADD, Box 30277, Chichiri, Blantyre 3

Mr. Banje, Acting Chief Research Officer and Mrs. Mhango, Horticulture Research Officer, Bvumbwe Research Station, P. O. Box 5748, Limbe

Mr. Mumba, Regional Forestry Officer, Southern Region

Miss Chawinga, District Forestry Officer, Blantyre District

Mr. Fortier, Red Cross

Tuesday, June 20

Mr. Phiri and Mr. Bentley Gondwe, Blantyre City Fuelwood Project

Mr. Kunthembwe, Traditional Authority

Mr. Chikwakwa, farmer

Mr. William Kayuni, Senior Land Husbandry Technical Officer of Blantyre ADD, P. J. C. Mwafulirwa, Development Officer for Blantyre ADD South, C. P. N. Allon, Field Assistant for Chigumula Section, Mr. Sumbuleta, Chigumula Village Headman, Mr. Mphero, Chigumula Conservation Catchment Area Committee Chairman, Mrs. Mijoso, Chigumula Conservation Catchment Area Committee member.

Mr. M. J. Kwalira, Assistant Chief Technical Manager and Mr. Chigaru, Production Manager for Thyolo North, and Mr. Jonas Negow, Field Assistant for Mianga - Smallholder Tea Authority, P. O. Box 80, Thyolo

Mrs. Bamusi and Mr. J. Jambo, smallholder tea farmers near Mianga.

Mr. Alfred Ntonga, Environmental Editor, Daily Times, P/Bag 39, Blantyre,

Mr. Skip Gilbert, Africare, Box 2361, Blantyre

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Wednesday, June 21

Mr. Ng'oma, Principal, Land Husbandry Training Center, P. O. Box 233, Zomba

Professor Ngugi and Mr. Hendrik Prins, ICRAF Regional Centre for Southern Africa, Makoka Research Station, P. O. Box 134, Zomba

Mr. Mwaleni, District Forestry Officer - Zomba

Mr. Kanadji and Mr. Mzoma Ngulube, Forestry Research Institute of Malawi, Box 270, Zomba

Mr. L. Masukwa, Center for Social Research

Mr. Rabson Jambe, Villager with woodlot; Mr. Makalas Subeli, Villager with nursery and woodlot

Thursday, June 22

Mr. Matali, Land Husbandry Field Officer, Mr. Maseko, Animal Husbandry Field Officer, Mr. Musiyzwiriyo, Senior Land Husbandry Assistant, and Mr. Matwengo, Forestry Technical Assistant - Mulanje, Phalombe RDP

Mr. Mabengo, Forestry Assistant - Mulanje

Friday, June 23

Blantyre
Lengwe

Saturday, June 24

Liwonde

Sunday, June 25

Mr. McDonald Ndekete and Mr. Graciano Kamgultse, Forestry Assistants, Mangoche

Monday, June 26

Mr. James Martin, U. S. Embassy, Refugee Officer; Mr. Charles Chaulouka, Dedza District Relief Officer

Mr. Kapese, Kapese Village Headman; Mr. Kaliyozi, Maisalani Village Headman

Mr. Mvula, Lecturer, Malawi College of Forestry

Tuesday, June 27

Dr. Alex Saka, Agroforestry and Soils Commodity Team Leader, Mr. Felix Kisiyombe, Biometrician, Chitedze Agricultural Research Station, P. O. Box 158, Lilongwe

Mr. Kanyinji, Deputy Principal, Natural Resources College, P. O. Box 143, Lilongwe

Mr. Kulapani, Technical Assistant, Energy Studies Unit

Wednesday, June 28

Carol Peasely, Richard Day, Roberta Mahoney, Steve Shumba, USAID

Thursday, June 29

Mr. Mwakalagho, Deputy Assistant Chief Agricultural Officer

Mr. David Harris, Land Use Advisor to the Smallholder Coffee Authority

Friday, June 30

Mr. H. C. V. Chavula, Principal Administrative Officer, Mr. Phiri, Mining Department, Henri Nsanjama, Chief Parks and Wildlife Officer, R. W. S Nyirenda, Assistant Chief Forestry Officer, B. J. Mkozi, Chief Fisheries Officer, G. M. Nongwa, Assistant Chief Fisheries Officer, S. A. Mapila, Principal Fisheries Officer, Dick Day, Program Officer, Stephen E. C. Shumba, Agricultural Program Specialist

Mr. Green, Land Resources Evaluation Project (UNDP/Min. Agric.), P. O. Box 30291, Lilongwe 3

Saturday, July 1

Dr. Richard Tinsley, Agronomist, MARE Project

Dr. George Khanyama-Phiri, Bunda College

Sunday, July 2

Report Writing

Monday, July 3

Report Writing

Tuesday, July 4

Report Writing

Wednesday, July 5

Departure

14. Scope of Work and Team Composition

MALAWI NATURAL RESOURCES MANAGEMENT ASSESSMENT

Objectives and Purpose

1. Assist USAID/Malawi to prepare for future natural resource management and biological diversity programming and the future Action Program/Action Plan.
2. Identify, document and assess improved NRM and biological diversity practices by farmers, foresters, and others involved in land and related natural resource based activities.
3. Identify and assess key NRM and biological diversity issues most likely to need attention in the near future.

