BASIC DESIGN STUDY REPORT
ON
THE ESTABLISHMENT PROJECT
FOR
CENTRAL FORESTRY DEVELOPMENT TRAINING CENTER
IN
THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

JUNE, 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Socialist Republic of the Union of Burma, the Government of Japan has decided to conduct a basic design study on the Establishment Project for Central Forestry Development Training Center and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Burma a study team headed by Mr. Hiroji OKABE, Inspector, Administrative Division, General Affairs Department of National Forests, the Forestry Agency, Ministry of Agriculture, Forestry and Fisheries from February 1 to 24, 1987.

The team had discussions on the Project with the officials concerned of the Government of Burma and conducted a field survey in Hmawbi area. After the team returned to Japan, further studies were made, a draft report was prepared and, for the explanation and discussion of it, a mission headed by Mr. Noriaki NIWA, First Basic Design Study Division, Grant Aid Planning and Survey Department, Japan International Cooperation Agency was sent to Burma from May 10 to May 17, 1987. As a result, the present report has been prepared.

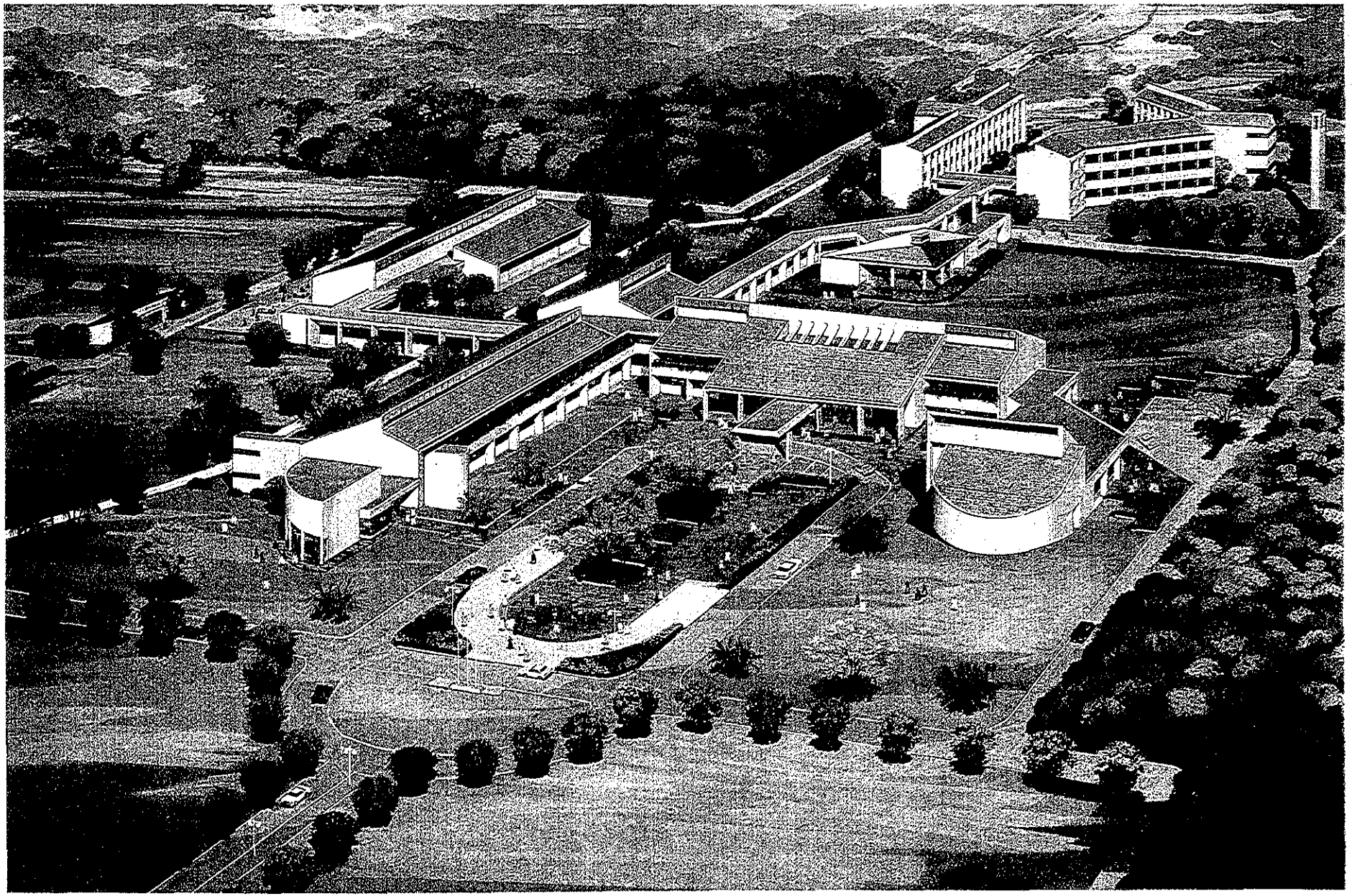
I hope that this report will serve for the development of the project and contribute to the promotion of friendly relations between our two countries.

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

June, 1987.

