No. 4

BASIC DESIGN STUDY REPORT

ON

ESTABLISHMENT PROJECT OF NURSERY TRAINING AND TECHNICAL DEVELOPMENT CENTRE FOR SOCIAL FORESTRY

IN

THE REPUBLIC OF KENYA

DECEMBER, 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of The Republic of Kenya, the Government of Japan decided to conduct a Basic Design Study on the Establishment Project of Nursery Training and Technical Development Centre for Social Forestry and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Kenya a study team headed by Mr. Bun-emon Kosugiyama, Head of Afforestation Division, Project Management Department, Forest Development Corporation from August 12th to September 1st, 1985.

The team had discussions on the Project with the officials concerned of the Government of Kenya and conducted a field survey in the Muguga and Kitui areas. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

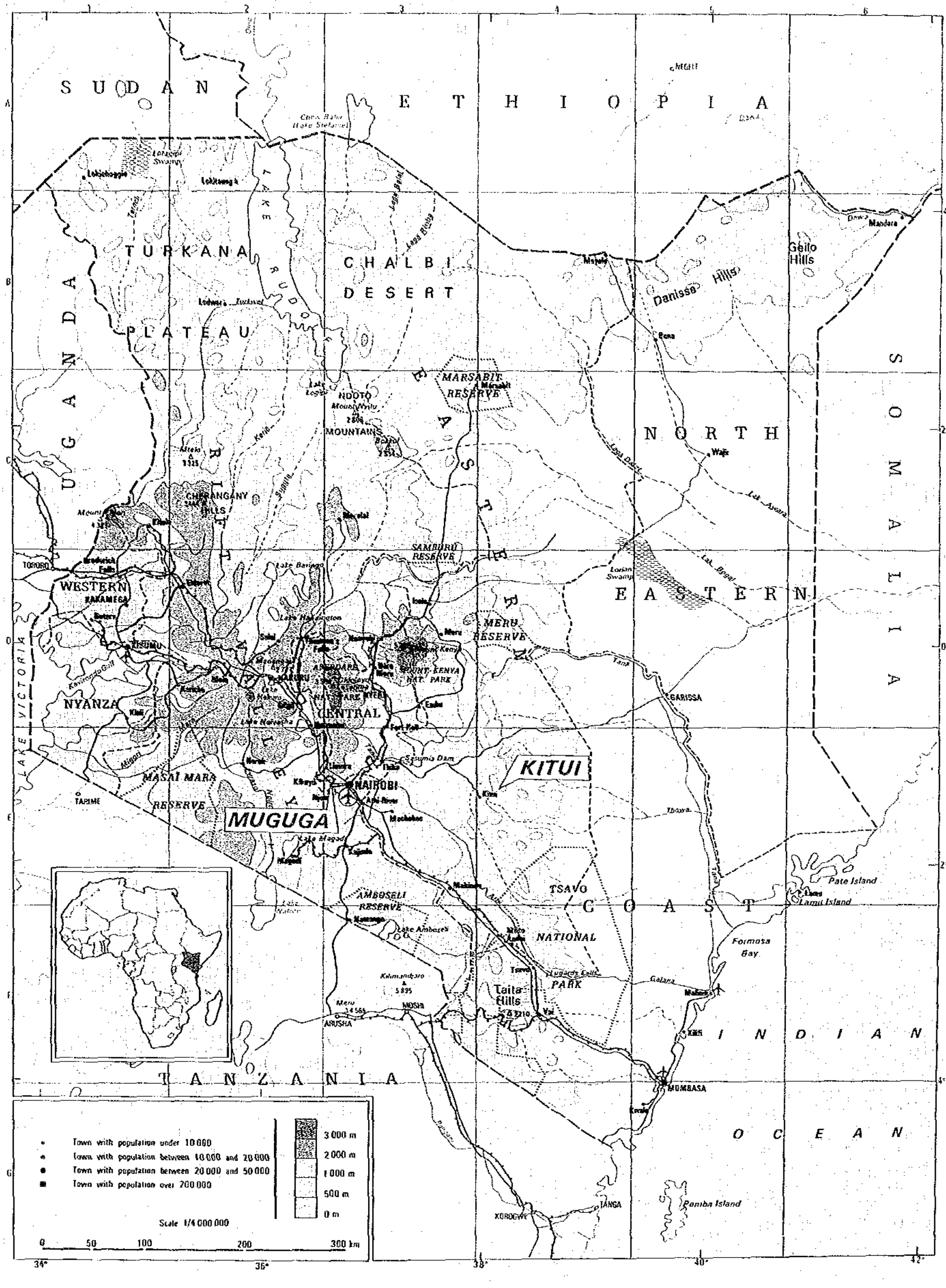
I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Kenya for their close cooperation extended to the team.

December, 1985

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency

MAP OF KENYA


SUDAN
ETHIOPIA
UGANDA
SOMALIA
TANZANIA
TURKANA
PLATEAU
CHALBI
DESERT
NORTH
EASTERN
CENTRAL
WESTERN
NYANZA
COAST
INDIAN
OCEAN
LAKE VICTORIA
MARSABIT RESERVE
SAMBURU RESERVE
MERU RESERVE
MASAI MARA RESERVE
AMBOSELI RESERVE
TSAVO NATIONAL PARK
KITUI
MUGUGA
NAIROBI
MOMBASA
GARISSA
KISUMU
TANGA
ARUSHA
MOSHI
Taita Hills
Pate Island
Lamu Island
Formosa Bay
Pemba Island
Danissa Hills
Geilo Hills
Town with population under 10 000
Town with population between 10 000 and 20 000
Town with population between 20 000 and 50 000
Town with population over 200 000
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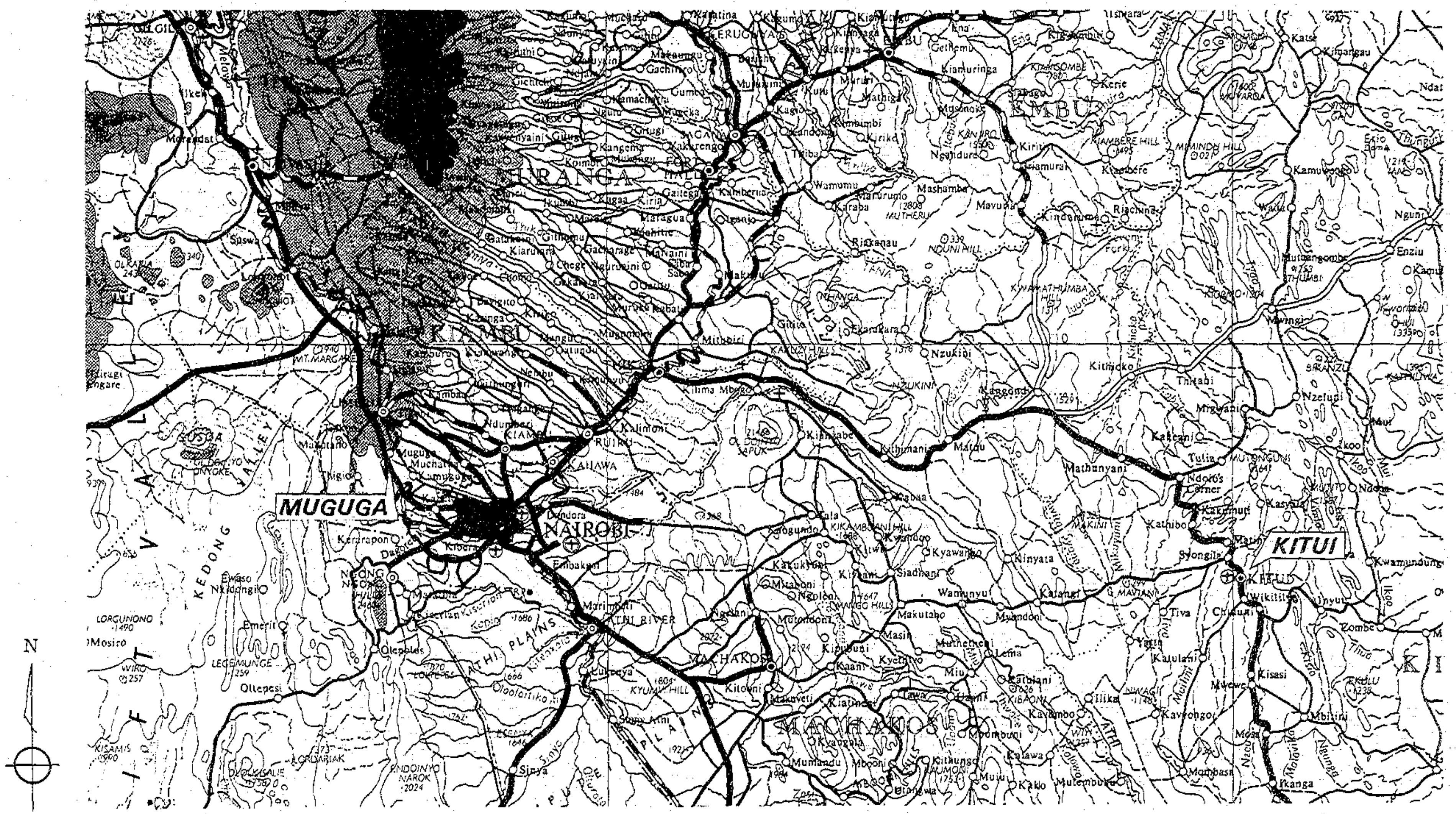
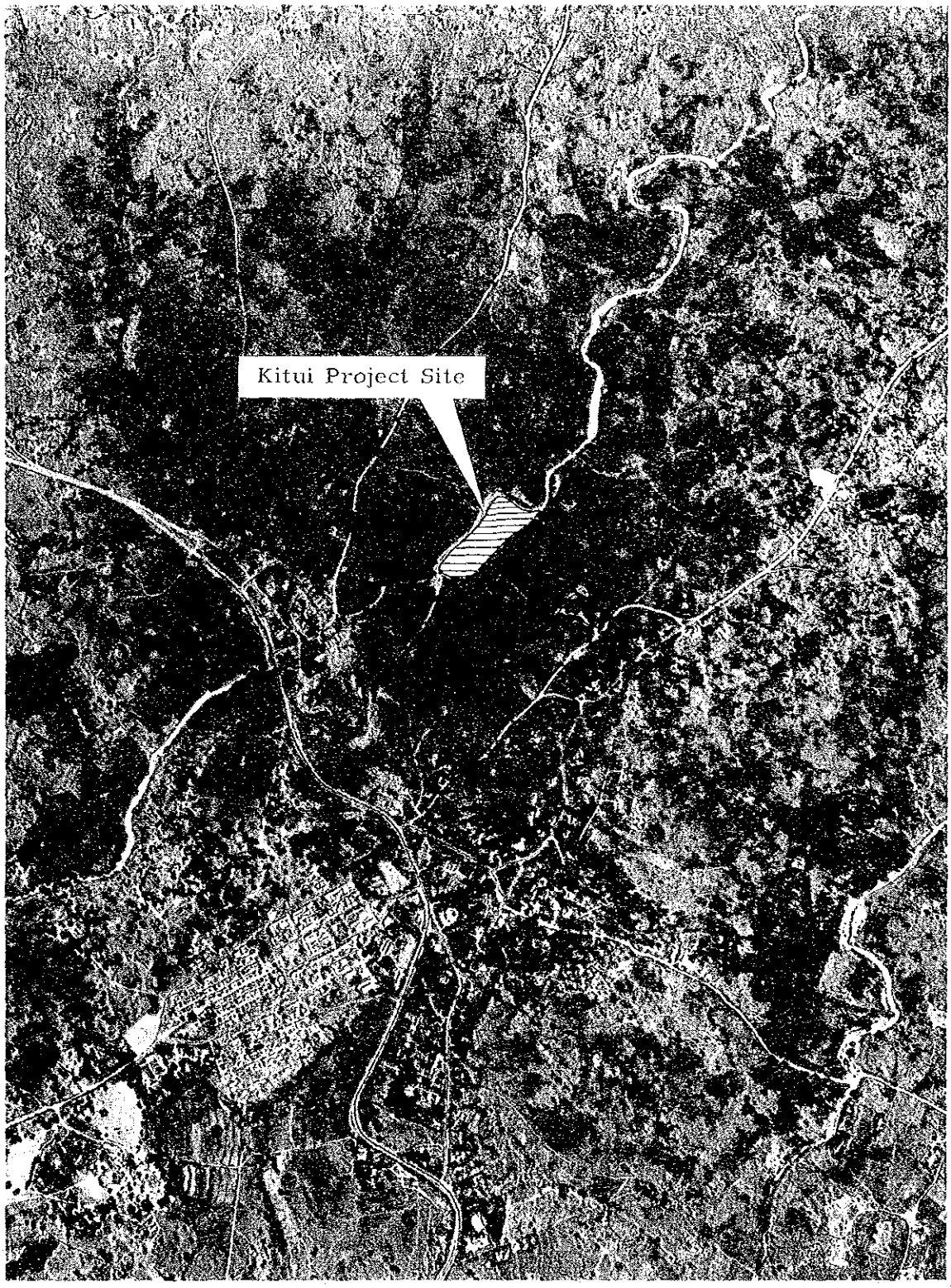


