

MINISTRY OF AGRICULTURE AND FORESTRY  
DEPARTMENT OF FORESTRY  
LAO PEOPLE'S DEMOCRATIC REPUBLIC

**BASIC DESIGN STUDY REPORT  
ON  
THE PROJECT FOR CONSTRUCTION  
OF AFFORESTATION CENTER  
IN  
LAO PEOPLE'S DEMOCRATIC REPUBLIC**

**MARCH, 1998**

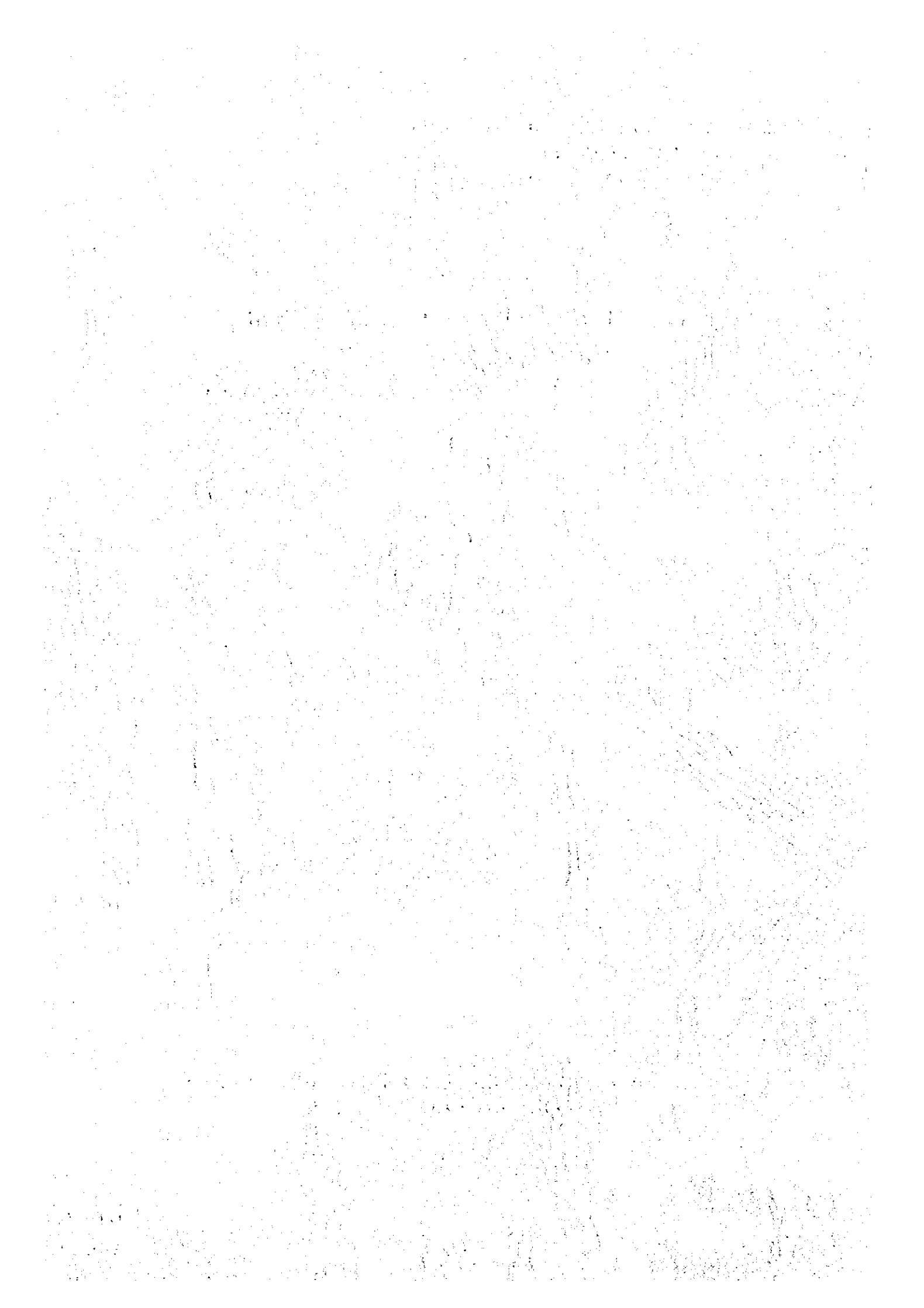
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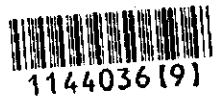


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## PREFACE

In response to a request from the Government of Lao People's Democratic Republic, the Government of Japan decided to conduct a basic design study on the Project for Construction of Afforestation Center and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Lao P.D.R. a study team from October 1 to October 25, 1997.

The team held discussions with the officials concerned of the Government of Lao P.D.R., 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 Lao P.D.R. 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 Lao People's Democratic Republic for their close cooperation extended to the teams.

March, 1998



Kimio Fujita

President

Japan International Cooperation Agency

March, 1998

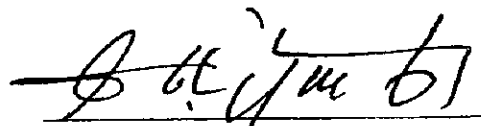
## Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Construction of Afforestation Center in Lao People's Democratic Republic.

This study was conducted by KOKUSAI KOGYO Co., Ltd., under a contract to JICA, during the period from September 25, 1997 to March 31, 1998. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Lao P.D.R.. 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.

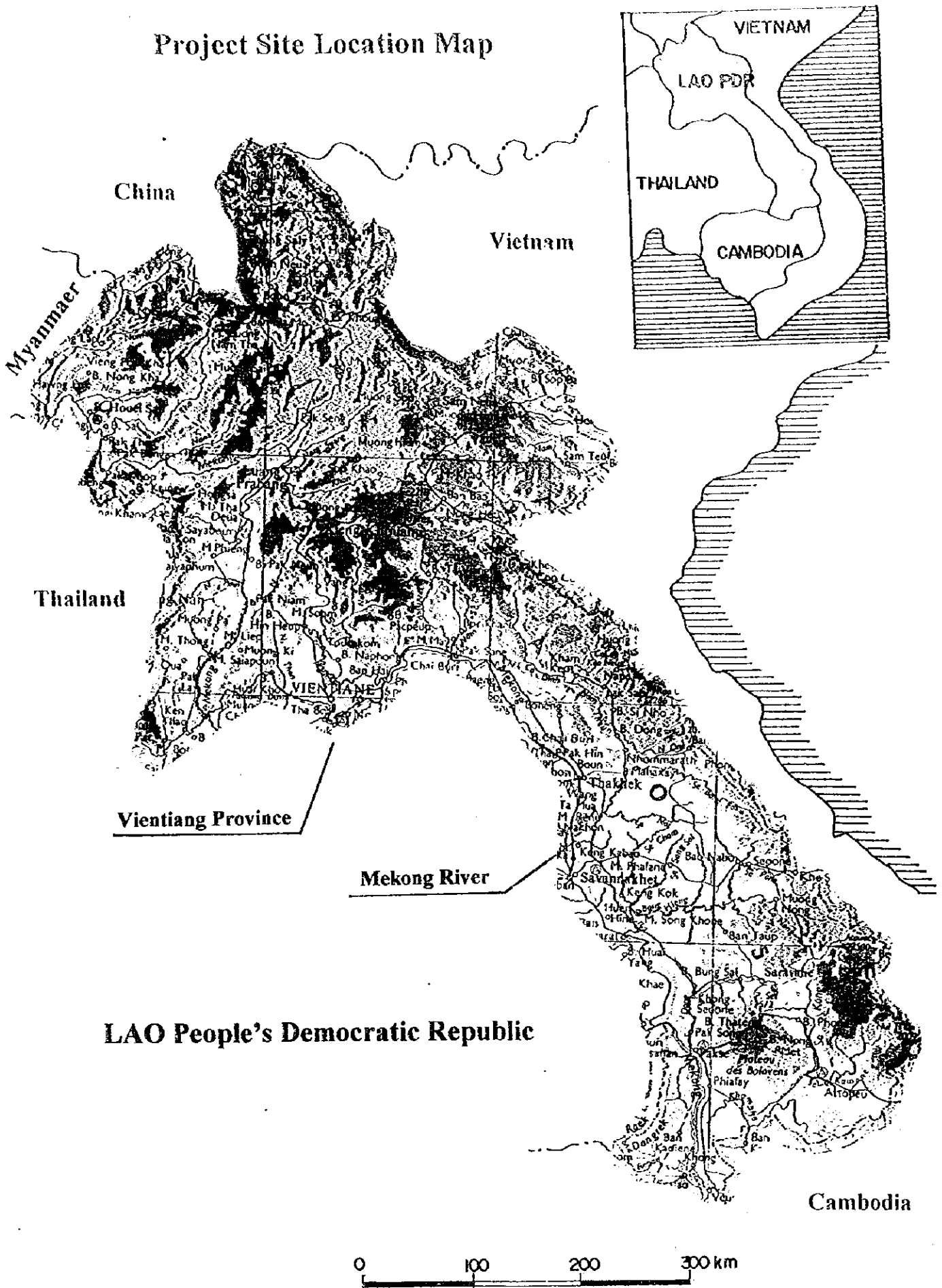
Very truly yours,



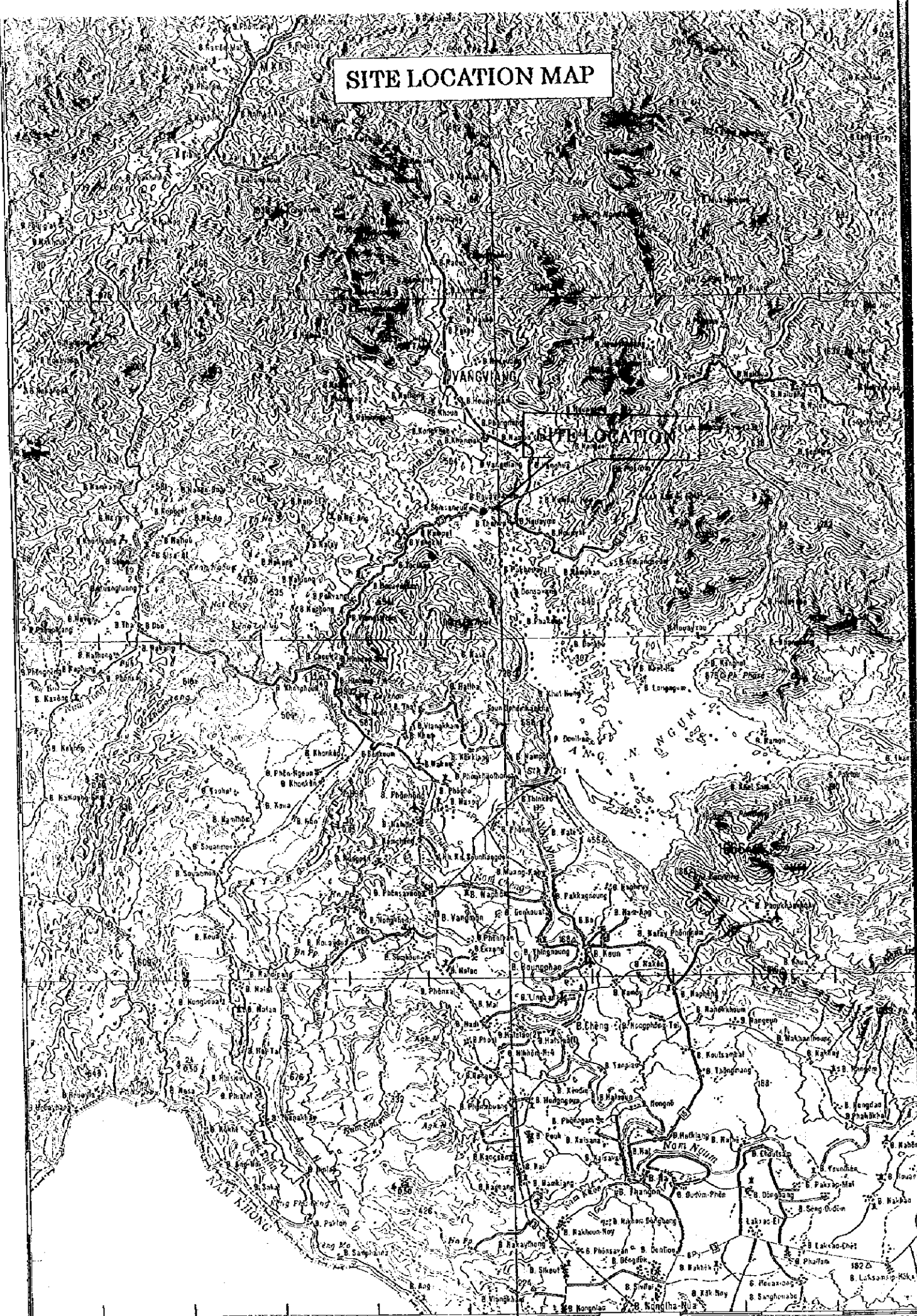
Kinya NAKAMURA

Project manager,  
Basic design study team on  
the Project for Construction of  
Afforestation Center  
KOKUSAI KOGYO Co., Ltd.