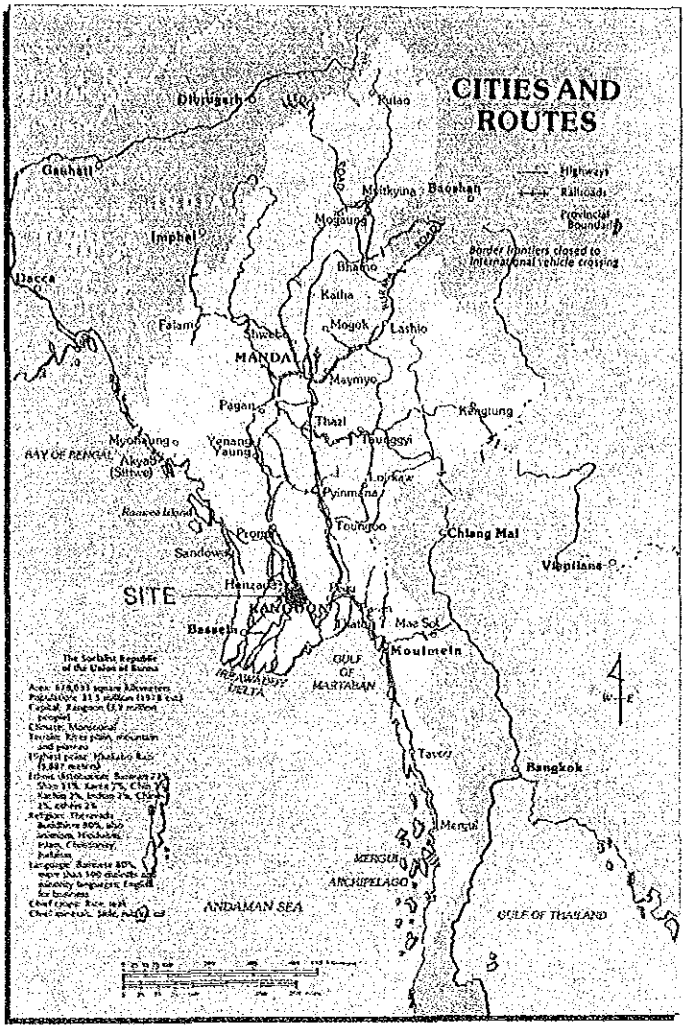
Keisuke Arita

President
Japan International Cooperation Agency

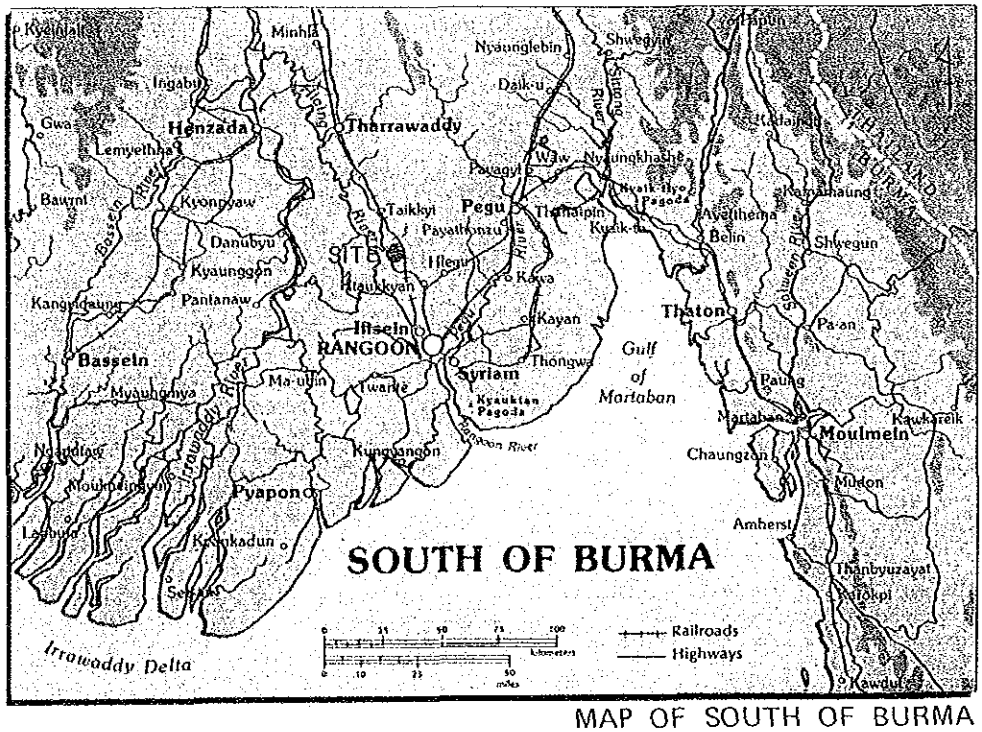


CENTRAL FORESTRY DEVELOPMENT TRAINING CENTER

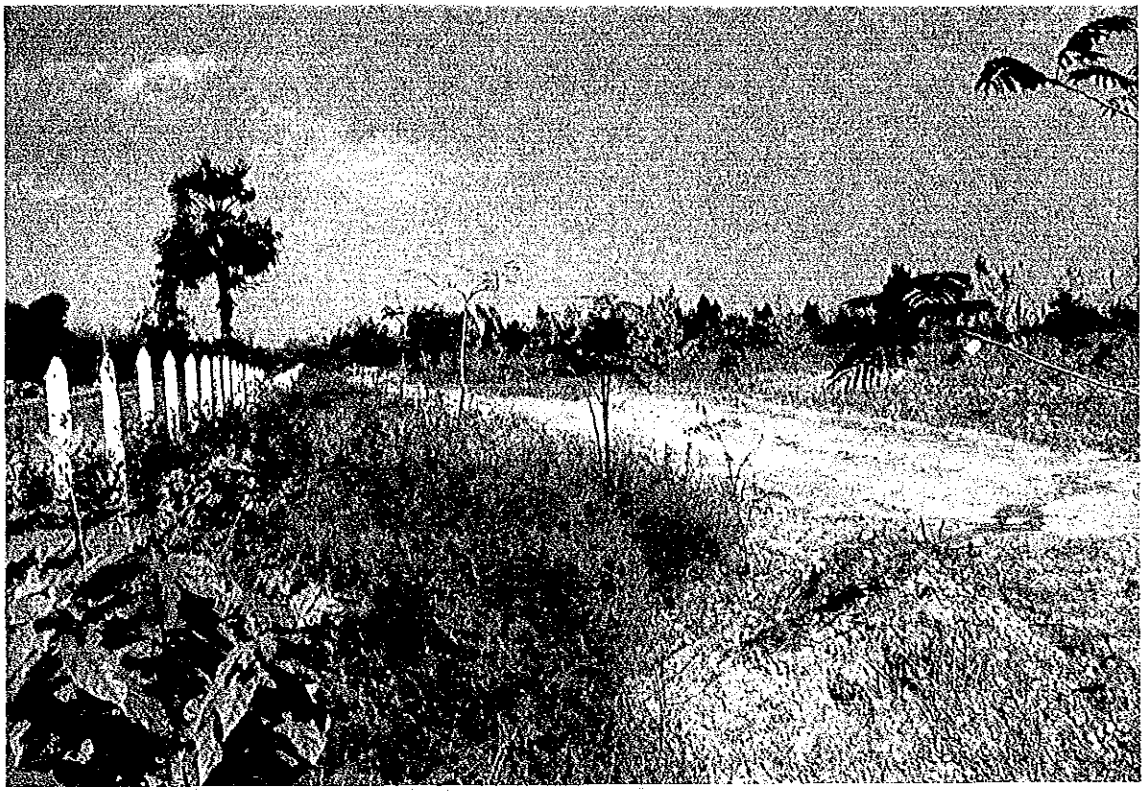
PERSPECTIVE



MAP OF BURMA



MAP OF SOUTH OF BURMA



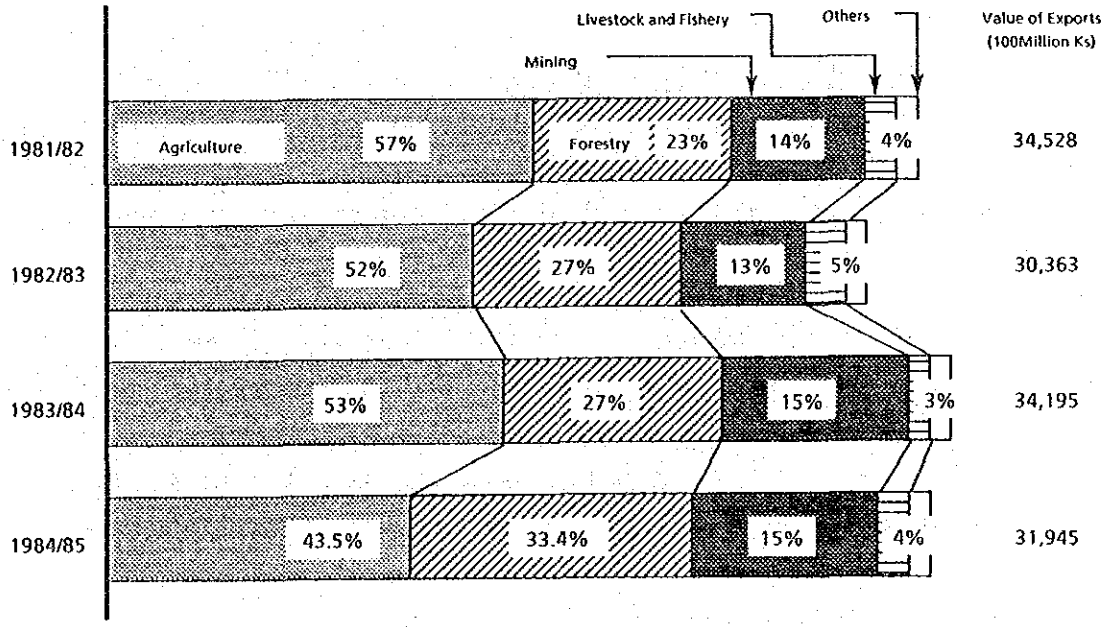
PROPOSED CONSTRUCTION SITE

SUMMARY

SUMMARY

In Burma, total forestland area amounts to 38,820,000ha, accounting for 57% of the nation's total land area. The forestland is divided into several types according to forest variety, climate, topography, soil and so on. The main types are evergreen deciduous forests (15,140,000ha), subtropical evergreen forests (10,093,000ha) and tropical evergreen forests (6,211,000ha). The number of different trees growing in these forests is enormous; there are about 1,200 kinds of tall trees, of which about 45 can be utilized. Teak (*tectona grandis*), pyinkado (*xylia dolabriformis*) and padauk (*pterocarpus macrocarpus*) are typical high-priced products traded on the timber market in Burma.

In 1985/86 the production of teak amounted to 410,000 cubic tons and that of other hardwood trees to 1,297,820 cubic tons, which were respectively about 1.46 and 1.66 times higher than in 1976/77. During the same period the production of fuelwood amounted to 16,900,000 cubic tons and that of charcoal to 781,000 cubic tons, which were respectively 1.49 and 2.05 times higher than in 1976/77.



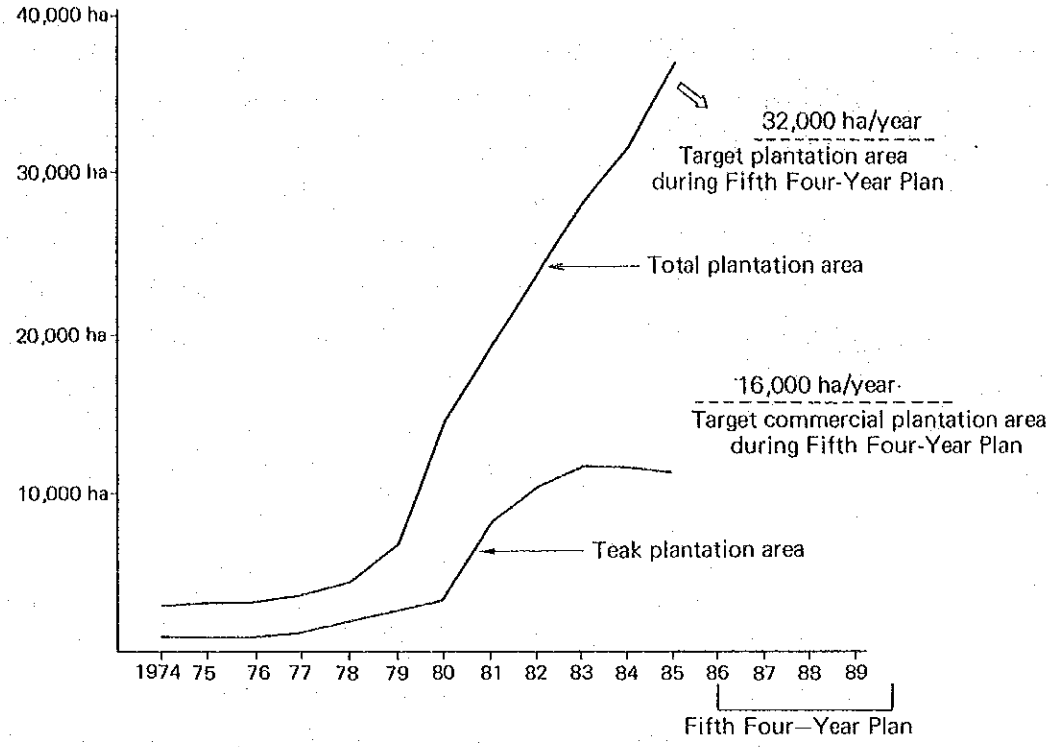
Exports by sector

Although Burmese forestry in 1985/86 accounted for only 2.1% of the nation's GDP and 1.2% of the nation's labor force, exports of forestry products accounted for as much as 33.4% of the nation's total exports in 1984/85, second only to the 43.5% share held by agricultural products. Accordingly, the maintenance of forest resources and increase of production in forestry products are very important to the national economy of Burma.

Up until about 1977, maintenance and administration of the nation's forestland had been the main responsibility of the Forest Department. The Department had been engaged primarily in the surveying of felled trees, girdling of teak trees and marking of other hardwood trees for cutting, as well as the annual foresting of about 3,000ha of the nation's reserved forests. Due to changes in the Burmese Government's economic policies, however, the Department's work load has increased remarkably over the past decade, and in keeping with the expansion of its organization the number of its full-time personnel has been increasing.

The Burmese Government's economic policies are being implemented through four-year plan based on the long-term 20-year economic plan which was revised in 1974. Under the Forest Department's 5th four-year plan, which was initiated in 1986/87, the area to be afforested every year was increased to 32,000ha, which is more than 10 times larger than the figure a decade ago. However, the marked increase in forest maintenance activities, such as undergrowth cutting in plantations, due to the recent rapid increase in the area to be afforested has not been matched by improvements in the training programs for forestry technical staff. It has now become a very difficult task to increase the area needed to be afforested every year.

Furthermore, it is now imperative to train community leaders in forestry technology so that they may actively promote community development programs conducive to the improvement of the socio-economic welfare of local residents as well as the enhancement of their living standards. To cope with its increased work load, the Forest Department plans to initiate a project in April 1987 which will aim to increase the number of its full-time staff from the 1986 level of 10,620 to 14,751.