MUGUGA
NAIROBI
KITUI
EMBU
MACHAKOS
ATHI PLAINS
KEDONG
N


Muguga Project Site

Site View (Muguga)


Kitui Project Site

Site View (Kitui)

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ABBREVIATIONS

MENR	Ministry of Environment and Natural Resources
MEPD	Ministry of Economic Planning and Development
MALD	Ministry of Agriculture and Livestock Development
MERD	Ministry of Energy and Regional Development
KARI	Kenya Agricultural Research Institute (MALD)
FRD	Forest Research Department (a Dept. of KARI)
KEFRI	Kenya Forestry Research Institute (projected)
FD	Forest Department (a Dept. of MENR)
ASAL	Arid and Semi-Arid Land
BS	British Standard
RAES	Rural Afforestation Extension Scheme
Ksh	Kenya Shilling
K£	Kenya Pound
JICA	Japan International Cooperation Agency

SUMMARY

SUMMARY

The population of Kenya went from 5,480,000 in 1948 to 19,530,000 in 1984, increasing 3.6 times over the 36-year period. The annual rate of population increase has accelerated from 3.3% between 1948 and 1962, to 3.8% from 1969 to 1979, and to 4% between 1980 and 1984.

Demand for wood fuel and construction materials has increased along with this rise in population. Export of such materials took a sharp downturn in 1983, and consumer prices of wood fuels rose. Also, population growth has led to a rapid increase in new land clearance drastically reducing forested areas. At present, forest covers only 3% of the land area of the entire country, the lowest level in any of the tropical African countries. The government has worked hard over the last 10 years to maintain a fixed level of forest area, but unfortunately it is clear that the capacity of the forestry industry has been decreasing relatively against the ever increasing demand for forestry products. The government expects a serious imbalance in supply and demand, especially for wood fuel, in the near future. Demand for wood fuel is expected to reach 30,300,000 tons in 1990, but supply will only be two thirds of that at about 20,500,000 tons. In fifteen years' time, in the year 2000, if the current situation is not remedied, it is predicted that only 16,500,000 tons will be available, while demand will reach 47,100,000 tons.

Wood fuels are an extremely important source of energy in Kenya. They account for 70% of all energy consumed (compared with 0.2% in Japan), and almost all of wood fuels are firewood and charcoal. The largest demand sector is the home, taking up 74% of the total. Now, wood fuels are renewable energy sources and are vital in Kenya, a developing country that is not an oil producer. The reduction in forest area, causing a scarcity of wood fuels, hits the home--the largest wood fuels consumption sector in Kenya--hardest. It also results in devastating ecological destruction: water sources drying up, soil erosion reaching alarming proportions, and desertification overtaking more and more land area. These effects result in enormous problems for the country.

Various projects are now under way involving research into afforestation techniques, designed to meet the looming crisis by expanding afforested areas -- one of the top policy priorities in Kenya. Recently, the trend in each of these projects has been to develop afforestation in dry areas, and to link this organically to research and education in agriculture, ecology, social structure, agroforestry and social forestry. Land area covered by planting forest in Kenya has steadily increased from a total of 1,310,000 ha in 1975 to 1,550,000 ha in 1982. Tree seedling production increased from 50 million seedlings in 1981/82 to 80 million seedlings in 1982/83.

However, these seedling production levels are not adequate to meet the projected expansion in demand for wood fuels and the many-faceted functions of expanding afforestation. In 1982, the government of Kenya set a target of producing 200 million tree seedlings each year. But meeting this goal is jeopardized by underdevelopment of seedling culture, problems in determining appropriate species of tree, and the fact that productivity is low in tree nurseries throughout the country. The lack of research and development facilities, as well as the shortage of trained personnel to disseminate the appropriate techniques around the nurseries, compound the difficulties of solving these technical problems. The Kenyan government therefore applied to the Japanese government for grant aid to construct the necessary facilities to fulfill their plans for research and development on, and training in, seedling culture. This aid will be used for planting forests and improving all the tree nurseries in the country, mainly by the guidance of officers of the Forest Department of the Kenyan Ministry of the Environment and Natural Resources.

The Japanese government responded to this request by sending preliminary study teams in both February and April in 1985 from the Japan International Cooperation Agency (JICA). These teams were charged with the task of clarifying the basic issues with the Kenyan government and determining the precise form the aid from Japan should take. As a result of the reports submitted by these groups on technical cooperation and the grant aid, and in order to determine the optimum scale of the assistance

required to implement the plans, a further basic design study team was sent in August 1985. This team held meetings with officials of the Ministry of the Environment and Natural Resources to clarify the details of the Kenyan government's request. It was primarily occupied with studies into the current state of seedling culture in the nurseries. The team also gathered information on forestry, construction capacity, and the general economic situation as well as conducting investigations of the proposed sites of Muguga and Kitui.

It became clear from the results of these investigations that improvements in tree nursery techniques are indeed necessary, that personnel must be trained in the appropriate nursery techniques, and further that the development of training programs as well as technological development are urgent issues. From calculations of the requirements and the feasibility of the technical cooperation, it was determined that the grant aid requested should be extended to Kenya for a fully equipped nursery training center with the facilities listed below.

The contents of the Center are as follows.

(1) Muguga

Training facilities	1,084.5 m^2 plus equipment
Dormitories	1,081.3 m^2
Research facilities	2,028.1 m^2 plus equipment
Nursery facilities	503.6 m^2 plus equipment
Subtotal	4,697.5 m^2

(2) Kitui

Training facilities	1,165.0 m^2 plus equipment
Dormitories	934.0 m^2
Nursery facilities	575.6 m^2 plus equipment
Subtotal	2,674.6 m^2
Total	7,372.1 m^2

The capital project costs born by Kenyan side amount to 3,219,000 Ksh and the annual administration and management costs of the center are expected to amount to 3,747,500 Ksh. The administration costs will be provided by the Kenyan government from their recurrent budget. Implementation of this plan is scheduled to take four months from E/N to completion of the detailed designs, two months to the tender, and 15 months for construction, making a total of 21 months.

The grant aid and technical cooperation for this project will directly contribute to the increase in seedling production, expansion of afforested area and the spread and development of social forestry in Kenya. In particular, it will be used to improve nursery technique and forest planting in semi-arid areas, thereby directly expanding the supply of wood fuels, protecting the natural environment, reducing soil erosion and facilitating water catchment. It is expected that these developments will have positive effects on agriculture and the living environment of the people of Kenya.

It is hoped that this high-priority project will be speedily implemented.

CHAPTER I INTRODUCTION

CHAPTER 1

INTRODUCTION

Demand for wood fuels in Kenya has been increasing along with the increase in population. Excessive cutting down of trees has destroyed forests, dried up water sources, and soil erosion and desertification have become serious problems in Kenya. A presidential directive was issued in April, 1982, entitled "Production of 200 million Tree Seedling per year - A Strategy and a Focus on Rural Tree Development." This directive established a plan to produce 200 million seedlings per year. An outline of the strategy was explained to the Asia and Africa Wood Fuels and Forestry Basic Preliminary Survey Team, headed by Mr. K. Kotari, sent to Kenya in February 1983 by JICA. In October, 1983, JICA's Kenya Agriculture and Forestry Cooperation Project Finding Survey Team, led by Mr. Y. Fujita, was verbally asked if Japan could provide the technical assistance and grant aid to establish a seedling production system to produce 100 million seedlings per year--half the 200 million required by the Kenyan government's plan. Then in April, 1984, the Kenyan government officially issued a written request to the Japanese government for a cash grant to plan the system to produce 100 million seedlings per year. The Japanese Embassy in Kenya considered this request and decided that JICA should be commissioned to do a development survey to investigate the feasibility of setting up the 200 million seedling per year production system, and the precise form that assistance from Japan should take.

JICA dispatched the Kenya Wood Fuels and Forestry Plan Contact Study Group, led by Mr. H. Kakuya, in August, 1984. This group held a meeting to explain in detail Japan's procedures for technical cooperation to the Kenyan representatives. It was decided that project type technical cooperation is to be done together with grant aid.

Following this decision, the government of Kenya repeated its request for a nursery training center in November, 1984. The Japanese government sent a preliminary study team to Kenya in February, 1985, headed by Mr. Y. Hironaka, Planning Division, Private Forest Department, Forestry Agency, to consider the final form the technical cooperation and grant aid should take. This group was charged with selecting potential sites and with determining the most effective methods for implementing the details of the technical assistance. Based on the report of this group, the Japanese government decided that Japan's main concern would be the development and improvement of seedling culture technology and training the required technicians. In April, 1985, a long-term study team headed by Mr. Yanagihara, Management Planning Division, Forestry Agency, was dispatched to clarify the technical details. This involved determining the machinery, equipment and facilities necessary to provide training in the techniques of seedlings envisaged by Japan's assistance plan. When the report of this longterm study team was received, it was concluded that JICA should send a study team headed by Mr. B. Kosugiyama from August 12, 1985, to September 1, 1985, to carry out a basic design study for the grant aid. This team was instructed to hold meetings with Kenyan officials, conduct site explorations, and collect relevant data. Finally, it was to decide on the most appropriate form of the grant aid and the best equipment and facilities for the project.

This basic design study report describes the background, content, basic design, operating costs, implementation system and operation evaluation for this plan based on analyses of the material collected in the studies in Kenya and meetings with the representatives of the Kenyan government.

CHAPTER 2 BACKGROUND

CHAPTER 2

BACKGROUND

2-1 Economy and National Development Plan

(1) Economy

The average growth rate of GDP (Gross Domestic Product) for the period 1979 to 1982 was 13.8%, nominal (STATISTICAL ABSTRACT, 1984 Central Bureau of Statistics), and 3.9% at the true percentage rate (using 1976 price levels). The growth rate for the five years 1984 through 1988, inclusive, is expected to increase from 3.9% in 1984 to 5.6% in 1988.

The GDP growth rate per capita averaged 0.2% for the period 1970 to 1982. Table 2-1 below shows the real prices and their conversion from Kenya shilling into U.S. dollar.

Table 2-1 GDP per Capita (1979 to 1983)

Year	1979	1980	1981	1982	1983
GDP per capita (Kenya shilling)	2,447	2,668.4	2,986.8	3,248.2	3,512.8
GDP per capita (U.S. dollar)	307.9	360.3	394.7	315.8	255.3
Exchange rate (Ksh/U.S.$)	7,947	7,404	7,568	10,286	13,760

The per capita GDP decrease from 1982 was a direct result of the devaluation of Kenya shilling relative to U.S. dollar. It originates from more than 10% inflation, a chronically adverse balance of exports to imports, expanding budget deficits, and growing foreign debt liabilities in Kenya.

Of the GDP, the major portion -- about 33% -- was in agriculture. The next largest bloc went to manufacturing, with 13% in 1982, while forestry accounted for 0.5% that same year.
These figures show only the value of business done in currency. However, forestry will command a larger share when domestic consumption, such as firewood and charcoal, is included.

(2) National Development Plan

After the independence in December, 1963, the government of Kenya organized a succession of five development plans beginning in 1964. The fifth development plan is now in effect and will continue through 1988.

The aim of the fifth development plan is to improve economic conditions through mobilizing domestic resources for equitable development.

