

NO 1

BASIC DESIGN STUDY
ON
AFFORESTATION PROJECT
IN THE DRY ZONE
IN
THE UNION OF MYANMAR

BASIC DESIGN STUDY ON AFFORESTATION PROJECT IN THE DRY ZONE IN THE UNION OF MYANMAR

MARCH 2002

JAPAN INTERNATIONAL COOP
KOKUSAI KOGYO

JICA LIBRARY



J1168442(0)

MARCH 2002

JAPAN INTERNATIONAL COOPERATION AGENCY
KOKUSAI KOGYO CO.,LTD.

104
883
GR1
BRARY

GR1
CR(5)
02-070

**BASIC DESIGN STUDY
ON
AFFORESTATION PROJECT
IN THE DRY ZONE
IN
THE UNION OF MYANMAR**

MARCH 2002

**JAPAN INTERNATIONAL COOPERATION AGENCY
KOKUSAI KOGYO CO.,LTD.**



1168442{0}

Preface

In response to a request from the Government of the Union of Myanmar, the Government of Japan decided to conduct a basic design study on Afforestation Project in the Dry Zone and entrusted the study to Japan International Cooperation Agency (JICA).

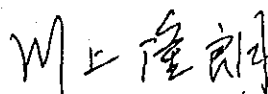
JICA sent to Myanmar a study team from May 22nd 2001 to July 19, 2001 and from October 1st, 2001 to November 8 2001.

The team held discussions with the officials concerned of the Government of Myanmar, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Myanmar in order to discuss a draft basic design, and as this result, the present report was finalized.

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

I wish to express my sincere appreciation to the officials concerned of the Government of the Union of Myanmar for their close cooperation extended to the teams.

March, 2002



Takao Kawakami

President

Japan International Cooperation Agency

March, 2002

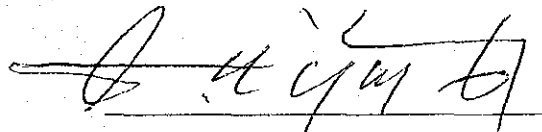
Letter of Transmittal

We are pleased to submit to you the basic design study report on Afforestation project in the Dry Zone in the Union of Myanmar.

This study was conducted by Kokusai Kogyo Co., Ltd., under a contract to JICA, during the period from May, 2001 to March, 2002. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Myanmar and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