Forest Plantations Established Starting from
Second Four—Year Plan

Training in forestry technology for the staff of the Forest Department is now mainly being undertaken at the Burma Forest School. The Forest Research Institute and the Seed and Seedling Center have also implemented supplementary training programs, but these training programs have been small-scaled and characterized by lack of the necessary facilities, equipment and machinery. It should be noted that these training programs do not include courses on the latest techniques in maintenance and administration of forests nor courses on advanced forestry technologies which presuppose the use of modern equipment and machinery. Moreover, although the need to train local residents in the maintenance and development of forests for self-sufficiency in the supply of fuelwood has been felt, such training programs have not yet been implemented due to the lack of necessary training facilities.

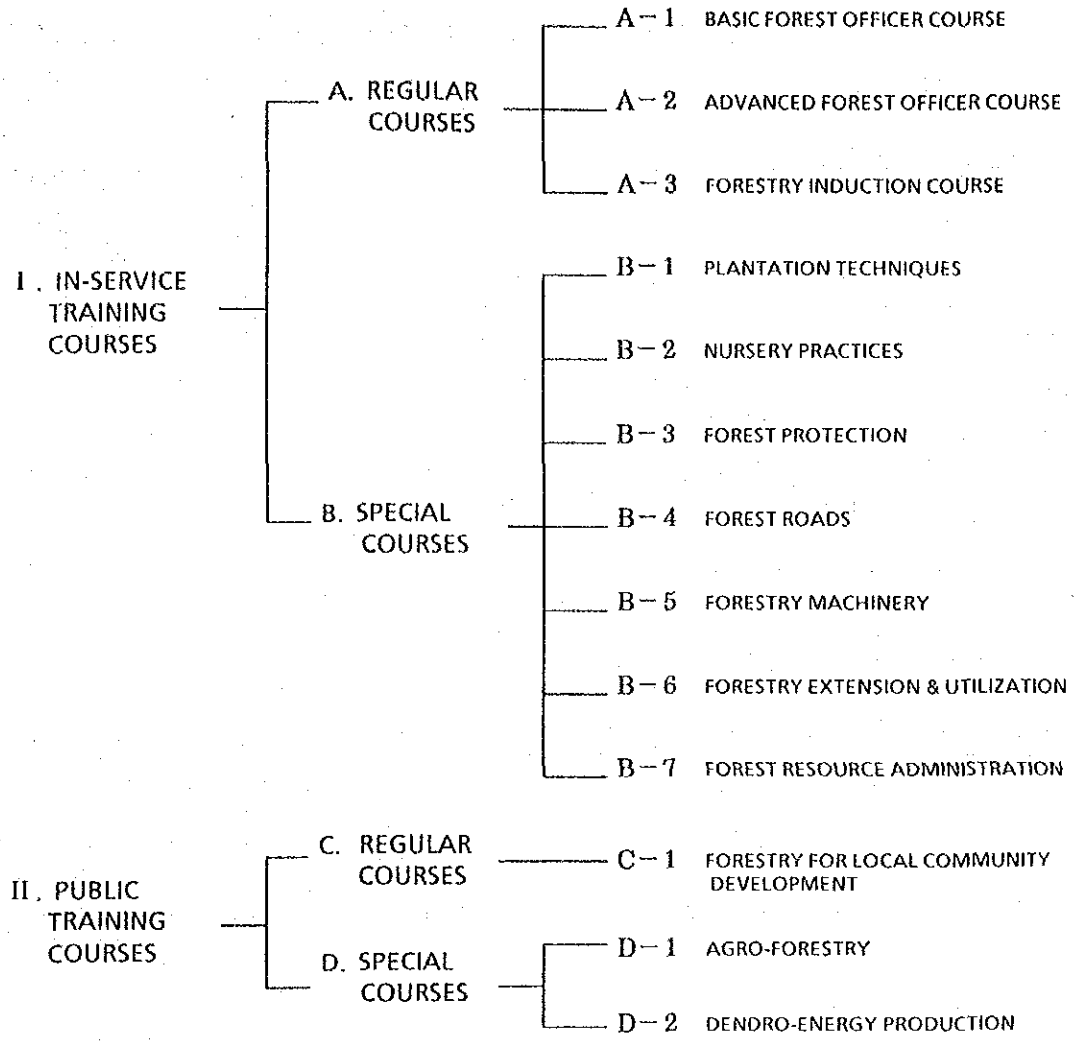
Against such a background the Burmese Government has formulated a project to establish the Central Forestry Development Training Center (CFDTC) aimed at training the staff of the Forest Department as well as local community leaders in forestry technology, and requested the Japanese Government to provide a grant aid for implementation of this project. The contents of the Burmese Government's initial request (made in February 1986) centered on the establishment of the CFDTC, training programs for

the personnel of the Forest Department and the Timber Corporation, increased efficiency in research and development activities, implementation of experiments and improvement of forestry technical staff's skills. As a result of consultations between the preliminary survey team dispatched from Japan and representatives of the Burmese Government, it was decided to limit the scope of this project mainly to the Forest Department of the Ministry of Agriculture and Forests, to offer a total of 13 training courses in two categories and four sub-categories, and to undertake only the technological development work necessary to implement the training programs manimizing conduct of applied research work.

In line with the final agreement governing this project, the Japanese Government decided to conduct a basic design study. It instructed the Japan International Cooperation Agency (JICA) to send a basic design study team to Burma to study the background of the project, the propriety of the grant aid cooperation, the planned local system of implementing the project, the system of maintaining and administering the proposed facilities and the local construction situation, as well as to confirm the details of the request made by the Burmese Government. The study team stayed in Burma from February 1st to 24th, 1987.

The Forest Department under the Ministry of Agriculture and Forests of Burma will be responsible for all matters to be undertaken by the Burmese Government in the implementation of this project. After completion of its facilities, the CFDTC will come under the direct control of the Training Division of the Forest Department.

The major function of the CFDTC is to train the personnel of the Forest Department and local community leaders in forestry and forestry technology. The following training programs will be implemented at CFDTC.



It is expected that a total of 1,100 trainees will participate in the 13 training courses to be offered by CFTDC (two categories and four sub-categories).

The A-1, A-2 and A-3 courses, which are currently operating at the Burma Forest School, will be transferred to the CFDTC upon completion of its facilities. Category B (special courses), Category C (general courses) and Category D (special courses) are all new training courses to be implemented at CFDTC.

The possibility of conducting technical cooperation on a project basis in Category A and B (except B-6, B-7 course) is yet to be examined.

After investigating the local natural conditions, the project site, the local infrastructure, construction situation and so forth on the basis of the contents of the projected training program and the details of the request made by the Burmese Government, and analyzing the results of the investigation, the basic design, in which the optimal scale and particulars of the facilities are defined, has been established as described below.

a. Building

Site: Hmawbi Township, Rangoon Division

Building structures: 2 or 3 storied reinforced concrete buildings

Total floor area: 10,820 m^2

(1) Main building

1. Seminar Rooms: 4 seminar rooms with respective seating capacities of 100(can be divided into 2 rooms, each with seating capacity of 50), 50, 30 and 30

2. Laboratories: one biology laboratory and one chemistry laboratory

3. Drawing Room: seating capacity of 30

4. Library

5. Sample Presentation Room

6. Training materials production rooms:
   audiovisual editing room
   printing room
   slide production room

7. Offices

8. Training Hall: seating capacity of 250 with audiovisual facilities

(2) Workshop building

1. Equipment and machinery storage, workshop

2. Garage

(3) Dormitory building

1. Dormitory: 50 single rooms, 44 three-bed rooms (182 beds in total)

2. Canteen: seating capacity of 180

(4) Other facilities

1. Facilities attached to Nursery
   germination shed, potting shed, glass house, compost shed, store house

2. Equipment storage facilities
   Electric building, pump house (three sheds)

B. Equipment

1. Laboratory equipment:
   germinator, microscope, autoclave, kjeldahl digestor, dry type sterilizer, etc.

2. Nursery equipment:
   wheel tractor, hand tractor, sprayer, pot making machine, soil crusher, concrete mixer, etc.

3. Silviculture equipment:
   chain saw, bush cutter, earth auger, tree pruning machine, tractors, etc.

4. Forest fire fighting equipment:
   tank lorry, engine fire pump, transceiver, etc.

5. Forest and road survey equipment:
   compass, clinometer, caliper, hypsometer, transit, hand level, drawing table, etc.

6. Forest road construction equipment:
   angledozer, tractor shovel, back hoe, portable crusher, compressor, hand drill, hand breaker, belt conveyer, vibrating roller, etc.

7. Meteorological observation equipment:
   instrument shelter, aneroid barometer, maximum and minimum thermometer, hygrometer, earth thermometer, thermo-hygrograph, rain gauge, barograph, sun-shine recorder, etc.

8. Repairing workshop equipment:
   hot water car washer, arc welder, gas cutting & welding tool, bench drill, grinder, parts cleaner, tester, etc.

9. Audiovisual equipment:
   amplifier, speaker, microphone, cassette tape recorder, monitor TV, 16mm film projector, slide projector, video cassette recorder, etc.

10. Training materials production equipment:
    copying machine, printing machine, typewriter, word processor, personal computer, binding machine, camera, film processor, video editing equipment, video camera, etc.

11. Vehicle:
    compact size bus, micro bus, dump truck, pick-up truck, van, truck, motorcycle.

C. Nursery

1. Nursery beds for potted seedling

2. Nursery beds for stump seedling

Regarding the methods of construction and types of building materials, the commonly used local methods of construction and locally available construction materials will be used wherever possible to expand the local

contribution portion of the project. Great emphasis was placed on ease of maintenance and economic efficiency in selecting not only the methods of construction of buildings but also the necessary materials, equipment, instruments and machinery.

The implementation period of the project is 19 months, of which 13.5 months has been allocated for the construction of the facilities andprocurement and installation of the necessary equipment and machinery. The cost for maintenance and administration of the facilities is to be appropriated out of the budget of the Forest Department. The estimated annual cost for maintenance and administration of the CFDTC facilities is approximately 2,100,000Ks which accounts for approximately 2.11% of the Forest Department's current expenses of 99,300,000Ks for fiscal 1987/88. This proportion is considered reasonable.

