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Technical Report 7

ASSISTANCE TO LAND-USE PLANNING

ETHIOPIA

FOREST RESOURCES AND POTENTIAL FOR DEVELOPMENT

UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS ROME, 1984

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ASSISTANCE TO LAND-USE PLANNING

E T H I O P I A

FOREST RESOURCES AND POTENTIAL FOR DEVELOPMENT

Report prepared for
the Government of Ethiopia
by
the Food and Agriculture Organization of the United Nations
acting as executing agency for
the United Nations Development Programme

based on the work of

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Forestry Expert

UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 1984

This technical report is one of a series of reports prepared during the course of the UNDP/FAO project identified on the title page. The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

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ABSTRACT

This report was prepared in conjunction with the forest component of the project 'Assistance to Land-use Planning, Ethiopia', ETH/78/003. The Forestry Expert was assigned to the project for 12 months from September 1979. The report describes the physical, social and economic factors which have influenced the forestry sector, and reviews the various ecological classifications already attempted in the country. An account is given of the various wood resources, and forest utilization and estimations of wood requirements for the future are discussed. Policy perspectives on forestry vis-à-vis land use, and potential for development are outlined. In conclusion, the report presents recommendations on forestry development in the larger context of land-use planning.

As the preparation of the Master Land-use Plan for the country, which will be the major output expected of the project, was still in its early stages at the time when this report was written, it has not been possible to specify geographical locations where development activities are to be undertaken. Possibly it could have been accomplished had the review and analysis of the forestry component commenced after the work on existing land use has been completed. However, guidelines given in this report will be of assistance in specifying locations for initiating forestry development activities.

The Food and Agriculture Organization is greatly indebted to all those who assisted in the implementation of the project by providing information, advice and facilities.

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FOREWORD

This report was originally issued in July 1980 as the Final Report of the Forestry Expert assigned to the project 'Assistance to Land-use Planning' ETH/78/003. It is now reissued in slightly revised form as a Technical Report, opportunity having been taken to edit and correct the original version. The Expert's terms of reference were the following:

- identification and classification of the main existing forest ecosystems for optimum sustained productivity (wood, fuel, fodder, etc.) and for provision of indirect services and benefits such as soil and water conservation, improvement of wildlife, employment for rural population;

- identification and classification of the main potential forest ecosystems as a contribution to the agroecological zones, for subsequent reforestation;

- assistance to the national authorities in the formulation and declaration of a national forest policy.

The material on the physical, economic and demographic background of Ethiopia given in Chapter 1 was that available at the time of drafting the report, which was at an early stage in the project. More accurate estimates of the numerical data given have since been obtained, and are contained in other technical reports. A new ecological classification, additional to those given in Section 2.1, has also been produced. However, since the remainder of this report rests on the data as given it has been left in its original form. Users who require precise values of climatic, population, economic and other data, as well as a considerably wider range of information on the physical, economic and social conditions in the country, should refer to other technical reports in this series.

The extent of remaining natural high forest is shown on the project map, Land-use and Land Cover at 1:1 000 000 scale.

Chapter 1

INTRODUCTION 1/

1.1 PHYSICAL CHARACTERISTICS

1.1.1 Physiography

Ethiopia, which covers an area of 1.2 million km^2, is a country of extreme variations in physiography. The altitude ranges from 120 m below sea level in the Danakil depression to about 4 620 m altitude on Mount Ras Dejen (Map 1). Within this range the country's topography varies from coastal plains in the east to high plateau and mountainous areas in the centre and west. Two main plateaux are generally recognized, the Central or Western Plateau and the Eastern Plateau, which together form the high-altitude areas. These are separated by the Rift Valley, which widens like a funnel from the south towards the northeast where it opens into the Danakil Plain. The Central Plateau is limited to the west by the Sudan Plain and to the northeast by the coastal plains along the Red Sea. The Eastern Plateau is limited to the east by the Ogaden Plain.

The directions of flow of the main rivers, as related to the topography, are towards the Nile system in the west and the Indian Ocean in the southeast. Rivers flowing into the Rift Valley form closed basins. Only short and intermittent streams flow eastwards into the Red Sea.

1.1.2 Geology and soils

The basement of Ethiopia is formed by Precambrian rock formations and consists of a wide variety of sedimentary, volcanic and intrusive rocks that have been metamorphosed to varying degrees. The basement in the south and east of the country, where granitic rocks and gneisses predominate, has been more strongly metamorphosed than the Precambrian rocks in the north. Though in many cases strongly folded and foliated, the rocks in the north, which include the youngest formations yet known in the Precambrian period, have generally undergone only weak metamorphism, reflecting the relatively low temperatures to which they have been subjected since their deposition.

1/ Some of the data given in this chapter have been modified in detail by project activities subsequent to the writing of this report (see Foreword).

Most of these Precambrian rocks are relatively rigid and have been subjected to several orogenic episodes since their formation. This process, combined with the rifting associated with the development of the Red Sea and Rift Valley, has resulted in considerable fracturing and shattering. Major water resources are associated with these fracture zones.

Strong volcanic activity started during the sedimentation of the Cretaceous and Cainczoic in Eritrea and the Ethiopian plateaux. The Central and Eastern plateaux are covered by Tertiary trap lavas.

Soils of Ethiopian highlands are the outcome of the decomposition of the volcanic material. They are derived from lava rocks and are clayey in texture. The colours vary according to the composition. In general they appear as red to light reddish brown on the mountains and hillsides, reddish brown on the slopes, brown to dark brown in the rolling country and very dark grey to nearly black in the lower parts.

In the Rift Valley, the soils in the northern part are shallow, brown to grey in colour, while they are generally brown and relatively deep in the south.

The southeastern lowlands mainly contain sandy soils. They are shallow and red in the northern parts and change to deep sandy steppe soils in the south.

1.1.3 Climate

1.1.3.1 General features

The climate in Ethiopia is very varied due to the great variations in altitude. Although the entire country lies within the tropics, only the lowlands have a hot climate. The effect of altitude produces moderate conditions on the highlands while in the high mountains a cold, alpine climate is experienced. Thus these varying conditions result in an extreme range in climate conditions from the snow-capped peak of Ras Dejen to Dallol, one of the hottest locations in the world.

1.1.3.2 Temperature

The mean annual maximum and minimum temperatures are very closely correlated with altitude, and places located at different latitudes but at similar altitudes in the country tend to have the same average temperatures. The approximate lapse rate is 0.7°C per 100 m. The annual range varies from 2° to 6°C, the values being greatest in the extreme north and on the extreme eastern edges of the plateaux. In the hot areas, mean temperatures range

from about 32°C (as on the Sudanese border), to about 20°C during the coldest month. Although the variations in monthly average temperatures are small, diurnal change is high, reaching over 20°C.

There are, in general, two cool seasons, a 'wet' and a 'dry', the former caused by the arrival of the rains and the latter as a result of the location away from the equatorial belt, which corresponds to the northern hemisphere winter, especially to the north of 8° latitude.

Frost occurs normally above 2 200 m during the cool seasons. In some places where there is cold air drainage, it also occurs well below this altitude.

1.1.3.3 Rainfall and water budget

Mean annual rainfall ranges from less than 200 mm along the coast, in the Danakil depression, the lower Awash Basin and in the eastern Ogaden, to over 2 200 mm in the highlands of Ilubabor. These highlands, facing the humid equatorial westerlies in summer, are the wettest part of the country. The amount of annual rainfall decreases in all directions from the Ilubabor highlands, and yearly average falls below 1 000 mm in the lower-altitude areas of the Central and Eastern plateaux. Although it appears that there is a correlation between the amount of rainfall and the elevation there is not a systematic variation, since at similar altitudes the rainfall is higher in the southwest than in the north and northeast.

The annual rains are spread out over almost nine months in the southwest highlands, reducing the dry period to two to three months, while the rest of the plateaux have a dry period of about five months.

In the country surrounding the plateaux and in the Rift Valley, the climate becomes much drier and hotter as the altitude becomes lower. In the Rift Valley the annual rainfall ranges from 500-900 mm and is concentrated over five to six months.

Gamachu (1977) calculated the water budget for 55 stations in Ethiopia, using the modified form of Thornthwaite's method. The difference between rainfall and potential evapotranspiration (PET) is noted for each month, and the positive and negative values are recorded as water surplus and water deficit respectively, taking into account an average soil field capacity of 10 cm. The results for six selected stations are presented in Table 1.

