

**THE FIRST TWO YEARS' REPORT
ON
THE RP-JAPAN TECHNICAL COOPERATION PROJECT
FOR
THE AFFORESTATION OF THE PANTABANGAN AREA**

November 1978

JAPAN INTERNATIONAL COOPERATION AGENCY

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JAPAN INTERNATIONAL COOPERATION AGENCY

THE FIRST TWO YEARS REPORT
OF
THE JAPAN TECHNICAL COOPERATION CENTER
FOR
THE RECONSTRUCTION OF THE HAWAIIAN ISLANDS

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FOR THE RECONSTRUCTION OF THE HAWAIIAN ISLANDS

PREFACE

The RP-Japan Technical Cooperation Project for the Afforestation of the Pantabangan Area was actually launched in late November 1976, on the arrival of two long-term experts. Those two experts are leaving the project very soon to be replaced by new experts. On this occasion, therefore, they planned to collect the information related to the project activities, together with two other experts who have worked with the former two since August, 1977, and also in cooperation with the RP-counterparts.

This report is primarily for compiling various materials related to the activities undertaken during the last two years, but some discussions and tentative comments are included in the chapter of Technical Exposition. Although there are little data, the experts certainly hope that such discussions and comments may favor further activities of the project in the coming years.

The Japanese experts are greatly indebted to all the RP-counterparts for compiling this report. Devoted cooperation of all the RP-counterparts during the period is also heartily appreciated. On this occasion, the experts should like to express their cordial gratitude to their counterparts and also to the short-term Japanese experts who have come and worked for the project since its start.

The experts should also thank the staff concerned of the Bureau of Forest Development, the Forest Research Institute, and relating agencies of the Philippines, and of the Embassy of Japan in Manila, the Japan International Cooperation Agency, especially her Manila Office and the Forestry Agency in Japan for their persistent support and cooperation.

Sumihiko ASAKAWA
Masanori TANAKA
Masayoshi SHINAGAWA
Osamu TAKASAWA

November 1978



A firm handshake between the Japanese Ambassador to the Philippines Kiyohisa Mikanagi (right) and Natural Resources Minister Jose J. Leido, Jr. (left) signalled the RP-Japan Technical Cooperation Project for the Afforestation of the Pantabangan Area on July 23, 1977 (after Philippines Evening Express, July 28, 1977)



Technical Cooperation Center Marinagalo, Carranglan, Nueva Ecija

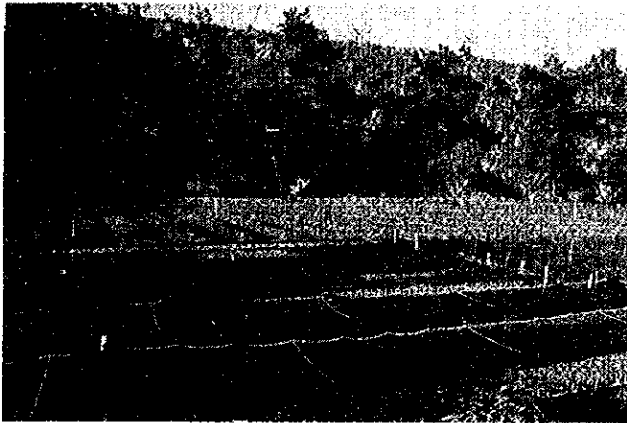
Baluarte Central Nursery for Parcel I



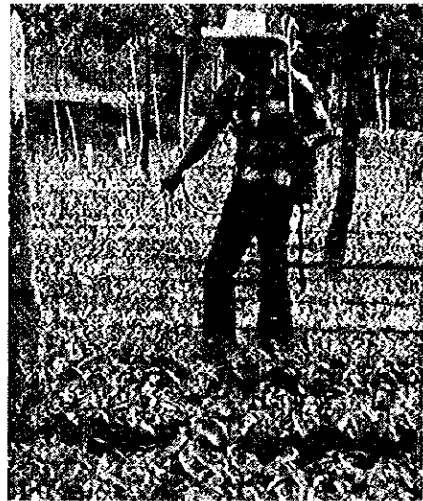
Just after opening
Photographed in February, 1977



Completed view
Photographed in June, 1978



Pine seedling beds installed with irrigation system and shades



Mahogany seedling beds sprayed with fungicide solution

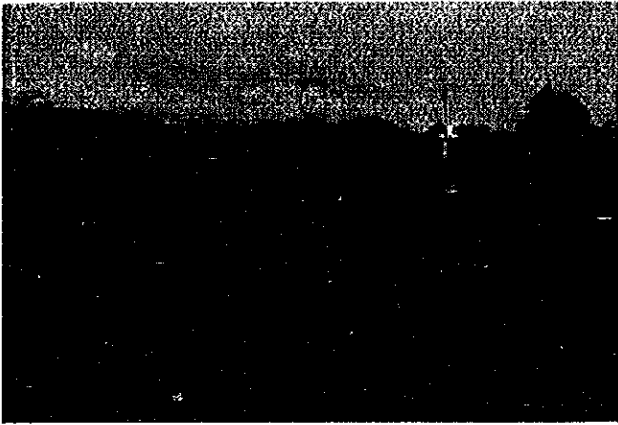
Central Trial Plantation



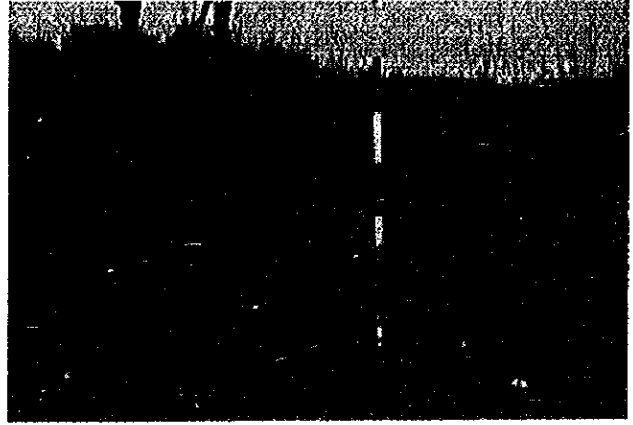
Signboard and the entrance of forest road