Domestic resources are divided into domestic funds, people, and natural resources. For the development of these domestic resources, concrete strategies such as improvement of land and water, spread and improvement of educational practices, and encouragement of savings have been planned.

Basic services are being improved to help accelerate equitable development of every field. A redistribution of wealth to benefit the poorer segments such as peasants, grazing peasants, and the poor in metropolitan areas is emphasized.

In order to abolish the great differences in wealth between cities and farm villages, provinces will be further developed. The responsibility and authority to execute public investment plans is being decentralized, being taken out of the central government offices and transferred to the district level.

To strengthen agricultural and industrial production and boost the vitality of the private sector, favorable price and distribution policies are planned for peasants. The tax system and monetary policies are being strengthened to encourage private investments in manufacturing. In addition, governmental capital participation in public corporations and industries is gradually being eliminated. Higher productivity is planned through the introduction of healthy private industries.

Forestry details in the fifth development plan are covered in Section 2-3-(3) Forestry Development Projects.

2-2 Forestry Administration and Education Organization

2-2-1 Administrative Organization

The government owns about 70% of all forest areas and they are managed by Forest Department, Ministry of Environment & Natural Resources.

The Forest Department appoints a chief conservator, and three assistant chief conservators of forests, who oversee the areas of forest development, forest conservation, and forest research & training coordination. Under the central management organization is the subordinate organization consisting of eight provincial forest officers administering the eight provinces. In parallel with this are three conservators of forest management services, forest industrial development, and extension & information. The next level below that is made up of district forest officers, managing 41 districts, foresters throughout the whole country (three or four per district) who manage, protect, and raise the government forests, nursery, etc. Foresters organize assistant foresters and supervisors who conduct and guide foremen and workers on the job.

There are about 17,000 workers, and about 100 have degrees above B.Sc. There are about 200 diplomas, and about 200 technicians. In addition there are foremen and workers under the assistant foresters and supervisors.

The budget is divided into the recurrent budget and a development budget. The budgets for the period 1975 to 1985 are shown in Table 2-2. The organization Chart for the Ministry of Environment and Natural Resources and Forest Department are shown in Fig. 2-1.

Table 2-2 Budget of Ministry of Environment and Natural Resources (Kb)

Year	Recurrent Budget	Development Budget
1975	3,821,476	3,090,853
1976	4,894,775	4,031,317
1977	5,477,335	4,810,751
1978	8,023,222	6,635,407
1979	9,164,938	8,147,193
1980	16,264,476	9,140,328
1981	24,568,265	10,374,482
1982	25,500,143	10,397,341
1983	15,285,295	13,478,545
1984	12,204,950	10,398,380
1985	15,327,000	13,425,288

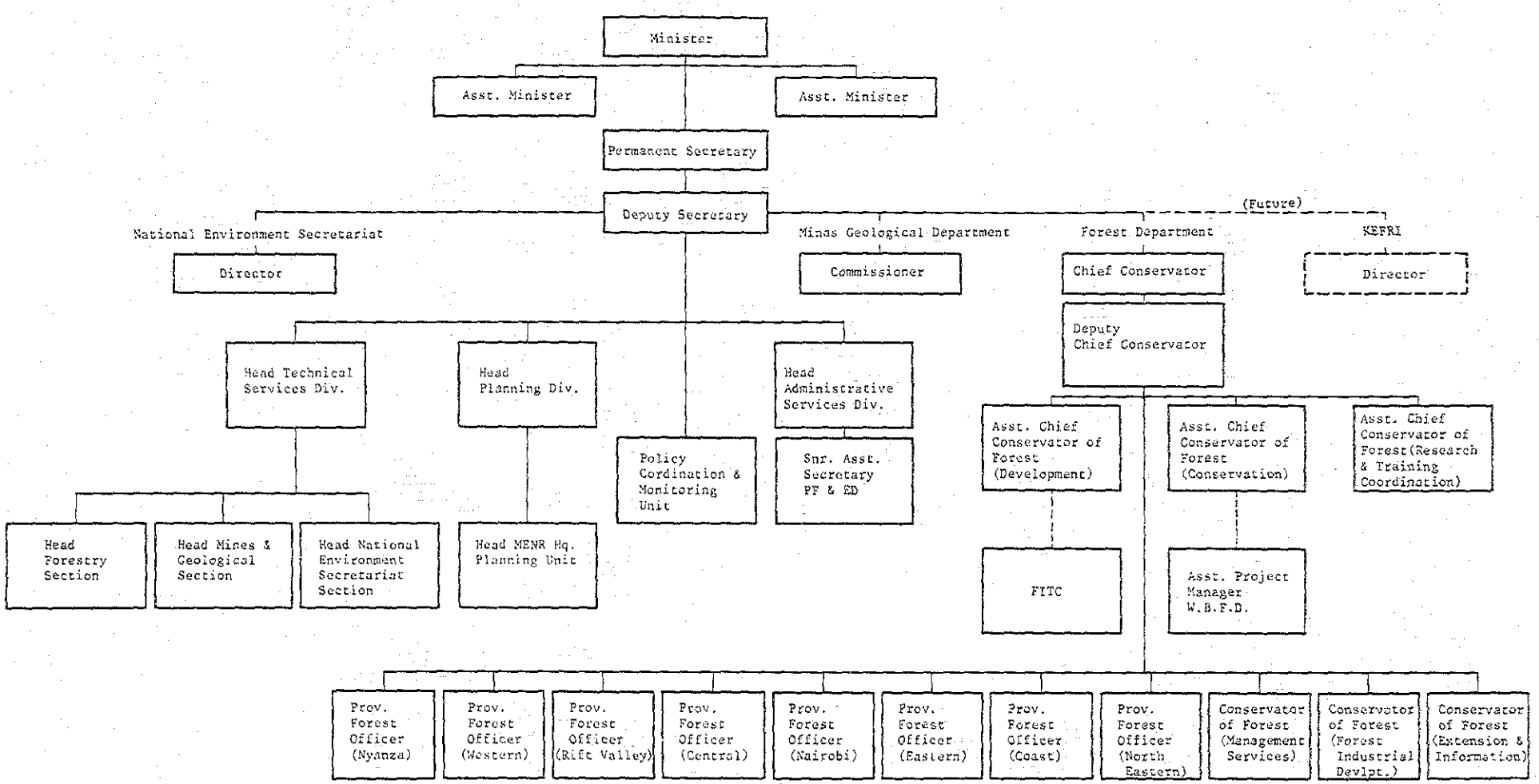
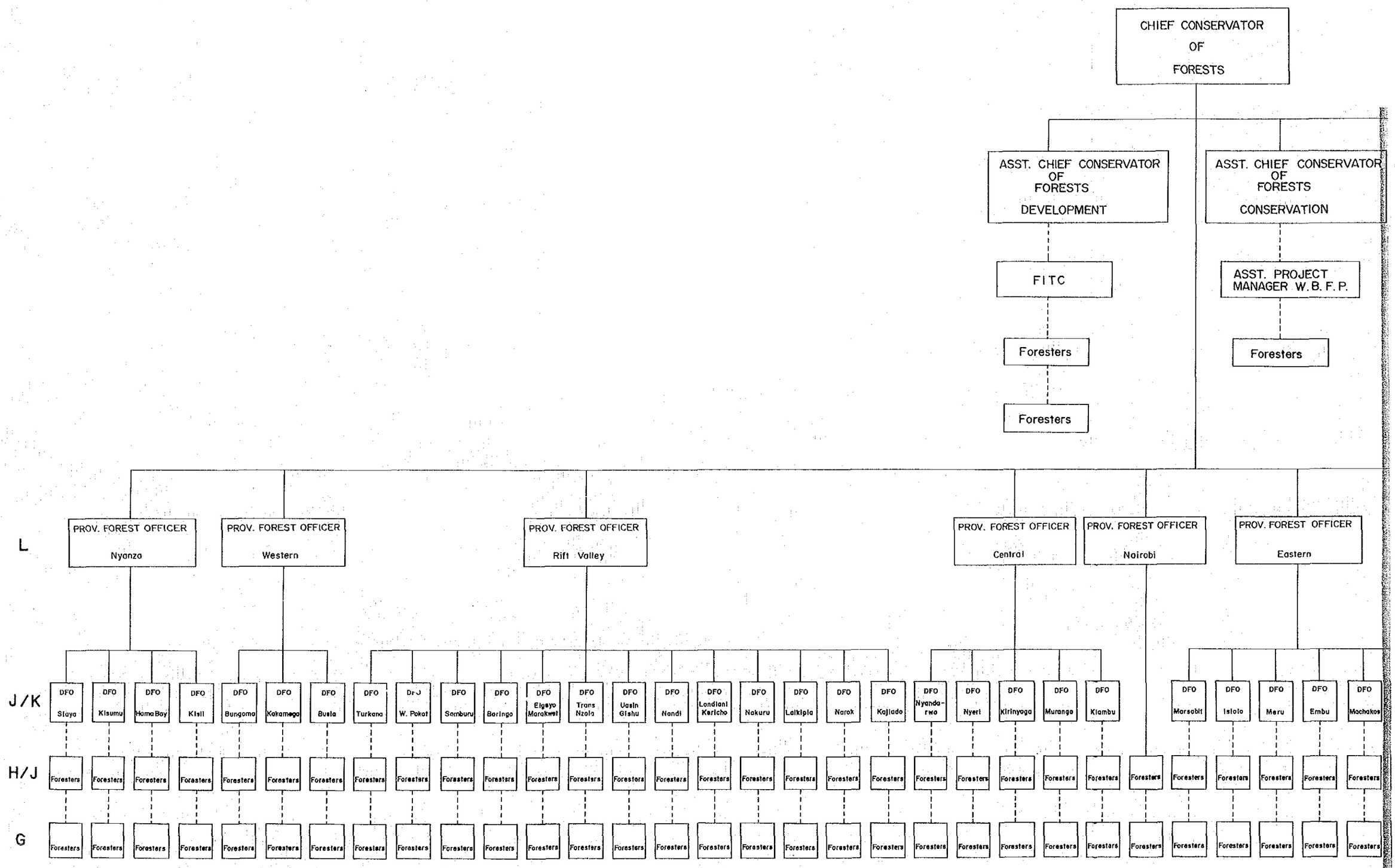
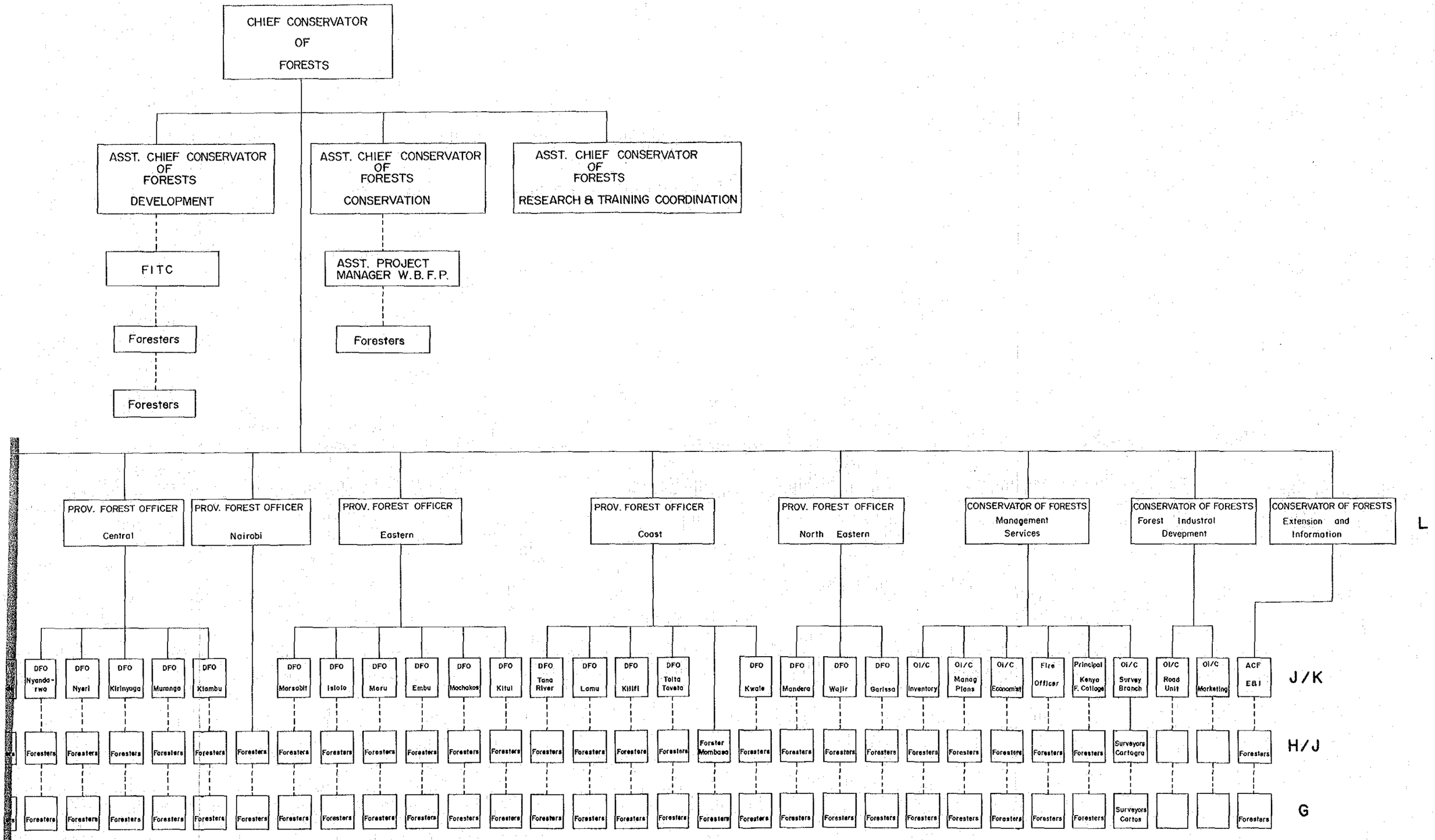