Table 1

WATER BUDGET FOR SELECTED STATIONS

			J	F	M	A	M	J	J	A	S	O	N	D	Total annual	Average annual
1.	ADDIS	Temp.	15.7	16.9	17.9	17.7	18.0	16.7	15.3	15.2	15.6	15.8	15.3	15.3	–	16.3
	ABABA	RF	1.62	3.48	6.49	8.79	9.04	12.43	27.62	33.58	19.47	2.61	1.17	0.79	127.09	
	Im+30	PE	7.50	7.74	9.48	9.48	9.94	8.90	7.78	7.70	7.65	7.65	7.06	7.13	98.03	
	9.02N	Deficiency	5.88	4.26	2.99	0.69	0.90	–	–	–	–	–	0.93	6.34	21.99	
	2 408 m	Surplus	–	–	–	–	–	–	13.37	25.88	11.82	–	–	–	51.07	
2.	DILLA	Temp.	21.3	20.9	21.5	20.7	18.6	17.9	17.8	17.3	17.9	17.4	17.4	18.3	–	18.9
	Im+18	RF	8.09	1.21	13.20	15.00	13.37	13.66	9.18	14.47	18.42	20.73	4.49	3.43	135.25	
	6.25N	PE	11.22	10.04	11.33	10.91	9.75	9.06	9.33	8.40	8.89	8.24	7.92	9.18	114.27	
	1 635 m	Deficiency	2.33	8.83	–	–	–	–	–	–	–	–	–	–	11.16	
		Surplus	–	–	–	–	–	4.18	–	5.92	9.53	12.49	–	–	32.12	
3.	GORE	Temp.	19.1	20.0	20.1	19.2	18.3	17.0	16.3	16.6	17.0	17.7	18.4	18.5	–	18.18
	Im+112	RF	3.95	4.69	11.12	13.68	25.95	41.71	33.42	33.22	32.74	19.16	9.72	7.49	236.85	
	8.09N	PE	10.10	9.46	10.71	10.51	10.26	8.48	8.21	8.24	8.16	8.98	9.31	9.41	111.83	
	2 002	Deficiency	–	2.84	–	–	–	–	–	–	–	–	–	–	2.84	
		Surplus	–	–	–	–	9.27	33.23	25.21	24.98	24.58	10.18	0.41	–	127.86	
4.	HARER	Temp.	18.5	19.8	20.5	20.0	20.	18.9	18.2	18.0	18.4	18.6	18.6	18.1	–	19.0
	Im+49	RF	0.84	1.15	3.26	10.64	4.90	5.16	7.47	15.65	7.91	1.98	0.40	0.06	59.42	
	9.18N	PE	9.20	9.28	10.82	10.61	11.	10.39	9.72	9.42	9.38	9.38	9.02	8.91	117.36	
	1 856 m	Deficiency	8.36	8.13	7.56	–	6.30	5.23	2.25	–	–	2.64	8.62	8.85	57.94	
		Surplus	–	–	–	–	–	–	–	–	–	–	–	–	–	
5.	JIMA	Temp.	18.2	19.4	20.2	20.0	19.5	18.7	17.4	17.5	18.1	18.0	16.9	17.2	–	18.4
	Im+36	RF	2.80	3.13	10.56	18.48	19.46	24.19	21.92	23.78	17.90	5.10	2.62	3.89	153.83	
	7.40	PE	9.20	9.19	10.82	10.61	11.02	10.07	8.96	8.88	9.18	9.18	7.84	8.02	112.97	
	1 740 m	Deficiency	6.40	6.06	0.26	–	–	–	–	–	–	–	–	3.43	16.15	
		Surplus	–	–	–	–	6.31	14.12	12.96	14.90	8.72	–	–	–	57.01	
6.	SIRE	Temp.	16.3	17.4	18.9	19.6	20.6	19.9	18.4	18.3	18.3	17.3	16.1	18.8	–	18.1
	Im20	RF	0.85	0.99	6.30	7.11	2.85	7.05	15.78	18.23	19.30	9.73	0.13	0.37	88.69	
	8.18N	PE	7.20	7.55	9.79	10.40	11.56	10.92	9.94	9.84	9.38	8.47	6.96	9.41	111.42	
	1 980 m	Deficiency	6.35	6.56	3.49	3.29	8.71	3.87	–	–	–	–	–	5.87	38.14	
		Surplus	–	–	–	–	–	–	–	4.23	9.92	1.26	–	–	15.41	

Source: Gamachu, Daniel. Aspects of Climate and Water Budget in Ethiopia. 1977.

1.2 POPULATION AND SOCIAL ASPECTS

1.2.1 Population

Information on the demographic characteristics of the population of Ethiopia, based on a census, is lacking. However, there have been several studies based on sample surveys. Current figures derived mainly from the National Survey of 1969-71, which covered over 80% of the population, show that the estimated present (1980) population of the country is 30.8 million. Of this, 4.3 million or about 14% live in urban centres having 2 000 or more inhabitants, while the remaining 26.5 million or nearly 86% are considered as rural population. Table 2 gives the estimated total population for 1980 by administrative regions.

The population of Ethiopia is estimated to grow at 2.5% per annum, and the total population is expected to reach 53.9 million by the turn of the century.

The urban population is growing at an annual rate of about 6.6%, of which 4.0% represents a net immigration from rural areas. Assuming the same rate of urbanization, the percentages of the total population in urban and rural areas are expected to be nearly 29% and about 71% respectively in the year 2000. However, in sympathy with social and economic development, migration from rural areas to urban centres is likely to be accelerated and might result in higher population in urban areas than expected. Projected total population and its composition at the turn of the century and those of intervening years are given in Table 3.

The average population density over the country is a little over 25.0 per km^2, although it varies considerably from region to region. The Ethiopian highlands are more densely populated than the lowlands, due to favourable climatic conditions. Shewa administrative region is the most densely populated area in the country with a density of 274 persons per km^2, while Bale region has the lowest density with 6.5 persons per km^2.

The rural population lives in compact family units scattered all over the country. Of the total rural population,18.2 million or nearly 69% are over 10 years old and regarded as economically active.

1.2.2 Social aspects

Peasants living in rural communities form the great majority of the people. The most striking feature is that more than 90% of economic activities undertaken are to meet subsistence requirements, thus leaving small room for a market economy in the rural areas.

Table 2

ESTIMATED POPULATION OF ETHIOPIA IN 1980
BY
ADMINISTRATIVE REGIONS

Administrative Region	Urban ('000)	Rural ('000)	Total ('000)
Arsi	100.0	1 039.6	1 139.6
Bale	47.0	824.7	871.7
Eritrea	709.2	1 701.4	2 410.6
Gamo-Gofa	43.0	950.6	993.6
Gojam	177.2	1 847.0	2 024.2
Gonder	199.0	1 831.5	2 030.5
Harerge	297.2	2 806.6	3 103.8
Ilubabor	49.9	752.8	802.7
Kefa	143.4	1 460.8	1 604.2
Shewa	1 876.2	4 438.7	6 314.9
Sidamo	216.1	2 571.9	2 788.0
Tigray	196.3	1 950.8	2 147.1
Welega	118.4	1 887.3	2 005.7
Welo	176.5	2 416.7	2 593.3
Total Ethiopia	4 349.8	26 445.1	30 794.9

Source: Ethiopia Statistical Abstract, 1977.

Table 3

POPULATION PROJECTION, 1980-2000

Year	Urban '000	Rural '000	Total '000
1980	4 349.8	26 445.1	30 794.9
1985	5 954.7	29 295.4	35 250.1
1990	8 196.8	32 443.0	40 639.8
1995	11 283.1	35 678.2	46 961.3
2000	15 531.6	38 415.9	53 947.5

Source: Ethiopian Statistical Abstract, 1977.

Peasant Associations formed after the declaration of the "Proclamation of 1975 to provide for Rural Land Ownership" constitute the basic units of rural community organization. They have replaced the 'chikashums' which were made up of several rural communities or 'goths'. The formal political leadership of the 'chikashums', although supported by the sanction of authority, had little power, while the informal leadership exercised by people such as the priests, elders in the community and others by tradition enjoyed considerable prestige and wielded power in the community. The leadership of the Peasant Associations, however, is formal and democratic and has the sanction of legal authority.

By having both power and authority, the Peasant Associations have become a major instrument for change and for the development of social and economic life in the rural areas. The Association has full control over the land within its boundary, and is responsible for the development of land resources under the directives given by the Government.

Rural labour is engaged mainly in agricultural activities, either collectively or individually. Rural unemployment exists even during peak seasons, i.e., sowing and harvesting seasons, indicating the availability of a potential labour force to undertake rural development programmes including forestry.

Although the rural social system is characterized by relative isolation of its members, communication with the outside world is made possible through the hierarchy of associations as several administrative levels, and with the expansion of extension services provided by the various government agencies.

1.3 ECONOMY

The agricultural sector dominates Ethiopia's economy. Agricultural production accounts for nearly 50% of the Gross Domestic Product. Table 4 gives the GDP by origin at constant factor cost for the years 1971/72 to 1975/76.

The share of forestry in the agricultural sector is 5.6%. It contributes 2.7% to the GDP. Together with primary woodworking industries, the total contribution of forestry to the GDP amounts to about 3%.

The value of exports, based mainly on agricultural products, amounted to Br 580.6 million in 1976, while imports were valued at Br 736.7 million, leaving a visible deficit of Br 156.1 million. The main export commodity is coffee, which accounts for more than 55% of total exports. Imports constitute mainly machinery, transport equipment and manufactured goods.

Table 4

GDP BY ORIGIN AT CONSTANT FACTOR COST
OF 1960/1961
(Br million)

Origin/year	1971/72	1972/73	1973/74	1974/75	1975/76
Agriculture	1 936.8	1 950.8	1 940.1	1 902.6	1 953.7
Industry	620.6	637.2	633.7	624.3	597.7
Distributive services	560.7	585.5	612.7	611.6	647.5
Other services	659.7	706.1	479.5	801.0	832.5
Total	3 777.8	3 879.6	3 936.0	3 939.5	4 031.4

Source: Ethiopia Statistical Abstract 1977.

Ethiopia is a net importer of wood and wood products. Import of wood and wood products amounted to Br 17.9 million in 1976 as against Br 0.9 million gained through the export of wood products in the same year. Pulp, paper and paperboard make up more than 90% of total wood and wood products import.

Chapter 2

WOOD RESOURCES

2.1 REVIEW OF ECOLOGICAL CLASSIFICATION

The formation of a climax vegetation is the result of several natural factors, the most significant being climate and altitude. Various ecological classifications have been attempted for Ethiopia using these factors. Although all classifications, in broad terms, are directed to distinguish ecologically homogeneous areas where one might find unique vegetation communities and similar growth patterms, they differ in one way or another according to the particular objective of the classification attempted.

The existing ecological classifications for Ethiopia can be put into three different categories based on certain identifying factors. First, the climatic factors of temperature and rainfall, and also either soil moisture content in combination with altitude or altitude by itself. The second approach takes the existing vegetation to derive the classes. The last is a combined approach of the first and second, containing climatic factors, altitude and vegetation communities.

The classification which has been in use traditionally by the Ethiopians divides the country into three different zones:

Kolla – Hot lowlands with an altitude below 1 600-1 900 m, and having an average temperature of over 20°C.

Wonia dega – Temperate highlands, with altitudes above 1 600-2 600 m and average temperature ranging from 16°-20°C.

Dega – Cold mountains, with altitudes over 2 600 m and having an average temperature in the region of 10°-16°C.

The zones are based primarily on altitude, and hence, temperature, and there is little concern about rainfall. This zonation has sometimes been used by botanists to describe the vegetation.

Three more classifications that are not directly incorporated with vegetation cover are by FAO (1954), Jackson (1974) and Ahsan (1978).

FAO describes five climatic regimes, each having different lengths of dry period:

1. Regimes of 11-12 dry months
2. Regimes of 8-10 dry months
3. Regimes of 6-7 dry months
4. Regimes of 5 dry months
5. Regimes of 2-4 dry months

Three factors identify the above regimes: altitude, temperature and mean annual rainfall. Although each regime appears to be an outcome of the interaction of these factors, only mean annual rainfall shows a clear correlation in the sense that it increases when the length of dry period decreases. This can be seen in Table 5 which gives altitude range, average minimum and maximum temperatures, and mean annual rainfall recorded for each regime.

Table 5

CLIMATIC REGIMES SHOWING ALTITUDE, TEMPERATURE AND MEAN ANNUAL RAINFALL

Regime (dry months)	Altitude (m)	Temperature (°C)	Mean annual rainfall (mm)
1 (11-12)	0 - 1 670	20 - 36	25 - 250
2 (8-10)	500 - 3 000	8 - 33	250 - 1 250
3 (6-7)	500 - 2 240	11 - 34	500 - 1 500
4 (5)	500 - 2 770	13 - 31	700 - 1 450
5 (2-4)	500 - 2 240	13 - 31	700 - 2 000

Source: FAO. Report to the Government of Ethiopia, on Forest Policy and Forest Development. Swain, E.H.F. Rome, 1954. ETAP Report No. 321.