Final Product

The final product of the Malawi NRM Assessment Team will be a report that assesses Malawi's NRM and biological diversity successes and priority concerns. The report will include the following:

- Identification and documentation of successful NRM and biodiversity interventions.
- Identification of important policy issues
- Tentative recommendations to further cooperation between donors and NGO community in NRM and biodiversity efforts.
- Biodiversity and tropical forestry assessment to satisfy Sections 118 and 119 of the Foreign Assistance Act.
- Other NRM related issues depending on Mission needs and time available.

Scope of Work

For the NRM Assessment each team member has tasks which are common to all of the team members; these are:

Before departing the US the team members should: 1) obtain and review relevant reports and publications in Washington, D.C. before departure; 2) meet people from AID, contractors or other donors who have worked previously on natural resources and related issues in Malawi; and 3) make a preliminary list of people, organizations, projects and places to visit while in Malawi.

Upon arrival in Malawi the NRM Assessment Team members will: 1) participate in meetings with USAID/Malawi personnel, GOM officials, PVOs and other bilateral agencies to determine priority NRM issues; 2) identify a range of sites to visit that represent promising NRM initiatives

While in the field and during interviews with government, donor and PVO and NGO personnel team members will: 1) interview farmers, foresters and those involved with land based activities and project personnel and give particular attention to attitudes towards natural resource issues; 2) review government policies, regulations, international treaties, and effectiveness of laws; that relate to natural resource issues; 3) assess extension, training and communications activities that relate to natural resource issues.

In the report preparation phase the NRM team will: 1) work with team to analyze and synthesize findings of field work; 2) prepare a final report which describes the results of the field work and highlights the salient points.

The scopes of work particular to the discipline of each NRMS Team member are:

Social Forester: 1) determine priority NRM and social forestry issues, 2) identify sites to visit in the area of social forestry, agroforestry and fuelwood; 3) during interview pay special attention to attitudes towards trees and tree products, forestry regulations, extension strategies and gender issues in forestry 4) review forestry regulations which affect smallholder tree production and utilization.

Biodiversity Specialist: 1) determine the priority ecological and biodiversity issues in Malawi; 2) visit sites that represent promising biodiversity initiatives; 3) during interviews focus on projects and activities affecting biological diversity both in and outside of protected areas, including species selection for agriculture and forestry projects and human interactions with wildlife; and 4) review existing GOM and donor policies affecting wildlife.

Agronomist: 1) determine the most important issues in subsistence and cash crop production that relate to NRM issues; 2) visit sites and conduct interviews which focus on NR issues such as soil erosion, water management, sustainable production, agroforestry, soil fertility depletion and agricultural chemical use; 3) review existing government policies that relate to both food production and NRM issues.

Malawi NRM Assessment Team Composition

There were three members of the Malawi NRM Assessment Team: Ms. Karen McKay (M.S.), social forester, Ms. Virginia Ravndal (M.S), biological diversity specialist, and Mr. Chris Seubert (Ph.D.), soil scientist/agronomist and team leader.

Karen McKay is a social forester and core member of the NRMS Project staff, who is familiar with the forestry, agroforestry and forest policy aspects of NRM Assessments as well as natural resource information systems. She worked for two years in the Central African Republic and worked with the NRMS Project field team on the recently completed NRM Action Program and Action Plans in Mali.

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Virginia Ravndal is a wildlife management and ecology specialist who has worked in Latin America and Africa in the sustainable use and conservation of animal and plant resources. her work has included studies of forest ecosystems, wildlife monitoring, environmental education, as well as environmental policies and regulations. Ms. Ravndal prepared a separate, full report entitled: An Overview of Issues Pertaining to Biological Diversity Conservation in Malawi.

Chris Seubert, an agronomist and core member of the NRMS Project staff, has a broad and varied long-term experience in Africa, particularly in Swaziland and Zimbabwe. He has also worked on short-term assignments in Burkina Faso and Nigeria, as well as a recent NRM Action Program and Action Plan for The Gambia. His work has included jungle clearing techniques, farming systems research and extension, crop and soil modeling, soil erosion and land capability studies and micro-computer training.