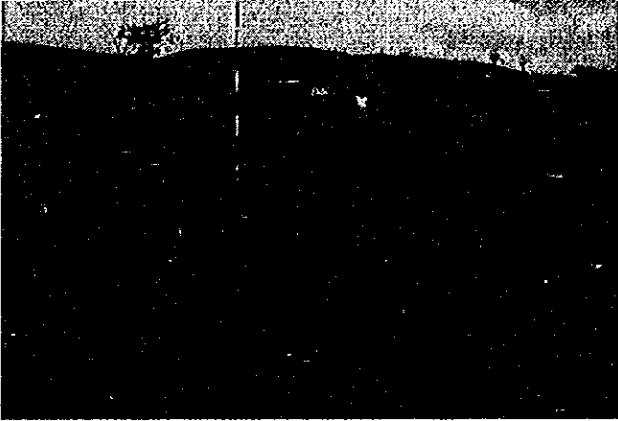
Giant ipil-ipil: 15 months old
Leucaena leucocephala: peruvian type
Planted in June, 1977
Photographed in September, 1978



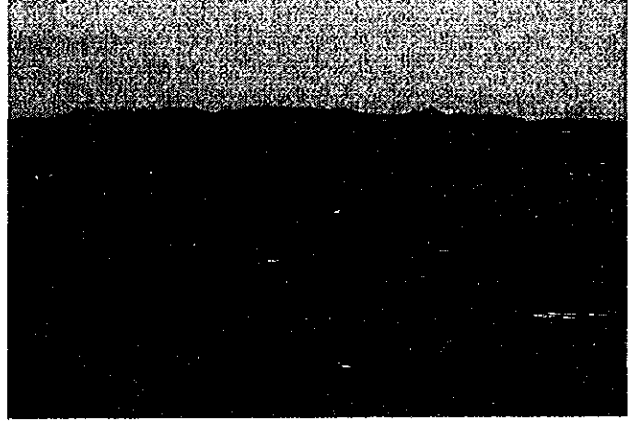
Benguest pine: 15 months old
Pinus kesiya
Planted in June, 1977
Photographed in September, 1978



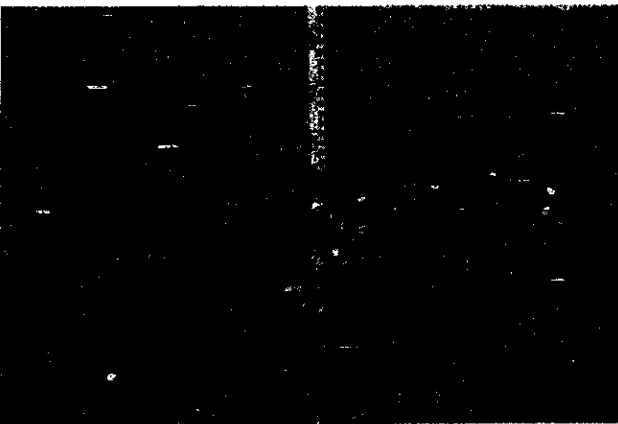
Caribbean pine: 14 months old
Pinus caribaea var. *hondurensis*
Planted in July, 1977
Photographed in September, 1978



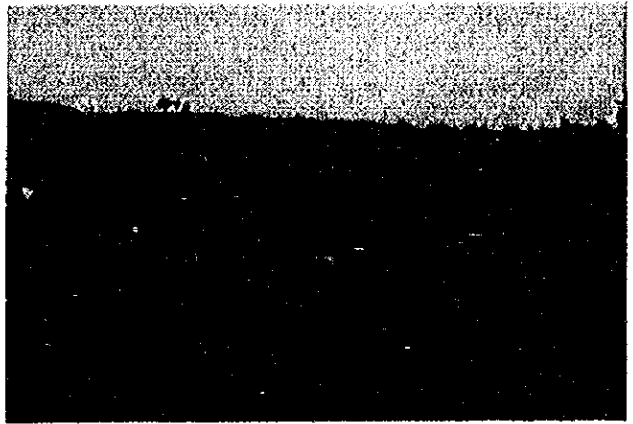
Narra: 14 months old
Pterocarpus indicus
Planted in July, 1977
Photographed in September, 1978



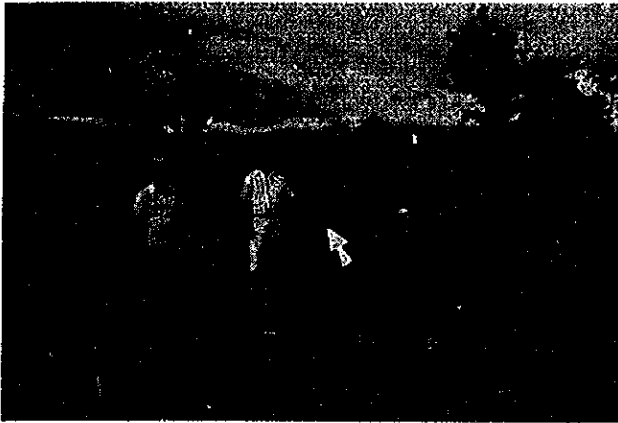
Teak: 15 months old
Tectona grandis
Planted in June, 1977
Photographed in September, 1978



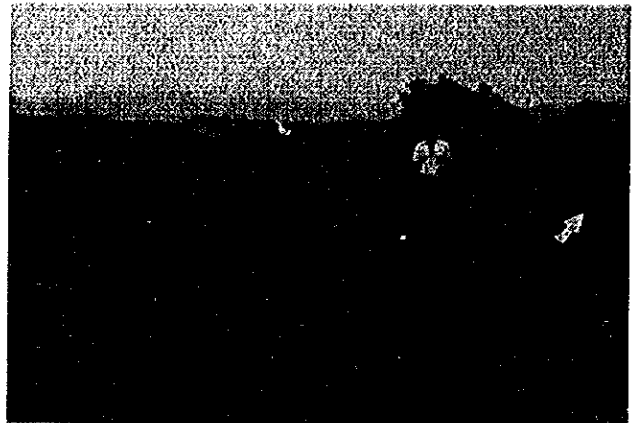
Camphor: 4 months old
Cinnamomum camphora
Planted in June, 1978
Photographed in October, 1978



Mahogany (Large-leaf mahogany): 15 months old
Planted in July, 1977
Photographed in October, 1978



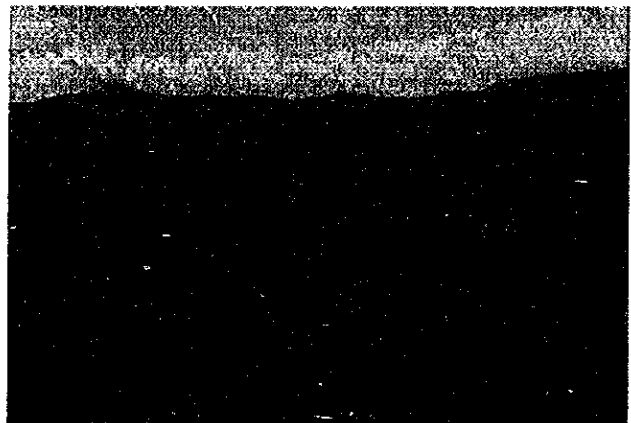
Narra: 11 months old
Planted on July 23, 1977
Photographed on June 27, 1978