It is expected that the prospective training courses for the Forest Department's personnel and local community leaders, if administered effectively, will enhance Burmese forestry technology and community development, and thereby contribute to the improvement and stability of the socio-economic welfare of the Burmese people.

Accordingly, this project is extremely significant in terms of its socio-economic impact on the lives of the Burmese people. In this context, it is considered reasonable and advisable for the Japanese Government to offer a grant aid for implementation of the project to establish the Central Forestry Development Training Center.

In conclusion, it should be added that close collaboration with the Forest Department, recruitment and training of the required number of full-time and part-time instructors, a workable budget for the CFDTC, a well-organized information dissemination system and the efforts to realize technical cooperation are indispensable in maximizing the socio-economic benefits of this project.

CONTENTS

CHAPTER 1
INTRODUCTION

CHAPTER 1 INTRODUCTION

The total forest area of the Socialist Republic of the Union of Burma (hereafter referred to as Burma) is 38,820,000ha which is under the responsibility of the Forest Department, Ministry of Agriculture and Forests. On the other hand, the number of staff of the Forest Department is 10,628 as of fiscal 1986/87. Among them there are 5,528 forestry technical staff so that each staff is responsible for an average 7,022.6ha of forest area. In addition, since the introduction of the Third Four-Year Plan in fiscal 1978/79, the required forestry technical staff has not been trained for the execution of forest development; for example, the weeding of reserved forest areas which have expanded as a result of implemented afforestation plans designed to expand the exports of forestry products, particularly teak. The supply of wood for the manufacture of paper and pulp, the securing of wood for fuelwood and charcoal, and the creation of forests for environmental preservation are also other areas that require urgent attention. Thus, it has become necessary to review the afforestation plans for the Fifth Four-Year Plan which is to commence in fiscal 1986/87.

Moreover, afforestation activities to prevent artificial forest destruction and to supply fuelwood and small diameter logs for self-support systems run by local inhabitants, the promotion of agro-forestry for the mutual development of agriculture and forestry, and the development and implementation of a rational utilization method of dendro-energy, are all aimed at enhancing the living standards of the local communities.

To cope with this expansion, the Forest Department will become a new organization from April 1987, with the number of its total staff members to be 14,751, and boost its total staff by about 4,000 within few years . So far training courses have been conducted for technical staff members of the Forest Department mainly in the Burma Forest School. However, training has been inadequate and preparations for future forestry innovations are insufficient because of the small scale of the courses and the shortage of new equipment and facilities. Furthermore, it can be said that the curriculum is overly academic and administration oriented. It needs to include the basic training related to forestry and forestry

administration, the latest approaches to forest management, and training with modern equipment.
For these reasons, Burma is now planning to construct a Central Forest Development Training Center (to be called CFDTC) which will serve to train capable men from among staff members of the Forest Department and local community leaders and has requested the Government of Japan for grant aid cooperation.

The government of Japan, deciding to carry out a basic design study on this plan, instructed the Japan International Cooperation Agency (JICA) to undertake the study.
In October 1986 JICA dispatched an expert study team for technical cooperation. A preliminary study team for grant aid cooperation was sent in November 1986 to Burma to discuss the details of the grant aid cooperation and technical cooperation.
The Burmese authorities have subsequently expressed strong interest in early realization of CFDTC with the cooperation of the Government of Japan. JICA sent a basic design study team in February 1987. The study team conducted the following study on the feasibility of this grant aid cooperation.

1. Analysis of the background of the Project and its appropriateness.
2. Clarification of the situation of forest and forestry in Burma.
3. Discussion on the contents of the Project and its scale.
4. Confirmation of implementation organization of the Project, management and administration system of CFDTC and budget allocation for works undertaken by the Burmese side.
5. Survey of the proposed construction site.
6. Survey of existing facilities similar to CFDTC
7. Data collection of the construction situation.

This report complies the results of the field survey in Burma and post-survey analysis in Japan. The list of the study team members, the study schedule, the list of main interviewers, and a copy of the minutes of meetings are included at the end of this report.

CHAPTER 2
BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Outline of Burmese Forest and Forestry Industry

The forestry industry of Burma accounted for 2.1% of the country's GDP in fiscal 1985/86, and this proportion has gradually decreased from the 2.9% in fiscal 1961/62. The forestry worker population stands at 183,000 which corresponds to 1.2% of the total labor force of 15.13 million (which includes workers in public and private organizations).

The Forest Department's allocated expenditure is 1.05 billion Ks (fiscal 1986/87) which is only 3.4% of the government's total operating expenses, and its capital budget is 180 million Ks (fiscal 1986/87) which is only 2.5% of the goverment's estimated capital expenditure. Forestry exports totaled 3.58 billion Ks (27.3% of the total export amount) in the Fourth Four-Year Plan period (1982 to 1986); the figure second only to the amount of agricultural products, 6.69 billion Ks (51.0%). In fiscal 1984/85, especially, the proportion of forestry products in the total exports amount to 33.4%, and was approaching the share held by agricultural products 43.5%.

Table 2-1 Value of Net Output and Services, Labour Force, Current Expenditure, Capital Expenditure and Exports by Sector

Sector	VALUE OF NET OUTPUT AND SERVICES %	LABOR FORCE (THOUSAND) %	CURRENT EXPENDITURE (100MILLION Ks) %	CAPITAL EXPENDITURE (100MILLION Ks) %	EXPORTS (MILLION Ks) %
	1985/86	1985/86	1986/87	1986/87	1984/85
AGRICULTURE	28.0%	9,580 63.3%	19.7 6.4%	9.3 12.7%	1,388.8 43.5%
LIVESTOCK AND FISHERY	6.8%	202 1.3%	8.1 2.6%	2.7 3.7%	136.1 4.3%
FORESTRY	2.1%	183 1.2%	10.5 3.4%	1.8 2.5%	1,067.5 33.4%
MINING	1.6%	87 0.6%	15.6 5.0%	2.4 3.3%	472.5 14.8%
PROCESSING, MANUFACTURING AND POWER	12.9%	1,304 8.6%	83.9 27.1%	29.5 40.4%	OTHERS 68.2 2.1%
CONSTRUCTION	2.7%	246 1.6%	15.0 4.9%	3.4 4.7%	
TRADE	20.5%	1,472 9.7%	69.0 22.6%	12.2 3.0%	RE-EXPORTS 61.4 1.9%
TRANSPORT AND COMMUNICATIONS	5.8%	500 3.3%	16.4 5.3%	10.7 14.6%	
OTHER SERVICES OTHERS	19.6%	1,556 10.4%	70.2 22.7%	11.1 15.1%	
TOTAL	100%	15,130 100%	309.2 100%	73.1 100%	3,194.5 100%

Source: Report to the Pyithu Hluttaw 1986/87

Table 2-2 Forestry Related Statistics

	FOUR-YEAR PLAN				
	1ST 1971~74	2ND 1974~78	3RD 1978~82	4TH 1982~86	5TH 1986~90 Planned target
AVERAGE GDP GROWTH A YEAR		4.7%	6.5%	5.5%	4.5%
FORESTRY SECTOR AVERAGE ECONOMIC GROWTH A YEAR		5.8%	6.1%	4.1%	3.8%
FOREST PLANTATION AREA		12,858ha	44,890ha	122,482ha	129,504ha
GROWING RESERVED FORESTS AREA	646,723ha	228,179ha	22,792ha	162,652ha	337,224ha
PRODUCTION *(Cubic ton)*					
TEAK	1,162,094	1,091,026	1,606,750	1,583,676	1,640,000
OTHER HARDWOOD	3,768,005	3,241,447	4,431,933	4,534,667	6,858,000
FUELWOOD		44,378,000	51,654,000	62,133,000	75,772,000
CHARCOAL		1,277,000	2,294,000	3,058,000	3,650,000
PRODUCTION (Metric ton)					
PAPER		37,400	59,000	75,900	99,400
PULP		1,800	12,600	26,500	26,400

Source: Report to the Pyithu Hluttaw

2-1-1 Current Condition of Forestry Resources

Fifty-seven percent (57%) of the entire area of Burma (38,820 000 ha) is covered by forest, which can be roughly classified into reserved forests and unclassified forests. Reserved forests are being managed under a forestry law (Burma Forest Act) and the unclassified forests are leniently regulated by law.
The distributions of these two forest types in 1986 are shown below, but unclassified forests are increasingly being included as reserved forests.

Reserved Forests	10,014,000ha
Unclassified Forests	28,806,000ha
Total Forest Area	38,820,000ha

The forests in Burma are classified into the following eight types on the basis of forest type.

TYPE OF FOREST	AREA (1,000ha)	EXTENT IN PERCENTAGE
1. Tidal forest		
2. Beach and dune forest	1,553	4%
3. Swamp forest		
4. Evergreen forest	6,212	16%
5. Mixed decidous forest	15,140	39%
6. Dry forest	3,882	10%
7. Indaing forest	1,941	5%
8. Hill forest	10,092	26%
TOTAL	38,820	100%

The rough forest distribution is shown in Fig.2-1.