Annex I

The Forestry Sector in Malawi

Malawi has been well-endowed with forest resources. In 1987 forest land as a percentage of total land area was estimated at 38%. Miombo woodland, (Brachystegia - Julbernardia - Isoberlinia) is by far the most widespread forest formation in Malawi. This open canopy, broad-leaved forest is found primarily on the heavily populated plains and plateaus and on lower mountain slopes. It has a rather low productivity with a mean annual increment of approximately 1.5 cubic meter/ha/year. In areas of population pressure and consequent fires and clearing this figure is reduced to as low as .8 cubic meter/ha/year. Many of these miombo woodlands are being severely degraded through deforestation, burning and grazing.

Other forest types include 'Mopane' woodland (Colophospermum mopane), a few scattered relics of lowland rain forest, gallery forests along rivers, streams and lakes, and montane, submontane and coniferous forests at higher elevations. It is in these forest areas that one finds some of Malawi's most unique and valuable forests and forest species, both from an ecological and an economic perspective.

Malawi is fortunate in having established early on both forest reserves, which serve a protection role for watersheds and fragile areas, and forest plantations. Industrial plantations, composed primarily of Pinus spp. now cover approximately 75,000 hectares. The Viphya plantation in the north accounts for 53,000 hectares of this. These plantations, give Malawi a much needed buffer against absolute wood scarcity for domestic needs as will be discussed below.

In addition to industrial plantations, the Forestry Department has established fuelwood plantations, primarily of Gmelina arborea, Eucalyptus spp. and Pinus spp.. The primary purpose of most of these plantations has been to supply urban centers with fuelwood. There are large plantations around Lilongwe and the Blantyre/Zomba area and proposals to establish more plantations.

Forest Classification and Use

In general forests in Malawi can be placed in five different classifications: forest reserves, plantations, national parks, forests on customary land and forests on leasehold or estate land. The Department of National Parks and Wildlife protects and manages forests in national parks. Harvesting and other extractive utilization is generally not permitted, however, in areas of extreme fuelwood scarcity as at Lake Malawi National Park, people are allowed to collect headloads of deadwood for a small charge.

Forest Reserves were established to protect watersheds and fragile areas such as steep slopes and waterways. These functions are critical in Malawi which has an extremely dissected terrain and a high potential for erosion and consequent degradation of water

supplies. In addition, the importance of Lake Malawi and the Shire river to the nation's economy and ecology require that very close attention be paid to watershed protection.

All wood from forest reserves must be purchased. There is some controlled wood removal in reserves both for commercial and domestic purposes. Headloads for domestic use must be purchased at 10-15t/headload. Grazing permits are also issued at most forest reserves.

In the last few years, several forest reserves have experienced extreme encroachment problems. These problems are concentrated, but not limited to the southern, more densely populated region. The Mulanje Forest Reserve, which is in an area of one of the highest populations densities in the country, has had to redraw its boundaries to accommodate squatters and establish a police station on the edge of the reserve to discourage further encroachment. Other reserves, such as the Mvai reserve between Dedza and Ntcheu, are being severely overgrazed and deforested for fuelwood. Part, but certainly not all, of the problem stems from the influx and concentration of Mozambican refugees in these areas.

As mentioned earlier, forest plantations have been established in several parts of the country. The initial program focus, started in the 1950s, was to establish industrial timber plantations for sawtimber, pulp, veneer, etc. Much of this production was intended for export. These plantations are almost exclusively of pine (Pinus patula) with a small amount of eucalyptus.

Due to transportation and market difficulties, some of these plantations have not been fully utilized. Shortages of manpower and management capabilities have led to stagnating stands with wasted wood and the risk of forest fires in some areas. The Forestry Department and donors are beginning to reconsider the original intent of these plantations and explore ways to use them more fully for the country's pressing energy needs.

The tradition of industrial plantations of exotic species set the stage for the initial method of coping with the growing fuelwood crisis: fuelwood plantations. Fuelwood plantations have been, and are continuing to be established, outside of the major urban areas of Lilongwe and Blantyre. All in all approximately 18,000 ha of fuelwood plantations have been established by the government. The initial species of choice were Gmelina arborea and Eucalyptus spp. with some pine. Now, these plantations are composed almost exclusively of eucalyptus.