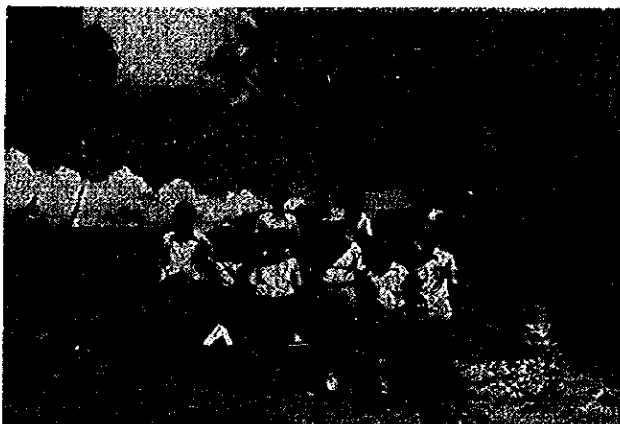
Narra: 13 months old
Planted on July 23, 1977
Photographed on August 22, 1978
The Plant with an arrow is the same as
the one with an arrow in the left picture.
The difference shows the growth for two
months.



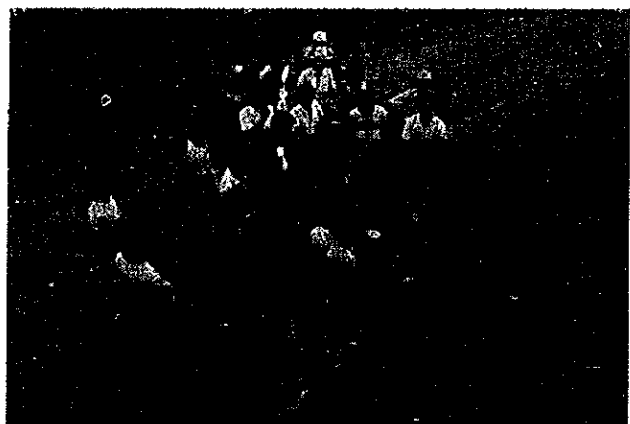
Talatalan Central Nursery for Parcel II con-
structed by the special fund provided by JICA:
photographed in January 1979



Newly established plantation in Parcel I just
after strip-weeding: photographed in August,
1978



Mr. I. IMAI, Japanese Diet Member, and his
group visited the project site. (Aug. 29, 1977)














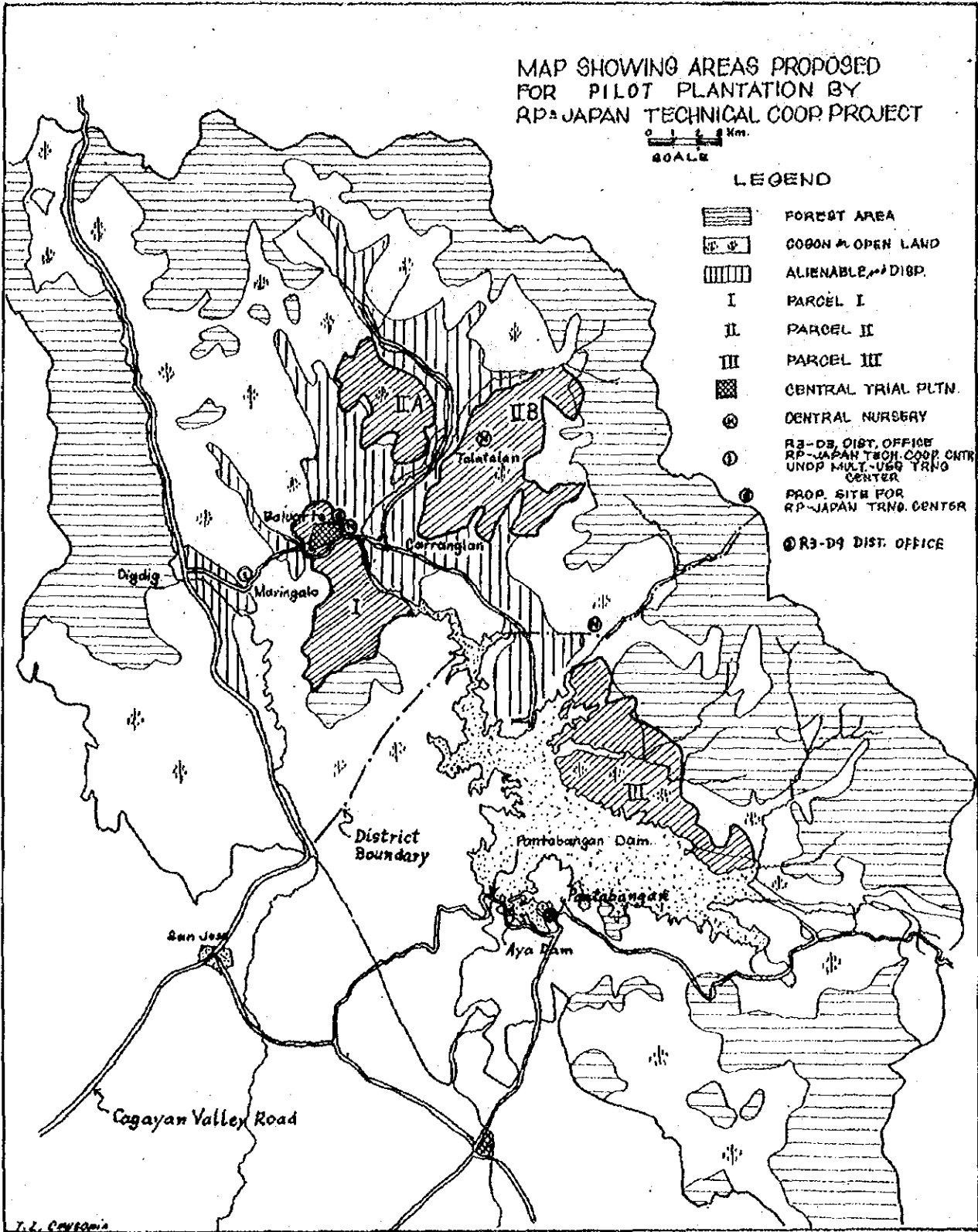
Field seminar on the physical properties of soil
(October 25, 1978)