Jackson classifies two sets of zones, one based on altitude the other on rainfall, as shown in Table 6.

The fact that mean annual rainfall has been the dominant identifying factor in the previous classifications may have prompted Jackson to choose the same criterion for his classification. Accordingly Ethiopia is classified by him into five bioclimatic zones, each representing a sizeable ecological range. The zones have been identified mainly to set up tree species trials and to indicate different possibilities for tree growth. The zones are:

	Zone	Mean annual rainfall (mm)
I	Semi-desert coastal plains	0-350
II	Dry lowland and plateau	350-700
III	Semi-dry lowland and plateau	700-1 050
IV	Semi-wet lowland and plateau	1 050-1 400
V	All year rainfall wet region	1 400

Table 6

TOPO-CLIMATIC ZONES

Altitudinal Zone (m)		Rainfall Zone (mm)	
Lowland	0 - 914	Arid	0 - 600
Highland	914 - 1 524	Dry	600 - 1 000
Lower Montane	1 524 - 2 134	Moist	1 000 - 1 600
Upper Montane	2 134 - 2 743	Wet	1 600+

Source: Jackson, J.A.S. Proposals for tree species trials in Ethiopia, Volume II, 1974.

Russ (1945) divides the vegetation of Ethiopia into four main types, though as he points out, each could be subdivided into as many formations as the needs of a particular study require. The four main types are:

1. Coniferous and mixed forests.

2. Broad-leaved forests.

3. High-grass savannah.

4. Desert savannah.

In this classification, effect of both altitude and rainfall account for the formation of vegetation type. Included, also, is the effect of temperature, since it has a high correlation with altitude. Types 1 and 2 are separated mainly because of the dominant tree species that they contain. Otherwise the factors affecting their formations are more or less the same, and these two types can be considered as subdivisions of a single type which may be called highland forest.

Breitenbach (1961) states that the principal physiognomic or habitat forms of the natural vegetation are well in accordance with the altitude or temperature zones, so that the lowlands are characterized by steppes,

savannahs and woodlands, while the highlands merging into the higher mountains are occupied by forests which dissolve again into woodlands, savannahs and steppes. Based on this observation, the vegetation types of the country are classified into:

1. Lowland steppes
2. Lowland tree-savannahs
3. Lowland woodlands
4. Lower highland forests
5. Higher highland forests
6. Mountain woodlands
7. Mountain savannahs
8. Mountain steppes

This classification refers to a progressive as well as retrogressive succession series, namely:

1. The hot to temperate series from the lowland steppes through the lowland savannahs and lowland woodlands to the lower highland forests.

2. The temperate to cold series from the mountain steppes through the mountain savannahs and mountain woodlands to the higher highland forests.

Gamachu (1977) estimates potential evapotranspiration (PET) from available climatological data by employing Thornthwaite's empirical formulae. Based on Thornthwaite's system of defining climatic or moisture regions, he calculates moisture index (Im) according to the water surplus and deficit found for the various stations and, in turn, determines moisture regions of the country as follows:

Im value			Moisture regions
Over		100	Perhumid
20	to	100	Humid
0	to	20	Moist Subhumid
-33	to	0	Dry Subhumid
-67	to	-33	Semi-Arid
-100	to	-67	Arid

Each of these moisture regions is associated with distinct types of climax vegetation and closely fits with the classification made by Breitenbach. Employing this closeness, Gamachu shows the relationships among climate, altitude and vegetation type by modifying and redrawing the Breitenbach original diagram. Table 7 shows the relationships between climate, altitude and vegetation.

Table 7

RELATIONSHIP BETWEEN CLIMATE, ALTITUDE AND VEGETATION
(m)

	Arid	Semi-arid	Dry-Sub humid	Moist Sub-humid	Humid
Steppe	Below 300				
Open woodland	300-1 100	Below 500			
Savannah	1 100-1 400	500-1 100	300- 700		
Deciduous woodland		1 100-1 500	700-1 200	600- 100	
Evergreen woodland	-	1 500-1 700	1 200-1 600	1 000-1 400	1 400-1 600
Lowland forest	-	-	1 600-1 700	1 400-1 600	Below 1 400
Higland forest	-	-	1 700-2 300	1 600-2 400	1 600-2 500
Mountain woodland	-	-	2 300-2 600	2 400-2 800	2 500-3 000
Mountain savannah	-	-	2 600-3 100	2 800-3 600	-
Alpine	-	-	Over 3 100	-	-

Source: Gamachu,Daniel. Aspects of Climate and Water Budget in Ethiopia. 1977.

A close relationship exists between climate and altitude on the one hand and vegetation on the other. The wood resources of Ethiopia occur, generally, between altitudes 600-3 000 m, with high forests for the most part occurring in the altitudinal range 1 400-2 400 m, though they may extend to both lower and upper altitudes according to climatic factors, especially rainfall. Woodlands whether lowland or highland, are located in the lower and upper part of forest ranges. However overlapping of these two climax types is frequent in many places, which again is the outcome of climatic effects.

2.2 WOOD RESOURCES

Natural high forests woodlands, bamboos and plantations constitute the wood resources of Ethiopia.

2.2.1 Natural high forest

The attached map (Map 2) showing areas of natural high forest, is based on a reconnaissance inventory undertaken with the assistance of the Ministry of Overseas Development, United Kingdom. The area covered by the inventory is situated in the southwest of Ethiopia and contains more than 95% of the existing high forest. Inventory results concerning forest mapping are given in Table 8.

Table 8

NATURAL HIGH FORESTS, SOUTHWEST ETHIOPIA

Forest type	Area ('000 ha)	Percent
1. Closed High Forests		
Coniferous	52.3	1.90
Mixed, Broadleaved/Coniferous	158.5	5.77
Broadleaved	2 134.3	77.69
Sub-total	2 345.1	85.36
2. Disturbed High Forests		
Coniferous	7.3	0.27
Mixed, Broadleaved/Coniferous	48.3	1.76
Broadleaved	346.6	12.61
Sub-total	402.2	14.64
Grand Total	2 747.3	100.00

Source: D.R. Chaffey. A Reconnaissance Inventory of Forest in Southwest Ethiopia, 1979.

The air photography used for the maps accompanying the inventory report was flown during the early seventies, and for a small portion during the fifties and sixties, so that the maps produced portray the forests as they were at the time the air photography was flown and take no account of subsequent forest depletion. With the known fact of high forest depletion experienced for a long time, the area of high forests must now be lower than that given in the inventory report. It is believed that the present area of high forests is of the order of 2.4-2.6 million ha.

High forests occur at altitudes ranging from 600–3 000 m, though the main portion is found within a much narrower range, 1 400–2 400 m.

Coniferous and mixed coniferous broadleaved forests are located mainly in the eastern highlands and form the major source of commercially valuable timber. They are usually the mountain or slope forests with Podocarpus gracilior as the dominant conifer at low elevations and in sheltered valleys, and Juniperus procera on ridges and at higher elevations. These two conifers are rarely found in pure stands as they are generally mixed with a great variety of hardwood species. The more common varieties occur with Podocarpus and include various species of Ekebergia, Pygeum, Celtis, Pouteria, Allophylus and Olea. Juniperus procera is found in association with species of Hagenia, Olea, Rhus, Ilex, Allophylus, Bersama, and Schefflera.

Broadleaved forests are mainly located in the southwest, especially in the administrative regions of Ilubabor, Kefa and Welega. Ilubabor contain more than 60% of these forests and they extend into the lowland area in western Ilubabor where the altitude is as low as 500–600 m. The forests contain a few Central African species and are a transitional stage between the Central and East African floras.

The most common species belong to the genera of Cordia, Croton, Ekebergia, Mitragyna, Albizzia, Pouteria, Pygeum, Apodytes, Syzgium, Ilex sapium, Milletia and Erythrina.

2.2.2 Woodlands

Whilst there are no reliable statistics regarding the extent of woodlands, currently accepted estimates put the area at about 20 million ha.

Woodlands in the country are largely dominated by Acacia though the species found are very numerous. They are for the most part of a wider continental distribution than those of the high forests, but the main species are still directed southward towards the centre of the East African flora. Together with Acacia, frequently found are species of Vitex, Lannea, Fremma, Gardenia, Terminalia, Combretum, Scherebera, Protea, Cussonia, Euphorbia, Grewia, Ehretia, Zisyphus, Stereospermum and Gymnosporia.

Incense-bearing trees, Boswellia and Commiphora spp., occur in the dry lowlands in many parts of the country, and gum arabic trees, Acacia senegal, are found in almost pure stands in Harer and in western Eritrea and Gonder.

2.2.3 Bamboos

In western Ethiopia, particularly in Welega, Ilubabor and Gojam, there are extensive stands of the bamboo, Oxytenanthera abyssinica. Scattered, very localized concentrations of the alpine bamboo, Arundinaria alpina

occur at high elevations in various parts of the country. The extent of lowland bamboo found in Welega, Ilubabor and Gojam is estimated at about 450 000 ha, while the rest, usually mixed with woodland, amounts to about 1.0 million ha.

2.2.4 Plantations

Initiation of the establishment of plantations in Ethiopia dates back to the times of Menelik II. Up to 1974 it is estimated that about 40 000 ha of plantations were established throughout the country, utilizing mainly Eucalyptus globulus and, to a lesser extent, E. camaldulensis. They were established with the objective of supplying major population centres with firewood and small construction poles. Of these plantations, about 15 000 ha are located around Addis Ababa.

In the northern regions, especially in Eritrea, Tigray and Welo, there are about 13 500 ha of plantations established with the assistance of USAID, and later with the World Food Programme/Federal Republic of Germany, (WFP/FRG), with the prime objective of soil conservation and erosion control.

Establishment of industrial plantations is a recent development in the country. Although the first attempts were made during the early sixties, sizeable plantations were established only in seventies. Plantations consisting mainly of Cupressus lusitanica and Pinus patula now have an estimated area of 12 000 ha.

Chapter 3

FOREST UTILIZATION AND WOOD REQUIREMENTS

3.1 FOREST UTILIZATION

In addition to providing a continuous wood supply, the forests in Ethiopia have been regarded and utilized as grazing fields for domestic animals and potential agricultural land for cultivation. These three types of usage constitute the distinct pattern of forest utilization in the country.