Fig. 2-1-(1) Organization Chart for the Ministry of Environment and Matural Resource, and Forest Deaprtment



Note: L, J/K, H/J, G indicate the grade of the government staffs.

Fig. 2-1-(2) FOREST DEPARTMENT ORGANIZATION CHART



2-1-(2) FOREST DEPARTMENT ORGANIZATION CHART

2-2-2 Forest Research Organization

Forest research in Kenya is now conducted by the Forest Research Department (FRD) of the Kenya Agriculture Research Institute (KARI) under the control of the Ministry of Agriculture & Livestock Development. FRD is budgeted as a department of KARI, while its activities are closely associated with one of the assistant chief conservators of the Forest Department in MENR who acts as coordinator of research and training. (For the Organization Chart of KARI refer to Fig. 2-2.)

The number of personnel is currently about 100. Records show two Doctors of Philosophy, seven Masters of Science, 17 Bachelors of Science, 18 Diplomas, 12 Certificates, and 44 miscellaneous.

The annual budgets of FRD for the years 1980 through 1985 are shown in Table 2-3. As of August, '85, FRD consists of three levels: National Forest Research Stations (National Sta.), Regional Forest Research Stations (Regional Sta.), and Dryland Reforestation Research Stations (Dryland Sta.).

Table 2-3 KARI Forest Research Department Budget (K£)

	1980	1981	1982	1983	1984	1985
Personnel Expenses	130,000	130,000	311,037	380,151	438,520	1,001,491
Office Supplies	6,500	6,500	15,000	30,000	26,800	30,000
Facility Maintenance	4,750	4,750	11,000	20,000	10,155	21,025
Transportation	18,000	19,000	26,000	50,000	38,300	145,626
Other	133,025	153,732	695,882	489,690	618,240	642,956
Total	272,275	313,982	1,058,919	969,841	1,132,015	1,841,097

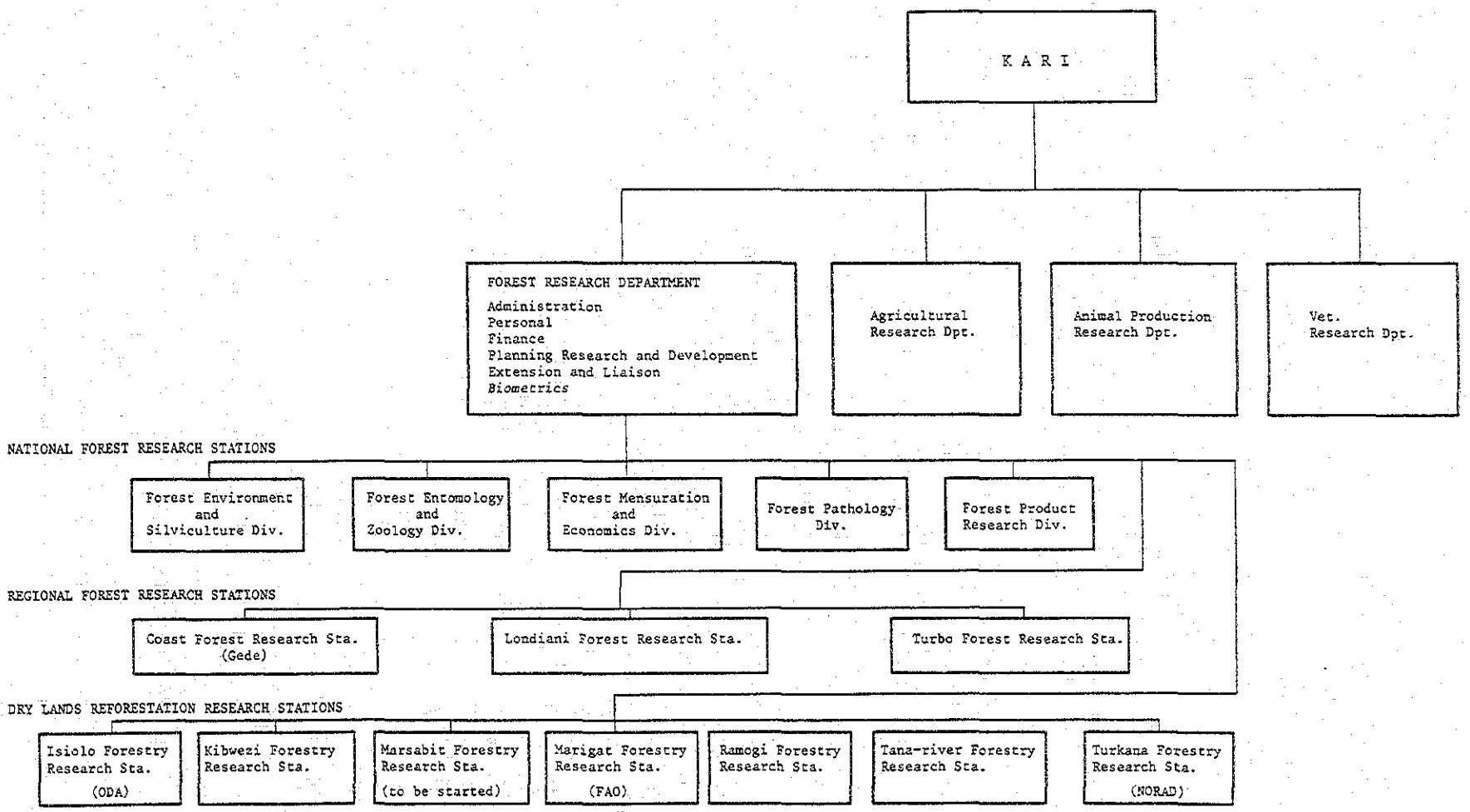


Fig. 2-2 Organization Chart of KARI

National Station consists of five divisions, the Forest Products Research Division which is located in Karura, and the other four divisions which are in Muguga, where activities are conducted at the KARI research facilities. National Station oversees three Regional Stations (in Gede, Londiani, and Turbo), and seven Dryland Stations (in Isicolo, Kibwezi, Ramogi, Tana River, Marigat, and Turkana). In these locations forest research is conducted, matched to the forest in that location. The eight major research themes for FRD in 1985 are as follows:

(1) Species and provenance trials and plantation management studies

(2) Afforestation research of arid and semi-arid lands

(3) Silviculture and ecology of natural forests

(4) Forest protection research (forest pests and diseases)

(5) Forest products research

(6) Social forestry

(7) Agroforestry

(8) Tree germplasm conservation

Note: The current National Forestry research program, compiled by FRD Jan. 23, 1985.

In the near future, the Forest Research Department will become independent of KARI, and will be called the Kenya Forest Research Institute (KEFRI). It will be under the control of MENR and parallel to the Forest Department. The legal details are currently being worked out. (The organization chart of the future KEFRI is shown in Fig. 2-3.)

KEFRI will take over the five divisions which constitute the National Stations of the present FRD, and will expand to nine divisions in order to facilitate full research efforts for the items in the above list.

(1)	Forest Environment and Silviculture Div.	(as before)
(2)	Forest Entomology and Zoology Div.	(as before)
(3)	Forest Mensuration and Economics Div.	(as before)
(4)	Forest Products Research Div.	(as before)
(5)	Forest Pathology Biodeterioration Research Div.	(modified)
(6)	Forest Seed Technology Div.	(newly organized)
(7)	Social Forestry and Agroforestry Research Div.	(newly organized)
(8)	Forest Fire Research Div.	(newly organized)
(9)	Dryland Aforestation System Research Div.	(newly organized)

This Center is to be established in close relation with Social Forestry & Agroforestry Research Div. in particular and other divisions of KEFRI.

When the Center is established the present staff of FRD consisting of 4 Bachelors of science, five technicians, and 20 subordinates will be shifted to the Center and in addition two professional staff, three technical staff and four subordinate staff will be added yearly including two professional MSC foresters abroad at present.

In KEFRI, the Regional Stations will be attached to the Forest Environment and Silviculture Div., as well as the seven Dryland Aforestation Stations to the Dryland Aforestation System Research Div.

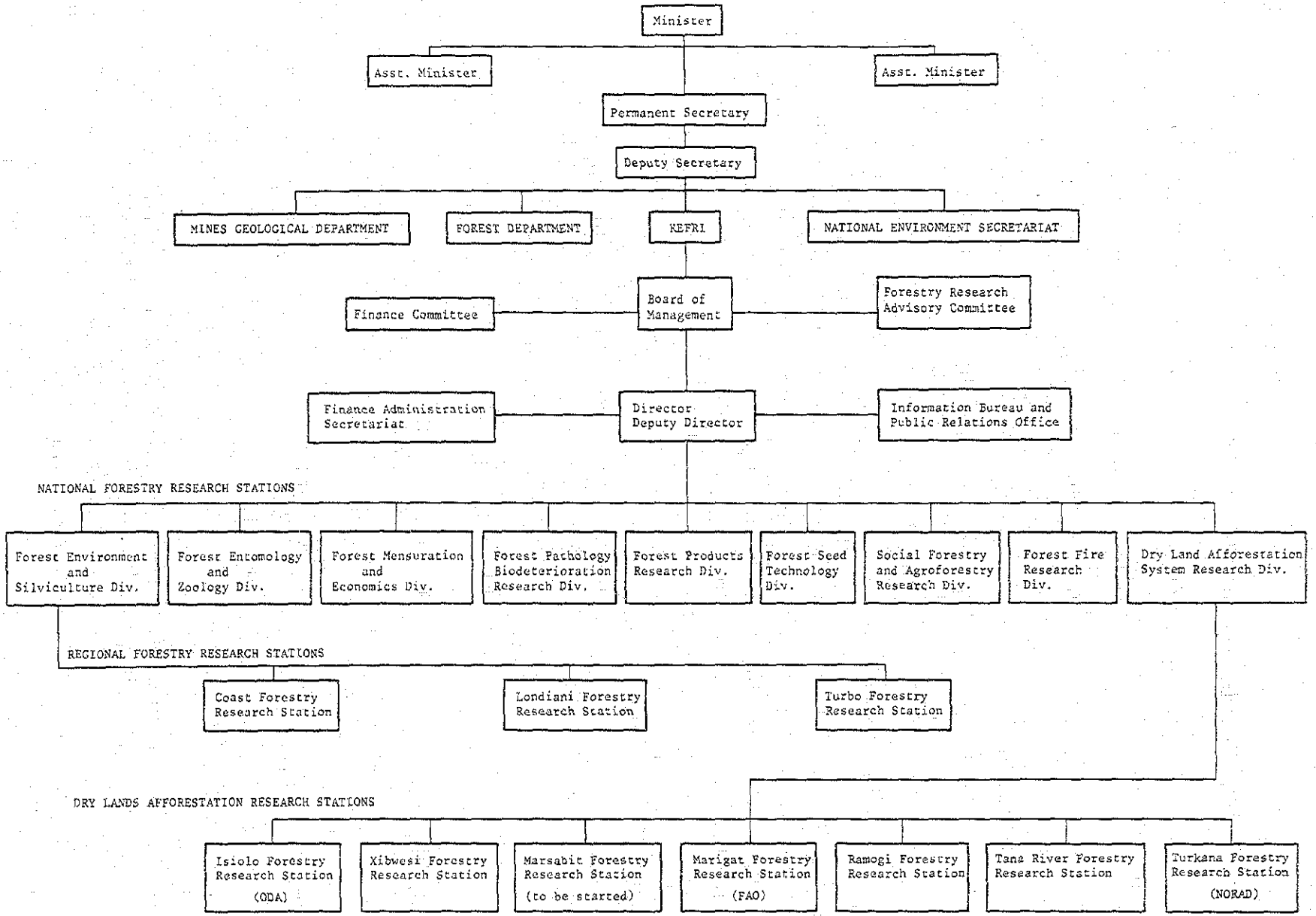


Fig. 2-3 Organization Chart of the Future KEFRI

2-2-3 Forestry Education

Forestry technician training is provided at three facilities: one university and two colleges.