MAP SHOWING AREAS PROPOSED
FOR PILOT PLANTATION BY
RP-JAPAN TECHNICAL COOP PROJECT

0 1 2 Km.
SCALE

LEGEND

-  FOREST AREA
-  COBON & OPEN LAND
-  ALIENABLE & DISP.
-  I PARCEL I
-  II PARCEL II
-  III PARCEL III
-  CENTRAL TRIAL PLTN.
-  CENTRAL NURSERY
-  R3-D8 DIST. OFFICE
RP-JAPAN TECH. COOP. CNTR.
UNDP MULT.-USE TRNG.
CENTER
-  PROP. SITE FOR
RP-JAPAN TRNG. CENTER
-  R3-D9 DIST. OFFICE



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#1. Objective

This technical cooperation project aims at the development of various techniques so as to contribute to successful afforestation in the open grassland and other denuded land of nearly 50,000 hectares in the Pantabangan Area which is one of the most important watersheds in the Republic of the Philippines.

#2. Project Site

The project site is located in the Pantabangan area, Nueva Ecija, Central Luzon (ca. 16°N & ca. 121°E). The area covers the northeastern part of the province and adjoins Cagayan River watershed by a branch of the Sierra Madre Mountains. The Pampanga River, taking its source in this divide, flows to the south through the Central Plain of Luzon and into Manila Bay.

The dam was constructed through a World Bank Loan along the Upper Pampanga River, mainly for flood control, irrigation and electricity. It was completed in 1974 and a power plant of one hundred megawatts capacity has been in operation since June, 1977. The resulting reservoir covers nearly 8,000 hectares at its full water level and its maximum water level is 220 meters above sea level. The catchment area covers about 80,000 hectares. The actual site is located in three parcels within the catchment: Parcel 1 in the northwest, Parcel 2 in the north, and Parcel 3 in the east of the reservoir.

These three parcels were formerly under the jurisdiction of the Upper Pampanga River Basin Multiple-Use Management District (R3-D3), Bureau of Forest Development (BFD). However, the District was divided into two and as a result, Parcel 3 now falls under the jurisdiction of the newly created Forest District in Pantabangan (R3-D9).

The watershed is covered by two municipalities: Pantabangan and Carranglan. Parcels I and II (A, B) are located in Carranglan while Parcel III is located in Pantabangan.

The population of both municipalities is as follows:

	Pantabangan	Carranglan
1960	8,169 (159.2)	10,100 (159.6)
1970	12,998 (159.1)	15,536 (153.8)
1975	18,074 (139.1)	16,875 (108.6)

(Note) Numerals in parenthesis show the percent to the preceding census. Population in 1960 is compared with the 1948 census.

Age distribution is greatly biased to young generation. According to the 1975 Census, the number of both sexes from 15 to 44 years old is 6,798 in Carranglan. Nearly half of this number could be the source for labor forces. In addition, there is another source with more population in Pantabangan, although at present, there is no direct route along the reservoir from Pantabangan to the project site.

3. Natural Environment

The average annual temperature is 28°C and average annual rainfall is 1,965 mm for the past years, although the latter ranges from 1,531 mm (1975) to 2,342 mm (1972). But the area is usually subjected to very severe dry season for more than half year - from November to May. The climatic record shows that rainfall is very intermittent even during the rainy season. (Figs. 1 to 3 & Annex 1)

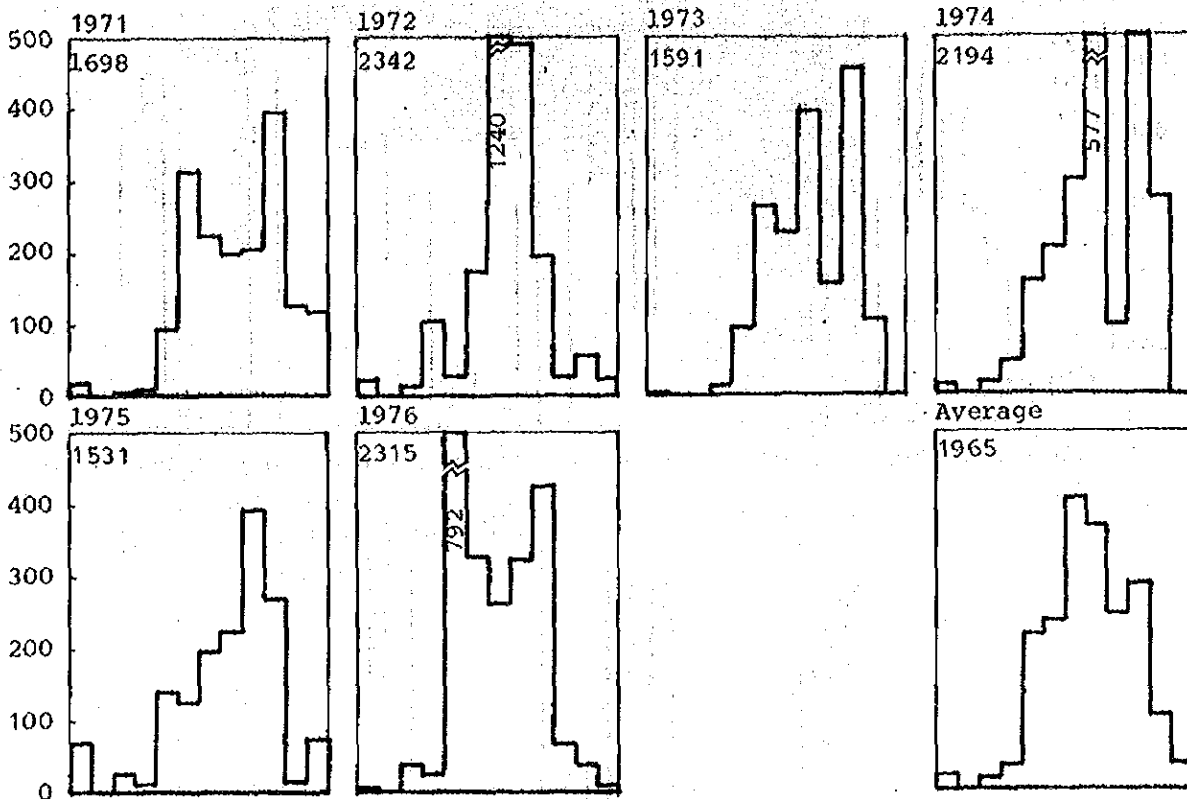
The area is classified into two geological types: one is the type with alternate layers of non-solid gravel and shale belonging to new tertiary formation, and the other is the type in which the surface is covered with protruded igneous rock allied to diorite.