Land acquisition from forests for cultivation and grazing has been in force since ancient times and has been intensified by the advance of social and economic life. This has resulted in heavy destruction of the forests. Despite the measures brought about by the Public Ownership of Rural Land Proclamation of 1975, which should have eased the pressure on the forest land, encroachment is still in practice. In fact the extent of destruction and deforestation had already reached alarming proportions long before this date.

Wood requirements of both subsistence and monetized sectors are met by the existing wood sources, i.e., natural high forests, woodlands and plantations. In general, high forests serve forest industries while woodlands, and plantations to a lesser extent, supply firewood and small construction poles to rural and urban household sectors.

Subsistence consumption for firewood and construction poles amounts to 20.8 million m^3 per year and accounts for about 80% of total wood used. In the light of this consumption pattern, the woodlands obviously have the largest share of wood production.

Wood production is realized in the absence of any management plans and carried out casually. In addition, lack of technical knowledge, organization and supervision result in over-exploitation in many areas. This is apparent in logged areas throughout the forests where all useable trees are removed and nothing is done to regenerate and rehabilitate the stands. In woodlands, bare land is common around populated areas and to a steadily increasing distance over which wood supplies are brought, and there is ample evidence of over-exploitation and destruction of the woodlands.

3.2 WOOD REQUIREMENTS

The forest utilization pattern prevailing in the country gives an indication of the kind of products that are obtained from the forests. Although the forests in Ethiopia are utilized also for the satisfaction of other needs, the basic requirement is for wood, still one of the essential commodities for daily life. Nearly 95% of energy requirements of the household sector is met by non-commercial energy for which firewood, to the extent of its availability, forms the main source. Only in those areas where wood is not obtainable is it substituted by other fuel sources such as cattle dung and agricultural wastes. Wood used as a household energy source accounts for more than 89% of total wood consumption.

Wood in its round form is required by both the subsistence and monetized sectors, the latter consisting of two major groups, the urban household as a direct consumer and the industry. The aggregate demand of these sectors constitutes the total wood requirement in the country.

3.2.1 Firewood

Firewood in rural areas is the principal source of energy, though its consumption is limited by its availability. In the northern regions virtually no forest is left and so cattle dung and agricultural wastes are used to satisfy rural energy needs.

Firewood consumption of rural households in 1975 was estimated at 16.8 million m^3, which corresponds to 0.7 m^3/caput/annum. This figure is low compared to consumption in other African countries, where it is of the order of 1.0-1.6 m^3. The difference is reflected in the high consumption of other non-commercial energy, which amounted to 12.0 million t or 13.4 million m^3 firewood equivalent in the same year, thus bringing the total per caput non-commercial energy consumption to about 1.3 m^3 firewood equivalent.

No change in the consumption pattern has occurred during the past few years, and it is unlikely that a change will take place in the forseeable future. For this reason it is assumed that per caput firewood consumption will stay at the same level unless an attempt is made to substitute the other non-commercial energy sources by wood. Meantime, it is expected that the usage of commercial energy may increase to compensate for the rising needs resulting from the increasing standard of living. Therefore the level of future firewood consumption in rural areas will be determined by two factors: (i) expected population increase; (ii) the government policy to substitute the other non-commercial sources of energy by wood.

According to the study made by the Ethiopian National Energy Committee, in urban areas it is estimated that about 50% of the inhabitants use charcoal to satisfy half of their needs for cooking and heating, while the remaining half are satisfied by firewood. The other 50% use only firewood for the same purpose. Charcoal consumption was estimated at 150 000 t in 1975, equivalent to about 1.7 million m^3 of firewood. Firewood consumption in the same year was estimated at 1.5 million m^3, making a total consumption of 3.2 million m^3. This represents an average of 1.1 m^3/caput/year. Assuming the same per caput consumption, the expected firewood requirement of the urban areas will be 6.5 million m^3 and 9.0 million m^3 in the years 1985 and 1990 respectively.

Total expected future apparent and potential firewood requirements are given in Table 9.

Table 9

FUTURE APPARENT AND POTENTIAL FIREWOOD REQUIREMENTS IN 1990

Requirement	Rural '000	Urban '000	Firewood equivalent '000 m	Total apparent '000 m	Total potential '000 m
Firewood	22 710.0 m^3	3870.0 m^3		26 580.0	26 580.0
Charcoal	-	385.2 t	4 360.0	4 360.0	4 360.0
Other non-commercial-energy	16 220.0 t		18 090.0		18 090.0
Total				30 940.0	49 030.0

3.2.2 Construction poles

Poles used for building and fencing are generally small and with diameters varying between 3-10 cm. The Forestry and Wildlife Development Department (FaWDA) estimates the consumption of poles for building and fencing at 0.5 m^3 per year. Although this estimate refers to the consumption in the central highlands, it is assumed that the same consumption level will be reached in the northern regions and lowland areas in the near future. The Government's settlement programme, which aims at undertaking large resettlement schemes, might justify this consumption. Thus, with an average of 0.1 m^3 per head, the expected requirement of construction poles in the rural areas will be 3.2 million m^3 in 1990.

In urban centres, however, a substantial part of wood used for construction consists of sawn timber, so that the use of poles on a per caput basis is lower than that of rural dwellings. It is estimated that per caput pole requirement in the urban centres will be 0.05 m^3, amounting to a total of 0.4 million m^3 in 1990.

3.2.3 Logs

The log requirement in Ethiopia arises from two sectors: subsistence and primary wood-working industries. Logs in the subsistence sector are sawn manually and thus do not go through an industrial process. It is estimated by FaWDA that the subsistence log requirement will reach 1.0 million m^3, the equivalent of 0.6 million m^3 of sawn timber.

Currently 34 sawmills and 2 plywood mills operate in the country. Their rated capacity is about 200 000 m^3 of logs in one shift. It is very difficult to reach full capacity due to old and worn out machinery and frequent breakdowns. Annual production during the past years has been around 60 000-70 000 m^3 of sawn wood. FaWDA's log production target for 1979/80 was 113 000 m^3, and is planned to reach 400 000 m^3 by 1990. This, of course, is on the condition that an expansion in the milling capacity to another 200 000 m^3 of log intake per year will occur.

Provided the planned expansion in wood-working industries takes place, log requirements in the country are expected to be 1.4 million m^3 by 1990.

3.2.4 Electric and telecommunication poles

Poles with the lengths of 7-15.3 m, and top diameter ranging from 14-25 cm, are consumed both by the Electric and Telecommunication Authorities for setting up electric and telecommunication lines. Current annual consumption of these poles is about 66 000, corresponding to some 26 500 m^3. Of the total, about 19 000 m^3 is consumed by the Electric Authority and the rest by Telecommunications. Pole consumption is expected to grow at an average annual rate of 2% for the next ten years, bringing the annual requirement up to about 32 000 m^3 by the year 1990.

Chapter 4

DEVELOPMENT PERSPECTIVES

4.1 LAND USE POLICY

Forestry, as one of the components of land use, competes for land with other land-using activities such as agriculture and grazing. Theoretically, all land which is suitable for some kind of cropping is suitable also for forestry. In this respect, as far as physical utilization is concerned, limitations on land availability act more favourably for forestry development than for most other land-use activities. However, in the context of multiple land-use practices, the established land-use policy restricts the availability of land and determines an upper limit for areas that are to be under forests. A lower limit, on the other hand, depends on physical characteristics prevailing in the country, e.g., topography, soil, water regime.

In the context of land use practised in Ethiopia, the major development objectives have been identified in Project Document ETH/78/003 as:

1. Improvement in the conservation and rational use of vegetation, soil and water resources to ensure a permanent productive agriculture and an increasing food supply for the people, as well as a sustained provision of forest products and services.

2. Improved diversification of the economy through the more rational use of natural resources.

3. Providing an effective base for overall rural development programme.

The above objectives are indications of the direction to be set towards meeting the main aims of the land-use policy, which is to maximize the contribution that all land uses can make to the social and economic welfare of the country. Aiming at maximization of the contribution refers to optimization of all the land-use practices under the existing constraints which are, in this respect,ecological characteristics and availability of resources on the one hand and social and economic requirements on the other.

Ethiopia, being a montainous country, has numerous steep slopes. Nearly one half of the country's land area falls into slope categories of 35% and more. On this land, the paramount need is to sustain productivity in both the long run and the short run, and to arrest the deterioration taking

place at an alarming pace. The land cannot be put to any alternative use other than that of facilitating a protective vegetation cover. As the forests, together with other benefits, function as a protective cover, these areas are best utilized by bringing them under protection forestry. Hence these are the potential forest areas and their extent represents the lower limit which should be under forest. The rate at which these areas could be brought under forests, however, will depend upon the ability of the economic system to deploy the necessary capital and human resources for forestry development.

In order to provide forest products on a sustained basis, further provision of land has to be made for forestry, as the existing resources are not capable of meeting the future requirements and it is unlikely that the future supply gap could be filled through protection forestry. Although a great part of the requirements of fuelwood and small construction poles could be met from protective forests under a combined management system, due to location factors such as the proximity to consuming centres and the need for minimizing transport costs, part of the requirements will have to be supplied from plantations established on better lands.

The creation of new wood resources is necessary for industrial wood supply, which needs lands endowed with better edaphic and climatic conditions in addition to location requirements. If Ethiopia is not to rely on wood imports in the future, this calls for the acquisition of those lands which might have alternative uses. In fact, as the country has vast potentials of land that could be spared for the development of forests, and the availability of labour is relatively abundant, reliance on imports can hardly be justified for meeting the nation's demand for wood products.

4.2 FOREST POLICY OBJECTIVES

Despite the fact that the negative effects of forest destruction through denudation of vegetation were realized long ago, any attempt to formulate a long-term forest policy is a recent development in the country. The first officially declared policy was recorded in the Second Five Year Development Plan 1963-67 of the Imperial Ethiopian Government (1962), and the development targets given for the forestry sector were then designed under the directives of these policy objectives. An excerpt from the plan document given below describes the underlying philosophy and the policy objectives formulated at that time.