# Project Site Location Map



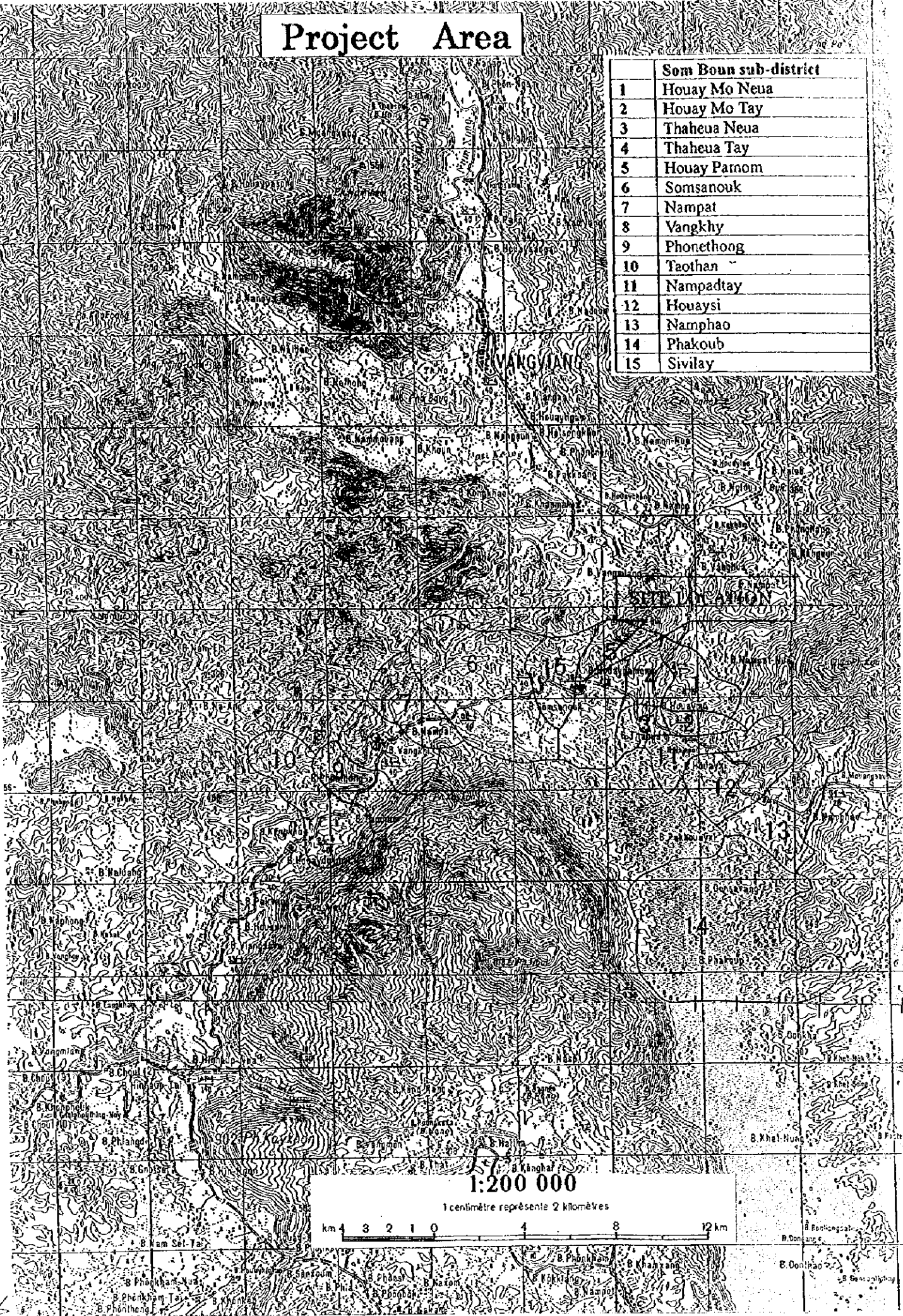
# SITE LOCATION MAP





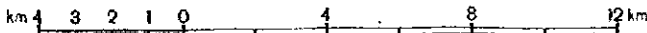
# Project Area

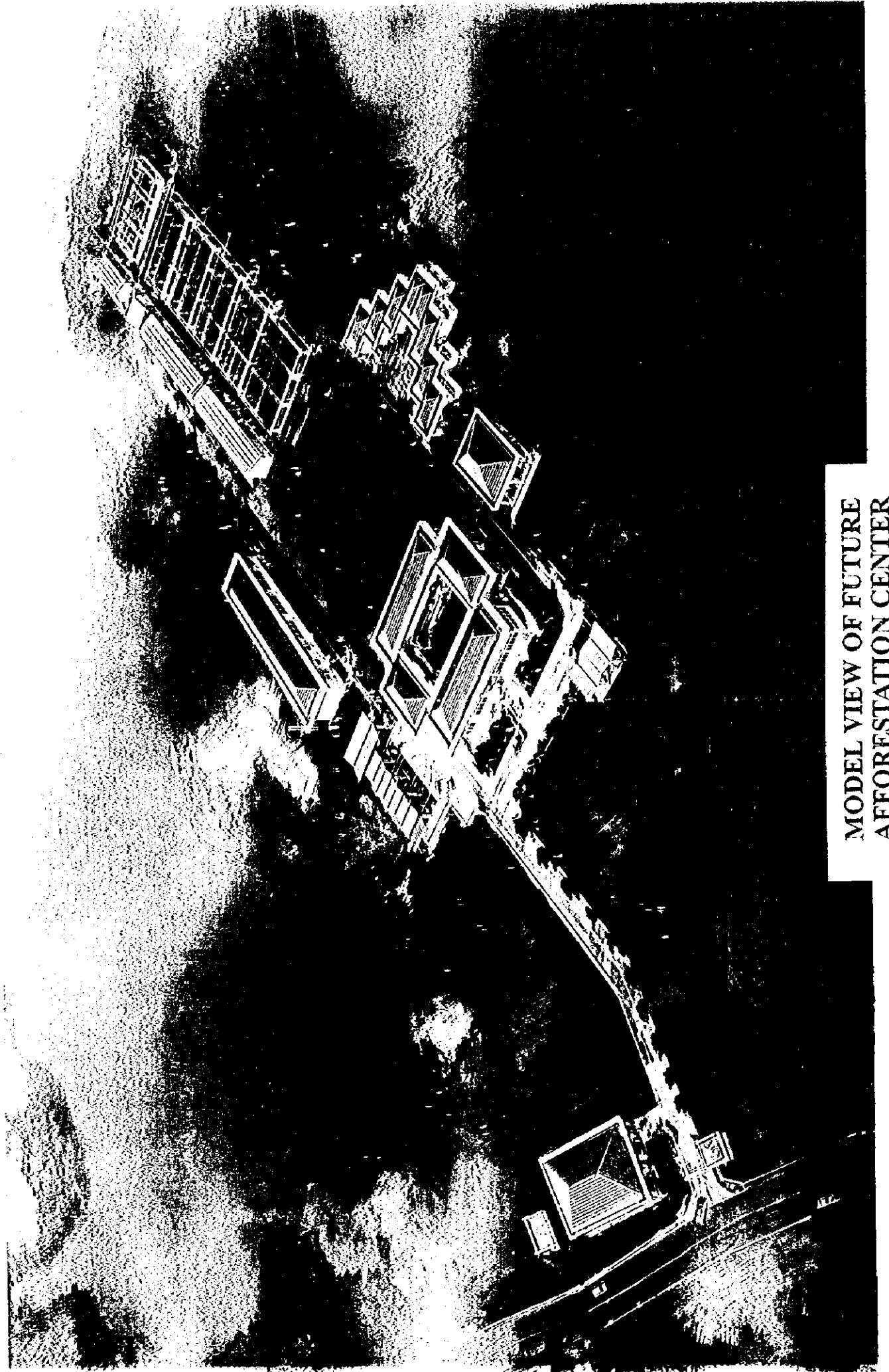
Som Boun sub-district	
1	Houay Mo Neua
2	Houay Mo Tay
3	Thaheua Neua
4	Thaheua Tay
5	Houay Pamom
6	Somsanouk
7	Nampat
8	Vangkhy
9	Phonethong
10	Taothan
11	Nampadtay
12	Houaysi
13	Namphao
14	Phakoub
15	Sivilay



1:200 000

1 centimètre représente 2 kilomètres





MODEL VIEW OF FUTURE  
AFFORESTATION CENTER



**Overall View of the Afforestation Center Construction Site**

The photo shows the site along Highway 13. The upper part of the photo shows the planned demonstration forest area. The city of Vientiane is located on the side of the highway before the construction site.



**Afforestation Center Construction Site**

A view of Highway 13 taken from the afforestation center construction site.



**Afforestation Center  
Construction Site**

The left side of the picture shows Highway 13.



**Unpaved Road in the  
Project Area**

This road is a (b) tributary of Highway 13 and is located near Imbao Village.



**Paved Road in the Project  
Area**

This is a part of Highway 13 near Hoai Bamon Village.