The whole catchment area may be classified into the following topographic types: alluvial, plateau, rolling hills, mountainous, and steep mountains. The actual sites proposed, however, consist roughly of rolling hills and mountains, which range from 230 to 800 meters above sea level.

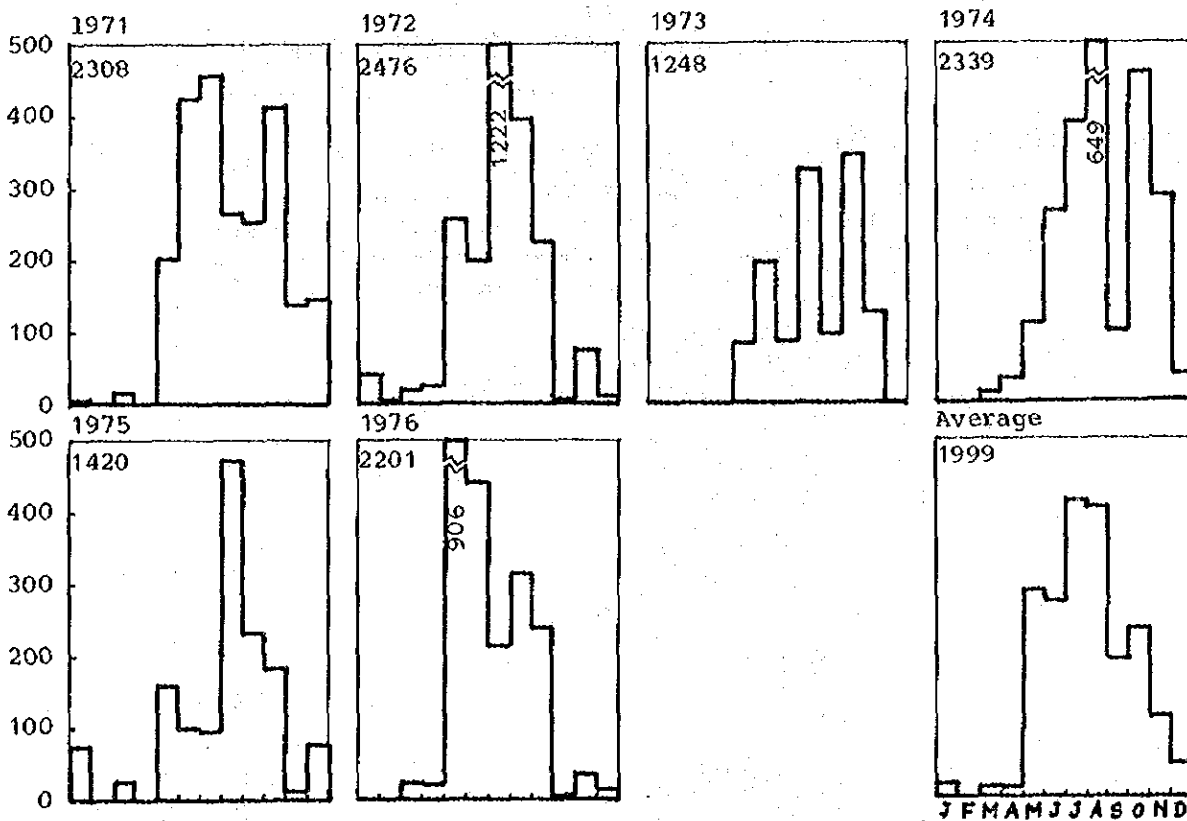
Soils in the area generally belong to red podosolic soil. Surface soil is a little dark and lower layer is reddish brown. During dry season, the soil is very hard and compact, and its physical properties are poor. Soil fertility is dependent on the difference of topography, geology, and soil. Generally speaking, however, the soils in the area are acidic and infertile.

It is said that the whole area below 1,000 meters above sea level used to be a tropical rain forest, but at present most parts have been looged-over. In the northern and northeastern parts,

natural forests of Pinus kesiya seem to be distributed on the ridges higher than 700 meters above sea level. Almost all the area located below 800 meters is occupied by grasses which are predominated by cogon (Imperata cylindricum), talahib (Saccharum spontaneum) and samon (Themeda triandra), although there are some natural forests left in strips or spots.

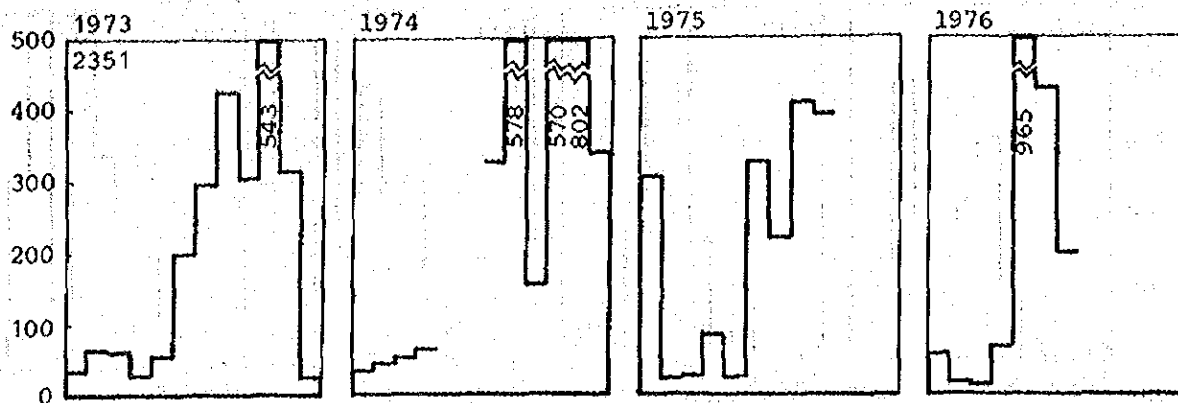


RP-Japan Technical Cooperation Center, Maringalo, Carranglan

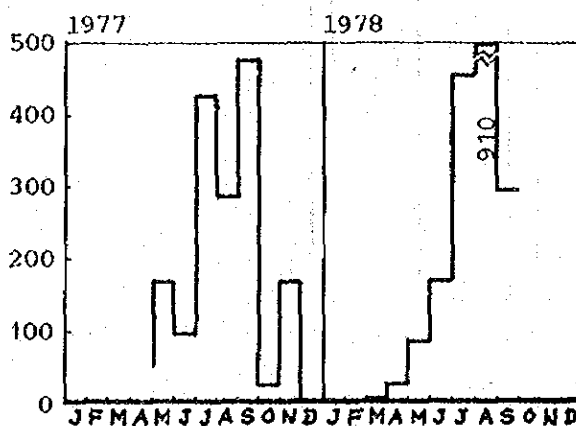


Palayupay, Pantabangan (between Pantabangan and Aya Dams)

Fig.1 Monthly rainfall in the Pantabangan Watershed (1) See Notes in (2).