	Graduation qualification	Number of staff	Number of students	Place
1. Moi University	B.Sc. Forestry	10	35	ELDORET
2. Kenya Forest College	Diploma in Forestry	12	80	LONDIANI
3. Egerton College	Diploma in Forestry	7	15	NJORO

Egerton graduates are employed by the Forest Department as foresters and forest guards. Each year 18 graduates from Moi University and 30 to 50 from Kenya Forestry College and Egerton College go to work for the Forest Department.

During the fifth Development Plan (1984 through 1988), the number of foresters will be increased by 145, and the number of forest assistants will grow by 559. The actual count is expected to reach 332 foresters and 1,167 forest assistants.

In the other facilities listed below, small-scale training is conducted.

- o Athi and Tana River Development Authority
  (Nursling and tree planting activities are pursued to develop riverheads.)
- o ICRAF (International Council for Research in Agroforestry)
  (International Organization for reviving Agroforestry: head office is in Nairobi.)
- o Public Schools (in public schools nurseries are made, and tree planting is done.)
- o KENGO (Kenya Non-government Organization)

- o GREEN BELT (Council of women of Kenya)
- o NCCK (Christian Council of Kenya)
- o MAENDELEOYA WANAWAKE (Women's organization)
- o BAT (British American Tobacco)
- o Kenya Shell Co. (Private corporations have private tree planting areas, and small scale training for managing them is provided.)

2-3 Present Situation of the Forest and Forestry Development Plans

(1) Present Situation of Forestry Resources

The actual area of forests in Kenya is not easy to estimate, since the low-tree forests, scattered throughout the range- and waste-land, are difficult to estimate.

Before the forests were cut down and the land cultivated by white immigrants in the high-land district in the 19th century, the forests occupied a considerable area; however, their area has now become very small for the following reasons:

1) An increase in population requires increasing the food yield, which means cultivating more land.

2) Development of such high-productivity cash crops as coffee, tea and tobacco has converted many forest areas into orchards.

3) An increase in livestock density has resulted in more hyper-grazing of the land; for example, in grassless lands the livestock eat out the sprouts of trees and shrubs.

4) As with 1), increases in population have brought about excessive deforestation for obtaining fuel and building wood: wood is being taken faster than it is growing.

The government's declaration states that recent forest acreage totals to 1.874 million ha, consisting of 1.75 million ha of public forest, with 1.338 and 0.412 million ha belonging to the central government and local public bodies, and 0.124 million ha of private forest. This equals about 3.2% of the country's area.

Table 2-4 Forest Acreage* (1973 - 1983)

(Unit: '000 Hectare)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983+
Type of Forest**										
Closed										
Central Government	784	746	746	746	746	746	746	746	746	746
Country Council	156	207	207	207	207	207	207	207	207	207
Total	940	953	953	953	953	953	953	953	953	953
Woodland										
Central Government	271	266	266	266	266	266	266	266	266	266
Country Council	65	73	73	73	73	73	73	73	73	73
Total	336	339	339	339	339	339	339	339	339	339
Bamboo										
Central Government	128	124	124	124	124	124	124	124	124	124
Country Council	23	26	26	26	26	26	26	26	26	26
Total	151	150	150	150	150	150	150	150	150	150
Grassland										
Central Government	162	157	157	157	157	157	157	157	157	157
Country Council	49	47	47	47	47	47	47	47	47	47
Total	211	204	204	204	204	204	204	204	204	204
Mangroves										
Central Government	45	45	45	45	45	45	45	45	45	45
Total	1,683	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691
Ownership**										
Central Government										
Gazetted	1,390	1,337	1,337	1,337	1,337	1,337	1,337	1,337	1,337	1,337
Other	17	1	1	1	1	1	1	1	1	1
Total	1,407	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338
Country Council										
Gazetted	293	354	354	354	354	354	354	354	354	354
Other	83	58	58	58	58	58	58	58	58	58
Total	378	412	412	412	412	412	412	412	412	412
Total	1,785	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750
Private Forests	124	124	124	124	124	124	124	124	124	124

Source: Forest Department and Central Bureau of Statistics.
Statistical Abstract 1984.
* Includes gazetted forest areas only.
** Excluding Private Forest Land.
+ Provisional.

Table 2-4 indicates no change whatever for 1975 to 1982, except for a decrease of 0.035 million ha during the period of 1974 to 1975. As for the period prior to 1974, no data are available. However, the Sessional Paper No. 1 of 1968 states that the forest area of those days was 1.727 million ha, 3.03% of the whole country, and it has shown no great increase or decrease during the last ten years or so.

On the other hand, research by FAO/UNEP classifies the forest area types as follows:

Table 2-5 Type-Classified Forest Areas

Closed broadleaved forests	0.690 million ha
Open broadleaved forests	1.255 million ha
Coniferous forests	0.250 million ha
Bamboo forests	0.165 million ha
Total	2.360 million ha*

Note: * 4.05% of the whole country's land area.
As of the end of 1980.

Source: Tropical Forest Resources Assessment Project, FAO/UNEP 1981.

This (Table 2-5) indicates that the proportion of forest area is 4.05% (3.2%, according to the data published by the Kenya government). Whichever figures are correct, the forest lies on the lowest level next to Brundi and Niger in tropical Africa. (cf. Table 2-6)

Table 2-6 Country Classified Proportion of the Forest Area in Tropical African Countries

(Forest area/Country land area, %)

Northern Savana Region		Central Africa	
Chad	10.51%	Angola	42.99%
Gambia	20.67	Cameroon	53.89
Mali	7.31	Central Africa	57.61
Niger	2.29	Congo	62.40
Senegal	56.15	Equational Guinea	46.17
Upper Volta	26.26	Gabon	76.87
		Zaire	75.69
West Africa		**East Africa & Madagascar**	
Benin	34.34%	Burundi	1.47%
Ghana	36.44	Ethiopia	22.22
Guinea	44.65	Kenya	4.05
Guinea-Bissau	58.26	Madagascar	22.49
Ivory Coast	30.50	Malawi	36.05
Liberia	18.32	Mozambique	19.17
Nigeria	15.97	Rwanda	8.73
Sierra Leone	28.02	Somalia	14.20
Togo	29.62	Sudan	19.01
		Tanzania	44.61
Tropical South Africa		Uganda	25.48
		Zambia	39.21
Botswana	56.63%	Zimbabwe	51.11
Namibia	22.35		

Source: Tropical Forest Resources Assessment Project FAO/UNEP 1981.

The transition of plantation area (cf. Table 2-7) indicates an increase from 1,000 ha/year in 1976 to 8,000 ha/year in 1982. This increase reflects the effort of the Kenyan government toward afforestation. However, the plantation area relative to the population decreased by cir. 30% for the ten year period ending in 1983, as seen from the change of forest area per head of population in Table 2-8.

Table 2-7 Plantation Area*

(Unit: '000 Hectare)

	1975	1976	1977	1978	1979	1980	1981	1982	1983**
Indigenous Softwoods	7	7	8	8	8	8	8	9	10
Indigenous Hardwoods	7	7	8	9	9	10	10	11	12
Exotic Softwoods	50	50	51	51	51	53	55	58	
Cypress	59	60	60	61	62	62	64	65	59
Pines	–	–	–	–	–	–	–	–	67
Total	109	110	111	112	113	115	119	123	126
Exotic Hardwoods									
Timber	2	2	3	3	3	3	3	4	4
Fuel	6	6	7	7	7	7	7	8	9
Total	8	8	10	10	10	10	10	12	13
Total	131	132	137	139	140	143	147	155	161

Source: Forest Department and Central Bureau of Statistics.
* Total area of Forest Plantation; this takes account of planting and felling during the year.
** Provisional.

Table 2-8 Forest Area per Head of Population

(Unit: ha)

1974	1979	1983
0.139	0.122	0.099

Note: Calculated from forest land area and population.

The actual situation of pure forest area shown in the figures is as stated above. Researches by FAO/UNEP indicate that Kenya possesses 3.750 million ha of extensive Savannah shrub forest (approximately 65% of the whole territory) in arid and semi-arid regions. Enlargement of forest area in these regions is one of the specific goals of the Kenyan government.

The distribution of forest lands, shown in Fig. 2-4, in some places overlaps farming cultivated lands (cf. the part of data) as well as areas of population concentration and also regions where woodfuel demands are urgent.

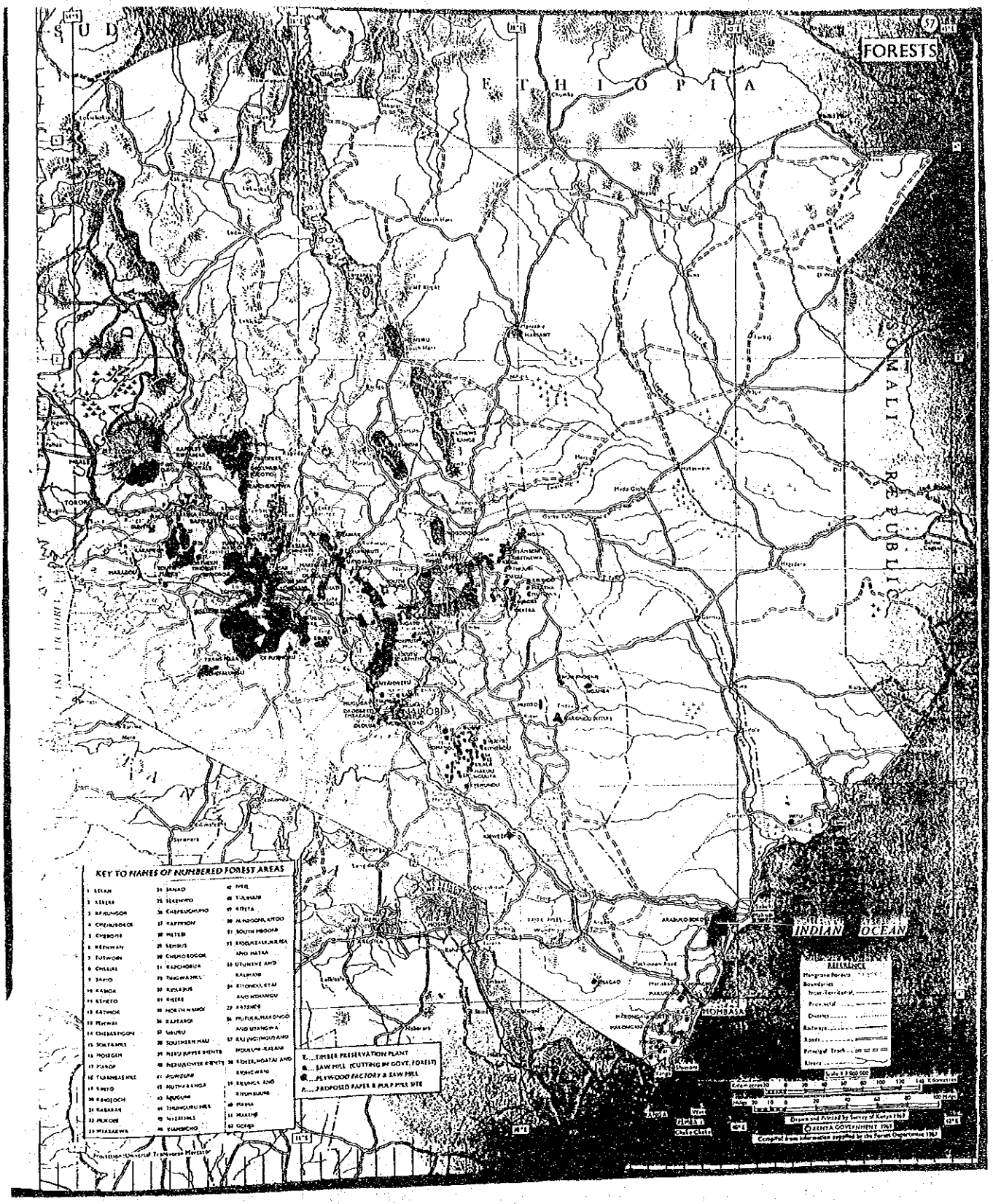


Fig. 2-4 Distribution of Forest Lands

(2) Present Situation of Demand and Supply of Wood

Yearbooks of Forest Product (FAO) indicate that the total product of 1981 was 27,414,000 m^3 of which 27,364,000 m^3 (99.8%) was consumed within the country and 50,000 m^3 (0.2%) was exported.