Another, smaller scale approach to fuelwood plantations is the creation of various community based fuelwood plantations. These have ranged from school to village woodlots. Although the emphasis is still on devoting a plot of land to trees, these approaches work in closer coordination with rural people. Village woodlots, for example, are created on a piece of land designated by the village headman. Labor is often organized on a communal basis. The village headman has an important say then in how the trees are eventually used and distributed. Again, the majority of these woodlots are stocked with eucalyptus.

The rapidly growing leasehold or estate sector in Malawi provides unique challenges for forestry. Tobacco estates require large quantities of fuelwood for curing tobacco and constructing barns. This is due not only to the nature of the operation but also to extremely inefficient barn design and management, some of which is now being addressed. Tobacco estates are also required to plant a certain percentage of their land in trees, something which will be discussed further below.

Communal land holds the greatest percentage of forest land in Malawi: approximately 56%. This land is held on a communal basis with Traditional Authorities and Village headman allocating land to farmers. Although farmers do not have official title to land, there does not appear to be any ambiguity towards who has the right to a piece of land and the trees thereon. Farmers seem quite secure in their rights to the land that has been allocated to them and pass it on to the next generation according to both matrilineal and patrilineal customs, depending on the area of the country. Local authorities also have the authority to designate unused areas of land as sites for community woodlots. There are signs that growing population pressures and critical land shortages may be eroding the authority of these traditional structures in some areas.

Although local authorities have the right to designate areas for tree planting, the Forestry Department has authority over all natural forests and trees on communal land. Headloads of firewood from communal land for domestic use may be collected for free. Anyone selling wood from a natural stand, even from land allocated to the farmer, must have a license or permit. For any of the eleven protected trees the farmer must also pay a fee. Planted trees generally fall outside this rule and a farmer is free to sell any wood s/he has raised.

There are several problems with this system, which was set up to reduce deforestation. Currently, there is no way to transfer licenses. Therefore, while the woodcutter may have a license he cannot pass it on to the wood buyer. Further down the road, the wood buyer may be stopped by forest guards and asked for a license which he does not have. I encountered one farmer who was cutting down some trees to clear his fields. He said he had asked the Department for a permit, but they refused to give him one. The farmer was selling bundles of wood along the side of the road anyway.

In addition to the communal woodlots mentioned above, the Forestry Department has a strategy for the creation of Village Forest Areas which are areas of natural woodland that the village decides to maintain and manage. The Department assists the village with management plans and advises them on utilization. Before independence there were many of these Village Forest Areas. Since independence, however, they have been largely neglected by the Department. It is only very recently that farmers and the government are showing a renewed interest in Village Forest Areas.

Some Issues and Activities in the Forestry Sector

Many of the priority issues related to the forestry sector in Malawi have already been mentioned. This section explores a few of these concerns in a bit more depth, examines some of the underlying constraints to sustainable forestry in Malawi and puts forth a few possibilities for addressing these constraints.

The Forestry Department is beginning a shift of emphasis from the straightforward task of production forestry (i.e. producing trees) to the complex task of social forestry. They are doing this in a variety of ways and with the help of several international organizations.

Production forestry has held a prominent and important place in Malawi. Forest plantations, which are generally more productive than natural woodlands, provide important wood products and help to relieve pressure on natural woodlands by producing more wood on less land. Production forestry is particularly important to deal with the fuel needs of tobacco estates and to satisfy needs for sawtimber and other industrial products. In the south, local populations are benefitting from the opportunity to collect waste wood and thinnings at a small charge from nearby forest plantations.

The Viphya plantation in the north, is now providing charcoal on a small scale to industries and domestic users who would otherwise be burning indigenous (and illegal) charcoal. The potential for sustainable charcoal production from the Viphya and other plantations to help supply the energy needs of Mozambican refugees in the south, urban and rural Malawians and, perhaps most importantly, the tobacco industry is only now beginning to be explored. Although there are several limitations (such as transport costs for charcoal from the Viphya which, although it is an enormous plantation, is far from population centers) there is also great opportunity thanks to this past investment.

Government managed, production forestry to produce fuelwood for rural and urban populations is, however, a rather different proposition from the situations mentioned above. It produces a very expensive fuel for an impoverished market that has a strong tradition of not paying for fuel at all. Currently, government produced fuelwood is highly subsidized. But the World Bank is encouraging the government to raise fuelwood prices to equal replacement costs. The World Bank estimated establishment costs for one hectare of government fuelwood plantation at MK 894 at 1986 prices. By comparison, the same area of woodlot established by a small farmer was estimated at MK 258. The price charged for wood produced from government plantations is now MK 3.50/stacked cubic meter. It costs the govt. approximately MK 21.50 to produce this same quantity of wood. Even collecting the nominal sum now charged is difficult given the shortages of staff, the distances farmers must walk to obtain licenses and the general income levels of the average farmer.