**Prevailing Conditions in the Project Area**



The swamp in Giu Village



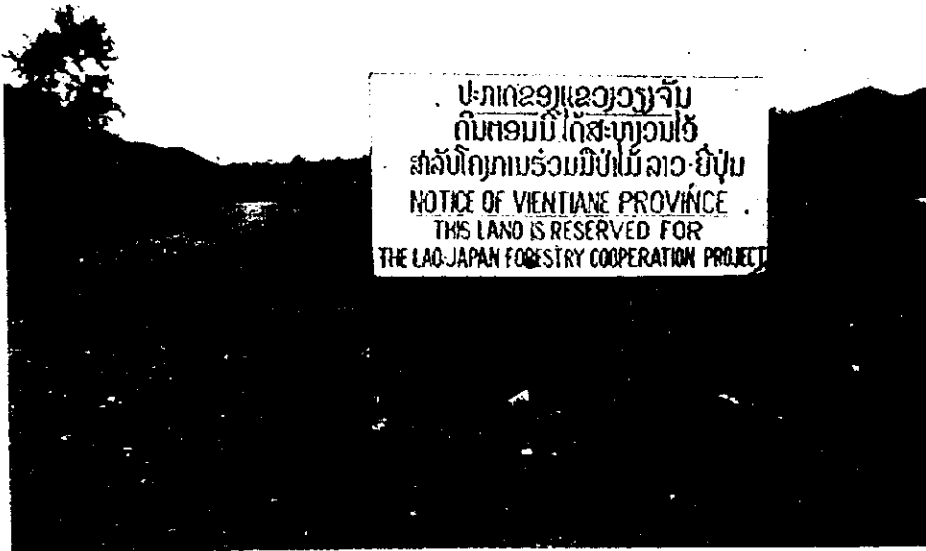
Areas subject to shifting cultivation in Ponton Village



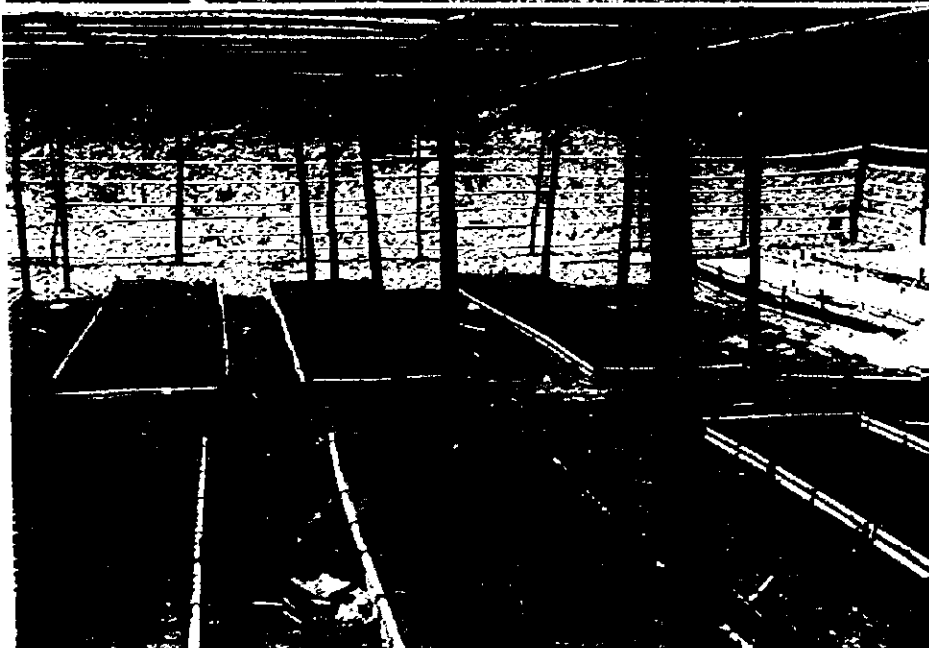
Field cultivated in the mountain area of Taotan Village

## Current Condition of the Afforestation Center Construction Site

Afforestation center  
construction site

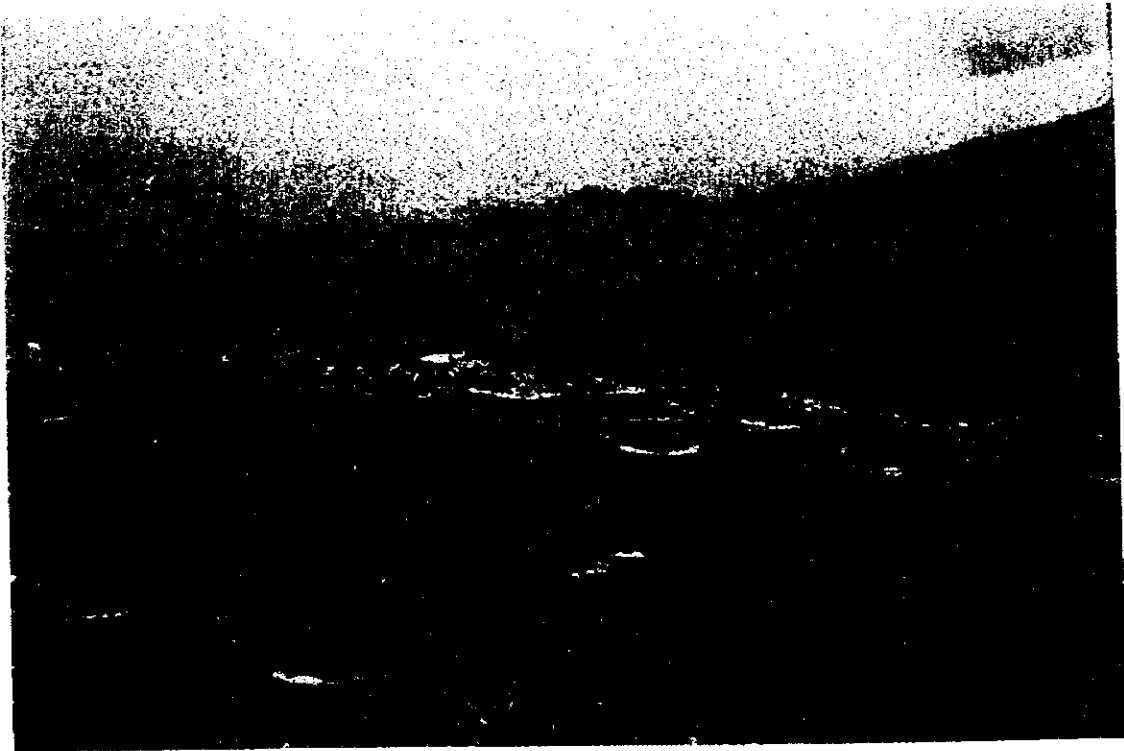


Before the afforestation  
center construction site  
is the nursery  
construction site



A section of the center  
construction site is  
currently used as an  
open nursery.

**Overall View of the Demonstration Forest Site**



The picture shows the Nam Son River in the center



The forest road that leads down to Highway 13 from the demonstration forest site

## ABBREVIATIONS

**FORCAP:** The Forest Conservation and Afforestation Project

**GTZ:** German Agency for Technical Cooperation

**JICA:** Japan International Cooperation Agency

**JOCV:** Japan Overseas Cooperation Volunteers

**JVC:** Japan Volunteer Center

**Lao PDR:** Lao People's Democratic Republic

**NGO:** Non Governmental Organization

**Pro-Tech:** Project-Type Technical Assistance

**SIDA:** Sweden International Development Agency

**The Center:** Afforestation Center

**BOD:** Biochemical Oxygen Demand

**HF:** High Frequency

**M/E:** Monitoring and evaluation

**PAL:** Phase Alternation by Line

**VHF:** Very High Frequency

**PCM:** Project Cycle Management

**dpi:** dots per inch

**GB:** Gigabyte

**MB:** Megabyte

**ppm:** parts per million  $\approx$  mg/l



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## **CHAPTER 1 BACKGROUND OF THE PROJECT**

## CHAPTER 1 BACKGROUND OF THE PROJECT

Forests used to cover 70% (170,000 km<sup>2</sup>) of the whole territory of Lao PDR in 1940. They were reduced to 64% (150,000 km<sup>2</sup>) and 47% (110,000 km<sup>2</sup>) of the national territory in 1963 and 1981 respectively, due to inappropriate and illegal felling, forest fires and slash-and-burn cultivation. The latter is the most influential factor in forest depletion, as 3,100 km<sup>2</sup> of forests are burned annually for cultivation.

The Second (1986-1990) and Third (1991-1995) National Socio-Economic Development Plans aimed at a 30% acreage reduction in slash-and-burn farming, but could only attain 35% of that objective. The Fourth Development Plan (1996-2000), which targets the implementation of a sustainable land use plan, aims especially at reforesting lands devastated by slash-and-burn cultivation through the adoption of land/forest classification and distribution policies. These measures, which shall increase land productivity by reducing slash-and-burn activities, are being implemented in the Luangphrabang, Vientiane and Savannakhet areas with the cooperation of assistance agencies and NGOs.

The area to be studied is in the watershed area of Nam Ngum hydro-electric dam, where random development of forest resources and unplanned slash-and-burn farming are most offensive, resulting in the severe decrease in and destruction of forest resources and soil destruction, adversely affecting not only the local residents but also the dam lake. In particular, 76% of the slash-and-burn farming in the Vangvieng District is concentrated in the area of Somboun, which used to be 95% forests. Now, 50% of the area is subject to slash-and-burn farming.

Although the Government of Laos plans to promote reforestation programs through resident participation, for the preservation and restoration of forest resources in this area, it is not fully capable of doing so due to shortage in manpower, resources, equipment, financial means and nursery facilities, on top of the central government and provincial personnel's lack of experience, know-how and technical skills.

In consideration of the above mentioned conditions, the Government of Japan formulated the "Forest Conservation and Afforestation Project" based on "project type technical assistance" (hereinafter called "Pro-Tech") in response to the request of the Government of Lao PDR. The preparation phase of "Pro-Tech" started in July 1996 and will end in July 15, 1998. The main phase of "Pro-Tech" will follow the preparation phase. Consequently, the Government of Lao PDR submitted a grant aid request to the Government of Japan for the procurement of equipment and materials and the construction of facilities which will contribute to the promotion of the Forest Conservation and Afforestation Project through resident participation in Somboun area, Vangvieng District.

## **CHAPTER 2 CONTENTS OF THE PROJECT**



## CHAPTER 2 CONTENTS OF THE PROJECT

### 2-1 Objectives of the Project

In the watershed area of Nam Ngum hydro-power dam, forest resources are randomly developed and unplanned slash-and-burn cultivation is extensive, resulting in severe decrease in and destruction of forest resources and soil erosion, which affect not only the local residents but also the dam lake. In particular, 76% of slash-and-burn cultivation in Vangvieng District is concentrated in Somboun, which used to be 95% forests. Currently, 50% of the area is dedicated to slash-and-burn cultivation.

Although the Government of Lao PDR plans to promote reforestation programs through resident participation, for the preservation and restoration of forest resources in the area, it is not fully capable of doing so due to shortage in manpower, resources, equipment, financial means and nursery facilities, on top of the central government and provincial personnel's lack of experience, know-how and technical skills.

The project aims to construct facilities and procure equipment and materials necessary for the improvement of the capabilities of relevant government agencies and the conduct of education programs for the residents in the area, in order to promote forest conservation and afforestation in the Nam Ngum Dam watershed area.

### 2-2 Basic Concept of the Project

#### (1) Outline of the Final Request

The study team thoroughly examined the necessity, appropriateness and scale of the project based on the final request of the Government of Lao PDR, which is as follows:

#### Outline of the Final Request

An Afforestation Center (hereinafter called the Center) which shall consist of an administration and training building, a nursery, etc., shall be constructed at the site of approximately 30,000m<sup>2</sup> prepared by the Government of Lao PDR in the village of Hoai Pamon in Somboun, Vangvieng District.