Table 2-9 Supply and Demand of Wood

(Unit: Thousand m^3)

	1970	1975	1980
Fuel Wood Materials	18,031	21,648	26,200
Industry Wood Materials	706	969	1,164
Import of Industrial Wood Materials	2	-	-
(In-Country Demand)	18,739	22,617	27,364
Export of Fuel Wood Materials	285	45	45
Export of Industrial Wood Materials	15	4	5
(Export)	300	49	50
Total	19,039	22,666	27,414
Export of Charcoal (Thousand tons)	48	8	8

Source: FAO, Yearbook of Forest Product 1981

In addition, 26,200,000 m^3, equal to 96% of the total production, was used as fuel wood materials, which points up the importance of fuel wood in the forestry. Of the fuel wood materials, only 1 to 3% was supplied from the areas belonging to the Forest Department, whereas the majority of it is thought to have come from the lopping or felling of trees in the wilderness, released forest and farming cultivated land.

A detailed analysis of the demand for and supply of woodfuel shows that out of 26,200 million m^3 for fuel wood materials, in the 1980 fiscal year, 17,128 million m^3, 65%, was for firewood and 9,072 million m^3, 35%, for charcoal wood materials, the production of

charcoal was 1,512,000 tons. The growth of the demand for and supply of woodfuel is annually averaged at 4.5% and exceeds the population growth rate, by about 3.8%. The yield ratio of charcoal is cir. 17% here but 10% in other statistics, which indicates an extremely low charcoal yield ratio. (In Japan, the rate is about 20 to 22%.)

Considering the province-classified demand for and supply of woodfuel, a shortage of woodfuel is found in such high population density provinces as Central, Nyanza, Western, Rift-Valley and Nairobi. In these provinces, felling of fuel wood materials has already begun to eat into the stock of wood (Table 2-10 and Table 2-11).

The demand and supply situation of fuel wood materials is as follows:

Table 2-10 Supply and Demand of Woodfuel

(Unit: Thousand m^3)

	1970	1975	1980
Needle-leaf Tree Fuel Wood Materials Broad-leaf Tree Fuel Wood Materials	562 11,241	663 13,503	761 16,367
Subtotal	11,803	14,166	17,128
Export of Fuel Wood Materials	285	45	45
Charcoal Wood Materials Products of Charcoal (Thousand tons)	6,228 1,038	7,482 1,247	9,072 1,512
Export of Charcoal (Thousand tons)	48	8	8

Table 2-11 Provincial and National Wood Supply and Demand

(Unit: Million tons)

	Central Nairobi	Coast	Eastern	North-Eastern	Nyanza	Rift-Valley	Western	Total
Local Woodfuel Demand	2.4	1.7	3.0	0.4	2.5	3.8	1.9	15.7
Woodfuel Demand Export to Other Region	0	0	0.8	0.1	0	1.5	0.2	2.6
Total Woodfuel Demand	2.4	1.7	3.8	0.5	2.5	5.3	2.1	18.3
Industrial Construction	0.1	0	0	0	0	0.3	0	0.4
Total Demand	2.5	1.7	3.8	0.5	2.5	5.6	2.1	18.7
Supply Sources from Sustainable Yield	1.2	1.7	3.8	0.5	0.4	5.1	0.3	13.0
Supply from Stocks	1.3	0	-	-	2.1	0.4	1.9	5.7
Total Supply	2.5	1.7	3.8	0.5	2.5	5.5	2.2	18.7

Source: Ministry of Energy: Kenya Woodfuel Development Policy, 1982.

The price of charcoal is rising even faster than the general inflationary trend.

Under such circumstances, the Kenya Government anticipates that the future demand for fuel wood will increase greatly. (Table 2-12)

Table 2-12 Future Prospect of Supply/Demand Balance of Woodfuel

(Unit: Million tons)

	1985	1990	1995	2000
Demand	2,450	3,030	3,860	4,710
Supply	1,910	2,050	2,060	1,650
From Yield	1,260	1,070	780	520
From Stock	650	980	1,880	1,130
Supply Short-fall	540	980	1,800	3,060

Source: Ministry of Energy, Kenya Woodfuel Development Policy 1982

Figures in Table 2-12 are adopted as the basic data for the Government's woodfuel forest development plan, and suggest that 41.9 million tons of fuel wood (from stock, 11.3 million tons and supply short-fall, 30.6 million tons) will fall short. The prospect for supply indicates a rapid decrease in normal felling and an increase in excessive felling to eat into the stock. Thus, though neither increase nor decrease in forest land area is found at present, the forest would decrease in future, exerting a harmful influence upon the natural environment, ecological system, and soil and water source conservation, eventually causing actual problems.

(3) Forestry Development Projects

The bases of the Kenya Government's forestry policy are the following ten items as stated in the Sessional Paper No. 1 of 1968, FOREST POLICY.

1) Reservation

Reserve in perpetuity the existing forests and, wherever possible, add to them so as to provide sufficient land in order to:

(i) maintain and improve the climatic and physical conditions of the country;

(ii) conserve and regulate water supplies by protection of catchments and by any other means necessary for the purpose, including the impounding of water in forest areas;

(iii) conserve the soil by prevention of desiccation and soil movement caused by water and wind;

(iv) to provide for the needs of the country in timber and other forest products adequate to meet the requirements of the community under a fully developed national economy and to provide the greatest possible surplus of those products for export markets.

2) Protection

Protect the Forest Estate by all the means at the Government's disposal.

3) Management

Manage this Forest Estate on the principle of the sustained yield in accordance with approved plans so as to obtain the best returns on its capital value and on the expenses of management in so far as this is consistent with he primary aims of forest reservation set out above; and to make and maintain an inventory of forest resources.

4) Industry

Foster the conception of a mutually interdependent forest industry and integrate to the best advantage of Kenya the production, harvesting and utilization of forest produce, by ensuring close co-ordination between all interests concerned in these aspects of the industry and, wherever opportunity occurs, to encourage industrial processes consuming forest products.

5) Finance

Provide adequate funds, within the limits of finance available from time to time, for the realization of the policy.

6) Employment

Pay full regard to the possibilities of using the Forest Estate for the provision of employment, and in particular to foster and develop under suitably controlled conditions the practice of employing resident forest workmen on the rotational cultivation system for reafforestation and forest maintenance work.

7) Country Council and Area Council Forests

Encourage, and assist by advice, the establishment and maintenance of forests managed by County Councils or Area Councils for local authorities.

8) Private Forests and other Forests not under State Ownership

Encourage the establishment and proper maintenance of private forests including farm woodlots not only for productive but also for protective purposes.

9) Public Amenity and Wildlife

Foster the value of the forests as areas of natural beauty or special interest, develop recreational facilities and preserve wildlife, both flora and fauna, in so far as is consistent with sound forest management.

10) Research and Education

Promote research and education in all branches of forestry and forest products and foster by education and propaganda a greater understanding among the people of Kenya of the value of the forests to them and their descendants.

Now, approximately 17 years later, though there has been no basic change in this basic policy, the strategic importance of executing the projects has altered in the two following ways: one is the shift of importance from industrial wood materials to fuel wood materials, and the other is increased interest in arid regions. Both of these changes are based upon an increased demand for wood energy by the growing population, and upon a recognition of how important soil conservation, water source insuring and natural environment conservation are. The absolute shortage of forestry-suited lands and the necessity of having to compete with farming where the land is forestry-suited has strengthen interest in the arid region that still remains to be developed.

In conjunction with this, there have also been changes in forestry-related subjects of study; that is, study of tree species suitable to arid regions, agroforestry, charcoal production technique and improving the rate of heat recovery in using woodfuel, have all acquired new importance.

Based upon these circumstances, "the National Forest Policy White Paper" makes much account of the advanced planting techniques in trust lands and private lands since various types of forests are necessary. This basic policy is succeeded by the present five-year project (1984 to 1988) as follows:

1) Reservation of land for forestry purpose.

2) Protection of forest resources, conservation and management of forests.

3) Development of agroforestry.

4) Continued establishment of forest estates.

5) Promotion of forestry and tree planting on identified trust as well as on private lands.

6) Promotion of forestry for public amenity and wildlife.

7) Ensuring continuing research in forestry.

8) Conducting mass public education on the value of forestry.

The following forestry-related work projects, are now in progress:

1) Forestry Plantation Development
(under the supervision of MENR)

The Forest Department performs afforestation in an area of 8,500 ha, of which 5,500 ha is new, each year, so as to increase the total plantation area from 154,000 ha** in 1983 to 198,150 ha by 1988. Total finances required during the period of the fifth development project (1984/85 - 1987/88, same as below) is expected to be 3,663,300 K₺, of which 1,491,800 K₺ is the amount of aid. Government will strengthen the Forest Economics Section and establish a Management Information System Section.

2) RAES (= Rural Afforestation Extension Scheme)
(1971 -, under the supervision of MENR)

The RAES was initiated in 1971 in 13 districts, developed into 36 districts in 1979 and now spreads throughout the country. For water source ensuring and soil conservation as well as for the production of woodfuel and construction wood materials, the RAES nursery shall be established in response to the afforestation in local districts. RAES offices shall be opened in all 41 districts to undertake the regulation of afforestation activities, and nurseries are to be established in all 180 divisions.

The present five-year development plan stresses afforestation especially in arid and semi-arid lands, individual farm, and communal lands. The budget is 678,100 K₺, of which 482,200 K₺ is aid.

Note: 155,000 ha, if figures from STATISTICAL ABSTRACT 1964 are used.

3) Local Afforestation Scheme
(under the supervision of MENR)

Stress is laid upon soil conservation and the ensuring of fuel and construction wood materials for local inhabitants. The planned budget is 309,100 K£, of which 206,900 K£ is aid.

4) The Chief's Tree Nursery Scheme
(1981 -, under the supervision of MENR)

The scheme to start and operate a seedling farm in each of 850 locations as a service to the inhabitants, by order of the president, so that the inhabitants can obtain seedlings within walking distance. As of 1985, about 800 of the seedling farms have been opened.

Note: Trust land: the land, ownership of which is held by local autonomy but which is entrusted to a citizen usually by a contract of 99 years' term. The entrusted citizen can buy or sell the right of using the land concerned.

The aforementioned is the afforestation section of the forest development plan. Other projects are as follows.

5) Road Construction Unit

A forest road improvement project. The construction of a forest road is planned at Eldoret and Kitale during the term of the fifth development plan. The budget is 213,700 K£.

6) Machakos Integrated Development Project (M.I.D.P)

A project to carry out the afforestation of 150 ha every year in Machakos District during the five year term, with a budget of 115,300 K£ and to install a seedling farm for this purpose.