NAKAMURA Kinya

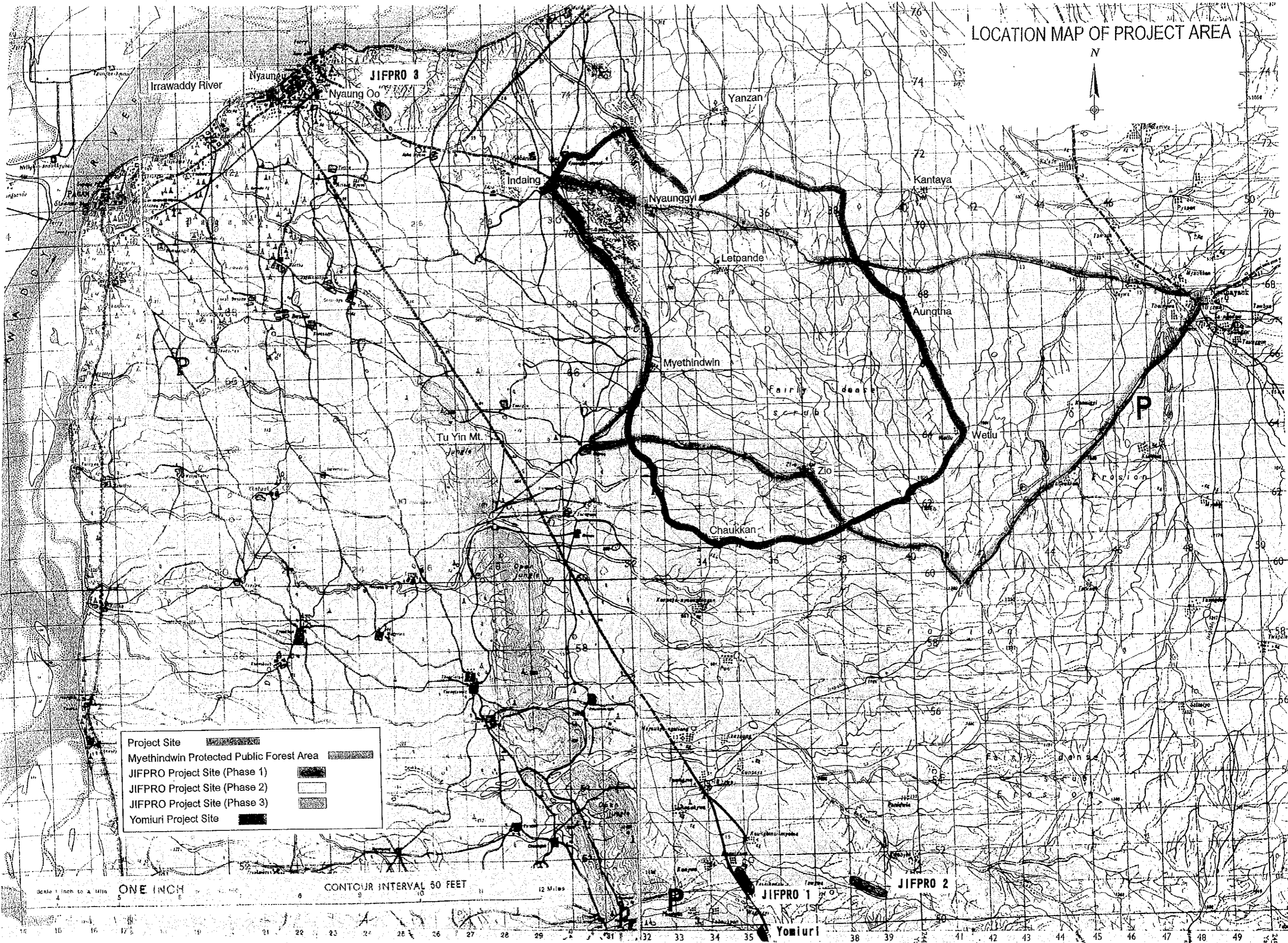
Project Manager,

Basic Design Study Team on

Afforestation Project In the Dry Zone

Kokusai Kogyo Co., Ltd.

LOCATION MAP OF PROJECT AREA



Project Site	
Myethindwin Protected Public Forest Area	
JIFPRO Project Site (Phase 1)	
JIFPRO Project Site (Phase 2)	
JIFPRO Project Site (Phase 3)	
Yomiuri Project Site	

Scale 1 inch to 4 miles ONE INCH

CONTOUR INTERVAL 50 FEET

12 Miles

15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

List of figures & Tables

List of Tables

		Page
Table 1	Planting Area	2
Table 2	Facilities	2
Table 3	List of Equipment to be procured.....	3
Table 1.1	List of Requested Equipment.....	1-3
Table 2.1	Annual Afforesting Plan	2-1
Table 2.2	Facilities Plan.....	2-2
Table 2.3	Equipment to be procured.....	2-2
Table 2.4	Candidate Planting Area	2-10
Table 2.5	Classification of Afforestation Sites.....	2-11
Table 2.6	Ideas of Community Forest by Villages	2-13
Table 2.7	Afforestation Area	2-14
Table 2.8	Vegetation Density of Protection and Fuel wood forests	2-15
Table 2.9	Annual Implementation Program for Multipurpose Forest	2-17
Table 2.10	Annual Implementation Program for Community Forest	2-18
Table 2.11	Working Schedule for the Afforestation	2-22
Table 2.12	Analysis results of the Chemical Fertilizer.....	2-26
Table 2.13	Recommended Plants for Afforestation in the Dry-Zone	2-29
Table 2.14	Characteristic of Candidate Tree for Afforestation in the Dry Zone.....	2-30
Table 2.15	Selection of Species	2-31
Table 2.16	Planting Species for Protection and Fuel wood Forest.....	2-32
Table 2.17	Planting Species for Community Forest.....	2-34
Table 2.18	Work Schedule of Producing Seedlings	2-35
Table 2.19	Nutrients of Animal Excrement	2-37
Table 2.20	Mixed fertilizer of N, P and K	2-37
Table 2.21	Experiment Tree Species.....	2-41
Table 2.22	Test Matrix for Experiment Plots	2-41
Table 2.23	Facilities Plan	2-44
Table 2.24	Specifications of the existing pumps	2-45
Table 2.25	Plan of excavation depth at each site	2-47
Table 2.26	Temporary Road Rehabilitation plan.....	2-48
Table 2.27	Equipment to be excepted from the plan.....	2-50
Table 2.28	List of Equipment and Procurement Plan.....	2-51