In effect then, the government is currently spending money producing wood that, unsubsidized, is far too expensive for most of the population to afford. At the same time, the illegal cutting and sale of wood from natural forests, not to mention the production of charcoal, continues at a rapid pace.

As discussed under "promising initiatives" in the main report, the Forestry Department has a number of approaches to farmer-level forestry problems. Forestry Assistants and District Foresters work with traditional leaders encouraging them to start village woodlots. The Department provides training, seeds, plastic tubes for seedlings and follow-up. The community decides where the woodlot shall be located and organizes all labor. Foresters also work with schools and local branches of the Malawi Congress Party to set up similar woodlots. The Department works with individuals to help them establish their own nurseries and woodlots on their land. These farmers often contact foresters at a government nursery or are prominent farmers and therefore known to agriculture extension agents. Village forest areas - while not as widely promoted as the programs above - seem to be growing in popularity as farmers and foresters realize that eucalyptus cannot be all things to all people.

Several donors, primarily the World Bank and FAO, are placing increasing emphasis on social forestry - helping farmers to grow their own trees. As discussed above, farmer-grown fuelwood is at least three times less expensive than government grown fuelwood. In addition to this reduced expense for government and donors, this approach also gives farmers the option of growing their own wood, thereby avoiding the expense and hassle of purchasing permits from the government or of gathering it from increasingly remote natural woodlands. In some areas in the south this latter option no longer even exists.

Different donors, however, have different approaches to the same end. Three different donors - The World Bank, U.N. FAO and NORAD's Blantyre City Fuelwood Project - serve as illustrations of three very different possible approaches to non-industrial forestry in Malawi. Additionally, the EEC has been and continues to be involved in funding government fuelwood plantations proposals for which will also be discussed. UNHCR is also funding government fuelwood plantations, but with the goal of providing fuelwood for refugees and replacing some of the forest cover already lost due to increased population pressure. Other donors have been involved in forestry projects in the past and continue to fund certain activities through integrated rural development projects. The ODA has provided funding for a women's dormitory at the Forestry College at Dedza. This should make a big difference in the number of women foresters in Malawi.

The World Bank's Wood Energy Project has been in place since the mid-1970's and has been a major force in forestry in Malawi. In addition to much-needed materials and personnel support, the Bank has helped to set up the government-run tree nurseries throughout the country which, up to 1989, have sold subsidized seedlings to farmers. Starting in 1990, seedling prices will be raised from one to three tambala - full recovery cost. At the moment, the nurseries are one of the key components of the forestry extension effort and have been instrumental in helping communities and individuals establish woodlots. Although the species composition is dominated by eucalyptus, fruit trees will soon be available.

The newest phase of the Wood Energy Project has just recently started up. The Bank is encouraging the Forestry Department to move away from government produced fuelwood and towards farmer produced wood. Three key elements of this will be full cost-recovery of wood sold by the government, the bonus incentive scheme and greatly increased

enforcement of existing regulations. The rationale behind the first is that by raising the price of fuelwood it will become financially attractive for farmers to raise fuelwood for sale. The second strategy hopes to build upon this by offering a bonus of five tambalas per surviving seedling after two years. This is offered to farmers that have bought one hundred seedlings or more.

Given the up-front capital requirements, not to mention land and labor, it is unlikely that this program will help the smallest smallholders. A 1985 survey showed that the great majority of farmers planted 1-10 trees a year. Less than five percent planted more than 100 (except in the Central region where that figure raised to 15%). It may indeed stimulate additional demand on the part of better-off farmers with extra land.

Such farmers are already stepping in to take advantage of good prices for poles and will undoubtedly continue to do so. It is not clear whether or not the government will try to prevent farmers from selling wood in the form of high-value poles instead of fuelwood. Of course, higher wood prices will necessitate the third strategy of increased enforcement to catch illegal woodcutters out to take advantage of good prices. At the same time, the bonus incentive scheme will require forestry agents to spend time in the entrepreneurs' fields keeping track of how many seedlings have lived and died, not to mention the paper work involved.

Agents will be busy helping farmers who can afford a minimum of MK 3.00 for seedlings, plus enough land and labor for a profitable woodlot, and hunting down offenders. Where is the average poor farmer without enough land, money or labor to take advantage of the bonus incentive scheme? He or she is out trying to gather the free headload of wood from what's left of the natural forest. Or she is lopping mango trees or burning dung. Finally, unless she's able to grow some of her own wood or participate in a village woodlot, she may have to pay the higher prices for fuelwood.