Canili, Ma. Aurora, Quezon (formerly, Lublub, Pantabangan, Nueva Ecija)



RP-Japan Central Nursery, Baluarte, Carranglan

Fig.2 Monthly rainfall in the Pantabangan Watershed (2)

Ordinates: rainfall in mm; Abscissae: month
 Numeral below year shows the total rainfall of the year.
 Numeral on the column broken shows the rainfall of the month which exceeds 500 mm.

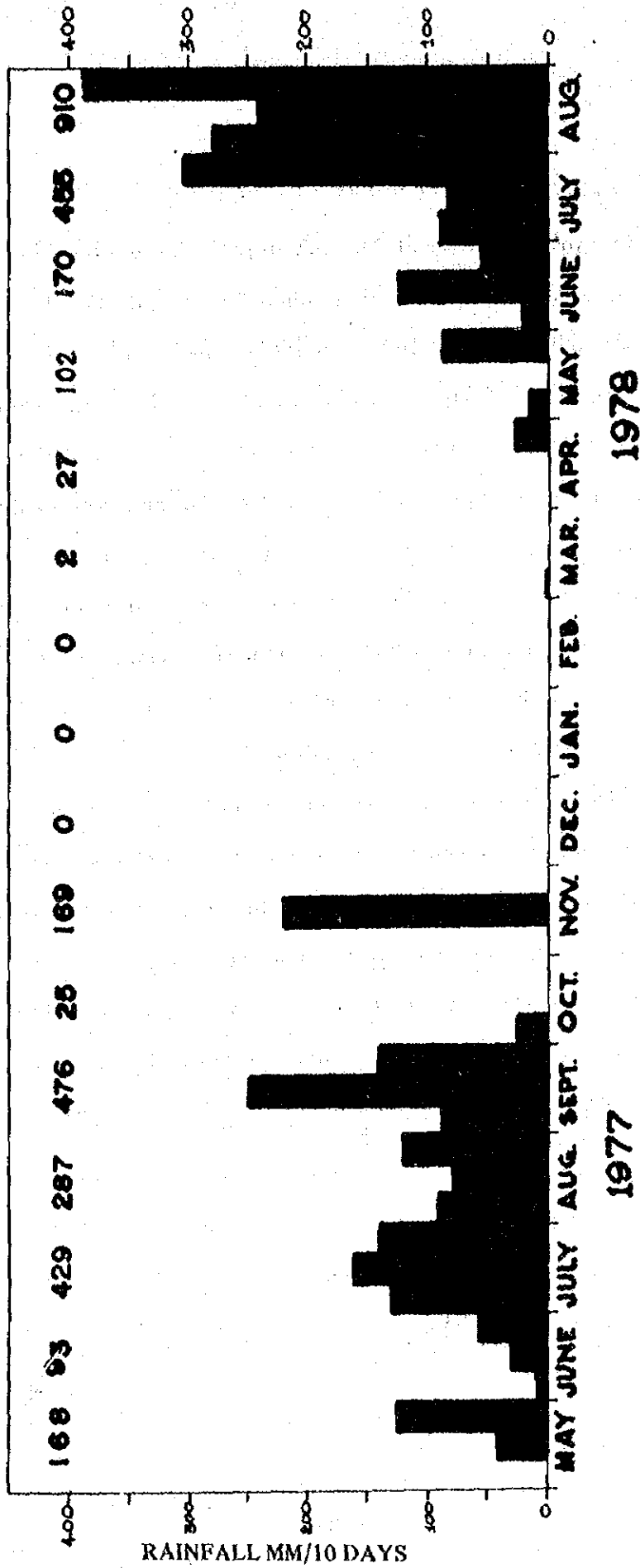


Fig. 3 Rainfall by every ten days at Baluarte Central Nursery

4. Basic Plan

The project aims at the development of various afforestation techniques applicable on grasslands, including the training of personnel, so as to contribute to the large-scale afforestation of about 50,000 hectares in the Pantabangan area. In order to achieve this objective, a trial plantation is established, at first, where the various individual techniques are examined. This is followed by the establishment of a pilot plantation where studies will be carried out for the systematization of various afforestation techniques, including managerial trials. Necessary training of personnel may be carried out right in the project or they are sent to Japan for a few months training.

This project is the first technical cooperation in forestry between Japan and the Philippines. Most probably, therefore, some modifications in the cooperation scheme were expected to arise during the process of implementation. Consequently, the cooperation has been based on the Record of Discussions already mentioned, for the first two years, although the plan prepared is for a total of seven years. At present, a new bilateral agreement is under discussion.

5. Program

To accomplish the objective mentioned, a plantation of 8,100 hectares will be established during the period of seven years. Of the total area, 1,300 hectares are trial plantations where individual techniques are developed. The remaining 6,800 hectares are pilot plantations where the techniques developed are systematized. The yearly plan of major activities is tentatively prepared as follows:

Year	Plantation		Forest Road Construction (km)
	Trial (ha)	Pilot (ha)	
1977	200		5
1978	600		30
1979	500	1,300	40
1980		2,500	30
1981		3,000	20
Total	1,300	6,800	125

Some thirty spots of erosion control work will also be implemented for six years.

The followings are major items to be examined and analyzed through the establishment of trial plantation: suitability of species, varieties, or provenances, spacing, size and quality of planting stock, planting method, interplanting, fertilization, etc. To carry out the plan as scheduled, studies are also needed on forest road system and effective fire protection scheme.

#6. Activities During the Last Two Years

I. Core of Management for the Project

1. Organization:

The organization of this project which is based on the record of discussions signed on 18th of June 1976 is composed of Central Office, Technical Cooperation Center in the job site, and Joint Committee between the Philippine and Japanese sides. The Central Office set up in Reforestation and Afforestation Division headed by Project Director who is Chief Officer in Charge of the Project.

The planning and controlling project and the liaison matter is being conducted at the Central Office. A Japanese Chief Advisor is stationed at the Central Office to help and advise the Project Director mainly in the technical matters since November, 1976.