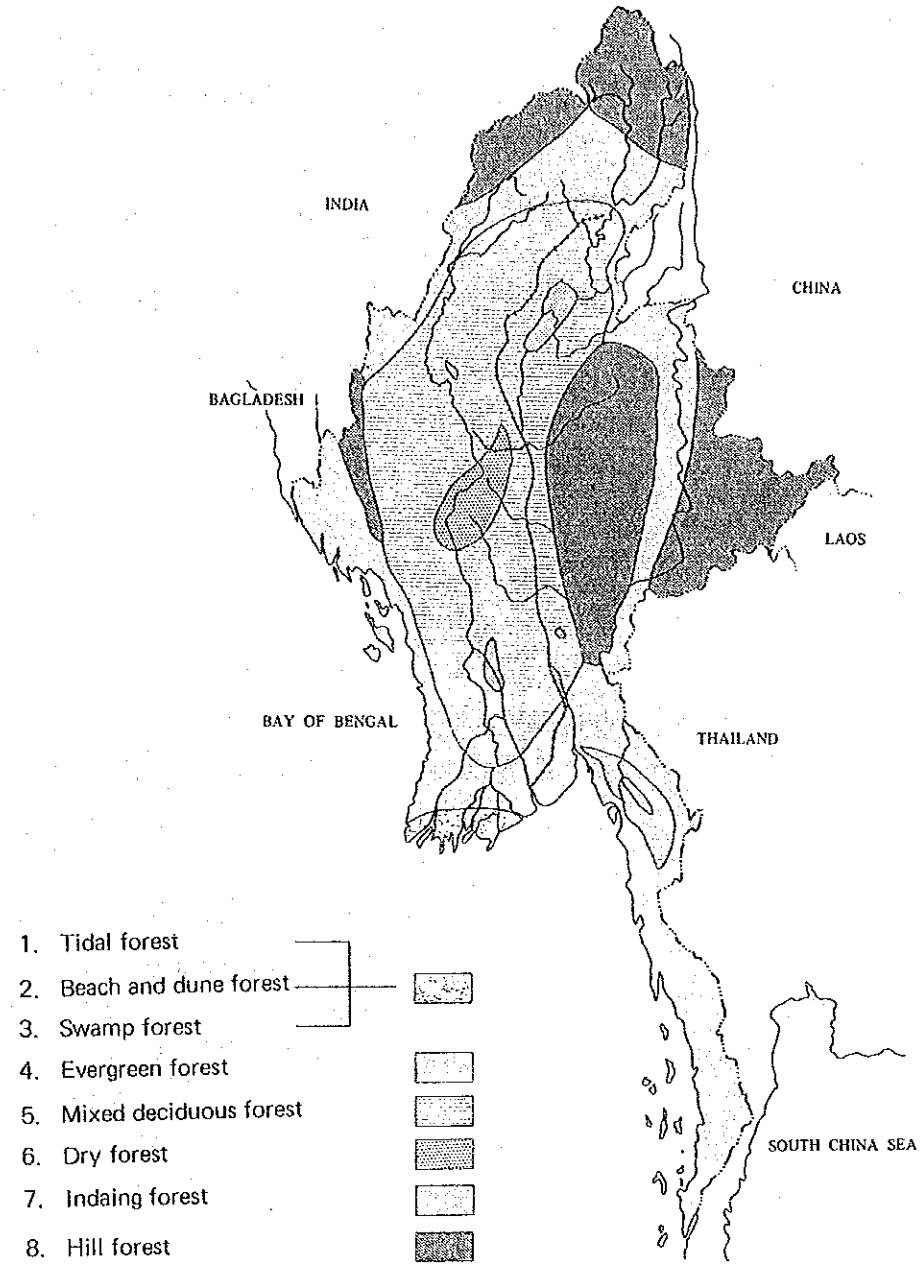


Fig. 2-1 The Rough Forest Distribution

2-1-2 Role of Forest

In Burma, forests and forestry products play important roles in the society and the economy. Forests are classified depending on their uses as shown below.

1. Commercial forests ····· provide timber for export (mainly teak) and domestic consumption

2. Local Supply forests ····· mainly provide fuelwood for domestic use

3. Industrial forests ····· provide raw materials for pulp and paper

4. Protection forests ····· protect catchment and prevent land encroachment

A. Commercial Forests

(1) Status

Teak, pyinkado, and padauk are listed as commercially important wood. Teak especially is prone to little termite encroachment, is highly corrosion-proof and strong. It is, therefore, indispensable for domestic construction materials along with pyinkado and padauk. It is also superior as a furniture material because of its beautiful grain. Then it has been exported to Europe, and is an indispensable material in Scandinavian furniture design. Burma is the home of teak and supplies 75% of the total world production of good quality teak. Annual potential yields are estimated at 335,000 cubic tons (603,000m3) for teak and 2,260,000 cubic tons (4,068,000m^3) for other hardwood trees (Notes on Forestry in Burma 1986).

In contrast, annual average production has amounted to 395,918 cubic tons (714,634m3) for teak and 1,133,667 cubic tons (2,046,268m^3) for other hardwood during the Fourth Four-Year Plan period. This means that 118% of the felling allowance for teak was felled.
(Note: Logs and sawn timber are converted using the measurement of 1 cubic ton =1.805m^3 and 1 cubic ton = 1.416m^3, respectively.)

It has already been mentioned that the share held by forestry products in total exports averaged out to 27.3% annually during the Fourth Four-Year Plan period and followed 51.0% of agricultural products. While commercialized agricultural products are being overproduced in the free world market and increased export prices cannot be expected, the wood market can be expected to be buoyant in the future. For example, the export price of rice, representative of agricultural products in Burma, dropped from 2,350 Ks/ton (100%) in fiscal 1981/1982 to 1,317 Ks/ton (56%) in fiscal 1985/86. On the other hand, since the export price of teak logs has almost leveled off, the export quantity of teak logs and boards in fiscal 1985/86 surpassed that of rice and ranked first among single commodity items.

Not only teak, pyinkado, and padauk but many other hardwood trees have beautiful grain and are superior materials. Many of these hardwood trees are promising as plywood and furniture materials but only about 45 of them are felled at present because the forest type in Burma is predominantly the multiple tree mingling variety with about 1,200 kinds of tall trees in existence. Thus, work efficiency drops.

(2) Problem

Teak, the most important forestry resource, is being felled using the method unique to Burma, Burma Selection System, and is still decreasing in quantity because of repetition of the same method without effective cultural operations.

Therefore, not only natural renewal but strengthened teak afforestation are thought to be necessary.

Furthermore, since teak production has its limits, the uses of other useful hardwood trees need to be developed.

Table 2-3 Production & Exports of Teak & Hardwood

Unit: Cubic ton

	YEAR	1981/82	1982/83	1983/84	1984/85	provisional 1985/86
Teak	Production of logs	375,872	442,278	329,306	379,716	413,000
		Index 100	118	88	101	110
	Export of logs	71,739	60,820	112,287	120,284	110,000
		Index 100	85	157	168	153
	Production of sawn timber	113,600	163,515	134,557	121,921	115,900
		Index 100	144	118	107	102
	Export of sawn timber	72,639	57,422	69,994	60,602	80,000
		Index 100	79	96	83	110
Hardwood	Production of logs	525,879	561,635	448,574	573,237	700,016
		Index 100	107	85	109	133
	Export of logs	56,299	52,918	33,320	23,512	70,000
		Index 100	94	59	42	124
	Production of sawn timber	257,062	283,637	232,988	266,833	288,330
		Index 100	110	91	88	112
	Export of sawn timber	-----	61	460	353	5,000

Source: Report to the Pyithu Hluttaw

B. Local Supply Forests

(1) Status

Local supply forests supply fuelwood (the only usable and cheap energy source for local inhabitants at present) and thin logs needed for the village economy.
In unclassified forests, local inhabitants are authorized to use fuelwood and thin logs for their own uses.
These demands are thought likely to increase as population increases and supply shortages are already occurring in the rural areas where population density is specially high and in urban districts.
The quantity of the wood which is consumed as fuel is especially large and reached 15,533,250 cubic tons on an annual average during the Fourth Four-Year Plan period. Its annual average increase rate is 5.58%, considerably in excess of the annual average population increase rate 2% during this period. In these statistics of fuelwood, however, it needs to be noted that a large quantity of the wood is used as industrial fuel.

(2) Problem

Village timber use, including fuelwood, comprises more than half the total demand for wood. Forests supplying it run short on the outskirts of cities and in dry forest districts in the middle regions of Burma.
For this reason, afforestation of fuelwood forests by fast growing trees is a pressing need. At the same time, the technical guidance is needed to assist local inhabitants in afforestation and educational and promotion activities are also needed for forest utilization.

Table 2-4 Production of Fuelwood & Charcoal

Year	Fuelwood		Charcoal	
	Production (1,000 cubic ton)	Growth rates	Production (1,000 cubic ton)	Index
1978/79	12,452	6.62%	640	100
1979/80	12,545	0.74%	529	83
1980/81	13,049	3.86%	508	79
1981/82	13,608	4.10%	617	96
1982/83	14,334	5.06%	765	120
1983/84	15,045	4.74%	719	112
1984/85	15,854	5.10%	793	124
1985/86 provisional	16,900	6.19%	781	122

Source: FD

C. Industrial Forests

(1) Status

Industrial timber is used mainly for manufacturing paper and pulp, the raw materials of paper. Paper and pulp are being produced in the Paper-Manufacturing and Chemical Industry Public Corporation's three factories: Kanbe Paper Mill, Yeni Paper Mill, and Sittangh Paper Mill. Paper production was 18,400 tons in fiscal 1985/86. Since the demand for paper and paper boards is estimated at 40,000 tons/year in Burma, the difference, approximately 22,000 tons, is thought to be imported every year.

To cope with the annual increase in the demand for wood as raw material, the afforestation of industrial wood forests is rapidly expanding, the afforestation area reached 2,812ha in the last year of the Fourth Four-Year Plan (fiscal 1985/86) which is 5.3 times the afforestation area 526ha in the first year (fiscal 1982/83).

(2) Problem

The consumption of paper and paper boards in Burma is estimated at 1.1 kg/year·person in 1985 and is one-fourth the amount in Indonesia and one-nineth that in Thailand.

The demand for paper is expected to increase in Burma in the future because of modernization and economic development. Supposing that paper consumption per capita becomes the same as that in Thailand at present ten years from now, then, if the population of Burma is assumed to be 44.7 million (the population was 37 million in 1985 and the population increase rate is 1.9%/year) after 10 years (1995), 0.0011x9x44,700,000=442,530 tons of paper and paper boards will be necessary. Since 4.07m^3 of trees used as material are needed to produce one ton of paper, 4.07x442,530=1,801,000 (m^3) of trees used as material are needed to produce 442,530 tons of paper. If the yield per hectare is assumed to be 250m^3 ten years after afforestation, 1,801,000m^3÷250m^3/ha=7,200ha of afforestation is thought to be currently needed.

The Government of Burma has forecasted the future consumption trend of paper and paper boards and has planned for 4,900ha of afforestation in 1987, or about 9.2 times the afforestation area in 1982. The afforestation area based on the Fifth Four-Year Plan is thought to be in the allowable range in which increases in the demand for paper can be dealt with providing that bamboo is also considered for use as a raw material for pulp production. Hereafter, however, the demand for the industrial timber including raw materials for paper is expected to sharply increase over the long-term and measures are needed to cope with this situation.