The FAO has a brand new forestry program in Malawi. It's main focus is social forestry and, although it has barely gotten off the ground, it's key programs have already been implemented in Southeast Asia. Briefly, there are three components: "learning by earning", "a tree for every child", and "employment guarantee through forestry".

The first two are fairly straightforward. "Learning by earning" involves school children. The Forestry Department helps the school in the target village to start a school nursery. It provides seeds, tubes, etc. When the seedlings are ready to outplant the project then buys them from the children (at three tambala each) and gives them to the children's parents to plant on their farms. This approach differs from the Forestry Department's own school woodlot program in that it pays the children for the seedlings. "A tree for every child" plans to purchase grafted tree seedlings and give them to village children.

"Employment guarantee through forestry" is a bit more complex than the first two. Basically, the Department works with the village committee set up to work on the project, to find a piece of land for a village woodlot. In Mangochi, this area is thirty-six hectares of forested land unsuited to agriculture. The community is then supposed to designate several families to manage this woodlot area. The Department will work with the village

to manage the woodlot. Currently, the Forestry Department is clearing the land and carrying out species trials for eucalyptus. The village will decide how to distribute the woodlot production. In addition, each family will be paid a regular wage. Again, this is similar to the village woodlot and village forest area schemes of the Forestry Department except that here villagers are paid for their labor.

Both the World Bank and the FAO programs call themselves social forestry. Both have different approaches and therefore send mixed messages to the government in its fledgling attempts at implementing social forestry programs with farmers. Yet both programs have a common theme - paying people to plant trees.

There's nothing very new in this idea. The question is, how sustainable is this approach and what kind of message is it sending farmers? How willing will farmers be to participate in the government programs mentioned above (no payments) when the World Bank and the FAO are handing out money down the road? What happens when the World Bank and the FAO turn to other things? Trees will have been planted. But will the Forestry Department be able to continue the programs without the payments?

A third approach to reforestation is the Blantyre City Fuelwood Project (BCFP), a SADCC project funded in large part by NORAD. Although not a social forestry project it, like many other government-managed fuelwood projects, has references to project personnel working with farmers on their own farms in addition to running the plantations. Ten thousand hectares are allocated to fuelwood production for the urban population in Blantyre. They are currently being planted to Eucalyptus by the well-staffed and well-housed Forestry Department personnel. Traditional authorities allocated marginal land for these plantations, although there were some cases of the Department using better land. Local people are benefitting from the project through employment and some infrastructure improvements. Presumably they also have access to thinnings for fuel. They were not, however, able to purchase seedlings from the project when the government-run nursery in the area ran out. All the seedlings were needed for the plantations.

Another component of the BCFP is the 10,000 hectares designated for natural forest management. There appears to be no progress yet on inventories, management plans, etc. Yet other projects refer to using BCFP as a model for natural forest management.

The EEC has put forth several proposals for fuelwood plantations - this time to supply primarily rural people. The enormous expenses of roads, water, personnel and other infrastructure are similar to the peri-urban plantations. Yet these plantations are not for people in the cities who are unable to grow their own fuel. The proposal for the Lilongwe Rural Fuelwood project, for example, aims to provide fuelwood for the rural population and the city of Lilongwe. Instead of helping the farmers and communities in the area to plant the bare hills and use agroforestry on the large farms, the government will move in with roads, new buildings (a project headquarters just three kilometers from the existing forestry buildings), eleven forestry agents (three of whom are supposed to work on extension), a school and other infrastructure. The proposal does have a one sentence reference to encouraging small farmers to plant trees.

Constraints and Concerns

The Forestry Department is being faced with somewhat conflicting messages from different donors. The World Bank's straight economic approach of raising prices and providing monetary incentives has little to do with the social and community forestry approach that emphasizes farmer participation and self-sufficiency. FAO's new program also uses monetary incentives but in a much more complex fashion that hopes to encourage community decision-making. Both of these approaches are less than a year old and it's impossible to judge whether either will be a success or a failure. They should be carefully watched and monitored not only for how many trees they produce but for who the beneficiaries are.

Neither the FAO nor the World Bank approach builds upon the types of initiatives mentioned above where communities and individuals had decided to start their own woodlots or tree plantings with little more input than encouragement, seeds and some plastic tubes from the Forestry Department. This raises the question of long-term sustainability.

In the beginning stages of any new approach there are bound to be problems. Lack of experience, reversion to familiar methods, errors and missed opportunities are inevitable. The Forestry Department's efforts to adopt social forestry and move away from an exclusive focus on production forestry have not been without setbacks.