The Technical Cooperation Center which is set up in UPRB-MUMD is being headed by a Project Leader. RP-Counterparts are stationed with Japanese Experts at the Cooperation Center. Every activity including the establishment of trial plantation and organization of training has been undertaken by RP-Counterparts under the technical assistance and guidance of the Japanese Experts.

At present two nurseries and motor pool is attached to this cooperation center. The two nurseries which are being

managed by Officer in Charge assigned respectively were established in Baluarte for Central Trial Plantation and Parcel I and in Tala-talan for Parcel II.

In order to meet the demand of planting stock, a new nursery in Parcel III was opened last September, 1978.

At present, there are three Japanese Experts including the Team Leader stationed at the Technical Cooperation Center, Maringalo, Carranglan, Nueva Ecija to conduct their mission, while other nine experts from Japan have been dispatched on short-time basis in order to develop various techniques which will be applied for the establishment of plantation in the open land and to have these various techniques inculcated effectively into the minds of the RP-Counterparts.

Aside from the regular counterparts assigned at Maringalo, two counterparts were dispatched on part-time basis to help implement the project.

In order to implement the project effectively and manage it well, two assistants to the Project Leader have been designated in July 1978.

The Joint Committee, presided by BFD Director was organized by Special Order on March 1977 to formulate annual plan and to discuss important matters related to implementation of the project.

As for the committee, meetings were held three times; on 30 June 1977, 18 November 1977 and 8 May 1978.

2. Equipment and Machineries:

Various equipment, machineries and vehicles needed for the implementation of the project were provided by the Japanese Government based on the Record of Discussions. These machineries were introduced to rationalize the forest operation and to ease the hardship of the work.

For better management and effective operation, these machineries were tested in the nursery and in the plantation. There are also equipment used for training and experiments. The machineries and equipment received so far were equivalent to one hundred seventeen million yen (170 million yen).

Other equipment are expected to arrive early next year.

3. Training

Training in Japan for RP-Counterparts has been undertaken since late 1976. This is in line with the effective inculcation of forestry techniques. Five counterparts have already been to Japan and two counterparts are now undergoing the training. They are expected to contribute for the development of the project. Aside from the training in Japan, off the job training as well as on the job training is being conducted for every personnel concerned. The training includes seminars, workshops or field discussions.

II. Accomplishment During the Last Two Years

1. Initial Steps of the Project:

Based on the Record of Discussions signed in June 1976 by the representatives of both the Philippines and Japan, two Japanese Experts, a Chief Adviser and a Silviculturist arrived on the 24th of November 1976 to start the RP-Japan Technical Cooperation in the Afforestation of Pantabangan Area.

General surveys were undertaken in the project site to get the information related to the implementation of the project. While the preparation for the project was being made, the Central Office of the project was located in the ProFEM building completed in January 1977. Following shortly was the completion of the cooperation center located in Maringalo, Nueva Ecija.

The first meeting of the Joint Committee was held on the 30th of June 1977 to formulate annual program. Several meetings were conducted between RP- and Japanese-Counterparts to discuss every matter related to the implementation of the project. In one of the meetings, a new Parcel I was determined in lieu of the previous proposal of the Japanese Mission.

On the other hand, the opening of the central nursery as the first step for the cooperation project was initiated at Barrio Baluarte.

2. Establishment of Central Nursery:

To raise the maximum number of seedlings essential to the establishment of plantation, the central nursery was opened in January 1977 at Barrio Baluarte which is 6 kilometers away from the Cooperation Center. A former nursery for ProfEM was turned over to our Central Nursery to provide the necessary area. However, due to limited time, only four hundred thousand seedlings were produced while six hundred thousand were needed for the coming planting season. To cover up deficit of two hundred thousand, seedlings were secured from other reforestation projects.

Main species include Caribbean Pine, Occarpa Pine and Slash Pine. Studies on various technical development of raising seedlings have been conducted to rationalize the nursery activities. The central nursery with production capacity of more than one million seedlings has been utilized as seedling production center as well as training and research center.

3. Establishment of Central Trial Plantation:

After the opening of the Central Nursery, the proposed site for central trial plantation was surveyed. The Central Trial Plantation is expected to be a site for the development of individual techniques related to establishment of plantation especially in the grassland.

The central trial plantation is located along the provincial road in Baluarte, Carranglan, Nueva Ecija. It will

serve as a demonstration forest in the future as well as a site for the development of individual techniques and for training because of its accessibility.

The first planting activity was started in June 1977 after waiting for rain for a long time.

In the preparation of the planting program, the Central Trial Plantation has been classified into three portions based on its site productivity, that is, compartments A to D for relatively plain grassland with stagnant water, compartments E, F, G, Q, R and S for relatively fertile soil, and other compartments for mountainous area. Likewise, the species have been categorized into three groups, fast-growing species, pine group and the long rotation broad-leaf species.

Principally, every species of each group was distributed and planted on the three different portions classified based on site condition so as to be able to make comparison of growth response among three classified sites.

At the same time, different experimental studies on planting techniques such as fertilization trials, spacing, weeding and inter-planting were established for further observation. Those help the way to establish the following trial plantations and 180 hectares of plantation were completed at the end of August 1977. Simultaneously after outplanting, weeding and fertilization were conducted in September, 1977.

In addition to Central Trial Plantation's establishment, a memorable event called the Kick-off Tree Planting was held on July 23, 1977. This Kick-off Tree Planting was participated by the heads of different government agencies. To mention them are as follows:

1. Mr. Mikanagi - Japanese Ambassador to the Philippines
2. Jose J. Leido, Jr. - Minister of Natural Resources (formerly Department of Natural Resources)
3. Edmundo V. Cortes - Director, Bureau of Forest Development
4. Rogelio B. Baggayan - Chief, Reforestation & Afforestation Division, BFD
5. Mr. Palomares - Chief Engineer, UPRP, NIA
6. Governor Joson - Office of the Governor, Nueva Ecija
7. Mayor Romeo Padilla - Municipal Mayor, Carranglan, Nueva Ecija

4. Trial Planting in Parcel II-B:

After the establishment of Central Trial Plantation, trial planting in Parcel II-B was conducted in September 1977 to get the various data which will be helpful for larger scale plantation. Also weeding activities and fertilization followed.

In spite of relatively late planting, planted stocks could get high survival and good growth because of fertile soil. At the beginning of dry season, the temporary nursery for next year (1978) was opened with CT-35 type tractor donated by Japanese Government through JICA.

5. Fire Protection:

One of the enemies in the reforestation projects is fire which will take place very frequently during dry season.