Table.2.29	Number of trees to be planted for the silvo-pastoral.....	2-52
Table.2.30	Nursery area for the silvo-pastoral.....	2-53
Table 2.31	Transportation plan.....	2-54
Table 2.32	Monthly Transportation volume.....	2-54
Table 2.33	Means of transportation.....	2-55
Table 2.34	Necessary Unit of Truck.....	2-55
Table 2.35	Transferable volume.....	2-56
Table 2.36	Necessary Unit.....	2-56
Table 2.37	Soil volume.....	2-57
Table 2.38	Excavation by Manpower and Machine.....	2-57
Table 2.39	Monthly Watering Plan.....	2-58
Table 2.40	Specification of Main Equipment.....	2-61
Table 2.41	Scope of Work.....	2-67
Table 2.42	Plan of Activities.....	2-75
Table 2.43	Project Design Matrix (Soft Component).....	2-77
Table 2.44	Phased Implementation Programme.....	2-79
Table 2.45	Members to be Assigned.....	2-83
Table 2.46	Annual Necessary Fee (Budget) for Operation and Maintenance for Afforestation.....	2-85
Table 2.47	Repayment (including O/M) of Water Supply Facility.....	2-86
Table 2.48	Repayment Computation (including repairing fee).....	2-86
Table 2.49	Repayment of Vehicle (including repairs fee).....	2-87
Table 2.50	Future use of Heavy Machines (5 yr plan).....	2-89
Table 3.1	Project Design Matrix.....	3-3
Table 3.2	Annual Growing Rate.....	3-6
Table 3.3	Annual Growing Rate after 5-7 years.....	3-6
Table 3.4	Volume after 5-7 years.....	3-7
Table 3.5	Residents of the Target villages.....	3-7
Table 3.6	Population of the Dry Zone.....	3-8
Table 3.7	Planting Activity Plan (Five-Year Plan).....	3-8
Table 3.8	Output and Goal (Direct Effect).....	3-9

List of Figures

		Page
Figure 2.1	Afforestation Planning Map.....	2-19
Figure 2.2	Work Flow for the First Year.....	2-20

Figure 2.3	Work Flow for Successive Years	2-21
Figure 2.4	Soil Dressing Work.....	2-24
Figure 2.5	Temporary Road Rehabilitation Planning Map.....	2-49
Figure 2.6	Work Shop	2-62
Figure 2.7	Administration Office	2-63
Figure 3.1	Flow for Evaluation.....	3-2
Figure 3.2	USLE Map.....	3-4
Figure 3.3	Objectives analysis.....	3-12

Abbreviations

Japan International Cooperation Agency:	JICA
Dry Zone Greening Department:	DZGD
Forest Department:	FD
Forest Research Institute:	FRI
Department of Development Affairs	DDA
Water Resources Utilization Dept.	WRUD
Bridge Asia Japan:	BAJ
The Organization for Industrial, Spiritual and Cultural Advancement-International	OISCA
Rapid Rural Appraisal:	RRA
Participatory Rural Appraisal:	PRA
Operation and Maintenance:	O/M
Project Design Matrix:	PDM
Exchange of Notes:	E/N
Authorization to Pay:	A/P
Banking Arrangement:	B/A
Parents Teachers Association	PTA
Union Solidarity Development Association	USDA
Village Peace and Development Committee	VPDC
State Peace and Development Committee	SPDC
Universal Soil Loss Equation	USLE