#### 1) Afforestation Center

##### ① Administration & Training Building

- a. Main office
- b. Administration office including office of the Head of the Center
- c. Meeting room
- d. Simple Testing Room

- c. Filing room
- f. Workshop
- g. Generator room
- h. Male and female toilets

② Simple Lodging Facilities

- a. Building A (for experts and visiting lecturers) 8 rooms
- b. Building B (for the counterparts) 10 rooms

③ Nursery Facilities

- a. Open nursery
- b. Closed nursery
- c. Potting house
- d. Workshop with a room for seed storage
- e. Compost house
- f. Greenhouse

④ Other Necessary Facilities

- a. Canteen  
One building for the canteen to be used by the experts, counterparts, visiting lecturers and trainees.
- b. Garage  
One building for the garage which will house 10 vehicles: a minibus, 2 pick-up trucks, 6 existing project vehicles and 1 reserve.
- c. Water supply facilities  
Water necessary for the administration & training building, lodging facilities, other buildings and the nursery will be supplied through a pipeline network connected to the submersible water pump installed in the Nam Son diversion channel running north of the Center.
- d. Display building  
One building to exhibit the works of the residents who undergo training.
- e. Guardhouse  
One building for the guardhouse for the regular security of the Center.

2) Procurement of Equipment and Materials

The following equipment and materials shall be procured for the Center.

- A. Administration and Training Equipment (refer to Table 2-1)
- B. Simple Testing Equipment (refer to Table 2-2)
- C. Nursery and Afforestation Equipment (refer to Table 2-3)
- D. Workshop Equipment (refer to Table 2-4)



**Table 2-1 List of Administration and Training Equipment**

A. Administration and Training Equipment	Q'ty	Reference
1. Personal computer	3	Required for administration and training
2. Printer	3	Same as above
3. Scanner	1	Same as above
4. Copier	1	Same as above
5. White board	6	To be placed in each room
6. Slide projector	1	Required for training
7. Screen	1	Same as above
8. Overhead projector	1	Same as above
9. Television set	1	Same as above
10. Digital camcorder	1	Same as above
11. Microphone set (with speakers)	1	Required for seminars and training
12. PC projector	1	Required for training
13. Wireless communication system (radio)	1	Required for daily communication
14. Micro-bus	1	Required for transporting trainees
15. Pick-up truck	2	Required for sapling and tree transportation
16. Motorcycle	4	Required for communication relay

**Table 2-2 List of Simple Testing Equipment**

B. Simple Testing Equipment	Q'ty	Reference
1. Laboratory table	1	
2. Laboratory shelves	3	
3. Revolving chair	6	
4. Stainless steel bowl (large)	5	
5. Stainless steel bowl (small)	5	
6. Stainless steel bucket	2	
7. Refrigerator for storing reagents, etc.	1	
8. pH meter	1	
9. Plastic tray	2 sets	50 pcs per set
10. Thermometer	10	for each room and the nursery
11. Measuring cylinder (plastic) 100ml	5	
12. Measuring cylinder (plastic) 500ml	5	
13. Glass rod	20	
14. Beaker	100	
15. Flask	100	
16. Test tube	100	
17. Test tube stand	10	
18. Electric scale	1	
19. Scale	1	

B. Simple Testing Equipment	Q'ty	Reference
20. Germination tester	1	
21. Soil sampler set	1	
22. Soil sample cans and carrying basket	1	
23. Soil sample cylinder	3	
24. Soil sieve	1	
25. Convex	5	
26. Standard soil color chart	1	
27. Soil moisture meter	1	
28. Handy shovel	2	
29. Water purifier	1	
30. Drying oven	1	
31. Soil salinity tester	1	
32. Pipette (with medicine dropper) 250 $\mu\ell$	5	
33. Pipette (with medicine dropper) 500 $\mu\ell$	5	
34. Standard storage container	10	

**Table 2-3 List of Nursery and Afforestation Equipment**

C. Nursery and Afforestation Equipment	Q'ty	Reference
1. Safety belt for tree climbing	1	Hardly used
2. Branch cutting saw	5	Opportunities for use are numerous
3. Sieve plate for seed selection	1	
4. Thermometer	1	
5. Rain gauge	1	
6. Seed storage refrigerator	1	
7. Hand level	1	
8. Compass	1	
9. Surveying pole	5	
10. Insecticide sprayer	2	
11. Pruning scissors	5	
12. Convex	5	
13. Curvimeter	2	
14. Soil agitator	1	
15. Potting stand	200	
16. Vinyl pot	200,000	4 x 6 inch: 100,000 pcs 5 x 7 inch: 50,000 pcs 6 x 8 inch: 50,000 pcs
17. Watering can (5 $\ell$ )	10	
18. Sickle	10	
19. Scythe	10	
20. Hatchet	10	

C. Nursery and Afforestation Equipment	Q'ty	Reference
21. Hoe	10	
22. Wheelbarrow	10	For sapling and tree transportation
23. Jet shooter	10	
24. Fire-fighting tools	10	To prevent forest fires
25. Chain saw	2	
26. Chain saw cut-loop chains	10	
27. Saw chain grinding files	9 boxes	12 files/box
28. Mower	5	
29. Mower saw	50	
30. Grinding files	3 boxes	
31. Compost chipper	1	

**Table 2-4 List of Workshop Equipment**

D. Workshop Equipment	Q'ty	Reference
1. Simple tool set	1	Required for maintenance of the facilities
2. Air compressor	1	Same as above
3. Charger	1	Same as above
4. Circular saw	1	Required for training and practical exercises
5. Woodworking lathe	1	Same as above
6. Fret saw	1	Same as above
7. Woodwork grooving cutter	1	Same as above

**(2) Direction of Cooperation**

- 1) This grant aid program aims to construct facilities (e.g. Afforestation Center) and procure the equipment and materials required for the actual "project-type technical assistance" scheme (hereinafter called "Pro-tech"), to introduce other means of livelihood to slash-and-burn farmers of Somboun, Vangvieng District, and educate them on forest conservation and afforestation.
- 2) To establish harmony with the "Pro-Tech", the type and scale of the facilities and equipment for the effective implementation of the project will be studied.
- 3) Equipment for laboratory shall be consistent with "Pro-tech" objectives, i.e. develop and disseminate afforestation through resident participation.
- 4) In consideration of facility operation after "Pro-tech" is completed, cooperation shall be extended to help improve the operation and maintenance capabilities of the implementing agency of the Government of Lao PDR.
- 5) The project implementation schedule should be in harmony with the "Pro-tech"

schedule to ensure efficiency.

### (3) Basic Concept of the Project

For the long-term conduct of **afforestation services through resident participation** in Lao PDR, assistance should be extended in order to make the following 3 social conditions fully functional:

- a) **Marketability and profitability:** Support the establishment of a market system as an incentive to forestry businesses formed through the afforestation and tree planting activities of the residents.
- b) **Appropriate land use system:** Support the establishment of an appropriate land use system that would ensure long-term land use and thereby promote investments in afforestation activities of residents.
- c) **Functional social organization:** Support local social organizations to ensure that they function effectively, through the reinforcement of regional and district organizations and the formation of independent village associations that would endorse the residents' afforestation activities.

The basic concept of this project, which targets the Nam Ngum Dam watershed area, is to improve the forest resources management capabilities of the implementing agency, upgrade the capabilities of the residents to plan and implement afforestation projects as well as enhance their awareness of the importance of afforestation. Accordingly, the Center to be constructed shall be used to: ① train the personnel of the Lao PDR Forest Department, the Forest Division of Vientiane Province and the Forest Section of Vangvieng District, as a means of reinforcing these organizations, ② increase the awareness of relevant agencies and the recipient villagers pertaining to the restoration of forest resources, and ③ establish social organizations in the 15 villages designated for afforestation activities. The main services to be conducted through the Center are shown in table 2-5.

**Table 2-5 Main Services to be carried out through the Center by relevant Government Agencies**

Necessary Social Conditions	Main services to be carried out (technical assistance to be extended through "Pro-tech")
a. Marketability Profitability	<ul style="list-style-type: none"> <li>• guide and teach the villagers on how to effectively use the land (e.g. afforestation)</li> <li>• nursery production with emphasis on industrial tree species</li> <li>• guidance in wood processing (timber, tree bark, fruits, herbs, roots)</li> <li>• assistance in public relations, distribution activities and shift to a market system</li> </ul>
b. Secure Land Use System (policies on classification and distribution of land and forests)	<ul style="list-style-type: none"> <li>• assist residents to ensure the long-term use of land (Decreets No. 169 &amp; 186)</li> <li>• guide and teach residents in land use planning</li> <li>• assist in the selection of land for afforestation and tree-planting</li> <li>• assist in understanding land use conditions and gaining approval for the land use plan</li> <li>• assist in the management of land use conditions after a guarantee is obtained and guide residents on land management</li> </ul>
c. Functional Social Organizations	<ul style="list-style-type: none"> <li>• understand actual village conditions and explain this to the villager.</li> <li>• present problems and guide and educate villagers participating in project planning and implementation</li> <li>• reinforce administrative organizations and promote cooperation between sectors</li> <li>• manage the afforestation activities of villagers' associations</li> </ul>

**(4) Use of the Center**

In accordance with the land and forests allocation policies, the Government of Lao PDR intends to improve the economy of the area and promote the conservation and restoration of forest resources. As a part of the forest conservation and afforestation project, the above mentioned services are the responsibility of Lao PDR, but for the time being, they will be supervised by the FORCAP team. In the future, the Government of Lao PDR will transfer this responsibility from the Forest Department to Vientiane Province. Based on these premises, the Afforestation Center shall serve the following purposes:

- A facility capable of planning training and guidance activities necessary to reinforce the organizations of the province of Vientiane and the district of Vangvieng.
- A facility that can work in cooperation with international agencies and other forestry-related agencies, in terms of training, guidance and the dissemination of forestry techniques.

- A facility that has the capacity to widely introduce, exhibit and publicize the works of the residents after undergoing training.
- A facility fully furnished with the equipment required for technical guidance, training and dissemination of techniques.
- A facility that will contribute to the creation and construction of various forest models.
- A facility (open and closed nurseries, potting house, compost house, etc.) that can provide training in the construction of nurseries that can produce excellent saplings.
- A nursery capable of supplying 40,000 superior saplings per annum.
- A nursery that can provide superior saplings to the village (the Government will expand the nursery in the Center and open it for the use of the villagers).
- A facility that could sufficiently display the activities of the residents, e.g. distribution of saplings, removal of weeds and fallen trees in the rainy season.

– Long term policies –

- A national facility which will expand its activities to cover not only the whole Vangvieng District, but also other districts and regions nationwide.
- A facility capable of offering short-term accommodation to visiting lecturers for training and lecture programs.
- A facility capable of offering short-term accommodation to trainees from other regions.

(5) Basic Concept of Operation & Maintenance Plan

In case the Center is transferred under the jurisdiction of Vientiane Province and Vangvieng District, consideration should be seriously placed on the fact that **budgetary assistance, assistance in organizational reinforcement and the enlightenment programs** received through “Pro-tech” will all cease after the completion of “Pro-tech”. It is therefore very important for the Government of Lao PDR to establish a system that can sufficiently cope with the management, operation and maintenance of the Center, and formulate the following measures:

1) Economic measures

- Operation of the Center based on the budgetary capabilities of the province and the district.

- Strictly manage the operation of equipment and facilities that incur high fuel costs (e.g. electricity, gasoline), and adopt ways to avoid excessive fuel consumption.
- Avoid conducting activities overlapping with the assistance programs offered by other cooperation agencies, use the facilities in cooperation with these programs and investigate the possibility of trainee exchange programs.
- Facilitate the management of electricity and water use every time the building and facilities are used.
- The products produced by the residents that are exchangeable for cash (c.g. timber, and processed goods) should be actively publicized to the general public, and assistance should be extended to the Center for their distribution.
- Establish a credit/fund system for village associations, as well as a system able to distribute profit back to the residents and the Center.
- As a facility recommended by the Forest Department, the guesthouse will collect an accommodation fee from the guests.
- A fee will be collected from users of the canteen.