Malawi is now in the difficult transition period between straight production forestry and a combination of production and social forestry. Finding the proper balance between these two approaches will continue to be a challenge. The difference between these two approaches is simple but extremely important. A production forester deals with trees and forests, making them produce in a certain way according to his, or in the case of government plantations, the government's needs. A social forester deals with people, helping them to produce trees, or forest products, in a variety of ways depending on their needs. Each approach satisfies a different need and requires different operating and staffing patterns. Production forestry has no real need for extension workers; social forestry cannot produce without them.

Not surprisingly, given its historical orientation, the Forestry Department finds itself with a critical shortage of extension workers and a general lack of training in social and community forestry at all levels of the Department. The shortage of extension workers has placed the frontline workers - guards and patrolmen - in the unenviable position of having to be policeman and advisor at the same time. Most Department personnel with whom I visited expressed this as a problem. It can be difficult to convince a farmer to plant a tree when the day before you were fining him for cutting one down. Building farmer trust, crucial to any extension effort, can be a real problem in this situation. When asked about their contact with the Forestry Department villagers often had no contact or mentioned the various prohibitions on cutting down trees.

This is in no way meant as a criticism of the extension workers. The extreme urgency of the deforestation problem, coupled with their lack of numbers and training, is bound to lead to such results. The truly hopeful note is that so much is happening in spite of these limitations.

The Forestry Department must rely on the better staffed and more extensive agricultural extension system to deliver their message. Forestry Department personnel understand this necessity and noted the importance of working together with agriculture. Given that agriculture extension workers have their own extension message and receive little to no training in forestry, this is only a partial solution to the problem.

The problem of training, and specifically the institutional weaknesses of the Malawi College of Forestry and the Forestry Research Institute of Malawi, must be addressed if social forestry and agroforestry are to go forward in Malawi. Farmers, and particularly small farmers, are not being reached by the Department's limited field workers. Field workers are not even able to keep up with illegal wood harvesting and charcoal making, much less get out to contact small farmers and help them with their forestry needs. Increased prices for government produced wood is likely to intensify this problem as more marginal farmers are forced to poach wood.

The Malawi College of Forestry, established near Dedza in the 1950s is the only source of forestry training within Malawi. It offers two year certificates for technical/forestry assistants, three year licenses for foresters and short courses for guards, patrolmen and nurserymen. These short courses: 4-6 weeks, are barely enough time to learn some basic nursery and tree planting techniques, much less extension techniques, natural forest management and agroforestry. The number of female students has been limited to a handful due to a lack of housing. A women's dormitory is currently under construction and the Department hopes to eventually have at least 50% women students.

The College suffers from critical shortages in all areas. Instructional staff generally have little more training than the students they are teaching. Books and current literature are nearly non-existent. Information on extension techniques, so necessary for the current challenges facing Malawi's forestry sector, is hard to come by. Relevant information on Malawian forests must come from the Forestry Research Institute of Malawi (FRIM).

FRIM is called upon to support government and donors in their forestry activities from pine plantations to agroforestry. Yet the Institute rarely receives funds from these projects and therefore is extremely underfunded and understaffed. Several individuals from different organizations seemed to think that FRIM was too conservative and only researched pine species. The discussions I had with FRIM staff indicated they were eager to respond to the challenges of agroforestry and natural forest management but needed funding.

This creates particular difficulties for foresters when attempts are made to enter new areas of forestry such as agroforestry or natural forest management. Although agroforestry has been largely left to the Ministry of Agriculture, FRIM is still called upon to identify promising species and provenances, planting densities and other silvicultural information.

Through social forestry and land scarcity, forestry is being drawn inexorably into agroforestry. In trying to help small farmers plant trees, foresters and nurserymen should be well versed in agroforestry species and techniques.

Although the Department has the policy of promoting Village Forest Areas and devising management plans for natural forests, in practice, foresters and extension agents have little management advice to give farmers once such an area is demarcated. The Blantyre City Fuelwood Project discussed above, illustrates the lack of information on natural forest management in Malawi. Management plans, harvesting schedules and determination of sustainable yield cannot be accomplished without some basic research.

This area of natural forest management, or the lack thereof, brings up another area of concern within the forestry sector in Malawi. As mentioned earlier, the emphasis on plantations naturally led to an emphasis on monoculture. Given the low productivity of many of the native species, exotics such as pine and eucalyptus were chosen.

Today, it's very easy to distinguish a planted tree from a non-planted tree: the planted tree is Eucalyptus spp.. Government nurseries are typically stocked with 90% eucalyptus. Farmers probably plant more than 90% eucalyptus. Trials for suitable species consist of comparisons between 3 or 4 different species of eucalyptus.