Summary

Forests occupy about 50% of the whole of Myanmar. Wood exportation is a very important industry and approximately 80% of the nation's energy consumption is dependent on fuel wood. The excessive felling of trees for household use (fuel wood, etc.) and export has resulted in serious problems such as a reduction of forest resources, soil runoff and land devastation.

The Dry Zone situated to the east of the Arakan Range is inhabited by one third of the national population (approx. 45,000,000) and an increase in population accompanied by an increase in the demand for fuel wood, has led to a drastic reduction of forest resources. Furthermore, soil degradation, which has resulted from the reduction in forest, has brought about a decrease in the productivity of agricultural lands. The Dry Zone, where the average annual rainfall over the ten-year period from 1987 to 1998 was only 568mm, is very hard region to recover forest by natural regeneration. Recognizing the importance of tree planting in the Dry Zone and the need for special afforestation skills, the Government of Myanmar, planted about 21,000 ha in the Dry Zone within a period of 3 years from 1994 and established the Dry Zone Greening Department (hereinafter called DZGD) in the Ministry of Forestry in 1997. The Integrated Dry Zone Greening 5 Year Plan including the planting of 42,000ha by 2005 was established and the 5 Year Plan targets to plant about 97,000 ha by 2009. Afforestation in the past was carried out in areas where the undertaking is technically easy to implement. Afforestation in the form of small experimental forests was also carried out in areas that highly required such undertaking due to deteriorating environmental conditions.

Therefore, it is urgently necessary to establish an afforestation model in order to extend planting activities in the Dry Zone.

Under such circumstances, the Government of Myanmar submitted a request to Japan for the Grant Aid for the establishing an afforestation model of 3000ha in Myethindwin Protected Public Forest in Nyaung Oo Township in Mandalay Division, and the necessary facilities construction and equipment.

In response to this request, the Government of Japan conducted a preliminary study in July 2000 to confirm the appropriateness of the request and the relevant issues concerned. Japan International Cooperation Agency (hereinafter called JICA) sent a study team to conduct the Basic Design Study for the project, once from 14 May to 20 July 2001 (68 days) and a second time from 1 October to 8 November 2001 (39 days). After the formulation of a plan for planting, the construction of facilities, the procurement of equipment and management based on field surveys, a study team was sent to explain the outline of the Basic Design Study report from 26 February to 9 March, 2002 (12 days). The final Basic Design Study report was compiled based on the results of discussions made between both sides.

The first field survey was conducted for topographic mapping, land use mapping, soil mapping and an RRA survey. The second field survey was conducted for the formulation of the resident participatory management system. As a result, 2,000ha (1,500ha by Japan side and 500ha by DZGD) has been selected for afforestation from the requested 3000ha by excluding restricted areas (road, reservoir, farmland, etc.). The planting area is shown in Table 1. The plan for equipment procurement and facilities construction is formulated as per Table 2 and 3 in consideration of DZGD capability required for sustainable management for afforestation of 2,000ha and annual planting of 200ha (refer to Table 2).

In order to maintain the afforested site in future, it is essential to introduce resident cooperation in management. As DZGD aims at establishing an Action Plan for the resident participatory management as a model, the technical support by the Consultant under the Soft component for formulation of Action Plan on resident participatory management will be executed during implementation of planting.