## 2) Measures for organizational reinforcement

- Rapidly improve the managerial and technical skills of the provincial and district officials, and together with the recipient villages, establish a functional social organization.
- Urge the residents – not only of the 15 villages but of other areas as well – and provincial and district officials to participate in the training programs held in the facilities.
- Consider the early conduct of guidance and training for monitoring/evaluation (M/E) activities, data management and enlightenment activities for the formulation of the Action Plan which the provincial and district forestry offices have to implement, as well as the capability to establish the required system.
- Develop a system that will particularly support the marketability and profitability factors aforementioned, to encourage the voluntary participation of villagers in the conduct of afforestation projects.
- Adopt measures that would make the presentation of the products made by the residents who underwent training beneficial.
- Early conduct of training and guidance activities in forestry and livestock industries to encourage slash-and-burn farmers to shift to a different means of livelihood.

### 3) Enlightenment Activities

- Expand model forests, workshop programs and educational materials formulated through “Pro-tech” to cover areas other than the 15 recipient villages.
- Urgently deepen relations with the forestry, agriculture and other regional industries, to promote the development of the project area.

### 4) Equipment Operation and Maintenance

- Accurately grasp the expenses required for the maintenance (e.g. annual plan of operation, required fuel and personnel expenses, repair fees) of the vehicles, and plan how to manage the expenses.
- Prepare a ledger (in the local language) for the management of every equipment, including spare parts, for management training and experimental activities, and thoroughly plan their proper storage and maintenance.
- Explain the costs involved for the depreciation of the equipment to the villagers.

## (6) Basic Concept on the Construction of Various Center Facilities

In order for the Center to effectively function as a training and dissemination facility, and in consideration of the **operation and maintenance capabilities** of the Lao PDR Forestry Department and the province of Vientiane, the Center shall be designed in accordance with the objectives of “Pro-tech” (refer to annex document) and in compatibility with local conditions.

In consideration of the “Pro-Tech” activities and the conditions of the sites, the facilities will be established as follows:

### 1) Outline and Scale of Administration and Training Building

- An office for the use of 8 experts will be prepared.
- An office for 15 counterparts will be prepared.
- A meeting room for 20 people (experts, counterparts and other individuals concerned) will be prepared.
- A simple laboratory for soil and water quality testing and a filing room will be planned.
- A workshop for 20 people (one from each of the 15 villages and the trainees from the Province and the District) will be prepared.



### Administration and training building

Facility	No. of persons	Area per person (m <sup>2</sup> )	Area (m <sup>2</sup> )	Comments
Administration office	10	3.0	32.5	Office for management and administrative staff
Main office	23	4.0	90.0	Among 6 short-term expert and visiting lecturers, it is estimated that 3 will use the office at the same time.
Meeting room	20	3.5	72.0	For meetings related to the operation of the center, planning of training sessions, training reports, etc.
Workshop	20	2.5	50.0	Venue for training and seminars
Library	20	2.0	37.5	Storage of forestry documents, consultation by instructors and trainees
Office of head of the center	1	17.5	17.5	General affairs of the Center

Note: This arrangement may vary slightly due to the layout of the pillars.

### 2) Simple Lodging Facilities

The project site is located 120km from Vientiane. There are no facilities in the villages along the periphery of National Highway 13 that would enable long-term stays. For the sustainable conduct of duties and responsibilities, lodging facilities will be constructed. Also, as training programs will be held by visiting lecturers of other cooperation agencies or NGOs, simple lodging facilities should be constructed.

- Because of different lifestyles, there will be two types of lodging facilities: one for the experts and visiting lecturers (Building A), and another for the counterparts, instructors from national universities and research agencies (Building B).
- Lodging for experts and foreign visitors should total 8 rooms to accommodate the 5 full-time experts, and 3 short-term experts and visiting lecturers.
- Lodging for locals should be able to accommodate 10 counterparts (the 5 remaining counterparts living in the district or the province will be commuting from their own residence).

### Simple lodging facilities

Building	Living space	Bathroom space incl. shower and toilet	Total	No. of rooms	Comments
Building A	22.5 m <sup>2</sup>	13.5 m <sup>2</sup>	36.0 m <sup>2</sup>	8	For experts and visiting lecturers
Building B	27.0 m <sup>2</sup>	13.5 m <sup>2</sup>	40.5 m <sup>2</sup>	10	For office staff

### 3) Annex Facilities

#### *Canteen:*

There are no local restaurants in the village of Hoai Pamon, where the Center will be constructed, or its vicinity. Therefore, there is a need to construct a roofed open building to serve as a canteen, for the dining convenience of the experts, counterparts and trainees.

The combined number of experts, counterparts, province and district employees and trainees will amount to between 50 and 60 persons. However, considering that staff duty will be in shifts, the canteen will be built for only about 30 persons.

#### *Guardhouse:*

The construction of a guardhouse is necessary to maintain security in the premises day and night.

#### *Garage:*

A garage will be constructed to house 10 vehicles (a minibus, 2 pick-up trucks, 6 existing wagons, and a reserve vehicle) for the use of FORCAP.

#### *Water Supply Facilities:*

Facilities to supply water to the administration and training building, nursery, etc. will be constructed.

A submersible motor pump station will be built in the Nam Son diversion channel. Pumped water will be stored in the sedimentation pool and the receiving basin equipped with a sterilizing device. From there, water will be pumped up to the elevated tank and supplied to the various facilities by gravity.

**Table 2-6 Water Supply Demand per Facility**

<b>1. Administration / Training Facilities</b>	<b>Design: 5,730 ℓ x 1.2 (allowance): 6,876 ℓ/day</b>
① Administration/Training Building	60 psn x 20 ℓ = 1,200 ℓ/day
② Canteen	60 psn x 40 ℓ = 2,400 ℓ/day
③ Simple Lodging Facility Building A	8 rooms x 2 psn x 30 ℓ = 480 ℓ/day
④ Simple Lodging Facility Building B	10 rooms x 2 psn x 30 ℓ = 600 ℓ/day
⑤ Guardhouse	2 psn x 30 ℓ = 60 ℓ/day
⑥ Garage	9 vehicles x 10 ℓ = 90 ℓ/day
⑦ Display Building	30 psn x 30 ℓ = 900 ℓ/day
Sub-Total	5,730 ℓ/day
<b>2. Nursery</b>	<b>Design: 1,040 ℓ x 1.2 (allowance): 1,248 ℓ/day</b>
⑧ Open Nursery	400 m <sup>2</sup> x 2 ℓ = 800 ℓ/day
⑨ Closed Nursery	80 m <sup>2</sup> x 2 ℓ = 160 ℓ/day
⑩ Workshop, potting house, etc.	4 psn x 20 ℓ = 80 ℓ/day
Sub-Total	1,040 ℓ/day
<b>TOTAL</b>	<b>8,124 ℓ/day</b>

Dimensions of the sedimentation pool and the receiving basin will be designed based on the above demands.

*Display Building:*

As part of the enlightenment activities planned under “Pro-tech”, a video clip will show how the residents’ training, drill programs, and the construction of village nurseries and collective forests are carried out. The products manufactured by the residents will be put on display and the products of the residents who underwent training will be shown to the public.

To make the assistance offered by “Pro-tech” significantly effective, a building will be constructed along National Highway 13 within the site. For a stronger impact, the building will be open but roofed, and annexed with a workshop and a storage area for tools.

Structure of the display building: one-storied building offering the 3 following uses:

Display building

a. Display area (open space)	b. Storage area	c. Workshop area	d. Guardhouse
<ul style="list-style-type: none"> <li>• To show products of the residents who undergo training.</li> <li>• To be used by the counterparts and the provincial and district employees to hold outdoor seminars and training activities.</li> <li>• To be used by the residents for the sales and distribution of saplings, fruits, vegetables and manufactured goods.</li> <li>• To be used as an assembly hall for village associations, etc.</li> <li>• To hold forest fairs.</li> </ul>	<p>To store display materials such as photos, panels, videos, chairs, tables, etc.</p>	<p>Used by residents to manufacture goods, equipped with a kitchen and toilet.</p>	<p>To maintain security in the premises.</p>

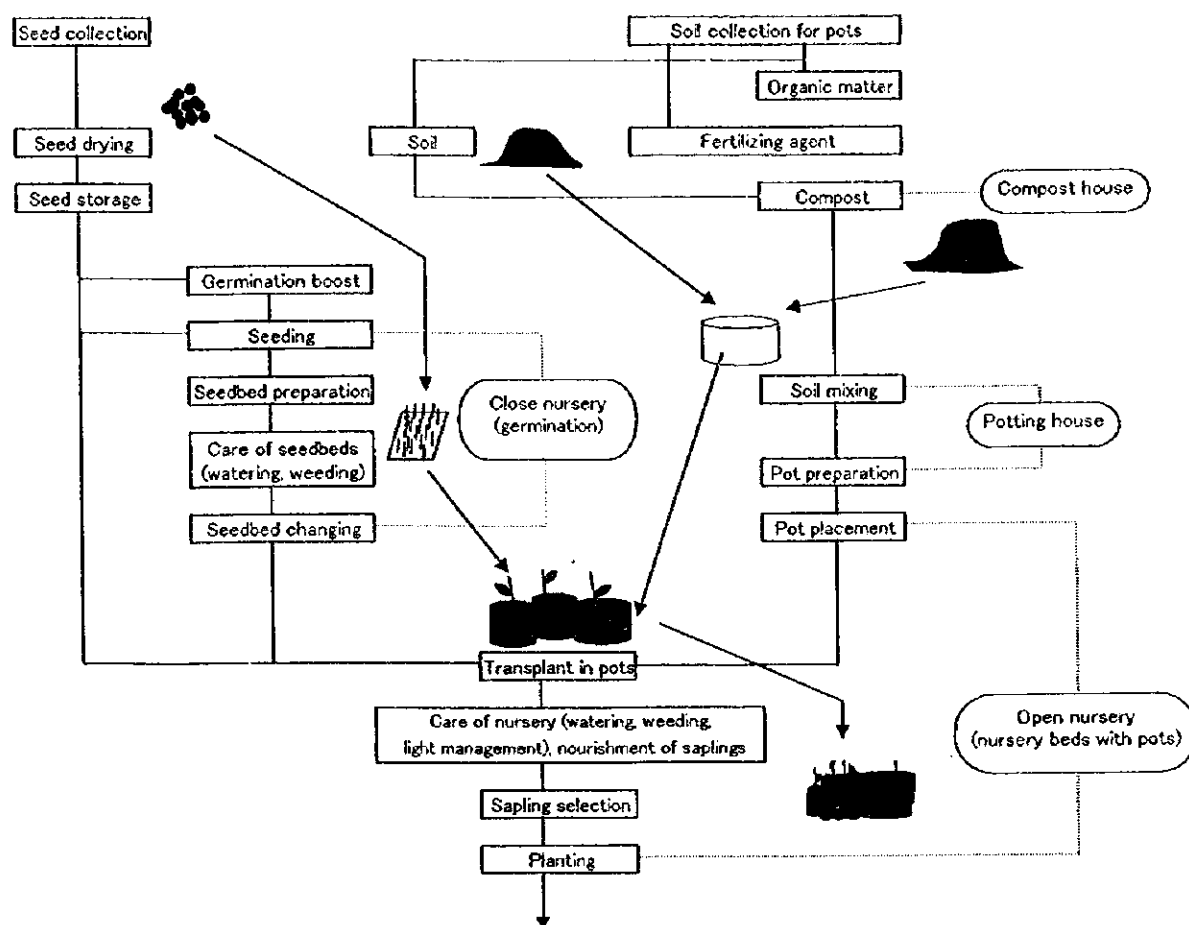
**Table 2-8 Afforestation Center Facilities**