"Forests which have once been devastated, regenerate very slowly. Due to the fact that errors in respect to forests once made are hard to correct, that they hit the future generations, and because there is a long time to wait for the results of afforestation, it is of paramount importance to start immediately on a sound long-term policy of protection, exploitation and regeneration of the forests. The main objectives of this policy will be the following:

1. Preservation of the existing forests - regardless of whether they are state-owned or private;

2. Rational utilization of all the forests in order to preserve their protective character and potential productivity, and to attain maximum economic benefits, taking into consideration the interest of the present, as well as the future generations;

3. Afforestation of the land where the forests would serve as protection against erosion, and to protect water flow and accumulation (Koka Dam, etc.);

4. Afforestation in the vicinity of settlements, particularly on the high plateau, in order to produce sufficient firewood (thus enabling cow dung to be used for manure), and lumber for construction purposes. These forests would protect the soil from erosion, improve the absorption of rains by the soil, reduce the evaporation of moisture from the soil, and considerably improve the supply of drinking water to the population;

5. Regeneration of the forests, in the first place in those regions where the forests have recently been devastated, by forbidding livestock grazing on those areas where natural afforestation in conjunction with care for the forests (thinning, etc.) is possible, as well as by afforestation where natural regeneration is not possible."

The same policy, although implicitly, was pronounced in the proclamations 1/ issued during the implementation period of the Second Five Year Development Plan, and also repeated in the Third Five Year Plan 1968-73. Since then, there has been no official declaration on forest policy, and thus, one may assume that the policy objectives of the Second Five Year Plan are still valid. However, in connection with land-use development objectives, as well as in the context of the radical changes contemplated in the social and economic life of the country after the revolution, they need reviewing and call for clarifications for making necessary adjustments and updating to be consistent with the emerging situation.

The long-term forest policy in Ethiopia lays emphasis on protection, utilization and regeneration. Regeneration in this context refers not only to the maintenance of the existing growing stock, but applies also to expansion of the forested areas, so as to rehabilitate forest cover in areas where both soil and water conservation and the promotion of wildlife and recreation are needed. The forest policy objectives may therefore be repeated as:

1/ State Forest Proclamation, No. 225 of 1985.
Private Forest Conservation Proclamation, No. 226 of 1965.
Protective Forest Proclamation, No. 227 of 1965.

1. Protecting and maintaining existing forests under rational management to ensure their productivity on a sustained basis.

2. Expanding the supply of raw materials in order to satisfy the increasing wood requirements of the country.

3. Replacing imports of wood products with domestic output.

4. Rehabilitating forest cover in areas where soil and water conservation and the promotion of wildlife and recreation are required.

5. Promoting forest industries to meet the increasing wood products demand.

6. Ensuring that forest development is used as a means of accomplishing rural development.

4.3 DEVELOPMENT POTENTIAL

Land-use development objectives and forest policy objectives together call for an accelerated forestry development effort in Ethiopia. The exigencies of the policy imperatives and their requirements are so compelling that the potential for forest development must be assessed by examining the availability of the resources that are demanded for translation of policy objectives and for facilitating development activities.

Ethiopia has more favourable ecological conditions for forest growth than its neighbouring countries north of equatorial Africa. It is also geographically nearer to a vast potential market for wood products. As nearly half of the land area of the country offers no alternative use other than forestry and only less than one-sixteenth of the total land (excluding Eritrea, Tigray, and western Welo) has been brought under the plough, land does not constitute a scarce resource for forestry development. However, there is currently an apparent lack of clarity as to which authority is vested with control of the use of rural land. On the one hand excessive livestock population grazes on these lands and on the other, this prevents FaWDA from carrying out forestry programmes even in priority areas. It is hoped that this nebulous state of affairs, as to the authority to control the use of land and as to the responsibility to develop it, will be resolved by forthcoming proclamations and thereby land will be available for forestry at low social costs.

Rural labour is engaged mainly in agriculture on a subsistence basis. Although unemployment exists in rural areas, more disputable is the disguised unemployment prevailing among the working rural population, which is indicated by the very low productivity of labour. Both disguised and open unemployment in the rural areas constitute a reservoir of potential labour force for forestry activities, whose social cost is low if not zero, in the absence of any other worthwhile economic opportunities in the rural areas.

Capital needed for forestry development activities can be regarded as scarce to the extent that all other economic and social development activities are competing for the limited resources. Nevertheless, the increasing need for forest products and the economic imperative of satisfying the demand for wood products from within the country, the urgency for undertaking soil and water conservation measures, and the

implementation of the government policy of achieving a more equitable distribution of income through generation of employment, are factors which are likely to weigh favourably for forestry development during the course of scarce capital allocation between the competing development sectors. Furthermore, forestry being in general composed of labour-intensive operations and depending largely upon internal capital resources, the foreign exchange component runs at a minimum. This could be a crucial consideration where scarce external capital allocation is made between different sectors in countries like Ethiopia where foreign exchange is one of the scarcest resources. Hence forestry deserves high priority among the alternative development activities.

As regards resources for development, a major bottleneck will arise from the inadequacy of skilled manpower, especially management personnel, for implementation of forestry development programmes. Considerable time will be needed to raise the level and to increase the quantities of skilled manpower required. This problem can possibly be overcome, in the short term, by bilateral or multilateral aid.

Chapter 5

FUTURE DEVELOPMENT

The broad objectives of land use and forest policies indicate the directions which forestry development are likely to follow. These are:

1. Protection and rational management of the existing forests.
2. Forest expansion through reafforestation.

These two distinct lines of development are to be implemented simultaneously so that their complementing contributions to the achievement of the forestry objectives can be kept at an optimum.

5.1 FOREST PROTECTION

The country once covered with extensive forest has now about 2.5% of the area under high forest as against an estimated 15% only 25 years ago. This high depletion rate is due to several factors, the following being the most substantial causes:

1. The traditional attitude of the Ethiopian peasant to a forest, regarding it either as a potential cropland, and hence its presence interferes with cultivation, or as a source of fuel. This attitude, together with an imprecise definition of forest ownership which had lasted for centuries, and a lack of authority of control over the forest, have been the major causes of heavy encroachment.
2. Grazing fires, which destroy all undergrowth and prevent the stand from regenerating itself.
3. Uncontrolled commercial exploitation, which is not followed by any silvicultural treatment so that the logged areas can be rehabilitated. Additionally, this practice has also been associated indirectly with encroachment, as logged areas are frequently selected by farmers in preference to undisturbed forests which are more difficult to clear and burn.

Success in forest protection basically lies in the growing economic wealth and social consciousness of the need for forests. Measures to control or eliminate the above causes of forest depletion are necessary for the immediate future. These measures, first of all, call for a clear definition of the areas to be kept under permanent forest cover, their ownership, and an agency charged with responsibility to control and manage them. Since the time of nationalization of rural lands, and of ownership resting with the state, the authority for control and management of forest lands has been unclear. Although FaWDA is nominally responsible for all forests, in practice it has very little or no real authority over most of the areas, control over them being exercised largely by Peasant Associations. Hence, against this confusing situation, nationalization of rural land, instead of working in favour of controlling and reducing forest encroachment, has resulted in its acceleration. It is expected that this lack of clarity will be overcome in a forthcoming proclamation which will place authority with the Forestry and Wildlife Development Department.

Grazing and grazing fires are practised indiscriminately resulting in heavy damage, especially to young stands and regeneration areas. Grazing fires should be totally stopped in the forest, whilst grazing can be allowed to continue in places other than in young plantations and regeneration areas.

Controlled logging followed by silvicultural treatment is essential for bringing the exploited stands back to a productive form. Complete protection is needed most especially for logging areas, since they attract encroachment by providing easy access and less difficulty for clearing and burning.

5.2 MANAGEMENT

Under the existing practice almost all accessible forests of various types, i.e., high forests, woodlands and plantations, are under some kind of utilization. The utilization pattern has resulted in the continuing degradation of these resources, which is the cumulative result of social and economic pressures. Despite recent developments, the basic conditions remain more or less the same and have aggravated the degradation to an even more alarming degree. There is urgent need to bring this pressure under control and to some extent, if possible, divert it from the existing forests to other areas. Besides securing a continuous supply of forest produce, forest management should aim at this purpose as well.

Under general management principles, the three types of forests are subject to different approaches each of different intensities of management. These approaches are discussed below.

5.2.1 High forests

There are two types of high forests, highland coniferous forest consisting of Podocarpus gracilior (zigba) and Juniperus procera (tedh), and mixed hardwood forests containing several tree species. Coniferous forests are the most valuable forests, since the two species they contain yield all-purpose timber known and well accepted in the market. More than 80% of log production in the country is accounted for by these two species. The species of mixed hardwood forests are generally not known in the market and therefore have no economic value. Exceptions to this are a small number of species such as Pouteria spp (karoro), Ekebergia reuppeliana (bamboo), Prunus africanum, (tukur inchet), Syzygium guineense (dogma), and Cordia abyssinica (wanza), which have a limited market and are suitable for general construction and for plywood.

Whatever high forests remain will, at least for another few decades, be the only domestic source to meet industrial timber requirements. For this reason, the main management objective should be that of supplying the primary wood-working industries with their log requirements on a sustained basis. They will also provide firewood and small construction poles for those who are residing in the vicinity.

Most of the accessible forests having a size of 200 ha or more have been inventoried by a project sponsored by the UK Ministry of Overseas Development. Although much of the area covered was subject to only low-density inventory, the reports regarding these areas contain maps and valuable information on growing stock which are to be used in management plan preparation.

In order to improve forestry management, a new bill entitled "A Proclamation to Provide for the Development and Management of the National Forests" has been drafted by the Ministry of Agriculture and is expected to be decreed shortly 1/. The proclamation seeks to transfer all the forests to the Ministry of Agriculture, and places on the Peasant Associations the responsibility of cooperating with the Ministry in the development, protection and conservation of forest land and forest products. In anticipation of the decreeing of the proclamation, FaWDA is undertaking a crash programme to demarcate forests. It is expected that 3 000 ha of forest will be demarcated in 1980. The programme in the following three years intends to demarcate a further 12 000 ha in the regions as given in Table 10.

All accessible forests, especially coniferous, are currently exploited by one or more mills. Thus the ongoing logging is practised in the absence of management plans. Such a forest exploitation programme will be likely to continue irrespective of whether the forests are brought under controlled management or not, as the existing wood-working industries cannot be kept idle and so cause both serious economic and social problems and as a further result, accelerated illegal felling.

1/ Statement written in early 1980.

Table 10

FOREST DEMARCATION PROGRAMME
(ha)

Region	1980-81	1981-82	1982-83
Arsi	14 500	1 000	
Sidamo	10 300	7 200	5 430
Ilubabor	1 000	7 200	5 430
Kefa		10 000	10 000
Gamo Gofa		10 000	1 240
Hirerge	5 200	4 600	4 600
Shewa			3 300
Total	40 000	40 000	30 000

Source: FaWDA.