Table 1 Planting Area

Village Name	Village Area (ha)	Multipurpose Forest				Sub-Total	CFI	Total (ha)
		Protect-F	Silvo Pastoral	Fuel-Wood F	Comm. F			
Myethindwin	700.49	0	0	0	0	15	15	
Zio	1128.52	143	0	237	380	0	380	
Letpande	1979.81	212	334	319	865	13	879	
Aungtha	462.01	0	0	135	139	0	139	
Wetlu	336.28	0	0	0	0	12	12	
Nyaunggyi	165.59	0	0	28	28	25	53	
Indaing	855.40	302	47	0	349	0	349	
Yanzan	613.73	92	100	0	222	0	222	
Total	6241.83	749	481	723	1,953	65	2,018	
Planting by Japan side		749	0	723	1,472	65	1,537	

Table 2 Facilities

Facilities	Plan
Office	Administration and Extension Office with area of 64m ² will be constructed in Myethindwin.
Workshop	Workshop will be constructed in Myethindwin
Tube-wells and Water basin	Tube-wells of 200m-250m in depth will be constructed in Myethindwin and Letpande. Elevated 20 tons water tank will be constructed at both sites.

Table 3 List of Equipment to be procured

No.	Equipment	Mandalay Plan	Nyaung Oo Plan	Myethindwin Plan	Total Plan
A. Planting					
A-1	Pocket Compass		2		2
A-2	Pole		5		5
A-3	Measure Tape		2		2
A-4	Potable GPS		1		1
A-5	Shovel			15	15
A-6	Vinyl pot (small)			250,000	250,000
A-7	Vinyl pot (large)			50,000	50,000
A-8	Seedling container			120	120
A-9	Knock-down nursery (400m ²)			1	1
A-10	Overlay net (400m ²)			1	1
A-11	Track 4 ton			3	3
A-12	2 Wheel Tractor			4	4
A-13	4 Wheel Tractor			2	2
A-14	Pick up			1	1
A-15	Air Compressor			1	1
A-16	Scoop			50	50
A-17	Hoe			30	30
A-18	Back Hoe		1		1
A-19	Bulldozer			1	1
A-20	Water tanker			1	1
A-21	Portable water Tank			7	7
A-22	Knockdown water tank			3	3
A-23	Water pump		0	5	5
A-24	Watering Pot			40	40
A-25	Water Bucket			20	20
B. Administration and Extension					
B-1	Meteorological observation unit			1	1
B-2	Personal Computer	1	1	1	3
B-3	Printer	1	1	1	3
B-4	Television		1		1
B-5	Video		1		1
B-6	Video Camera		1		1
B-7	Portable Wireless Communication unit		2	2	4
B-8	Facsimile		1		1
B-9	Motor cycle		0	2	2
B-10	4x4 Wagon Type		1		1
B-11	Back shooting			30	30
B-12	Firebreak tool			15	15
B-13	Locker			1	1

The Soft component ensures that staff members of Nyaung Oo District Office responsible for the project will acquire necessary knowledge (management, extension services, resident participatory, etc.), and the plan includes implementation of 65ha of community forest , aiming at resident participatory management.

The implementation period is expected to be about 63 months from the Detail Design Study to the completion of planting.

The expected benefits of the project for the 285,000 residents are as follows;

- An increase in protected forest (about 750ha)
- An increase in fuel wood forest (about 720ha)
- The establishment of community forest (about 65ha)
- The establishment of silvo pastoral (about 500ha)
- A decrease in soil erosion in the project site
- The acquisition of knowledge on resident participatory agro forestry by DZGD and resident
- An increase in fuel wood supply for residents (expecting volume of 30m³/ha)

This project as a model will contribute to the promotion of the Integrated Dry Zone Greening 5 Year Plan that expects to plant 11,000ha in Mandalay Division and extend significant results that will benefit the 6,000,000 residents in the surrounding area. As mentioned above, this project is appropriate for the Japanese Grant Aid Program, as it will have significant results. In order to maintain sustainability of the project, it is essential that DZGD establish close cooperative relations with FD on handing over authority of the afforestation sites and raise residents' awareness on the importance of planting in the Dry Zone.