Facilities	Use & Necessity	Design
① Administration & Training Building	• Administration office	1 room for 10 people
	• Director's office	1 room for 1 person
	• Office of experts and counterparts	1 room for 23 people
	• Workshop for the training of provincial and district employees as well as residents of the 15 villages	1 room for 20 people
	• Meeting room and hot water supply room	1 room for 20 people
	• Simple laboratory	1 room
	• Library and storage	1 room
	• Generator room	1 room
	• Toilets: Male: 3 urinals and 2 water closets, (including one local style) Female: 2 water closets (including one local style)	One unit each
② Simple Lodging Facility	• Will be equipped with a kitchen and a reception room in view of long-term stays	8 rooms for experts and visiting lecturers
	• For counterparts who intend to stay for a long time	10 rooms for counterparts
③ Canteen	• For the use of experts, counterparts and trainees. • Local style toilet	Roofed open building for 30 people
④ Garage	To house and protect pick-up trucks and other procured vehicles from sunlight and rain	Roofed open garage for 10 vehicles
⑤ Guardhouse	To keep the facility secure day and night	The guards will work in two shifts.
⑥ Water Supply Facilities	For the supply of water to the training building, nursery, etc: • Pump (40 liters/minute) • Elevated tank (15m high, FRP [1m × 1m × 1.5m]) • Reservoir (FRP [ 2m × 2m × 2m ] )	For domestic water supply Tanks in FRP or RC

4) Nursery

This project intends to supply 40,000 superior saplings per year for the establishment of various model forests, which shall be under the supervision of the Center. The details and scale of the nursery will be based on the production facilities.

## SAPLING PRODUCTION FLOWCHART



### Open Nursery:

- An open nursery with a concrete pool will be constructed to raise various seedlings.
- The number, width and division of nursery beds will be determined based on the production of 40,000 seedlings.
- The design of the open nursery beds, nursery pots, work site, work roads, and water conveyance pipes to be connected to the nursery beds will be made after the appropriate seed planting method and schedule are determined.
- The equal distribution of 40% to 50% of sunlight to the nursery beds around April to September, when the sun is strong, will be considered.
- A plan to use economically maintainable materials and a net to provide the nursery beds with shade will be made.
- With a width of 1m x 8m and a planting interval of 10cm x 10cm, a nursery bed can produce 800 saplings (10x80 = 800, using 10cm x 10cm pots). One unit will be made up of 10 beds with a work road on both sides. It will, therefore, measure 286 m<sup>2</sup> (13m x 22m = 286 m<sup>2</sup>) and produce 8,000 saplings. Therefore, if 5 units are formed, an open nursery capable of producing 40,000 saplings on a total area of 2,000 m<sup>2</sup> (including roads and work areas) can be realized.

### *Closed Nursery:*

- The plan for seed raising indicates the indispensability of a systematic production of saplings that would entail the selection of tree species compatible with the conditions of the target villages. In addition, it is also important to implement a production system that would fully meet the demands of the demonstration forests (model forests). Moreover, because the planting method varies according to tree species, measures to minimize the damaging effects of nature (e.g. temperature, humidity, sunshine, wind) should be considered.
- To minimize the damaging effects of nature, e.g. direct sunlight and strong winds, the nursery will be constructed with a 1.5m fence to protect it from the direct rays of the sun.
- A closed nursery equivalent to 1 unit of open nursery beds (10 beds) with work roads will be constructed on 442m<sup>2</sup> (26m × 17m).

### *Potting House: (144 m<sup>2</sup>)*

- A house for individually potting the saplings in plastic pots filled with a mixture of soil and fertilizer is to be constructed.
- The house will have no walls but will be roofed as a protection against direct sunlight and heavy rain.
- The house will be equipped with a booth for mixing fertilizer and soil.

### *Workshop (192 m<sup>2</sup>) and Seed Storage (24 m<sup>2</sup>)*

- A workshop will be prepared for seed extraction, grafting, etc., as well as for training and practice.
- The workshop will be equipped with a desorption machine, dispersing equipment, and a soil tilling equipment.
- A seed storage room (24 m<sup>2</sup>) with a refrigerator will be annexed to the workshop.

### *Compost House: (48 m<sup>2</sup>)*

- Compost is indispensable to sapling production.
- The house will be fitted with a roof for protection against wind and rain, and the upper part of the walls will be open for good ventilation.

### *Greenhouse: (54 m<sup>2</sup>)*

- This facility will be used for germination and cuttage.

Details concerning the roads within the nurseries, the field where the seeds are to be extracted from, the booth for mixing soil and fertilizer, are as shown in the attached drawings.

## 5) Basic Concept of Equipment and Material Procurement

### • *Equipment for Administration and Training:*

Equipment necessary for the residents' training activities, actual practice in the nurseries, drills in the demonstration forests, and the presentation of their products to the public will be procured.

A micro-bus will be procured for the transportation of residents scheduled for training and other activities. There is no bus that goes to the Center through National Highway 13 from recipient villages. Accordingly, the procurement of the bus is necessary to accelerate training activities.

Two pick-up trucks will be procured for the transport of saplings, soil, tree stems, residual soil, and numerous tools and equipment. Two 1-ton trucks will be provided, one for the demonstration forests, and the other to support the works in recipient villages.

Four motorcycles will be procured for the transport of documents, messages and other important materials between the province, district and the villages. They will also be used for monitoring activities.

The required minimum amount of repair tools and equipment will also be provided for the repair of vehicles and equipment in the nurseries.

An OHP projector, slide projector, screen, video equipment, computers, etc., will be necessary for classroom use and administration purposes.

Six white boards will be procured for the training room, administration room, etc.

As the use of phones and facsimiles is not possible in the project area, radio communication devices will be provided as a means of communicating with FORCAP.

Currently, both VHF and HF systems are used at FORCAP to communicate with the Forest Dept.. A study conducted to determine whether the use of a VHF system alone, with a repeater (relay station), would be adequate for communications between the Afforestation Center and FORCAP, resulted in electrical supply problems and operation and maintenance difficulties when the repeater was established on top of a 1,000m high mountain. Therefore, it was decided that both VHF and HF systems would be installed.

### • *Simple Testing Equipment:*

To conduct various tests relevant to the objectives of the Center, instruments for simple soil and water quality analyses, as well as for germination tests should be provided.

A hole will be drilled at selected survey points for profile measurement. Samples will then be extracted and analyzed in the laboratory to investigate the various characteristics of the soil that classify the several geological layers that make up the survey point. The soil sampler set, container for soil sample transport, cylinders and sieve will be necessary for this operation. Also, a laboratory table, shelves, stainless steel bowls, thermometers, scales, soil salinity tester, water purifier, etc. will be necessary for soil analysis.

A standard soil color chart, soil moisture meter and pipettes will also have to be prepared for observation and analysis of soil color, soil characteristics, grain size classification, stone proportion, etc., whereas measuring cylinders, beakers, flasks and others will be used for sample measurement.

- *Nursery and Afforestation Equipment:*

Equipment necessary to raise and produce saplings in the open and close nurseries, potting house, workshop, compost house, etc., will be procured.

A safety belt for tree-climbing, pruning scissors and a sieve for seed extraction, a refrigerator for seed storage, a thermometer and rain gauge for weather observation, vinyl pots, watering cans, sickles, scythes and hatchets for the production of saplings will be procured. For afforestation, the following will be procured: surveying instruments such as hand level, compass and convex, felling and cutting equipment such as a chain saw and mowers, replacement chains and grinding files for the chain saws (5 filing operations can be performed with each file). Files will also be necessary for the mower.

- *Workshop Equipment:*

In order to increase the marketability and profitability of afforestation activities implemented by the residents, simple woodwork equipment, such as those for timber processing, will be necessary. The required minimum amount of equipment for the repair of tools and vehicles will be provided.

Repair tools such as a compressor and a battery charger will be necessary.

A number of tools, such as a circular saw and a woodworking lathe, will be procured for educational activities aiming at showing the residents how to process the timber that they fell and how to give it added value.

**Following the study of the above points, the basic concept of this Project has been designed to provide facilities and equipment for the conduct of educational activities for the benefit of the residents of Somboun, Vangvieng District, Vientiane Province, Lao PDR.**



## **2-3 Basic Design**

### **2-3-1 Design Concept**

The design of each facility will be determined according to the objectives of this project, the operation and maintenance capabilities of the recipient government, and in consideration of the role of these facilities in the effective conduct of afforestation activities through resident participation.

#### **1) Policies in consideration of natural conditions (climate, natural features)**

- Taking into account the effect of significant rainfall fluctuations in the rainy and the dry season on drainage and slopes in the project area, appropriate countermeasures will be taken so as to prevent delays in the construction work and execution schedule.
- The local climate, natural features, construction conditions, and operation cost, particularly in terms of energy conservation, will be considered in designing the facilities.
- The design ground height will be high enough to prevent water seepage into the building floor when the lake water level rises in the rainy season.
- The spouts of building roofs will be designed properly.
- The high temperature and humidity level in the rainy season will be considered when planning the procurement schedule of equipment and materials, to prevent rusting.
- Rooms will be constructed in a manner that will prevent rainwater leakage and block the direct rays of the sun.
- Considerations will be taken so as to prevent the water required for the nursery and the drainage of facility wastewater from adversely affecting the surrounding environment.

#### **2) Policies in consideration of land use conditions**

- As the district will adopt afforestation countermeasures not only for the Somboun area, but also for other slash-and-burn farming areas, it should provide space for the expansion of the nursery, which it will supervise with the province.
- The implementation of measures to diminish slash-and-burn cultivation in the project area is urgently required. Cooperation will be immediately extended to the recipient government in their formulation of national policies, that will reflect the need for such measures.
- The site where the Center is to be constructed is surrounded by a lake. The Center will be designed with due consideration of area characteristics and in harmony with

the surrounding environment.

- For the handling of sewage, three complex cesspit tanks, which adhere to the national construction standards, will be adopted. The tanks will be operated using charcoal and lime.
- 3) Cooperation with other forestry related programs and facilities
- The possibility of conducting guidance and training programs in collaboration with other agencies will be examined.
  - The Center will be designed to contribute to the realization of policies for national priority development plans.
  - The space for the nursery expansion plan to be executed by Lao PDR will be considered.
- 4) Policies concerning conditions relevant to construction
- The Lao PDR construction and civil engineering standards will be adopted in consideration of the repair skills of the Laotians.
  - As a rule, construction materials will be procured locally in consideration of the cheap cost and to facilitate repair works in the future.
  - The buildings to be constructed will be simple, solid, durable and one-storied.
  - The construction standards will be based on the Japanese or Laotian standards. The construction standards of Lao PDR (Construction Rules) were established in 1992 and are applicable to both civil engineering and architectural works. The application of a construction permit will be carried out in accordance with the aforementioned "Construction Rules".
  - The scale and the outline will be determined based on the financial and technical capabilities of Lao PDR to conduct operation and maintenance.
- 5) Measures to be taken during the construction period
- An overall work flow chart showing the construction period and the procurement of the equipment will be made after the following items are confirmed:
- The desire and the reasons of the government regarding the priority ranking of the constructions work and the procurement of equipment.
  - In consideration of the overall "Pro-tech" period, the priority ranking of the construction work necessary for the conduct of the planned activities will be confirmed and shown in the implementation schedule.