Table 2-5 Consusnption of Paper in Selected Countries

Unit: 1000metric tons

Ranking	Country	1984	1985	Remarks
1	U.S.A.	68,555	67,966	
2	Japan	19,200	20,303	
14	Korea	2,194	2,290	
31	Indonesia	630	** 730	
40	Thailand	** 490	** 505	
79	Burma	** 40	** 40	

Source: Pulp & Paper International 1986

Report to the Pyithu Hluttaw

** Estimated figure

Table 2-6 Production of Paper in Selected Countries

Unit: 1000metric tons

Ranking	Country	1984	1985	Remarks
1	U.S.A.	62,226	61,121	
2	Japan	19,345	20,469	
15	Korea	2,207	2,311	
36	Indonesia	** 380	** 480	
40	Thailand	329	** 350	
—	Burma	18.3	18.4	

Source: Pulp & Paper International 1986
Report to the Pyithu Hluttaw

** Estimated figure

Table 2-7 Per Capita Consumption of Paper in Selected Countries (1985)

Ranking	Country	Population (1,000)	kg per capita	Ratio
1	U.S.A.	239,300	284.0	258
11	JAPAN	121,047	167.7	152
31	KOREA	41,209	55.6	51
44	MALAYSIA	11,500	** 33.2	30
70	THAILAND	50,000	** 10.1	9
98	INDONESIA	150,000	** 4.7	4
—	BURMA	37,000	*, ** 1.1	1

Source: Plup & Paper International 1986

Note: Population of Burma based on Report to the Pyithu Hluttaw

*40,000(tons)÷37,000,000(人)×1000=1.1kg per capica

**Estimated figure

Table 2-8 Forest Plantations for Industreal

Established Area during the Fourth Four-Year Plan

Unit: ha

year	Area
1982/83	525
1983/84	768
1984/85	1,433
1985/86	2,812
TOTAL	5,539ha

Source : Report to the Pyithu Hluttaw

Target Area during the Fourth Four-Year Plan

Unit: ha

year	Area
1986/87	3,400
1987/88	4,900
1988/89	4,900
1989/90	4,900
TOTAL	18,100ha

Source : FD

D. Protection Forests

(1) Status

Although forests play an important role in protecting catchment areas and agricultural land, they have not been sufficiently developed in these areas in some cases.

Kinda Dam, the largest in Burma, and Sedawgyi Dam, which is near completion, will promote the most preferential undertakings for Burma, such as the expansion of irrigated agricultural land and boosted power generation capacity, whose absolute quantity is presently insufficient.

To assist these undertakings indirectly, it is important to control flow-down quantity and to prevent land encroachment by afforesting water-collecting areas of dams. Even in the case of the above two dams, the state of the forests are poor in the peripheral areas and afforestation for environment preservation is urgently required.

(2) Problem

The total water-collecting area of the dams completed from 1962 to 1986 and those which are currently under construction or near completion is estimated at around 2,000,000ha from the irrigation areas of individual dams. Most parts of the areas are thought of as being covered by forests but certain parts of the areas, especially dam site peripheries, are run down and require afforestation.

2-2 Outline of Related Policy

2-2-1 The Twenty-Year Plan

In 1971, the "Guideline for Preparation and Implementation of Economic Development Plan" was adopted in the first general meeting after the transition of the Burma Socialist Planning Party to a people's party. A "Twenty-Year Long-Term Plan" was started with fiscal 1971/72 as the starting point.
The main aims of this long-term plan are as follows:

1. Optimal exploitation of natural resources for export

2. Development of industries that substitute imports.

3. Development of heavy industry utilizing domestic mineral resources

With the transition to civil administration in 1974 as the turning point, this guideline was revised to the "New Twenty-Year Plan" (fiscal 1974/75 to 93/94).
This twenty-year plan lists the following three items as aims of the forest-related policy:

1. To assure continuity of adequate supply of forest products for local use and export.

2. To increase forest plantation program and to harvest, using latest technology.

3. To coordinate and cooperate in the area of land use for optimum production.

Furthermore, the following policies are shown in "Twenty-Year Plan" to achieve the above aims:

1. Shifting cultivation, the major cause of forest destruction, be replaced by terrace cultivation wherever possible through systematic education.

2. To step up the establishment of forest plantations, conservation of forests and expansion of reserved forest areas.

3. To speed up the transportation of logs from the extraction sites to depots and mills.

4. To encourage the participation of the cooperative societies in forest conservation works, felling, extraction and rafting of timber.

5. To increase the formation of the village forest plantations using fast growing species for local use and establishment of the industrial plantation for export market.

6. Forest regeneration and conservation works should be done, giving priority to the Dry Zone area.

7. Formation of forest plantation introducing selected valuable species for both domestic consumption and export market.

The Burma forest plan has been implemented in the four-year plans whose first period was fiscal 1971/72 to 1973/74, with the above items kept in mind, and has been included in the Fifth Four-Year Plan period from April 1986.

2-2-2 Forest policy

The Burma Forest Act was enacted in 1881 and has been modified to allow for individual variations. Based on the terms of the forest policy announced in 1984, forests in Burma are now managed and operated in the following four categories:

1. Protection forests
2. Commercial forests
3. Local Supply forests
4. Reserved forests, sanctuaries and national parks

2-3 Present State of the Forest Department

2-3-1 Activities and Responsibilities of the Forest Department

Forest-related activities are being operated by three organization: the Forest Department in the Ministry of Agriculture and Forests, Timber Corporation, and Survey Department. The Forest Department is in charge of the process from seeds to fully grown trees and Timber Corporation is in charge of felling and subsequent stages. The responsibilities are shown below.

- Responsibilities of the Forest Department

  1. Forest plantations
  2. Management of all forest resources of the country
  3. Normal forest cares (such as girdling of teak trees, selection marking of other hardwood trees, various types of plantations, propagation activities for forest improvement, etc.)

- Responsibilities of Timber Corporation

  1. Promotion of forest product market
  2. Felling
  3. Transportation of logs
  4. Milling
  5. Marketing of timber

- Responsibilities of Survey Department

  1. Survey
  2. Preparation of topographic maps

2-3-2 Organization of the Forest Department

The Forest Department has the position in the Ministry of Agriculture and Forests as shown in Fig. 2-2.

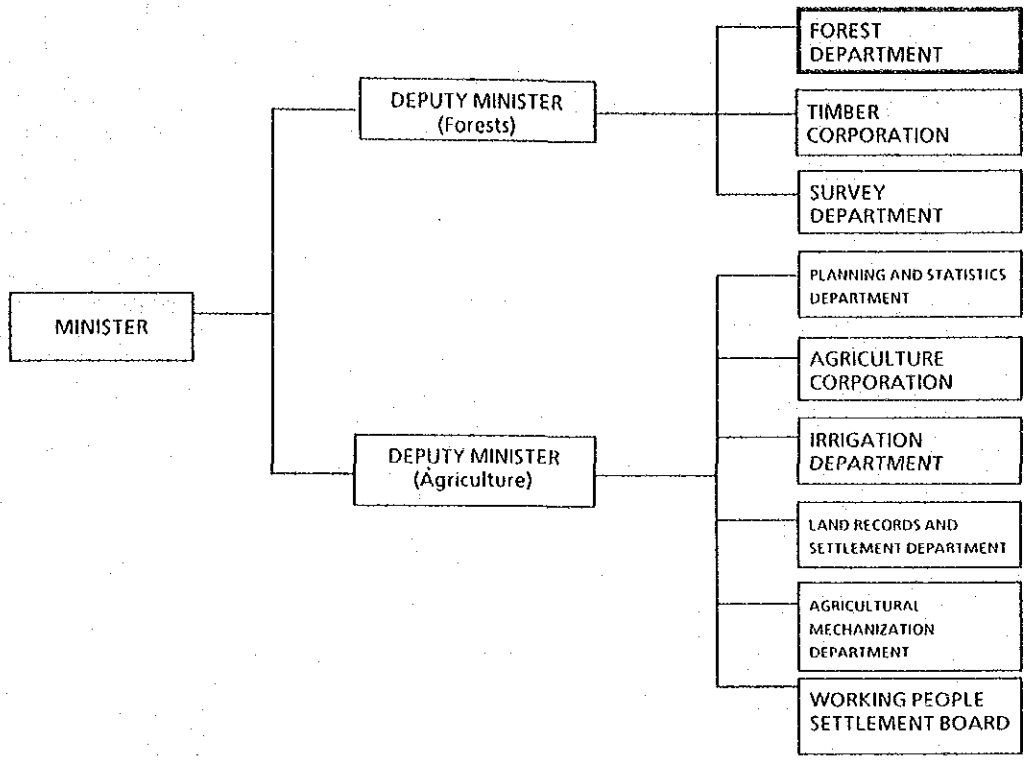


Fig.2-2 Organization of Ministry of Agriculture and Forests

A. Old Organization of the Forest Department

As of February 1987, at the time of the basic design study, the Forest Department consisted of a main branch, consisting of an office and five divisions, and nonclerical organizations in the business division: six seed and seedling centers, three district afforestation offices, four projects, the Burma Forest School, a main storehouse, five parks and facilities, and fourteen district offices.

Fig.2-3 Shows the old organization of the Forest Department.