Contents

Preface

Letter of Transmittal

Location Map/Perspective

List of Figures & Tables

Abbreviations

Summary

Chapter 1 Background of the Project1-1

- 1-1 Background and Particulars..... 1-1
- 1-2 Outline of Requested Project..... 1-2

Chapter 2 Contents of the Project2-1

- 2-1 Basic Concept of the Project 2-1
 - 2-1-1 Afforestation Plan..... 2-1
 - 2-1-2 Construction Facilities..... 2-1
 - 2-1-3 Equipment to be procured 2-2
 - 2-1-4 Soft Component..... 2-2
- 2-2 Basic Design of the Requested Japanese Assistance..... 2-3
 - 2-2-1 Design Policy for the Afforestation Sites 2-3
 - 2-2-1-1 Basic Design Policy..... 2-3
 - 2-2-1-2 Policies for Natural Conditions 2-5
 - 2-2-1-3 Policies for Social Conditions 2-5
 - 2-2-1-4 Policies for the Cooperation by Local Companies and Community 2-6
 - 2-2-1-5 Policies for Implementation Phases and the Construction Period 2-7
 - 2-2-1-6 Basic Policies for the Operation and Maintenance (O/M) 2-7
 - 2-2-1-7 Policies for Responsibility and Obligations of the Government of Myanmar 2-8
 - 2-2-2 Basic Plan (Afforestation, Facilities and Equipment) 2-9
 - 2-2-2-1 Afforestation Plan..... 2-9
 - 2-2-2-2 Planning of Species Selection and Nursery Practice 2-28
 - 2-2-2-3 Facility Design 2-43
 - 2-2-2-4 Temporary Works 2-48
 - 2-2-2-5 Equipment to be procured 2-49

2-2-3	Basic Design Drawing	2-61
2-2-4	Implementation Plan	2-64
2-2-4-1	Implementation Policy	2-64
2-2-4-2	Implementation Conditions	2-66
2-2-4-3	Implementation and Procurement Planning	2-66
2-2-4-4	Detail Design Study, Supervision and Soft Component	2-67
2-2-4-5	Quality Control Plan	2-71
2-2-4-6	Soft Component	2-72
2-2-4-7	Implementation Schedule	2-78
2-3	Responsibility and Obligations of the Government of Myanmar	2-80
2-3-1	Responsibility and Obligations of the Government of Myanmar	2-80
2-3-2	Cost to be covered by the Myanmar side	2-81
2-3-3	Estimation Conditions	2-81
2-4	Project Operation Plan	2-82
2-4-1	Steering Committee for Operation and Maintenance (O/M)	2-82
2-4-2	Member to be assigned	2-83
2-4-3	O/M Cost	2-84
2-4-3-1	O/M Cost	2-84
2-4-3-2	Extension use of Heavy Machine and vehicles in near Future	2-89

Chapter 3 Project Evaluation and Recommendations 3-1

3-1	Effect of the Project	3-1
3-1-1	Target of the Project	3-1
3-1-2	Expected Output	3-5
3-1-2-1	Protection against Soil Erosion	3-5
3-1-2-2	Guarantee of Livelihood Resources (Basic Needs)	3-5
3-1-2-3	Expected Benefit from the Procured Equipment	3-8
3-1-2-4	Establishment of O&M System for the Afforestation Sites (Support by Soft Component)	3-9
3-2	Subjects and Recommendation	3-13
3-2-1	Budget Allocation and Establishment of Funding	3-13
3-2-2	Management Committee	3-13
3-3	Evaluation	3-14
3-4	Conclusions	3-15

[Appendices]

1. Member List of the Study Team
2. Study Schedule
3. List of Parties Concerned in the recipient Country
4. Minutes of Discussions
5. Cost Estimation Borne by the Recipient Country
6. Other Relevant Data

Chapter 1 Background of the Project

1-1 Background and Particulars

Forests occupy about 50% of the whole of Myanmar. Wood exportation is a very important industry and approximately 80% of the nation's energy consumption is dependent on fuel wood. The excessive felling of trees for household use (fuel wood, etc.) and export has resulted in serious problems such as decrease in forest resources and soil runoff and land devastation. The resident population in the Dry Zone amounts to one third of the national population (about 45million). The Dry Zone, where the population increase, shortage in alternative fuel resources (non-wood) and inefficiency of fuel consumption have led to a drastic decrease of forest, is the focus of countermeasures against deforestation.