## 6) Principles for determining the responsibilities of the Government of Lao PDR

To determine the extent of the work to be shouldered by the Government of Lao PDR, the following items should be confirmed. The work and equipment to be provided by the Government of Lao PDR, and their share of the project expenses will be made. The approval of the government authority concerned will be obtained for the latter.

- Acquisition of a site for long term use for the construction of the Center, which will also consist of a nursery.
- Removal of graves within the site: there were eight graves on the top of a small hill within the land which is being considered for the Center. After having been notified by the district of the plan to use the site, the said residents have shown willingness to exhume and transfer the remains of their relatives to the other cemetery in the village. With the mutual consent of the parties (province, district and residents concerned), a local burial ceremony was held in February 1998 for the transfer of the remains.
- Construction of necessary fences around the Center.
- Necessary procedure to obtain the approval for the supply of electricity to the Center through a high-tension cable and by pumping water from the Nam Son diversion channel.

## 7) Policies for the procurement of equipment

The following items are considered in the selection of equipment for procurement:

- Equipment that are new to the Forest Department will be cautiously selected for procurement. The list of equipment owned by forestry related agencies does not include heavy equipment for afforestation use. Therefore, such equipment will not be procured because it is highly likely that problems will arise regarding their operation and maintenance.
- Only a few of the existing equipment for the nursery, afforestation, educational programs and survey are modern equipment using electricity and gasoline. Most of the equipment will be manually operated. Accordingly, the selection of modern equipment or those operable by gasoline will be carefully carried out.
- Studies were also carried out regarding how often the equipment will be used, their complexity in terms of operation and maintenance, operating costs, efficiency, ease or difficulty in the future procurement of spare parts or replacement, their specifications, as well as the required number of units and spare parts. Lao PDR and a third country were also considered for the procurement of the equipment.

### **2-3-2 Basic Design**

The basic design will be made in consideration of the following items and the conditions involved for facility construction and equipment procurement.

#### **(1) Site for the Afforestation Center**

- All the aforementioned facilities for the project will be constructed within the site acquired and prepared by the Government of Lao PDR.
- The design ground height will be 0.5m higher than the road surface of National Highway 13.
- The embankment will be constructed using soil from an area within a distance of 1km, which is of good quality.

#### **(2) Administration and Training Building**

- To prevent excessive energy consumption through the use of air conditioners and electricity, the administration and training building will have a courtyard and a corridor that's exposed on one side, for natural ventilation and lighting. This will be a one storied building.
- To prevent the heat of the day from fully penetrating the building interior, an insulated sheet will be installed under the roof.
- In consideration of the rainwater spout, the roof will be designed with a gradient of 1:1.
- To prevent rainwater leakage and as a protection from direct sunlight, the eaves will measure 2.0 to 2.5m deep.
- The height of the ground floor will be 60cm higher than the design ground height to improve natural ventilation.
- A 25 kVA generator for emergency use will be installed.
- Both local and foreign style toilets will be provided.
- Security grills will be installed at every window for safety.

#### **(3) Lodging Facilities**

The facilities for the bathroom and kitchen will be fueled by propane gas. Small size gas cylinders will be provided for each room. Security grills will be provided on each window.

#### **(4) Water Distribution Facilities**

A submersible motor pump capable of pumping up the planned water volume of 40 liters/minute will be installed in the deeper section of the Nam Son diversion channel,

to pump water up to the receiving basin (8 ton capacity, attached to a sedimentation pool). Water pumped up to the receiving basin will then be pumped to the elevated tank (1 ton capacity) for distribution by gravity to the pipelines connected to the facilities.

**(5) Radio Facilities**

The VHF (Very High Frequency) and HF (High Frequency) frequencies appropriated by FORCAP are 146.100 MHz and 7.100 MHz respectively. Consequently, FORCAP uses radio equipment operating on ultra short wave frequency ranging from 30 to 300 MHz and short wave frequency ranging from 3 to 30 MHz. Ultra short waves are only effective up to 20 to 50km, while short waves cover over 100km. Because the city of Vientiane is 120 km from the Afforestation Center, a short wave frequency system will be installed. However, an ultra short wave system will also be installed to cover the target villages (within 50km).

Installation Plan:

VHF: 1 base transceiver, 2 units for vehicles and 6 portable units.

HF: 1 base transceiver with antenna, 1 unit for a vehicle

**(6) Environmental and Wastewater Management**

Wastewater from the administration and training building and the lodging facilities will be treated using three complex cesspit tanks and allowed to naturally permeate the ground.

Drains will be constructed to direct drainage and rainwater from the concrete pool type nursery to the Nam Son diversion channel.

**(7) Construction Method and Materials**

The construction methods and materials to be used shall be in accordance with the construction and civil engineering standards established in Lao PDR.

- Rahmen structures made of reinforced concrete will be adopted.
- The walls will be made of red bricks plastered with mortar.
- The architectural standards of Japan or Lao PDR will be used. In particular, the standard for the installation of the cesspit tanks will be according to the standards of Lao PDR.
- As a rule, the construction materials will be locally procured to facilitate future repair works.

## (8) General Description of the Facilities

For the design of the following facilities, refer to the attached drawings.

### 1) Administration and Training Building

One-storied building floor area	: 562.5m <sup>2</sup> in total
Structure	: reinforced concrete frame; painted red bricks put together using mortar; insulated roofing
Openings	: glass windows with grills for security
Flooring	: wooden parquet-type flooring with ceramic tiles, mortar paved
Air conditioner	: offices of the experts, administration office, meeting room and library
Toilet	: tile flooring; Western and local style toilets
Generator room	: mortar paved, vented walls
Corridor leading to canteen	: tile roofing, open type, concrete flooring

### 2) Simple Lodging Facilities

#### ① Building A – 8 rooms

One-storied building floor area	: 288m <sup>2</sup> in total
Structure	: reinforced concrete frame; painted red bricks put together using mortar; insulated roofing
Openings	: glass windows with grills for security
Flooring	: wooden flooring
Air conditioner	: 1 unit per room
Bathroom	: gas water heater, with western type tub and toilet

#### ② Building B – 10 rooms

One-storied building floor area	: 360m <sup>2</sup> in total
Structure	: reinforced concrete frame; painted red bricks put together using mortar; insulated roofing
Openings	: glass windows with grills for security
Flooring	: ceramic tiles
Ventilation	: ceiling fan

Bathroom : shower and local type toilet

### 3) Other Facilities

#### ① Canteen

One-storied building floor area : 121.5m<sup>2</sup>  
Structure : reinforced concrete frame;  
painted red bricks put together using  
mortar; insulated roofing  
Openings : the canteen will be an open structure  
Flooring : ceramic tiles  
Ventilation : ceiling fans  
Toilet : Western and local style toilets

#### ② Guardhouse

One-storied building floor area : 12.25m<sup>2</sup> in total  
Structure : reinforced concrete frame;  
painted red bricks put together using  
mortar; insulated roofing  
Openings: : glass windows with grills for security  
Flooring : mortar paved

#### ③ Garage (for 10 vehicles)

One-storied building floor area : 180m<sup>2</sup> in total  
Structure : reinforced concrete frame, slated roof

#### ④ Water Supply Facilities

A submersible motor pump (40 liter-capacity) will be installed in the deeper section of the diversion channel. FRP will be used to construct the receiving basin and the elevated tank. Water from the elevated tank will be distributed to each facility by gravity.

#### ⑤ Display building

One-storied building floor area : 288m<sup>2</sup> in total  
Structure : reinforced concrete frame,  
painted red bricks put together using  
mortar; insulated roofing  
Openings : open structure  
Flooring : mortar paved  
Ventilation : ceiling fan

### 4) Nursery Facilities

For the design of the nursery facilities, refer to the attached drawings.

- ① Open nursery
- Area : 2,002m<sup>2</sup>
- Structure : concrete pool type nursery beds with wastewater and rainwater drains to act as protection against humidity; the work path will be covered with gravel.
- ② Close nursery
- Area : 442m<sup>2</sup>
- Structure : concrete pool type nursery beds flanked with block hedges to provide shade from the sun
- ③ Potting house
- One-storied building floor area : 144m<sup>2</sup> in total
- Structure : reinforced concrete frame, slated roof
- Openings : open structure
- Flooring : mortar paved
- ④ Seed storage area and workshop
- One-storied building floor area : 216m<sup>2</sup> in total
- Structure : reinforced concrete frame, slated roof
- Openings : open structure
- Flooring : mortar paved
- ⑤ Fertilizer/compost storage area
- One-storied building floor area : 48m<sup>2</sup> in total
- Structure : reinforced concrete frame, slated roof
- Openings : the upper part of the wall will be left open for ventilation
- Flooring : mortar paved
- ⑥ Greenhouse
- One-storied building floor area : 54m<sup>2</sup> in total
- Structure : reinforced concrete frame, corrugated transparent plate roof
- Openings : glass windows, ventilation gratings on the roof



## 5) Specifications of Equipment to be Procured

### ① Administration and Training Equipment

- **Personal computers:** The clock speed, hard disk capacity and other specifications have been decided in consideration of the currently used OS (operating system), application software (MS-Office), ease of operation and smooth utilization of MO drive data. Thus, computers with a minimum of 200 MHz Pentium processor, a minimum hard disk capacity of 2.5 GB and a minimum DRAM of 32 MB will be procured.
- **Printers:** Since printers will be needed to output detailed image data (e.g. map information) and distinguish color differences, color printers for paper sizes up to A3 will be procured.
- **Scanner:** This item is essential for inputting data onto the hard disk. A general and practical flat-bed type scanner is selected rather than a high class type that can scan thick objects. Since the scanner will need to input detailed images (maps, etc.), it will have a resolution of 1,200 dpi.
- **Copier:** A desktop copier with reduction and enlargement functions, and capable of handling paper sizes up to A3 will be procured.
- **Slide projector:** A slide projector attached with a slide storage device (carousel) and possessing basic functions will be procured. Since between 20 and 25 trainees are expected to take part in each training session, a tripod stand-type screen will be provided.
- **Overhead projector:** An easy to carry overhead projector capable of magnified projection and possessing a folding lens head will be procured. The screen supplied for the slide projector above shall be jointly used with the overhead projector.
- **Television set (with video deck):** This shall be used in training for showing images taken by the camcorder and also utilized in enlightenment and dissemination activities. Since between 20 and 25 trainees will take part in each training session, a 28-inch television set will be procured. The video deck will be able to play both commercially recorded materials (VHS), and images recorded with the digital camcorder.
- **Digital camcorder:** The camcorder shall be equipped with a 4-inch LCD monitor, a 40X zoom, a photo mode allowing the shooting of still pictures, and a laser V-link function for cordless transmission of AV material.
- **Microphone set:** Since this will be used for lectures and field training, a wireless microphone set with integrated amplifier and speaker will be procured.