7) Product Development Promotion and Marketing Unit

Development and popularization of primary and secondary forestry products in cooperation with F.I.T.C. (Forest Industrial Training Center, aided by Finland).

8) Forest Research and Development Programmes

The main themes of study during the term are the same as with KARI FRD in page 17.

Besides these, there are projects aided by foreign countries, which are summarized in Table 2-13.

In promoting these projects, the Kenyan Government established a plan to produce 200 million seedlings, titled "A Strategy and Focus for Rural Forestry Development," by order of the president and is promoting a nation-wide afforestation movement. This strategy focuses upon increasing seedling production. A lack of seedlings is a stumbling block to many of the afforestation projects mentioned above and takes into account the following recognition of the status quo: Table 2-12 of page 29 in the preceding section, Future Prospect of Demand for and Supply with Woodfuel, indicates a 41.9 million ton shortage of fuel wood materials in the year 2000. To solve this, 210 million seedlings must be planted by 1980, or else the natural environment will worsen, as mentioned above.

This figure of 210 million is estimated on the following assumptions:

1) Assume the felling age to be 20 years and the yield per tree to be 500 kg.

2) Assume that 40% of the planted trees become grown-up trees.

Then,

41,900,000 tons ÷ 0.5 ton/tree ÷ 0.4 = 209,500,000 trees
≒ 210 million trees

The plantation area required for this becomes

210,000,000 trees x 5 m^2/tree = 105,000 ha

(4) Organization of Seedling Production

The production of seedlings amounts to cir. 50 million trees in 1981/82 and cir. 80 million trees in 1982/83. Seedlings are now produced in nurseries directly managed by the MENR Forest Department, which are called Forest Department Nurseries (cir. 500 sites).

Other nurseries, operated by voluntary women's groups, churches and other groups, are called NGO Nurseries (cir. 200 sites). There are also nurseries situated in schools in various places throughout the country (cir. 200 sites), Chief's Nurseries obligatorily operated by community members in various locations throughout the country (800 to 1000 sites) and nurseries of other ministries (Ministry of Agriculture and Livestock Development; Ministry of Energy and Regional Authorities [such as Lake Basin Develop. Auth.]); and such private enterprises as B.A.T.

In NGO Nurseries and Chief's Nurseries, the staff is dispatched from the Forest Department and guidance is provided. However, the present situation is that nurseries other than those run by the Forest Department are small, and lack of manpower, and no seedling production of tree species suitable to individual localities is performed.

Table 2-13 Projects Aided by Foreign Countries

	NAME OF PROJECT	LOCATION	G. OF KENYA CONTRIBUTION	EXTERNAL CONTRIBUTION	TOTAL ALLOCATION	FUNDS EXPENDED	STATUS	ORIGINAL ESTIMATED COST	CURRENT ESTIMATED COST	STARTING DATE	COMPLETION DATE	REMARKS
1	EMBU-MERU ISIOLO FORESTRY PROJECT	EMBU, MERU AND ISIOLO DISTRICT	Kŧ133,462	Kŧ551,728 (BRITISH)	Kŧ685,190	Kŧ187,496	PHASE I IN PROGRESS	Kŧ685,190		1982/83	1986	TENDERING AND STAFF DEVELOPMENT BY DPM ARE MAJOR BOTTLENECKS
2	MACHKOS INTEGRATED DEVELOPMENT PROJECT	MACHAKOS DISTRICT	Kŧ606,100	Kŧ235,100 (E.E.C)	Kŧ841,200		PHASE II	Kŧ841,200		JULY 1983	JULY 1986	PRODUCTION COSTS VERY HIGH AND THERE IS LACK OF TECHNIAL INPUT FROM M.I.D.P.
3	FAO/AUSTRALIA COK FUELWOOD PROJECT	BARINGO DISTRICT	Kŧ107,888 EQUIVALENT TO 1983 US	Kŧ207,090 EQUIV.1983 US$ FEBR	Kŧ314,978		PHASE I	Kŧ314,978		FEBRUARY 1983	JUNE 1984	MAJOR OBJECTIVE IS TO ESTABLISH DEMONSTRATION/ EXTENSION CENTRE FINANCING IS A MAJOR BOTTLENECK
4	NORAD FORESTRY PROJECT	TURKANA DISTRICT		Kŧ450,000 (NORAD)				Kŧ450,000		OCTOBER 1981	1986/87	OBJECTIVE: ESTABLISH A PILOT PLANTATION BOTTLENECK: LACK OF INTEREST BY THE LOCAL COMMUNITY
5	THIRD FORESTRY PROJECT	NATION-WIDE	Kŧ7.0 M	IBRD Kŧ10.8 M IDA Kŧ8.0 M ITALY Kŧ4.5 M SWISS Kŧ3.8 M	Kŧ34.1		PHASE III	Kŧ34.1		MAY 1983	DECEMBER 1987	OBJECTIVE: SUPPORT A FOREST PLANTATION PROGRAMME BOTTLENECK: DELAY IN CO-FINANCING ARRANGEMENTS
6	BARINGO PILOT SEMI-ARID FORESTRY PROJECT	BARINGO DISTRICT	Kŧ55,000		Kŧ55,000	TOTAL SPENT TO BE REIMBURSED BY WORLD BANK	PERIODIC ASSESSMENT	Kŧ55,000		1980/81	1987/88	OBJECTIVE: IDENTIFYING SPECIES SUITABLE FOR SEMI-ARID LANDS PROBLEMS: FUNDING, UNRELIABLE RAINFALL AND POOR MONITORING
7	EUPHORBIA HYDROCARBON RESEARCH FORESTRY PROJECT	BARINGO DISTRICT	Kŧ188,405 1983-84 ALLOCATION	Kŧ1,500,000 (BELGIUM)			PERIODIC ASSESSMENT			1982	MARCH 1984	OBJECTIVE: PROVISION OF ENERGY AND SOIL COVER
8	FOREST FIRE MANAGEMENT PROJECT	KITALE TURBO AND NYAHURURU	Kŧ113,930	Kŧ277,800 EQUIV.1982 US$ UNDP/FAO	Kŧ391,730		PHASE II	Kŧ391,730		1985/86	1986/87	OBJECTIVE: PROVISION OF PROTECTION OF THE NATION'S FORESTS BOTTLENECK: REDUCED FOREIGN FUNDING
9	TAITA/TAVETA-SOUTH NYANZA AFFORESTATION PROJECT	TAITA TAVETA AND SOUTH NYANZA DISTRICT	Kŧ10	Kŧ10 DANIDA			IDENTIFICATION COMPLETED BY COK/ DANIDA MISSION			1985	1990	OBJECTIVE: TO AFFORESTATE HILLY AREAS AND TO INTRODUCE AGRO-FORESTRY
10	RURAL DEVELOPMENT IN TURKANA		NORAD		Kŧ200,000 (ANNUALLY FOR AFFORESTATION SECTOR)					1980	- 85	GRANT
11	FOREST INDUSTRIAL TRAINING CENTERER (F.I.T.C.)	NAKURU	Kŧ650,000	ESTIMATES FOR 1984-86 Kŧ1,464,000 (FINLAND)			STAGE I & II IN PROGRESS	Kŧ2,970,000 FOR 1982-86	REVISED Kŧ1,464,000	1981/82	BEYOND 1986	STAGE I AND II CARRIED OUT SIMULTANEOUSLY CONTINUATION OF STAGE II BEYOND 1986 WITH FINISH AID
12	ARID AND SEMI-ARID LAND DEVELOPMENT			USAID	US$18.0 M					1975	- 84	SMALL FUELWOOD PLANTATION COMPONENT. GRANT
13	AGROFORESTRY DEMONSTRATION PLOTS			ICRAF	MAINTENANCE							DEMONSTRATION ONLY NOT RESEARCHED. GRANT
14	EMBU-MEW-ISIOLO INTEGRATED PROJECT			ODA (U.K.)	US$712,000 (FORESTRY SECTOR)					1980	- 83	GRANT
15	RURAL DEVELOPMENT IN MAGARINI (MAGARINI LAND SETTLEMENT SCHEME)			ADAB	US$12.0 M					1978	- 88	FORESTRY SECTOR TO ESTABLISH PLANTATION. GRANT
16	FUELWOOD/AFFORESTATION EXTENSION IN BARINGO			F.A.O. (WITH AUSTRALIAN FUNDS)	US$318,600					1983	- 84	GRANT
17	TREE SEED CENTRE		GERMANY		US$2 MIL							PROPOSAL GRANT 5 YEARS
18	AGROFORESTRY IN MACHAKOS DISTRICT		E.E.C. IDRC		US$293,000							PROPOSAL GRANT 4 YEARS
19	FAST GROWING INDIGENOUS N FIXING TREES		N.A.S. (US)							1982	- 86	THROUGH FORESTRY DEPARTMENT NAIROBI UNI. GRANT
20	THE TURKANA INTEGRATED DEVELOPMENT PROJECT	TURKANA DISTRICT	NORAD		Kŧ450,000		PHASE II				1987	INTEGRATED DEVELOPMENT PROJECT GRANT NO TRAINING PROGRAMME NOT YET EVALUATED
21	MAGARINI PROJECT	KILIFI DISTRICT	AUSTRALIA		Kŧ55,200		PHASE I				1994	INTEGRATED DEVELOPMENT PROJECT GRANT NO TRAINING PROGRAMME NOT YET EVALUATED

2-4 Contents of the Kenya Government's Social Forestry Development Project

In promoting the forestry-related project described in the preceding section, the following points are problematic:

(1) Lack of information about growing techniques and the tree species suitable to each region, especially those suitable to arid regions and those best suited to agroforestry.

(2) Lack of superior species, which would be strong in adaptability to environment, low in cost, convenient for transportation and easy to control.

(3) Retarded development of forestry-related techniques and lack of practical applications.

(4) Lack of training in the techniques necessary for developing and managing forestry resources.

(5) Shortage of engineers trained in seedling culture, and a lack of forest bureau staff able to spread forestry techniques.

Considering these problematic points, the Kenya Government planned a project titled "A Strategy for Realizing the Production of 100 million Tree Seedlings and a Systematic Development of Social Forestry in Kenya" and formally asked the Japanese Government for cooperation in 1984. The contents of this project will be described below.

First, the purpose of this project consists of the following six items:

(1) To establish in various parts of the country tree nurseries with a capacity to produce 100 m tree seedlings per annum.

(2) To conduct research, and where necessary, establish research facilities as appropriate.

(3) To establish a blue print modus vivendi for guiding the incorporation of trees in the farming systems to facilitate an orderly growth and evolution of the state of the art of social forestry.

(4) To catalyse and generate an increased supply of tree seedlings as a step in the continuing implementation of the national forestry policy; aiming at high survival rate in the implementation process.

(5) To promote the training of Kenyan in forestry matters within Kenya and Japan or elsewhere.

(6) The project will work closely with on going rural development projects with similar or related goals.

To fulfil these purposes, the government will found the center for educational training and technical development as KEFRI Social Forestry Research Division at Muguga and install regional centers in seven other areas. The regional centers are planned at the eight places mentioned below; their aims are to train persons in the forestry field; to carry out the training in both the technique of managing nurseries and the promotion of farm forestry management; and to give education in production techniques to increase and spread seedlings. The research institute of the center at Muguga is installed primarily to carry out tests and research concerning forestry seedling culture.

① Mombasa (Coast Province)
② Garissa (North-Eastern Province)
③ Kitui (Eastern Province)
④ Nyeri (Central Province)
⑤ Nakuru (Rift-Valley Province)
⑥ Kakamega (Western Province)
⑦ Kisimu (Nyanz Province)
⑧ Muguga (Covering the Nairobi District)

The training at every regional center is intended mainly for the Forest Department staff to increase the production of seedlings through passing along know-how and guidance to individual nurseries and to spread the social-forestry-related techniques to farmers through Chief's Nurseries. The following items are prearranged as the contents of training:

1) Seedling Farm Operations

① Selecting a nursery site

② Building a nursery and nursery layout

③ Seed procurement, storage and pretreatment

④ Sowing and care of seedlings

⑤ Vegetative propagation

⑥ Bud grafting

⑦ Nursery management

⑧ Labor and personnel management, work scheduling

2) Role of trees in Kenya's economic development

① Possible planting places within individual holdings

② Intercropping trees with other crops

③ Appropriate trees for individual holdings

④ How and when to plant a tree

⑤ Tending and care of young trees

⑥ Pruning non-fruit trees

⑦ Establishment and maintenance of live fences and hedges

⑧ Woodlot production

⑨ Concept and scope of sustained management of trees in social forestry context

3) Harvesting of various wood products

① Growing simple tool fabricants

② Technical development of charcoal production and fabrication of appropriate furnaces

4) Communication skills and forest extension methods

Further, in the center of Muguga, research is to be performed on the following tasks:

① To screen species and provenances for social forestry with a view to provide a data-base on site-species and provenance-suitability and yield given rotation by ecological zone within region.