The decrease in forest resources is related to the deterioration in soil quality and decrease in the productivity of agricultural lands. Therefore, the adoption of a comprehensive countermeasure that would not only promote afforestation but also appropriate land use, that takes agriculture and livestock raised into consideration, is of enormous significance.

Afforestation including those for commercial use in Myanmar has been carried out about 640,000 ha. In particular, within a period of 3 years from 1994, the government afforested about 21,000 ha in the Dry Zone. In 1997, Dry Zone Greening Department (hereinafter called DZGD) was established in the Ministry of Forestry, and the plan to afforest about 97,000 ha by 2009 is prepared.

Afforestation in the past was carried out in areas where the undertaking is technically easy to implement. Afforestation in the form of small experimental forests was also carried out in areas that highly required such undertaking due to deteriorating environmental conditions. Using experiences gained from these undertakings, an afforestation project that would serve as a model should be implemented. With this in mind, the Government of Myanmar prepared a model afforestation plan and requested funding for this afforestation project. In response to this request, the Government of Japan executed a preliminary study in July 2000 to confirm the appropriateness of the request and the relevant issues concerned.

Japan International Cooperation Agency (herein after called JICA) dispatched study team to Myanmar twice from May 2001 to July and from October to November 2001 to conduct the basic design study for the requested project.

1-2 Outline of Requested Project

The outline of the requested project was as follows:

(1) Overall Goal

Promotion of Greening in the Dry Zone

(2) Project Purpose

Tree Plantation to build up a model of afforestation in the Dry Zone

(3) Outputs

Afforestation for 3,000ha in the Myethindwin protected public forest area

(4) Input

(Requests)

- ◆ Afforestation of 3000ha of land
- ◆ Nursery Facilities Construction (Administration office, Pump, Generator, Sprinkler, etc.)
- ◆ Afforestation Facilities (Administration, Workshop, Pump, Spare-parts)
- ◆ Audiovisual equipment, Survey equipment, Water supply equipment, Fire fighting equipment, Administration equipment and transportation equipment.

(By Myanmar side)

- ◆ Acquisition of land lots for Afforestation, nursery, water supply, administration and others.
- ◆ Operation and Maintenance for Afforestation sites
- ◆ Tax exemption for Study member and equipment
- ◆ Approval for bringing materials out of Myanmar

(5) Project site

6700 ha in Myethindwin protected public forest, Nyaung Oo District, Mandalay Division

(6) Beneficiary

270,000 residents

(7) Organization in charge of the Project

DZGD

(8) Japan's former related aid projects:

- ◆ Project for the Establishment of the Central Forestry Development Training Center (Grant Aid, 1990, 2700 million yen)
- ◆ The Central Forestry Development Training Center Project (Project-type Technical Cooperation (hereinafter called "Technical Cooperation") 1990-97, 1997-2001)
- ◆ Community Forestry Training and Extension Project (Technical Cooperation, 2001-)

Table 1.1 List of Requested Equipment

No.	Item	Unit
A	For Nursery Works	
A-1	Water Pump (submergible)	20
A-2	Generator	20
A-3	Compressor	10
A-4	Sprinkler	20
B	For Plantation Works	
B-1	Water Bowser	3
B-2	Truck	2
B-3	Fuel Bowser	2
B-4	Backpack shooter	5
B-5	Hand tools for fir fighting	4
B-6	Farm Tractor with trailer	10
B-7	Crawler tractor	2
B-8	Pick up	4
B-9	Wagon type 4X4	5
B-10	(Repair tool)	
C	For Camp Construction	
C-1	Generator	10
C-2	Water pump	10
C-3	Spair parts	1 lot
D	For Extension Works	
D-1	Audio unit	
D-2	Survey Instrument Pocket compass	
D-3	Water supply equipment	

Source: DZGD