The above facts and developments may be taken as a base for formulating a strategy according to which preparation of the management plans for high forests can proceed in an efficient way without interrupting wood production. It is suggested that strategy is adopted which starts with priority areas that are defined according to the following criteria:

1. Areas under heavy exploitation.
2. Areas already inventoried.
3. Areas demarcated.

While a programme of management plan preparation is being carried out for the priority areas, a separate programme for the following activities is to be drawn up and implemented:

1. Demarcation of the rest of the areas.
2. Inventorying areas not covered by the previous inventory project.
3. Intensifying data collection in the areas where low intensity inventorying has already been undertaken.

This will enable the whole programme of management plans preparation to be accomplished without interruption.

A high proportion of existing coniferous forests are over-mature and their composition differs from one place to another. Although an even-aged forest system is the appropriate management system to be adopted for these forests, some modifications on rotation, as well as on the determination and calculation of annual allowable cut, might be necessary. This is necessary especially because of a lack of experience on how to establish natural regeneration and on raising nursery stock of indigenous conifers, in which case introduction of new species will be indispensable. Furthermore, in areas where a backlog of regeneration or reforestation exists, felling can be kept at a minimum in the remaining stands during the early stages of management. Simultaneously, the rate of reforestation may be accelerated to bring the whole forest under sustained management on an increasing yield basis. The existing low market demand for industrial wood in fact favours this approach and provides an opportunity to regulate wood production.

The management of mixed hardwood forest should follow the same principles. However, the system of management here should be based on selective felling of desirable species having more than a predetermined girth or diameter breast height, if the forest is to be kept as mixed hardwood forest. In this case rotation will be determined according to the growth pattern of the desirable species.

The amount of desirable species in these forests is low and for this reason in most areas logging becomes costly and uneconomic in practice. Research on wood utilization is needed in order to increase the number of desirable hardwoods and to introduce them into the market.

Elimination of undesirable species to give way for others to grow, followed by enrichment planting, is a common practice applied in many countries. Killing is done either by poisoning or by felling. The latter is more advisable wherever markets for firewood, charcoal or small industrial wood exist.

In already-exploited areas where there are virtually no species of economic value left, clear felling and replanting become necessary. In this way, converting the forest into fast growing even-aged stands should follow the same system that is applied to coniferous forests.

In both coniferous and mixed hardwood forests, logging has been and is being done on a selective cutting basis. In most of the logging sites visited, the trees to be felled are selected by the labourers who are working on a piece rate basis. Their selection criterion is to choose and fell any tree which yields two or more 4 m-length logs. Traditional log length is 4 m, and more than 90% of logs produced throughout the country have the same length. With this practice, in most cases part of the stems are left in the forest, resulting in substantial waste. Considering a production target of 113 000 m^3, if only 10% of the stems are left in this way the total wood left in the forest amounts to 11 300 m^3 which by itself can feed two sawmills. Other noticeable wastage in the forest occurs

because of high stump height. Trees are usually cut well above buttress, leaving a significant usable part of the stem on the ground. These can be avoided by training the labourers and by close supervision.

There is no specific reason other than habit for producing 4 m logs for sawmills. For sawing, log lengths can be varied from 2-2.5 m up to 6-6.5 m with an interval of 0.5 m. Within this wide range a stem can be cross-cut most efficiently and give no waste.

5.2.2 Woodlands

Woodlands in Ethiopia are the natural result of either progressive or retrogressive succession of climax vegetation, and being located in transitional zones their role in environmental protection is substantial. Their extent is estimated at about 20 million ha. Woodlands have been the main source of land for firewood production as well as grazing and cultivation. Over-exploitation, together with heavy grazing, thinning and clearing for cultivation has resulted in rapid degradation of woodlands, especially in densely populated areas and in the vicinity of urban centres. The Rift Valley represents an outstanding example of this degradation, where in many places desertification appears to be in progress.

Current utilization of woodlands is likely to continue until such a time as:

1. New sources for firewood and/or substitutes are found which may reduce the production level from woodlands and keep it within the capacity limit.
2. Measures are taken to reorient the cropping patterns with the introduction of fodder and forage crops so as to ease the pressure on woodlands for grazing;
3. Implementation of a government policy, limiting crop production to agricultural lands and seeking to meet additional demands on the land through the adoption of intensive agricultural practices rather than the expansion to new agricultural lands - this, as the current experience shows, is often at the cost of fast-depleting forests and woodlands.

With the growing social consciousness of the need to preserve the woodlands so as to prevent the deterioration of the environment and provide sustained forest products, and with the increasing capabilities of the agricultural system to meet the enhanced demands from the land resources, the restoration of the woodlands could be accomplished. In the medium term, as an interim measure, and considering the need for multi-sectoral usage, woodland management should be directed to establish a balance between these uses. This could be achieved by adopting a silvi-agri-pastoral approach to the management practice. This package of management practices should consist of the following essential components:

1. Preventing land clearing.
2. Protecting and, wherever applicable, regulating fires.
3. Controlled grazing by limiting the stock and regulating the frequency and interval of grazing.
4. While retaining tree growth, introducing appropriate crops wherever soil, slope and other agronomic conditions permit profitable crop production.

5.2.3 Plantations

Plantations are directed to three uses, each having different objectives: soil conservation and erosion control, firewood production, and industrial wood production.

Until the early seventies, the main emphasis had been given to firewood plantations utilizing Eucalyptus spp to provide for firewood required by urban centres. Almost all plantations were established and managed by private individuals. Since the start of the economic campaign in 1978, Peasant Associations have been encouraged to establish village woodlots for their own use, with the collaboration of FaWDA which supplies seedlings and provides necessary supervision. With this new programme it is estimated that about 20 000 ha of firewood plantations have been established during the past few years.

Firewood plantations established prior to the revolution have been handed over to Peasant Associations and "kebeles" following the issue of the Public Ownership of Rural Lands Proclamation, and since then have been managed by them. All the plantations are managed under a coppice system, though their yields are normally lower than what they would have been under normal conditions, due to very close spacing, old mother stumps and short rotations. For example, it is difficult to see a eucalyptus stand with an average diameter of more than 8 cm around Addis Ababa.

In 1971 the Government, being aware of the serious soil erosion problem which had been developing, initiated a soil conservation and afforestation programme which was started first in Eritrea and Tigray, and later expanded to cover more regions including Welo, Harerge and Gonder. The programme is being implemented with WFP/FRG assistance, the former supplying grain for wages, the latter providing technical supervision and tools and equipment. Up to 1979,13 580 ha had been afforested and an additional 13 500 ha will be planted during the next two years under the same programme.

The areas planted under this programme are usually steep hillsides with slopes of 35% or more, and marginal lands which have been exposed to soil erosion over a lengthy period. Hence, the prime objective has been to establish a vegetation cover over bare lands, so preventing further deterioration. The plantations are also expected to contribute to the wood

supply for community needs without jeopardizing the main objective of their establishment. In this respect, nearly 90% of them can be considered as potential fuelwood sources, while the remainder are grown under relatively good conditions and show better growth, and may provide also some industrial wood.

Although the extent of already established industrial plantations is estimated at about 12 000 ha, only around 1 500 ha occupy sizeable areas, the rest being scattered over a vast geographical area in sizes ranging from 25-200 ha. Munesa plantation of about 1 100 ha, comprises the largest single compact planted site. Planting in Munesa was started in 1969, thus some of the stands have reached commercial thinning stage. Consideration may be given to the utilization of commercial thinnings from softwood plantations but as yet the country has no experience in this field.

The wide scattering of small-sized plantations creates the problems of protection and maintenance. Furthermore, their location and size, in most cases, are questionable from the point of viability for industrial utilization. It is therefore more desirable to concentrate plantation efforts in a few large areas so that the economics of establishment as well as utilization can be improved substantially.

5.3 REFORESTATION

In addition to the measures to be taken to increase the productive capacity of existing resources, there is a need for expanding forest areas to enable them to meet the rising demand for forest products and services in the country. Based on the immediate as well as the anticipated requirements for the future, the expansion of the forest is needed to cover three major fields: soil conservation and erosion control, village woodlots and industrial plantations.

5.3.1 Soil conservation and erosion control

Soil erosion is the greatest single menace emerging from the current land use practices in Ethiopia. It has mainly been the result of indiscriminate clearing of the vegetation on the mountain slopes for cultivation and grazing, and is accelerated by high rainfall and accentuated by the mismanagement of croplands and overgrazing. It is estimated that more than 52% of the area of the country is affected by soil erosion in varying degrees, causing a loss of about 2 000 t of topsoil per km^2, or 2 billion m^3 from the whole country every year.

The most effective way of preventing soil erosion and conserving soil is to protect the soil from exposing to the direct impact of falling raindrops and wind. Under natural conditions, in areas liable to soil erosion, this is achieved by vegetation cover combined with the litter it

produces. Nature can also do the same to conserve the land in eroded areas, provided that necessary conditions are created and the natural process, wherever required, is supplemented by complementary activities such as planting. This implies that natural rehabilitation should receive the first consideration in soil conservation practices. In many areas this can be achieved by providing complete protection temporarily, or by controlled utilization such as regulated grazing.

Afforestation should be considered as one of the means for soil conservation in places where nature itself is unable to re-establish vegetation cover. Although a detailed survey has not yet been conducted to identify the extent of areas needed to be afforested, it is believed that the task of afforestation for soil conservation purposes is immense and that it deserves careful planning and programming. FaWDA plans to accomplish an annual target of 100 000 ha under afforestation. Only the WFP/FRG assisted projects, which at best take care of 5 000 to 7 000 ha a year, are implemented on surveyed, pre-identified areas, while the rest of the programme is attempted on an ad hoc basis. The fact that success in soil conservation can best be attained by improved land use practices in a complete watershed or catchment area means that any attempt at soil conservation must take into account a complete catchment area, and that afforestation should be combined with other activities intended to improve the land use. Furthermore, afforestation with the main objective of soil conservation can and should be managed to meet other needs also in which case, under the prevailing conditions, providing fuelwood and building poles must have high priority. In this context it is advisable to combine the efforts for soil conservation and fuelwood production by giving the priority in those catchments where there is a need for both.

5.3.2 Village woodlots

Of the estimated 25.6 million m^3 of annual wood production about 80% are consumed as fuelwood by both urban and rural households, the latter accounting for 76% of the total fuelwood consumption. The major part of the fuelwood supply for urban consumption comes from already established plantations, while rural areas are supplied almost wholly from woodlands and natural forests. As the forests and woodlands of the country are fast depleting resources, the high demand for fuelwood is either met at the cost of further depletion of the remaining meagre stock or, in the areas where wood sources have already disappeared, by such substitutes as dry cow dung and agricultural wastes. Particularly in the northern regions, where virtually no forests are left, fuelwood has been completely substituted by cow dung and agricultural wastes, which could otherwise have been used to enrich the land fertility. With an anticipated growing demand, it is essential that new sources of fuelwood should be created to ease the high pressure on existing resources and to divert the usage of cow dung and other agricultural wastes to this more profitable use as fertilizers for the soil.