Given the high demand for poles and the need for fast-growing species that coppice for fuelwood, eucalyptus makes a lot of sense and seems to be the species of choice among small farmers. Because social forestry emphasizes listening to farmers and helping them grow the trees they want, eucalyptus will continue to be planted on farms. The impact this has on biological diversity and natural forest management needs to be addressed. Large amounts of natural forest have already been replaced by exotics and they are unlikely to be restored. The need to efficiently manage what little natural forest remains for a diversity of products becomes even more critical in this situation.

Small numbers of villages are interested in Village Forest Areas. The District Forester in Zomba received 11 requests last year to establish these areas. He said that villagers were interested primarily in food and medicinal products that were traditionally found in natural forests. But, unless foresters can work with villagers to make these small forest areas as productive as possible it will be difficult to preserve them and the diversity they contain in the face of mounting land pressure.

Strategies to Complement Existing Activities

There are obviously many areas in which support for the forestry sector is possible. Based upon the successes, constraints and current activities identified above, the following areas are put forward for consideration.

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Human Resources Development and Training

The shortage of extension workers and their lack of training is a critical bottleneck in the expansion of small farmer tree planting. The World Bank does not seem to have a comprehensive training program or any provision for training. FAO provisions for training in conjunction with their program needs to be determined. This constraint can and should be addressed on two levels.

o Malawi College of Forestry

The Malawi College of Forestry desperately needs improved training of its staff. This implies degree training abroad in forestry for College instructors. This would be a logical area of support for donors.

Another area where support to the College could be valuable is the area of curriculum development and short-courses for extension workers. Experts in agroforestry, social forestry, natural forest management and forestry extension could be brought in or temporarily seconded from on-going projects to teach short courses, develop curriculum and advise on suitable literature, materials and training approaches.

Included in any funding for the latter activity should be generous provisions for transportation of students to visit sites and materials which can be left with the College for future use.

o Short courses in agroforestry, social forestry, extension

Training of trainers, working with counterparts in extension, practical workshops, visits to view successful initiatives - all of these are approaches to training which can be taken at the project level or through the work of a PVO.

Currently, PVO activity is lacking in the forestry sector in Malawi. Elsewhere in Africa, PVO involvement in the areas of private nursery establishment, school nurseries, training of trainer workshops in extension techniques, farmer to farmer visits and other activities has helped to train government extension workers and at the same time served to augment the government's limited extension staff. Exploration of these possibilities with interested PVOs should be pursued.

Research

There are many issues in the forestry sector in Malawi that are stagnating because of a lack of research. Natural forest management and agroforestry are two that immediately come to mind. As with training, the World Bank's project does not include funding for research. Most other reforestation projects do not have funds for research.

Currently, the agroforestry projects in Malawi offer little or no support to FRIM in their efforts to research multi-purpose trees, natural regeneration, harvesting regimes for indigenous forests, etc. At the minimum, funding should be built into every agroforestry and forestry project for FRIM to carry out research in the designated area.

Other research that could be of value to Malawi would be to identify other forestry techniques and approaches in other African countries that would be relevant to the Malawian situation. This could be in the form of a straightforward desk study carried out over three to four weeks in the United States or elsewhere. It would be essential that the researcher have some experience with the problems faced by Malawian foresters in order for the research to be helpful. This research could be carried out by a Malawian student during his or her degree training abroad.

Agroforestry

Agroforestry holds great potential for the forestry sector in terms of working with small farmers, yet the Department has not been involved in this new area. While continuing to keep the main focus of agroforestry in agriculture it should still be possible to more actively involve the Forestry Department in terms of training, research design and extension of agroforestry techniques. This can be accomplished through existing projects such as the IDRC funded ICRAF project and the USAID MARE project.

In the area of in-country training, there is considerable scope for joint training activities for forestry and agriculture extension workers through agroforestry. These could be carried out regionally, at the level of District Foresters, foresters and forestry assistants and RDP assistants, EPA heads and Land Husbandry officers. Ideally, such training activities would facilitate continuing cooperation and collaboration at the field level. It would expose agriculture extension workers to forestry concepts in agroforestry and thereby broaden the scope of agroforestry.

Conclusion

These recommendations are far from complete even given the limited focus of this report on the smallholder sector. There are many areas, such as the indirect effects of pinewood charcoal utilization by tobacco estates, which were not mentioned.

In general, the forestry sector in Malawi, has many promising beginnings. Long-term sustainability needs to be kept constantly in view as a balance between production forestry and social forestry that helps the small holder is sought. The Forestry Department needs support in the area of training, increases in extension workers and added emphasis on agroforestry and smallholder needs.

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