- PC projector: This will be used in training and educational activities to directly project computer images and data onto the screen. A projector with reduction and enlargement functions will be procured.
  - Radio: Both a VHF system (30-300 MHz) for short-to-medium range use and an HF system (3-30 MHz) for long range use shall be installed. An easy-to-use system with a fixed frequency function will be procured.
  - Micro-bus: Since between 20 and 25 trainees will take part in each regular training session, a micro-bus with a capacity of 26 passengers will be procured. In consideration of driving mileage, a diesel engine which offers low running cost will be procured.
  - Pick-up trucks: These vehicles can carry light luggage in the rear. Two-wheel drive and four-wheel drive pick-up trucks are available; the latter are more useful on poor roads and steep slopes. In terms of cabin shape, single cabin types for carrying two or three passengers and double cabin types for carrying four or five passengers are available. Considering the poor local road conditions and the purpose of use of the vehicles, four-wheel drive, single cabin, diesel engine pick-up trucks with a loading capacity of approximately one ton and a displacement of 2,800 cc will be procured.
  - Motorcycles: There are various types of motorcycles: sport type, off-road type and ordinary type. Considering the poor road conditions in the area, off-road types seem to be the best choice. However, since ordinary types are common in Lao PDR and consideration needs to be given to the ease of procuring parts and carrying out operation and maintenance, ordinary type motorcycles will be procured. Since the motorcycles will be used within the district, those with a displacement of approximately 120 cc or more will be procured.
- ② Simple Testing Equipment
- Refrigerator: Special refrigerators for storing reagents, etc., are available in the local market. However, since they are expensive and the tests involved are simple, a general household refrigerator will be procured. The capacity is set at approximately 200 ℓ.
  - Germination tester: A germination tester that can control temperature and light intensity and has a storage capacity of approximately 300 ℓ will be procured. The temperature control ranges from 0°C to 50°C, and the light intensity control ranges from zero to around 20,000 lux.
  - Water purifier: The selected water purifier has a purifying capacity of approximately 1.8 ℓ per hour and is capable of producing ion water.
  - Drying oven: This equipment is needed to analyze soil samples and determine

the moisture content of soil. The drying oven to be procured will have a temperature control range from room temperature to approximately 300°C, a capacity of 160 ℓ and will be fitted with partitions.

### ③ Nursery and Afforestation Equipment

- Rain gauge: A battery driven (DC) self-recording tipping rain gauge will be procured. The recording range is repeatable every 50 mm of rainfall and the pen is cartridge type.
- Seed storage refrigerator: A refrigerator with a capacity of approximately 480 ℓ but without a freezer – as it will not be used to freeze seeds – is selected.
- Soil agitator: The selected soil agitator has a mixing capacity of approximately 100 ℓ, is fitted with an engine that eliminates the need for power supply, and is a type used for general concrete mixing.
- Chain saws: The selected chain saws have a displacement of approximately 50 cc and are fitted with a vibration control device, front and rear hand guard, chain catcher, kick-back prevention, chain brake and other functions. 18-inch guide bars will be procured.
- Mowers: The mower will have a displacement of approximately 25 cc and will be fitted with eight blades.
- Compost chopper: Since paper pulp-producing chippers are large and expensive, a chopper that produces fertilizer in the form of finely crushed chips will be procured. The selected type is mainly used for gardening purposes. It is engine-driven and portable. The engine capacity is 15 ps and the chip production capacity is around 0.3-0.5 m<sup>3</sup>/hour.

### ④ Workshop Equipment

- Air compressor: This shall be used for pumping vehicle tires. A compressor with an output of approximately 1.5 kW and an air supply capacity of approximately 200 ℓ/minute will be procured.
- Charger: This shall be used for charging vehicular batteries. A small charger with an output of approximately 0.4 kW will be procured.
- Circular saw: The circular saw will be roughly 200 mm, have a maximum cutting thickness of approximately 60 mm and an output of roughly 1.35 kW.
- Woodworking lathe: The woodworking lathe will have a maximum working diameter of approximately 170 mm, maximum working length of approximately 750 mm and an output of roughly 0.4 kW.
- Fret saw: A fret saw with a maximum working thickness of approximately 50 mm and an output of roughly 0.1 kW will be procured.

- Woodwork grooving cutter: A woodwork grooving cutter with a cutting blade of approximately 120 x 35 mm, maximum cutting depth of approximately 30 mm and an output of roughly 1.1 kW will be procured.
- Each of the above four pieces of woodworking equipment are selected because they are convenient and simple to use.

6) Tables of Specifications of Equipment to be Procured

**Table 2-8 A. Management and Training Equipment**

Equipment Name	Q'ty	Specifications
1. Personal computer (English version with stabilizer, UPS, software and MO drive)	3	CPU (Pentium MMX 200 MHz), MS-Office, MO drive, etc.
2. Printer	3	Color, A3 size, ink jet
3. Scanner	1	Flat-bed type, A4, color scanner
4. Copier	1	A3 size
5. White board	6	Approx. 1800 × 17 × 900 mm
6. Slide projector	1	2 × 2 mount slide, circular tray
7. Screen	1	Approx. 70 × 70 inches, with stand
8. Overhead projector	1	265-305 mm variable focus lens
9. Television set (with video deck)	1	28-inch screen, VHS system, digital video (DV)
10. Digital camcorder	1	With LCD monitor
11. Microphone set (with speakers)	1	Wireless amp, microphone set
12. PC projector	1	LCD color projector
13. Radio set (including antennas) VHF: 1 base station 2 vehicle-mounted units 6 portable units HF: 1 base station 1 vehicle-mounted unit	1	
14. Micro-bus	1	Diesel, 26 passengers
15. Pick-up truck	2	4-wheel drive, single cabin
16. Motorcycle	4	For communication relay and transportation, 125 cc

**Table 2-9 B. Simple Testing Equipment**

Equipment Name		Q'ty	Specifications
1.	Laboratory table	1	With sink, approx. 2400 × 1200 × 800 mm
2.	Laboratory shelves	3	Approx. 900 × 450 × 1200 mm
3.	Laboratory revolving chair	6	Approx. 560 × 540 × 380 mm
4.	Stainless steel bowl (large)	5	Approx. 320 × 250 × 50 mm
5.	Stainless steel bowl (small)	5	Approx. 150 × 120 × 25 mm
6.	Stainless steel bucket	2	Approx. 240 × 240 mm
7.	Refrigerator for storing reagents, etc.	1	Cold chamber capacity approx. 200 ℓ
8.	pH meter	1	Measuring range 0.00-14.00 pH
9.	Plastic tray	2 sets	Diameter 75 × 20 mm, 50 pcs/pack
10.	Thermometer	10	Temperature range -20°C~+50°C
11.	Measuring cylinder (plastic)	5	Capacity 100 ml
12.	Measuring cylinder (plastic)	5	Capacity 500 ml
13.	Glass rod	20	Diameter 7 mm × 270 mm
14.	Beaker	100	Capacity 500 ml
15.	Flask	100	Capacity 500 ml
16.	Test tube	100	15 mm × 150 mm
17.	Test tube stand	2	For holding 50 test tubes
18.	Electric scale (digital)	1	Maximum 2000 g, minimum reading accuracy 0.1 g
19.	Scale	1	Maximum 12 kg, minimum reading accuracy 5 g
20.	Germination tester	1	Capacity 290 ℓ, 0-50°C, program control
21.	Soil sampling set	1	Soil sampling trowel, folding rod, magnifying glass, carrying case
22.	Soil sample cans and carrying basket	1	Single cover type, for carrying 6 sample cans
23.	Soil sample cylinder	3	Dual caps, Ø 10 × 20 cm, 6 cans per set
24.	Soil sieve	1	5-piece set (4, 2, 1, 0.5, 0.25 mm hole sizes), with cover
25.	Convex	5	5.5 m × 25 mm, steel
26.	Standard soil color chart	1	B6, 406 colors
27.	Soil moisture meter	1	With 40 lime block electrodes (35x52x12mm), electric resistant from 0.1-50/1-1000 kΩ
28.	Handy shovel	2	Folded length 50 cm, with canvas case
29.	Water purifier	1	Capacity 1.8 ℓ/hour
30.	Drying oven	1	Capacity approx. 160 ℓ, natural convection type
31.	Soil salinity tester	1	Measuring range 0-30%, digital display
32.	Pipette (medicine dropper)	5	Plastic, capacity 250 μℓ, includes 10 tips of 1-5 μℓ
33.	Pipette (medicine dropper)	5	Plastic, capacity 500 μℓ, includes 250 tips of 1-5 μℓ
34.	Standard storage container	10	Plastic, white, capacity 100 ml

**Table 2-10 C. Equipment for Nursery and Afforestation**

Equipment Name	Q'ty	Specifications
1. Safety belt for tree climbing	1	Length 2 m, elastic material with nylon fasteners
2. Branch cutting saw	5	High branch saw, 3-stage pole with saw, 1,740-4,400 mm
3. Sieve plate	1	Round hole sieve, 2.5, 3.0, 3.5, 4.0 mm, with cover
4. Thermometer	1	-20°C~+50°C, differential type
5. Rain gauge	1	Tipping bucket recording rain gauge, sensitivity 0.5 mm, DC drive
6. Seed storage refrigerator	1	Capacity 480 ℓ
7. Hand level	1	With telescope
8. Pocket compass	1	5 minute readings, with horizontal protractor, telescopic hand level both sides, tripod
9. Surveying pole	5	2 m, 2 poles joined, metal, with vinyl case
10. Insecticide sprayer	2	Capacity 15 ℓ
11. Pruning scissors	5	200 mm, leather stop
12. Convex	5	5.5 m × 25 mm, steel
13. Curvimeter	2	Needle type both sides, surface rotation 100 cm, 1 graduation = 1 cm
14. Soil agitator	1	Mixing capacity approx. 100 ℓ, engine drive
15. Potting stand	200	Plastic
16. Vinyl pot	200,000	4×6 inch: 100,000, 5×7 inch: 50,000, 6×8 inch: 50,000
17. Watering can	10	Plastic, capacity 5 ℓ
18. Sickle	10	Blade length 210 mm
19. Scythe	10	Afforestation scythe for weeding and brushing
20. Hatchet	10	Blade length 130 mm
21. Hoe	10	Blade 300 mm
22. Wheelbarrow	10	No-puncture tire, capacity 130kg
23. Jet shooter	10	Direct projection range 15 m max., water capacity 18 ℓ
24. Fire-fighting tools	10	Hatchet, portable shovel, mower, carrying bag
25. Chain saw	2	Displacement approx. 50 cc, guide bar 18 inch
26. Chain saw cut-loop chain	10	Pitch 325 inch
27. Saw chain grinding files	9 boxes	12 round files/box, 3/16 inch
28. Mower	5	Displacement approx. 25 cc, tank capacity 0.7 ℓ
29. Mower saw	50	8 blades
30. Grinding files	3 boxes	12 flat files/box
31. Compost chipper	1	Engine drive, capacity 0.3-0.5 m <sup>3</sup> /hour, can be carried

**Table 2-11 D. Work and Woodworking Equipment**

Equipment Name		Q'ty	Specifications
1.	Simple tool set	1	60 items (double-end spanners, etc.), with steel cabinet
2.	Air compressor	1	For vehicle air pumping
3.	Charger	1	0.4 kW
4.	Circular saw (with working bench)	1	Round saw 200 mm, max. cutting thickness 60 mm, 1.35 kW
5.	Woodworking lathe (with working bench)	1	Max. working diameter 170 mm, max. working length 750 mm, 0.4 kW
6.	Fret saw (with working bench)	1	Max. working thickness 50 mm, 0.1 kW
7.	Woodwork grooving cutter (with working bench)	1	Cutting blade size 120 × 30 mm, max. cutting depth 30 mm