Assuming that with better management and protection, existing resources will be able to produce the same amount of fuelwood as at present, there will be a need to provide an additional 10 million m^3 a year to maintain the current consumption pattern, or 28 million m^3 a year with the objective of substituting other non-commercial fuels by fuelwood. As the Government's long-term policy is to provide enough fuelwood even in non-wooded areas, a total of 2 million ha of fuelwood plantations will be needed to satisfy all these requirements.

FaWDA has launched a programme for the establishment of village woodlots with the collaboration of Peasant Associations, and intends to reach an annual planting target of 100 000 ha. Considering the number of Peasant Associations already formed throughout the country, more than 25 000, the programme is accomplishable, though it certainly needs an efficient and good network of extension and supporting services. Further consideration should be given to combining fuelwood plantations with soil conservation activities. In this respect, it is believed that nearly 50% of fuelwood supply can be obtained from protective forests especially in the northern regions where neither fuelwood is available nor soil conservation measures are adequate.

5.3.3 Industrial plantations

According to the inventory figures already mentioned, the estimated growing stock of the high forests in southwest Ethiopia was about 140 million m^3 in 1975, of which 90% were found to be in the millable size range. Of the total millable volume only, less than 60% were accounted for by merchantable species, both coniferous and hardwoods together, and although the latter comprise 14 species, only one of these, (karoro),is cut on any scale, most or all of the rest being left standing irrespective of the stem quality. The coniferous species Juniperus procera and Podocarpus gracilior, which are widely used and account for 80% of total annual log production, constitute only about 7% or 5 million m^3 of the total merchantable volume. Further allowance has been made on the available merchantable volume, as 64% of the forests were classified as physically and/or economically inaccessible.

Considering the growing demand for industrial wood, the existing stock of high forests will probably be inadequate for meeting the rising needs in 15-20 years time. This is true especially for softwood timber as the remaining exploitable stock is only of the order of 3-4 million m^3. The future supply gap will have to be filled by establishing industrial plantations, giving priority to fast growing species.

It is not unreasonable to assume that up to the late 1990s all log requirement can be met from the existing high forests. Thereafter part of the demand will have to be met from additional sources, especially industrial plantations, by gradually increasing proportions, which might

eventually reach 75% of the total requirement. The remaining 25% can be obtained from high forests, especially mixed hardwood, some of which may even be considered for export markets. Aiming at this proportion of the production requires the establishment of 107 000 ha of plantations with a 25-year rotation and at a modest estimates of 350 m^3/ha of log production, which corresponds to a planting programme of 4 030 ha per year for the next 25 years.

For accomplishing the expansion of the industrial plantations by the proposed amount, two major limitations arise, dictated by location specificity, namely ecology and markets. As the high forests are located in relatively high altitudes ranging from 1 400-2 400 m, this range represents ecologically the highest potential area for industrial plantations. Cupressus lusitanica and Pinus patula are the two introduced species which proved to perform well in Ethiopia under highland conditions, especially above 1 800 m. It is advisable to limit the expansion of industrial plantations to these two species and to confine them to areas above 1 800 m, until such time as the ongoing trials identify other species suitable for high as well as lower altitude regions.

Existing wood-working industries have mainly been developed in and around the main consumer centres, such as Addis Ababa, Jima and Shashemene, and this pattern of development is likely to continue in the foreseeable future, due to the concentration of infrastructural development and skill availability in these areas. To strike an optimum balance between maximizing the use of the raw materials and minimizing the transportation cost, it is desirable to establish these plantations within acceptable distance from the industrial consumer centres, which at the present reckoning could be up to 200 km.

In addition to industrial log production, consideration may also be given to providing electric and telecommunication poles. Eucalyptus poles with top diameters ranging from 14-25 cm and lengths of 7-15 m are being used for both these purposes. The Electric and Telecommunications Authorities are facing difficulties in getting these poles to facilitate their development programmes. Their annual consumption is expected to rise by 2% per annum reaching 32 000 m^3 by 1990, and hence meeting the rising amount may become even more difficult. A project covering an area of 1 500 ha in ten years might meet the purpose. Considering the vast potential for hydro-electric power throughout the country for economic development, and for the building up of an extensive network of power distribution, the projected demand for poles appears to be greatly in excess of available supplies. Unless advance planning is attempted for the massive production of transmission poles, any further accelerated expansion of these crucial infrastructure facilities for economic development is likely to be constrained by the lack of availability of wooden poles, as substitutes like steel or concrete poles are far more expensive and would use up scarce

foreign exchange reserves. Therefore, the proposed project for the production of transmission poles may need upward revision to meet these demands. As the poles used are impregnated, location of the plantations should be as close to these plants as the conditions permit.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

Forestry's role in the monetized sector of the Ethiopian economy is insignificant in comparison with its subsistence contribution and its outstanding importance for soil and water conservation. However, increasing demand for industrial forest products is an indication of the growing importance of forestry in the monetized sector of the economy.

Forestry's contribution to the development of the country should be considered under three aspects:

1. Soil conservation and erosion control.
2. Meeting subsistence requirements.
3. Providing industrial products needed by the growing economy.

These are also the main lines through which the sectoral development is likely to be materialized. As the development level in each of these areas might differ in sympathy with local conditions, it is recommended that these fields be treated separately, i.e., protection forestry, subsistence forestry and industrial forestry at regional level, though their mutual interdependence must be given utmost consideration.

Faced with long continuing denudation of the land, the forests are now deficient in performing their role in these three aspects. In view of the prevailing deteriorating forestry situation and of the importance of realizing the land use objectives, it is hoped that forestry will receive adequate attention in the course of rational land-use planning. In this way its contribution to the preservation of the productive capacity of the land and to social and economic development can be optimized.

6.1 ASSESSMENT OF FORESTRY PROGRAMME

The ongoing forestry programme has two major components, reforestation and exploitation of the high forests.

6.1.1 Reforestation

Reforestation efforts aimed at the establishment of village woodlots, industrial plantations, and soil conservation and erosion control have been intensified with the declaration of the revolutionary economic development campaign, and they are likely to be accelerated with a growing awareness of their importance.

Reforestation of eroded areas and steep slopes for the conservation of soil and control of erosion has been started, first in Eritrea and Tigray and has been extended to cover much wider areas in northern Ethiopia. The programme is implemented with the assistance of WFP/FRG. Food for Work encourages the peasant to participate in the programme and has a sound impact on rural development.

Establishment of village woodlots to provide fuel and construction poles to the rural communities is undertaken by Peasant Associations supervised by FaWDA field officers. FaWDA also provides necessary seedlings for these plantations. Although the economic and social benefits of the programme have been appreciated by the rural people, and hence projected expansion can be realized without much difficulty, two points are to be noted by way of bringing about certain improvements so as to achieve full success.

1. Planning and programming for the establishment of plantations are done by FaWDA and their annual target is given on the basis of seedling production. Having received the target, field officers are expected to decide on the species to be produced and afterwards to identify areas where the seedlings are to be planted. This raises the problem of finding suitable areas for planting the already produced nursery stock, and in most cases results is under-utilization of the seedlings produced. To overcome this problem it is recommended that the planting targets should be set on the basis of available areas for planting out, which should be identified at least a year before planting, with mutual agreement between FaWDA and Peasant Associations so that the amount of required seedlings can be estimated and the production achieved accordingly.

2. Peasant Associations are supplied with seedlings by the nurseries from their available stock regardless of the kind of species and their suitability. In many places this results in supplying unsuitable tree species for the purpose of establishing woodlots which, in the immediate future, might create problems and discourage the people from participating in the programme. It is important that the nurseries should supply the right kind of species to serve the true purpose for which the plantations are established.

The extent of the plantations established for industrial wood production is estimated at about 12 000 ha, of which about 1 500 ha are in the Munesa and Shashemene areas, while the rest are scattered over a large area, in varying sizes ranging from 25-2 000 ha. Cupressus lusitanica and Pinus patula, the main species used, have proved to be well suited to high altitude areas. Species trials are being carried out under the project 'Assistance to Forestry Research, Ethiopia, Phase II', ETH/78/012 to identify other species which may be utilized successfully in different zones of the country.

The main difficulty in the implementation of a reforestation programme arises from the dispute between FaWDA and Peasant Associations on the land to be reforested. This compels FaWDA to carry out planting wherever it is possible, regardless of the size and location of an area. It is to be hoped that this difficulty will be overcome by the measures to be brought about through the forthcoming proclamations. A review of planting priorities is still needed in view of the prevailing practice.

At present, silvicultural treatment following logging in an area is totally ignored, and thus the logged areas are steadily losing their productive capacity and their current underutilization is tempting the peasant to encroach. It is believed that in logged areas replanting is the most direct means of accomplishing regeneration, as no silvicultural research has been conducted to develop natural regeneration methods which are applicable to the existing forests. For this reason it is recommended that in the industrial plantation programme, priority should be given tp logged areas.

By so doing FaWDA can also avoid uncertainties about the availability of land and secure continuous productivity, and in the meantime prevent encroachment. The rest of the programme should be based on a well appraised and evaluated project which should take into account size and locations of areas to be planted.

6.1.2 Exploitation

Almost all accessible forests of commercial importance are under exploitation. However none of them is yet exploited according to established management objectives and a management plan. Demand of currently working industries forces FaWDA to continue with logging without management plans. There is an urgent need to bring all these forests under proper management plans. FaWDA, aware of this, is attempting to prepare management plans for the most important areas. It is hoped that these will be implemented soon, and that later this practice will cover all forests. In the meantime certain measures regarding the selection of logging areas, marking trees to be felled and control and supervision of felling and cross-cutting can be taken as a step towards improving the current situation. These measures

as such surely will prevent, to a certain extent, uncontrolled felling until the forests are brought under proper management - and further, will increase substantially the recovery rate of the forests.

6.2 FUTURE DEVELOPMENT PERSPECTIVE AND STRATEGY

A medium-term perspective for development of the forestry sector in Ethiopia must be planned against the imperatives of:

1. The extreme urgency in arresting the deterioration and degradation of the land resources.
2. The continuation of the over dominance of fuelwood and construction poles component in the demand pattern for forest products.
3. The need for meeting additional demands of forest products by the monetized sector from within the country.
4. The emergence of Peasant Associations following the organization of the rural society consequent on the revolution as the new custodians for the conservation and development of land resources.