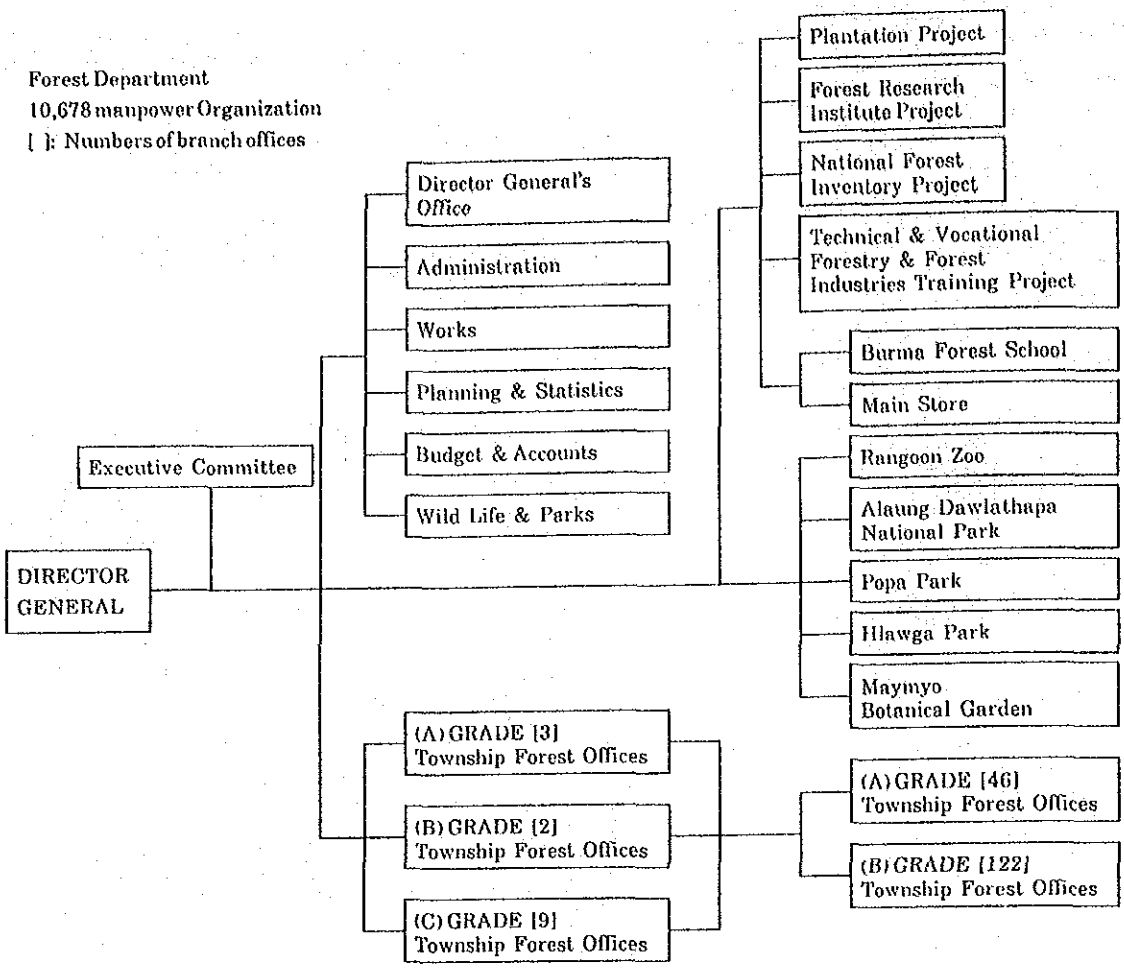


Fig.2-3 Old Organization of Forest Department

B. New-Organization of the Forest Department

The Forest Department will become a new organization from April 1987. Staff numbers are to be increased from 10,678 persons, the number in the previous organization, to 14,751.

According to the new organization, the CFDTC is positioned under the training division alongside the Burma Forest School.

Fig. 2-4 Shows the organizational diagram.

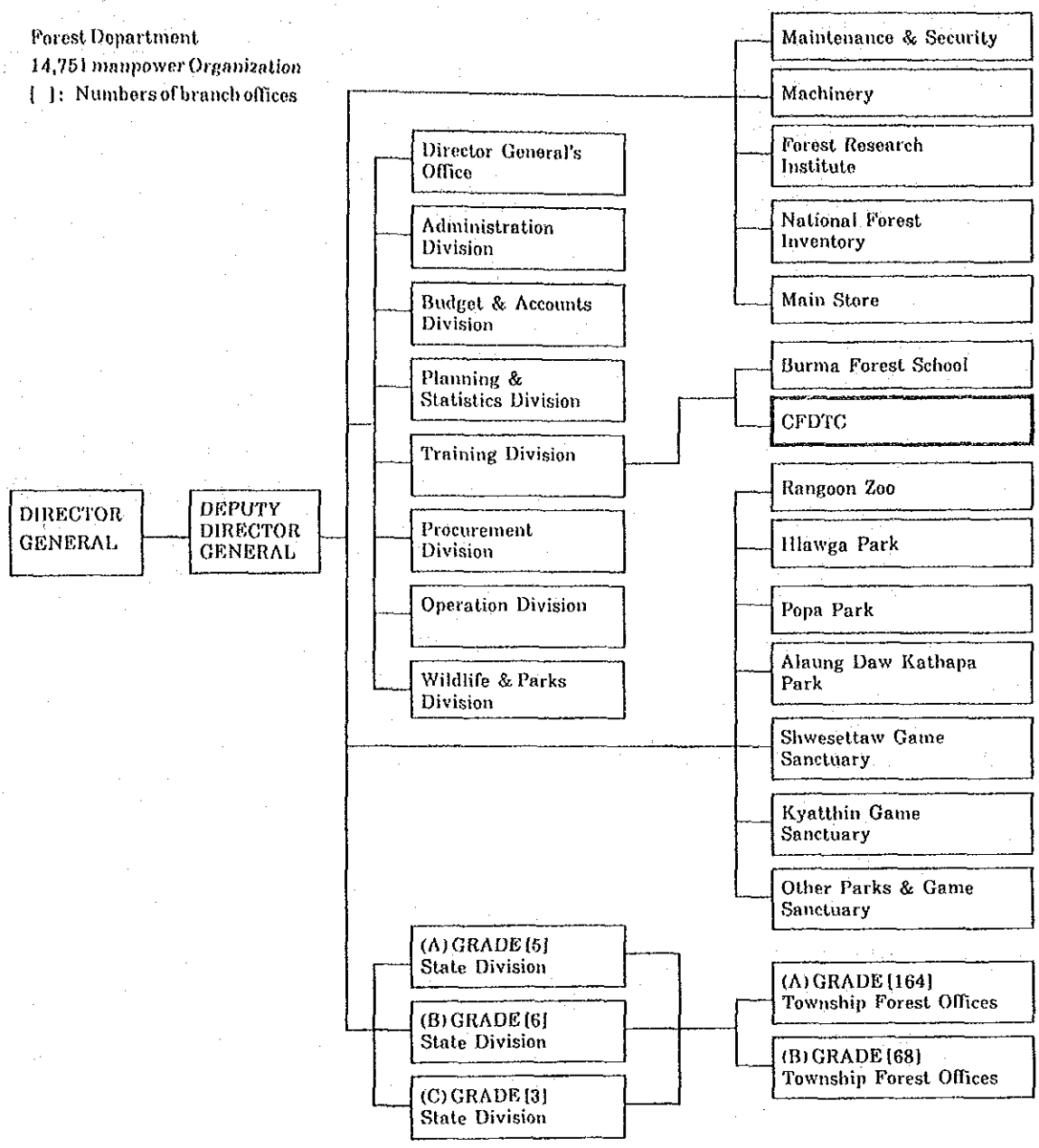


Fig.2-4 New Organization of Forest Department

2-3-3 Present Activities of the Forst Department

Main activities of the Forest Department is shown below

1. Management of forests
2. Seedling culture
3. Forest Plantation
4. Research and training
5. Others

A. Forest management

The forest management activities include general preservation work on forests including reserved forests, adjustment of allowable felling quantity, decision on felling areas, selection of trees to be felled, girdling of teak, and collection of royalty from teak and other timbers.

B. Seedling culture

At present, the six seed and seedling centers are conducting the following activities.

1. Collection and distribution of seeds
2. Production and distribution of seedlings for plantations
3. Production and distribution of trees for urban afforestation
4. Germination test
5. Management of test plantation plots for different species
6. Management of a seed farm (conducted at Oak-twin S.S.C only)

Seedling for general afforestation and tree planting are usually supplied at the site of afforestation or tree planting by the setting up of a temporary nursery and at the nursery of each forest office.

Table 2-9 Number of Seedlings Produced during the Fourth Four-Year Plan

Unit: Number in a million

Year	Commercial		Fuelwood	Industrial	Water shed	Woodlot	Seedlings for distribution	Total
	Teak	others						
1982/83	12.4	5.5	2.7	0.6	1.9	0.5	3.4	27.0
1983/84	18.5	7.0	5.4	1.1	2.2	0.8	3.4	38.4
1984/85	18.5	10.8	7.8	2.0	2.1	1.1	3.4	45.6
1985/86	17.0	12.0	20.0	4.5	2.2	0.9	4.5	61.3

sourse: Compiled by FD

C. Forest plantation

Since teak and other hardwood trees are harvested according to the Burma Selection System whose felling cycle is 30 years, forests are thought of as being naturally renewed. However, when the number of living teak and pyinkado, whose diameters at chest height are 45cm or more, is 25 or less per hectare, all the trees are felled and useful trees are planted to prevent useful trees from decreasing because of selective felling.
Also, afforestation is being implemented in areas where the saved forest quantity is small or climate conditions are bad and is sharply increasing to secure timber for industrial use, such as for paper and pulp, and for fuel.

Table 2-10 Forest Plantation Established during the Fourth Four-Year Plan

Unit: ha

Year	Commercial			Fuelwood	Industrial	Watershed	Woodlot	Total
	Teak	Pyinkado	Others					
1982/83	10,508	2,365	1,792	3,491	526	3,554	1,821	24,054
1983/84	11,810	2,199	2,294	6,235	769	4,304	1,107	28,718
1984/85	11,799	3,775	2,941	6,907	1,433	3,960	1,295	32,110
1985/86	11,554	3,217	2,286	12,131	2,813	4,229	1,366	37,596

Source: Compiled by FD

Table 2-11 Forest Plantations Targets for the Fifth Four-Year Plan

Unit: ha

Year	Commercial	Fuelwood	Industrial	Watershed	Total
1986/87	17,900	8,500	3,400	2,600	32,400
1987/88	16,200	8,100	4,900	3,200	32,400
1988/89	16,200	8,100	4,900	3,200	32,400
1989/90	16,200	8,100	4,900	3,200	32,400

Source: Compiled by FD

D. Research and training

The Forest Department is operating and managing the following institutes:

(1) Forest Research Institute (Location:Yezin)

This institute is conducting all the forest and forestry-related activities, researches related to forest products, and the services for spreading research results.
The total number of staff is 227 (including 24 research staff members).