② To develop appropriate paradigms for tree establishment, tending practices and other silvicultural operations within the context of social forestry systems.

③ To provide a ready source of tree and shrub seeds for representative ecological zone and subsequentry providing a base for social forestry.

④ To develop an appropriate social forestry modus operandi.

⑤ To provide a more appropriate extension package.

⑥ To stimulate the cultivation of hitherto unknown indigenous trees.

2-5 Contents of Requests

The Kenya Government requested cooperation of Japan Government in implementing the project, "A Strategy for Realizing the Production of 100 m Tree Seedlings and a Systematic Development of Social Forestry in Kenya," the content of which is as already described in the preceding clause "2-4". The substance of the above-described "strategy" is, as is

described in 2-4, the project, (with a production of 100 million tree seedlings as a goal), of establishing a Main Center equipped for the functions of training and research in Muguga and Regional Centers in eight places in the country (among which one Regional Center is united with the Main Center in Muguga) with the projects of research and development of forestry techniques, including seedling culture technique, and of extension of forestry techniques through education and training.

In response to the request, the preliminary study team and the long-term study team were dispatched to Kenya in February and April in 1985. As a result, it was agreed between that cooperation should be carried out as to the Main Center in Muguga and as to one of the regional centers, selecting Kitui as a site appropriate for research and training of semi-arid region forestry out of seven places of the proposed sites for a Regional Center. Further, as to the research subjects it was agreed that it is appropriate to cooperate in the four research fields of afforestation, seedling culture, forest protection and charcoal.

The present basic design study team concerning the economic cooperation in grant form conducted research again on the basis of the reports submitted by the preliminary study team and the long-term study team to examine the purpose, contents, facilities, equipment and materials of the project. As a result, it was decided that the Main Center equipped for the functions of training and research should be established in Muguga, and a field office (sub-center) for training in the techniques of seedling culture in semi-arid land in Kitui; that the construction of the facilities of both the centers and the supply of equipment and materials should be implemented by economic cooperation in grant form; and that technical cooperation be carried out regarding technical development and training. The contents of training and research activities in Muguga and Kitui, in which the Japanese side is to cooperate, are set forth hereinafter as CONTENTS OF THE PROJECT of the Nursery Training and Technical Development Center for Social Forestry in Kenya in Chapter 3, and the concrete scale and details of the Japanese economic cooperation in grant form as BASIC DESIGN in Chapter 5.

CHAPTER 3 CONTENTS OF THE PROJECT

CHAPTER 3

CONTENTS OF THE PROJECT

3-1 Contents of the Project

3-1-1 Objectives

The problems of forestry, and the supply and demand of fuelwood and charcoal in Kenya of today and in the future must be coped with by extensive means and measures. Among the means and measures, a production increase in saplings, the research and development of related technologies and the education and training of persons who are engaged in forestry are extremely and urgently necessitated. It is on these points that the Kenyan government also lays stress from the viewpoint of a strategy to promote forestry in Kenya.

Accordingly, the present project provides training mainly for staffs of Forest Department who work in nurseries of Forest Department, and who instruct ordinary farmers in Chief's nurseries, etc. and further conducts technical development in techniques for the purpose of development of Social Forestry. In order to achieve these aims, training and research facilities are to be equipped as a main center in Muguga, and there will be conducted education and training as to forestry in general and highland forestry as well as research as to the development of forestry techniques. On the other hand, a sub-center shall be established in Kitui, and there will be conducted training activities, laying stress on field training, as to seedling culture including arid land forestry.

3-1-2 Training Plan

(1) Trainees

The object person of training are the staffs of Forest Department of MENR, who will be classified in three groups. The persons included in the first group are manager and officers of the equivalent level including District Forset Officers, Provincial Forest Officers and Researchers who have graduated from universities (about 63 persons). The second group include Foresters, Assistant Researchers who are Diploma-holders (about 168 persons). These persons should be educated in the new techniques and knowledge of forestry. The third group include about 1,000 staff (one person from each of the about 500 Forest Department nurseries and about 1,050 site engineers who are new working as supervisor in the about 850 Chief's nurseries and 200 NGO nurseries and such about 38 persons who will be required in the future at the 7 Regional Centers for work as technicians or plant operators. Now, since no organized training system has been set up, training for these kinds of persons is not available; it is therefore recommended that the Center form a base for training workers who can then diseminate their knowledge and teach their techniques to the mass of forestry workers. (Confer. Table 3-1)

(2) Contents of training project and location

1) Outline of training

a) Forestry Development Course I (for managers with college background or persons of the equivalent level)

The general business adjustment and control as to nursery control and seedling production

Table 3-1 Forest Department (FD) Officers
(engaged in Social Forestry)

	Office, Center, Nursery	FD Officers	
Provincial Forest Office	8	8	Provincial Forest Officer one/ea. province
District Forest Office	41	41	District Forest Officer one/ea. district
		150	Forester 3-4/ea. district
Nursery Training Center			
Main Center at Muguga	1	35	Researcher 7 Assist. Researcher 4 Technician 24
Regional Center	7	35 (approx.)	Researcher 1 x 7 = 7 Assist Researcher 2 x 7 = 14 Plant operator 2 x 7 = 14
F.D. Nursery Provincial, district, division nursery, etc. approx. 320 RAES nursery 180	500 (approx.)	1,000	2 Supervisor/ea. nursery
Chief's Nursery (locational nursery)	850	850	One FD supervisor dispatches to ea. nursery
NGO Nursery	200	200	One FD supervisor dispatches to ea. nursery
Total		2,320	

(approx. number)

* RAES: Rural Afforestation Extension Scheme

b) Forestry Development Course II (for senior technicians having forestry expert skills or persons of the equivalent level)

The development, improvement, training and production control as to techniques concerning seedling production

c) Forestry Management Spreading Course (for field technicians or persons of the equivalent level)

Techniques and skills in nurseries or actual working fields

2) Places where training will be provided

Training will be provided in both the Centers in Muguga (Main Center) and Kitui (Sub-Center). In Muguga, the training of basic seedling techniques common to highland and semi-arid land, and the field training of seedling techniques related to semi-arid land are to be practiced in Kitui.

3) Training program and method

Training is will be given by the method of combination of lectures (indoor learning, audio-visual device-aided education) and field practices. The training programs are collectively shown in Tables 3-2-(1) and 3-2-(2).

Table 3-2-(1) Training Programme

Course	Forestry Development Course I	Forestry Development Course II	Forestry Management Spreading Course
Outline of training	Business adjustment and control of nurseries	Development, improvement, training and production control as to techniques concerning seedling production	Seedling culture techniques and skills
Number limit (Muguga) (Kitui)	5 persons 5 persons* 5 persons	25 persons 25 persons* 25 persons	40 persons 40 persons* 30 persons
Training period (Total) (Muguga) (Kitui)	30 days 20 days 10 days	90 days 60 days 30 days	60 days 60 days (30 days / 30 days) 0 day
Object persons	District Forest Officer and Manager of higher level	Forester	Assist. Forester Supervisor
Level of object persons	College graduate or persons of equivalent level	Forestry experts	Field technicians
Number of object persons	approx. 50	150	2,000
Number of times of training per annum	2	1	2
Number of trainees per annum	10	25	80

Note: In Forestry Development Courses I and II, the same persons receive training in Muguga and Kitui. In Forestry Management Spreading Course, 30 persons out of those who receive training in Muguga also receive training in Kitui.

Table 3-2-(2) Training Programme

Course	The 1st Quarter of Year	The 2nd Quarter of Year	The 3rd Quarter of Year	The 4th Quarter of Year
1. Course I (Manager Level)			5 5	5 5
2. Course II (Senior Technician)		25 25		
3. Course III (Technician)	40 10 30		40 10 30	
4. Probable other activities	30 30	15 15 40	35 30 30	40 35 40

Ref. 1 Muguga Kitui

Ref. 2 >40 .... max. 40 trainees

3-1-3 Research Plan

(1) Substance

In Kenya, as production of fuel forestry which was planned as a part of tree-planting campaign advances and afforestated land expands into semi-arid land (including arid land) and highland, there have appeared, as new issues, minimum requirements of research and technical development of tree species and varieties, adaptability thereof to environments, disease and insect damages, and the utilization of forestry products.

In order to solve these new problems efficiently, researches are promoted separately in respective four divisions which are composed of 6 laboratories (Silviculture, Tree Seed, Tree Improvement, Forest Entomology, Forest Pathology and Forest Chemistry) and the results are adopted in the forestry and seedling culture trainings.

The main research subjects of respective divisions are as follows. These researches are conducted in the research facilities to be provided in Main Center in Muguga.

(2) Contents of technical development

The subjects of the research and development are as follows.

1) Silviculture researches div.

Moisture physiology of fast-growing xerophyite tree species, rootstock development and soil moisture conditions, physical properties of soil and plant physiology, chemical properties of soil and plant physiology, soil improving methods

2) Tree improvement research div.

Preservation and germination of seeds, fertility of tree species and varieties

Improvement of multiplication techniques, locality characteristics, selection of suitable tree species and growth thereof

3) Forest protection research div.

Biology-meterological research, ecological research of insects, insect damage countermeasures, ecological research of tree disease, disease damage countermeasures

4) Forest chemistry research div.

Efficient production of charcoal, improvement of charcoal utilization methods

3-1-4 Organization and Personnel Required

The Center is presumed to be managed by the following organization and personnel required.

Table 3-3 Personnel Required

	Muguga		Kitui	
	Training	Research	Training	Research
Director		1	1	
Deputy Director	1			
Secretary	1	1	1	
Instructor*	5		5	
Training Planner	8		3	
Researcher		7		
Assist. Researcher	1	4		2
Technician	1	23		
Administrator	1		1	
Document Officer	1	1	1	
Clerk	1	1	1	1
Typist	2	2		1
Driver	1	2	1	1
Worker	10	28	20	20
Night Watcher	5	5	5	10
Plant Operator			2	

Note: * The numbers of Instructors are indefinite. The number of Instructors in Muguga and Kitui include those overlapped. (It is expected that one and the same Instructor stays for periods of time in Muguga and in Kitui, respectively.)

3-2 Contents of Economic Cooperation in Grant Form

The economic cooperation in grant form is "Establishment Project of Nursery Training and Technical Development Center for Social Forestry in the Republic of Kenya" by project name, and by this cooperation, facilities, equipment and materials necessary for training, research and development to be carried out in the Center are to be provided. The facilities for training and research are planned in accordance with "3-1-2 Training Plan" and "3-1-3 Research Plan."

Muguga Site

(1) Training facility and equipment

(2) Dormitories for 40 trainees and Instructors

(3) Research facility (laboratories)

(4) Nursery facilities

Kitui Site

(1) Training facility and equipment

(2) Dormitories for 30 trainees and Instructors

(3) Nursery facilities

3-3 Contents of Technical Cooperation

(1) Objectives of the Project

The objectives of the Project is to develop and improve techniques for the production of tree seedlings and to train personnel concerned in order to contribute to the development of social forestry in Kenya.

(2) Objectives of the Japanese Technical Cooperation (Preparatory Phase)

1) Formulation of Master Plan and Tentative Implementation Program of the Project [Main Phase]

   a. Formulation of the nursery techniques development program (seedling production, silviculture including Pilot Forest, etc.)

   b. Preparation of curricula for training courses

   c. Other activities as and when required

2) Training of Kenyan counterpart personnel

3) Collection of data and survey of selected areas

4) Construction and trials of nursery