The areas of concentration in the medium-term perspective for forestry development are protection forestry, subsistence forestry and industrial forestry. Interest in these areas is already growing, and FaWDA is attempting to expand its activities in all these areas. However, there is a need for sound planning and efficient management of these activities in order to optimize the utilization of available development resources.

The severe soil erosion which affects more than the half of the country requires preventive and restorative measures. In soil conservation and erosion control, high priority should be given to natural rehabilitation, as nature in most cases can rehabilitate vegetation cover over the land at the least cost. Temporary protection of the land by closing the area for grazing and other human activities in many areas can facilitate this rehabilitation. Afforestation, with the primary objective of soil conservation, should be given consideration in the areas where natural rehabilitation appears to be inadequate and time consuming, if not impossible. Furthermore the protective function of afforestation should also be combined with wood and fodder production, so that rural participation in afforestation programmes is ensured and economic viability of such undertakings can be established more securely.

More than 85% of the population, with an annual wood consumption of 20.8 million m^3 account for about 80% of the total wood consumed and constitute the subsistence sector within the country. As the anticipated proportion of the subsistence sector in the total population is likely to remain at over 60% in the coming few decades and to constitute the major consumer, the establishment of village woodlots is indicated as the most

important development activity. Programmes jointly undertaken by FaWDA and Peasant Associations are certainly the best approach for implementing this plan, the former providing seedlings and technical support and the latter dealing with the establishment and maintenance of woodlots. More efforts by FaWDA are needed to improve its technical support and extension services since, as managed at present, they are inadequate for such programmes.

The need to supply urban areas with fuelwood and construction poles requires further consideration in the fuelwood plantation programme. The establishment of plantations to supply the urban needs can be undertaken directly by FaWDA on a commercial basis. An alternative approach is to encourage Peasant Associations located in nearby urban centres to plant more areas than are required for meeting their subsistence needs. The latter will also act as an important means for bringing some of the rural people into the market economy.

Existing high forests currently constitute almost the only source for the production of industrial wood. As the growing stock of the high forests is not capable of meeting the expected demand, the need for the establishment of industrial plantations is inevitable unless reliance is to be placed on the import of wood products from external sources. It is estimated that nearly 110 000 ha of plantations will be required to meet the rising demand in the medium term. Although a reforestation programme is required as an immediate start, management of existing high forests deserves higher priority in the industrial forestry development, as they represent the source at hand and the extent of new plantations will depend upon the success of their management. As clarification on the ownership and boundaries is a prerequisite for proper forest management, it is recommended that the areas to be kept under permanent forest should be designated as National Forest Reserves, and accordingly the demarcation programme be revised to give priority to exploited areas so that management planning can be materialized effectively.

The extent of industrial plantations required as a supplementary source to the existing high forests can best be determined after bringing all high forests under a management aimed at achieving optimum production on a sustained basis. The estimated 110 000 ha can be taken as an initial target, and this might be revised later as the generation of information regarding the production capacity of the high forests is intensified. As the allocation of land resources based on optimum land-use practice is still in its early stages, so specific areas have been identified for location of these plantations. Nevertheless, it is suggested that the following should be taken into account in the identification of locations for industrial plantations:

1. High-altitude areas between 1 400-2 400 m because of good conditions for ecological adaptations, and more specifically in areas above 1 800 m with Cupressus lusitanica and Pinus patula on account of their already proven growth pattern.

2. Proximity to consumer centres (within a radius of about 200 km), where already forest industries have been developed or show high potential for development such as Addis Ababa, Jima and Shashemane.

6.3 INSTITUTIONAL CONSIDERATIONS

Forestry has to be seen not only as an economic activity in the short term, but also in the larger setting as an instrument for the best use of the land resources, from the standpoint of sustaining the productive capacity of land resources. Several organizations that are engaged in development using land as the major input or one of the inputs would have to follow the guidelines being evolved by the Land-use Planning and Regulatory Department (LUPRD). In the short-term although LUPRD with the assistance of the project on Land-use Planning ETH/78/003 is largely concentrating on the preparation of a master land-use plan, it may soon have to acknowledge the necessity of translating the ideas being developed during the project into the field as models applicable to Ethiopian conditions.

Forestry practices including wildlife have a crucial role to play in the stabilization and natural recuperation of the productive capacities of the land resources through clothing the land surface with vegetative cover either through the natural process or by man-made efforts. This may involve either the determination of specific land uses or choosing alternative practices. Even though forestry has been identified and recognized as one of the major land resource uses and a restorative mechanism, its role is not yet fully appreciated, since the forestry component in the technical programme of the Department is not fully integrated and since adequate forestry personnel are not yet deployed. It is hoped that, in the final redefinition of the scope and commitment of the Department and its restructuring, this critical deficiency will be rectified.

FaWDA, being the institution primarily responsible for forests and forestry development, should have the organizational set up and staff capabilities adequate to discharge its commitments and accomplish the long-term development objectives. Currently as structured, its organization consists of the headquarters in Addis Ababa and field offices spread out right through the regional and awaraja levels reaching down to the smallest administrative level (woreda). It does not seem geared as yet to the tasks allotted to it, due to the lack of clarity of the division of responsibility and authority in the chain of command, and the lack of trained personnel and consequent leakages of communication, of information and feedback, to enable the decision making and backstopping at the higher levels. Against

the overall diffusion of responsibilities for initiating, programming and implementing rural development programmes from national and regional to woreda levels vested with the Ministry of Agriculture and its regional administrations, and the involvement and participation of the Peasant Associations, the role and commitment of FaWDA has first to be clearly defined. The division of responsibility and authority at each level should be linked through a single command channel, so that the confusion and overlapping in the hierarchy is overcome. In principle it is advisable that FaWDA is given the full command in merging the forests and in initiating, programming and implementing projects like industrial plantations which are location specific and spatially concentrated. In programmes which are spatially diffused and which the participation of the Peasant Associations in the establishment, maintenance and management of forestry undertaking is envisaged, it is preferable that FaWDA should limit its responsibility to providing technical support and necessary inputs, and should work in close cooperation and coordination with the administrative units of the Ministry of Agriculture.

Improvement of existing lines of communication and feedback systems is essential, as decisions on the issues are fully dependent on the speed as well as the quality of the information being transmitted. However, FaWDA should operate a decision-making system which requires a minimum of communication, both day to day as well as periodic. One way of achieving this would be to issue manuals and standing orders on technical as well as administrative subjects. This would bring about unformity in conceptual understanding and serve as a frame of reference enabling the field staff to conduct their task in a clearly defined fashion without frequent reference to superior authorities.

Project planning, preparation and evaluation, together with the management of existing forests, are the urgent tasks which FaWDA faces. Yet there are no specific sections with primary responsibility assigned to deal with these important subjects within the FaWDA organization. It is recommended that project planning and working plan sections be set up within FaWDA to undertake all related activities.

Considering the magnitude of the task ahead, the technical and management capabilities of FaWDA are far from adequate both in quantity and quality. The mounting of a massive programme for training of required personnel and staff development is urgent, and the future of the forestry development in the country is contingent upon the success of this programme. This Expert recognizes this deficiency but could not undertake an in-depth study of its problems and recommended solutions for want of sufficient time. However, prima face, it appears that the possibilities should be explored of utilizing the existing training facilities within the country to the maximum extent and if need be by providing extra support in funding and training personnel. For instance, doubling the intake capacity of the Ranger Training Programme in the Wendo Genet Forest Resources Institute can partly meet the deficiency of this category of core personnel.

In addition, the possibility of organizing courses with a focus on practical aspects of forestry may be considered as a means of training personnel as support to the rangers, which could be accomplished over a shorter time and more frequently. It is also suggested that the proposal for getting adequate numbers of personnel trained in the forestry institutions abroad be given top priority, so that there will be at least one forest graduate at the regional level in every region within the next 4-5 years.

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Map 1

ETHIOPIA
ALTITUDE MAP

Below sea level
0 – 600
600 – 1400
1400 – 2400
2400 – 3000
Above 3000
Water bodies

0 40 80 120 160 200 Kms

Scale 1:4,000,000

34° 36° 38° 40° 42° 44° 46° 48°

16° 14° 12° 10° 8° 6° 4°

Map 2

ETHIOPIA

EXISTING HIGH FOREST

LEGEND

Coniferous forest

Mixed forest

Scale 1:4,000,000

ERITREA

ASMERA

MEKELE

TIGRAY

GONDER

GONDER

WELO

GOJAM

DESE

DEBRE MARKOS

WELEGA

SHEWA

HARER

NEKEMTE

ADDIS ABEBA

METU

ILUBABOR

ARSI

HARERGE

ASELA

JIMA

GOBA

AWASA

KEFA

BALE

ARBA MINCH

GAMO GOFA

SIDAMO

33° 36° 39° 42° 45° 48°

18° 16° 14° 12° 10° 8° 6° 4°

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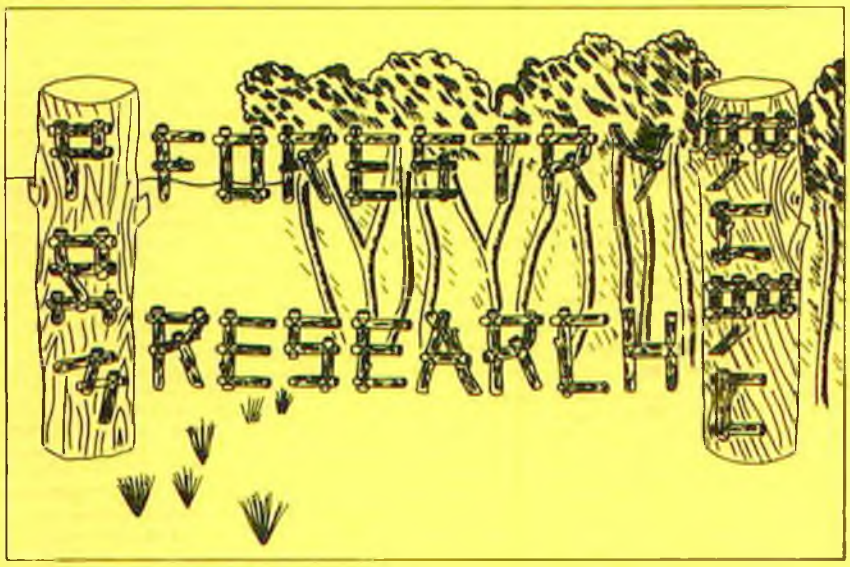
RESEARCH NOTE No 2



Growth of some forest trees in Ethiopia and suggestions for species selection in different climatic zones

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