(2) Burma Forest School (Location:Maymyo)

This school is conducting vocational training in forestry techniques.
The following four training courses are being conducted:

1. Basic forest officer course, 2. Advanced forest officer course, 3. Forestry induction course, and 4. Forestry technical course
The total number of trainees is estimated at 1,220 in fiscal 1986/87.
The total number of staff is 61 (including 23 instructors).

E. Other activities

In addition, the Forest Department is operating and managing the following related facilities.

1. Rangoon Zoological Garden
2. Alaung Dawlathapa National Park
3. Papa Park
4. Hlawga Park

5. Maymyo Botanical Garden
6. Wildlife sanctuaries

2-3-4 Training activities of the Forest Department

A. On-going training

At present, the Forest Department is conducting the following training:

1. Basic forest officers course
   This course aims to train newly recruited technical officers (university graduates)

2. Advanced forest officers course
   This course is offered to staffers (university graduates) with four or five years' work experience.

3. Forestry technical course
   This course aims to upgrade technical level of the field staff.

4. Forestry induction course
   This course is designed for newly recruited field staff.

Fig. 2-5 shows the relationship between the above four courses.

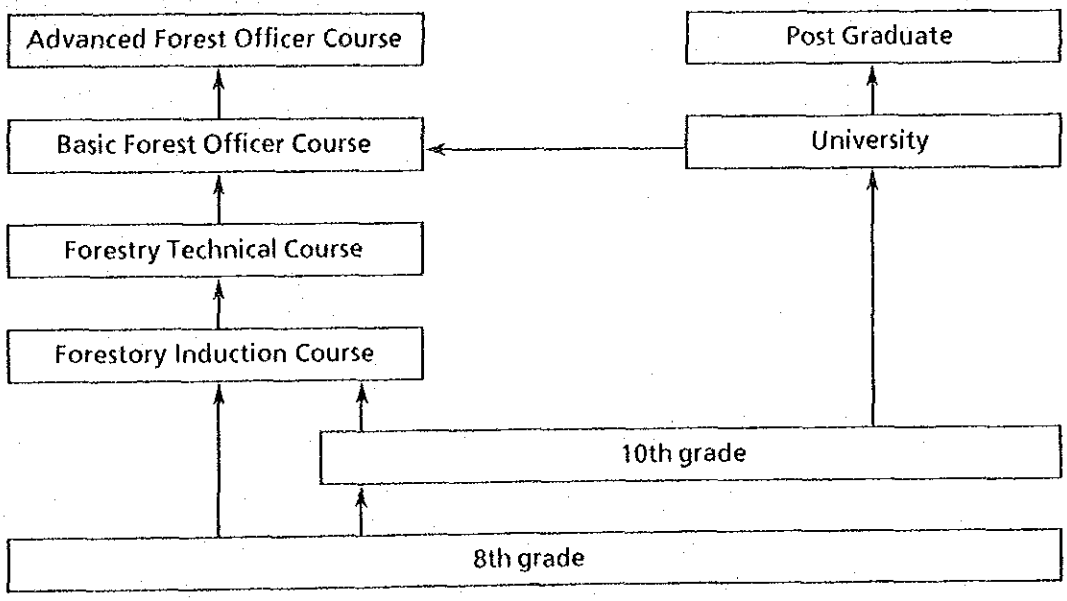


Fig.2-5 Relationship of Training Courses

The above training activities are conducted mainly in the Burma Forest School in Maymyo, but some of the courses were once provisionally conducted in the seed and seedling center in Ywathagyi and in the Forest Research Institute in Yezin. After completion of this project, only the forestry technical course is left in the Burma Forest School and three other courses, together with ten new courses, will be conducted in CFDTC.

B. Problems in the present training system

In 1984, the training courses were revised, and the Basic Forest Officers Course (A-1), the Forestry Induction Course (A-3), and the Forestry Technical Course (2 year course) were set up with the assistance of the forestry training project of the United Nations' Development Program. At present, the four programs consisting of the above three courses and the Advanced Forest Officers Course,(A-2) are being conducted. However, the training content is limited to academic and administrative subjects and no intermediate training is being conducted. New approaches to forest management and administration and modern technology and equipment especially need to be introduced.

Also, since the current facilities are small in scale and only limited training equipment is available, the necessary training is impossible.

The equipment offered by the United Nations' Development Program to the Burma Forest School is mainly for educational use and is insufficient, with the exception of multipurpose devices such as video devices, overhead projectors, cameras, etc. These devices are provided in accordance with the forestry technical course aimed at basic forestry education which is scheduled to remain in the Burma Forest School in the future and not suitable for the in-service training course scheduled for CFDTC.

C. Role of CFDTC's training

With the setup of the CFDTC, the Forest Research Institute in Yezin, the Forestry School in Maymyo, and CFDTC are now responsible for research (including education in the faculty of forestry), education (general forestry education), and training, respectively, as a research institutes for forests and forestry,a forestry education institute equivalent to a

junior college, and an institute for vocational training and education and training of local communities, respectively.
Thus, centralized and effective implementation of the business will be possible.

2-3-5 On-going Forestry Projects

Shown below are the projects which the Forest Department has carried out recently with overseas assistance.

1. National Forest Survey and Inventory Project
   - Assisting agency : United Nations Development Program
   - Investment : US$ 4,030,000
   - Implementation Period : 1981 to 1986
   - Details : Landset surveys of forest resources and geographical distribution of plants, ground surveys of about 26.7 million acres and aerial photography of about 75 million acres.

2. ADB Second Forestry Project
   - Financial agency : Asian Development Bank
   - Investment (Loan) : US$ 2.3 million
   - Implementation Period : 1982 to 1988
   - Details : Plantation teak : 15,500 acres
     pine : 6,500 acres

3. Strengthening the Forest Research Institute
   - Assisting agency : UNDP
   - Investment : US$ 1.45 million
   - Implementation Period : 1983 to 1987
   - Details : Research and technology development in forestry
     Provision of necessary facilities and equipment

4. Technical and Vocational Forestry Training Project
   - Assisting agency : UNDP
   - Investment : US$ 380,000
   - Implementation Period : 1983 to 1986
   - Details : To review, reorganize and extend the existing training programs and related facilities and to provide training

at Burma Forest School (Forest Induction Course, Technical Course and Basic Forest Officers Course) Number of trained personnel during the project period:658

The purposes of Technical and Vocational Forestry Training project was to investigate educational facilities and the vocational training being conducted by the Forest Department to conduct training to educate capable staff necessary for the Forest Department and to offer teaching materials and equipment. Of the courses which have been conducted from 1984, the basic forest officer course and the forestry induction course are scheduled to be transferred to CFDTC, but the technology course will remain in the Burma Forest School because it is basically academic. The offered equipment is educational and does not overlap that which is being planned to be installed in CFDTC.

2-4 Background and Contents of Request

Burma is in the Fifth Four-Year Plan period (fiscal 1986/87 to 1990/91) based on the long-term 20 year plan and is required in the last stage to provide a successful conclusion to the long-term plan.

The country has made every effort to increase exports since 1981, but has not been able to raise total exports above the fiscal 1981/82 level because of the drop in international prices for primary industry products.

The country has greatly expanded exports centering around teak in place of agricultural products. Thus, the proportion held by exports of forestry products in total exports in fiscal 1981/82 was 22.48% but in fiscal 1984/85, the proportion was up to 33.42%, indicating the increased importance of forestry in the Burmese economy.
The Forest Department implemented 44,890ha and 122,482ha of afforestation in the Third and Fourth Four-Year Plan periods, respectively. As a result, in fiscal 1986/87 the required number of forestry technical staff members could not be trained for the execution of forest tending such as weeding 200,000ha or more of plantation area. Consequently, in the Fifth Four-Year Plan, the afforestation target has been revised to 32,000ha/year, a level 85% of the actual afforestation results in fiscal 1985/86.

At present, the number of forestry technical staff is 5,528 (total number of the Forest Department staff:10,628). Since the total forest area is 38,821,000ha, the forest area per one forestry technical staff is 38,821,000ha/5,528=7,022.6ha.
Furthermore, since the aforementioned plantations need to be maintained and 32,000ha of new afforestation is needed, the responsibility per forester is on the increase.
The Forest Department reorganized itself in April 1987, to cope with expansion in responsibilities, and raise its total number of staff to 14,751, increasing its full-time staff by 4,123.

Thus, the following have become the necessary and pressing subjects: (1) The effective and efficient training of current in-service forest workers to improve their skills so that entire afforested land can be optimally managed; (2) The training of new forest workers who have been hired as a

result of the increase in the number of full-time staff; and (3) The education of local inhabitants in forestry.

In this background, the government of Burma has introduced training on forest-related duties and advanced techniques, has planned the establishment of the Central Forestry Development Training Center aimed at improving human skills, and has requested Japan to provide grant aid cooperation and project-type technical cooperation for the implementation of the plan.
Shown below are the details of the grant aid cooperation request which have been modified as a result of the consultation between the preliminary study team and the Burma side.

1. Objective
To improve the skills of the Forest Department staff and the living standards of the local inhabitants as well as to perform centralized operation of agriculture and forestry, the Forest Department staff members and leaders of the local communities should be trained.

2. Implementing agency
Forest Department, Ministry of Agriculture and Forests

3. Project site
Hmawbi Township, Rangoon Division

4. Facilities
- Main Building : large lecture hall (250 seats)
  meeting room (100 seats)
  lecture rooms (50 and 30 seats)
  laboratories (4 rooms)
  audio visual education room
  AV material production room
  exhibition hall
  library
- Workshop
- Glasshouse
- Dormitory and dining hall (for 180 people)
- Accommodation for guests
- Accommodation for staff and field workers
- Sport facilities : athletic ground (for soccer and volley ball)

gymnasium

swimming pool

- Nursery
- Others

5. Equipment and machinery

- Wireless communication equipment (between Forest Department and CFDTC)
- Office equipment
- Teaching materials production equipment
- Audio visual education equipment
- Field training equipment
- Furniture, kitchen units