Recognizing that every effort on making plantation will be in vain without effective protection measures, many activities on fire control had been conducted since the beginning of dry season. As to the construction of fireline, fireline of 8 kilometers was completed with width of 15 meters which surrounded the entire central trial plantation to avoid the penetration of fire from outside. It was constructed along the forest road which was also intended to be utilized as a firebreak. Moreover, inner fireline was made inside plantation to enable to take some diminishing measures when fire enters to plantation unfortunately. At the strategic portions like Compartment No. D or E, extra outer fireline was made to reduce the speed of fire penetrating to plantation.

The fireline was cultivated three times by tractors to remove fuel completely.

Aside from fireline, more or less 30 patrollers including fire fighters were assigned to undertake their primary duty as well as extension work.

Those measures were adopted for Central Trial Plantation of about 180 hectares made in 1977. In other words, main fireline was constructed by the density equivalent to 40 meters per one hectare. Also one patroller was assigned for every

10 hectares. Those come from experience in the past years. The concept of density in construction of fireline and in assigning of patroller should be studied further more from various viewpoints.

In spite of such intensive protection, 30 hectares of trial plantation in Parcel II-B were hit by fire on 25th March 1978. The fire was reportedly caused by careless mistake of somebody who entered into the forest land from our plantation.

Intensified protection measures were introduced after discussion on the report of the fire damage submitted by Project Leader. It included setting up "streamers" across the provincial road, distribution of T-shirts appealing fire protection, or movie show for information and dissemination to the rural people. The forest fire which took place in Parcel II-B was discussed at the 3rd meeting of the Joint Committee for further attention.

6. Establishment of plantation of 600 hectares:

The working plan for 1978 was discussed at the 2nd meeting of the Joint Committee held on 18th November 1977 at Maringalo. The proposed target of 400 hectares was revised into 600 hectares after careful discussion among the members.

Based on the discussion of the meeting, raising of seedlings to be needed for 1978 was started in two nurseries, Baluarte and Tala-talan.

While survey on planting site and survey on mortality in nursery was conducted to check the number of seedlings by species to be needed, temporary nursery was opened at Piut to cope up with seedling requirement and also to raise new species, namely, Pinus caribaea var. bahamensis.

By that time, various machineries and equipment had arrived from Japan to help rationalize nursery and planting operation. These include potting houses, shed houses, shade net, sprinkler system, tractors, trucks and so on.

The primary program for seedling production was supposed to raise one million which can be outplanted in the plantations of 400 hectares. Since the Joint Committee mentioned above decided to increase the target to 600 hectares, another 500,000 seedlings were needed, which was expected to be provided from other reforestation projects based on the discussion of the Joint Committee.

However, every effort was taken to self-produce seedlings as many as possible. Finally, we could produce the seedlings of 1.3 million; 700,000 in Baluarte, 500,000 in Tala-talan and 100,000 in Piut.

In May, preparation for planting was started as programmed. After digging operation, filling up was carried out in Central Trial Plantation made last year, the last week of May.

Planting was started on the 1st of June in Parcel I and Parcel II-B simultaneously. We encountered some difficulties in hauling of seedlings which should be brought to planting site in advance/in time. This was not recognized last year because the plantation to be established was rather small in its scale. Fortunately, ordinary trucks and dump trucks could solve this problem by quick and mass hauling because access road of about 10 kilometers had already been constructed.

Another problem like lack of crude oil for machinery, which we had in process of development of planting, was solved properly and promptly by RP-Counterparts and personnel concerned.

Finally, we could exceed our target of 600 hectares by more than 200 hectares due to very favorable weather condition.

Accomplishment breakdown by different parcels is as follows: 20 hectares in Central Trial Plantation, 340 hectares in Parcel I, 410 hectares in Parcel II-B and 30 hectares in Parcel III were newly planted.

7. Forest road construction:

Forest road is inevitable not only for logging operations, but also for reforestation works. And also, it can help better and effective forest management, especially in tending and protection. Forest road with a total distance of 125 kilometers is scheduled to be constructed in our project site to implement

cooperation project successfully. In 1977, 4 kilometer-forest road for Central Trial Plantation was constructed on contract basis under the close supervision of the project. Another 15 kilometers has been made by administration in Parcel II-B by the end of September 1978.

More consideration should be given to selection of route of forest road to be constructed. Route of forest road was selected in higher portion of the mountain to ease difficulty of hauling seedlings and some other materials and to minimize the number of drainage to be installed.

It will be also advisable to control the erosion along the road which will take place in the construction work of forest road. As to the method of cut and pile of slope, vertical cutting method was applied to avoid soil erosion. However, performance of constructed forest road is not always satisfactory to some extent because of short experience of operators.

Further training for operators is needed for construction of forest road as designed. The items to be studied include preferable effective width in open grass land, structure of shoulders, drainage facilities as well as the concept of forest road density per hectare which can be a criteria in determination of forest road net work.

8. Erosion control:

There was eroded area of 1000 square meters near the nursery which was caused by intensive rainfall in May 1976. Some demons-

tration work for erosion control was conducted there at the back of Baluarte nursery in 1977.

In order to stop horizontal erosion in creek, wet stone work with 2.5 meters in height and 33 meters in length was undertaken first while hillside work of vegetative cover was followed.

Since it was already October, replacement of Cogon grass with soil was introduced instead of sowing grass seed. Simultaneously vegetative bags with soil, seeds and fertilizer from Japan were used in lower portion for experimental aspect. Moreover, several pegs made of bamboo were set for further stabilization of moving soil.

In 1978, six spots in proposed planting site were selected for erosion control works.

Combination work of structural and vegetative cover has been carried out.

9. Research

Various research studies have been conducted in Central Trial Plantation and also in trial plantations of different parcels to develop the appropriate techniques to be applied in making plantation and to systematize developed individual techniques.

Details will be discussed in next chapter (#7). Main items taken up so far include the selection of species including exotic species like Caribbean Pine; nursery techniques including the proper size of seedling; planting techniques like the method

of cultivation; protection measures; construction techniques of forest road and establishment of erosion control works.

Many experimental spots related to those items have been established and observed by RP-Counterparts for collecting data.

And short-term Experts from Japan have contributed to the further study in the form of giving fundamental data or introducing the analyzing methods. List of experimental studies conducted so far is attached in Annex.

10. Training:

Technical transfer which is a main objective of this project has been conducted to the counterparts with taking various opportunities. While on-the-job training is given to the counterparts through implementation of the project, off-the-job training is also considered to be held as one of the measures for technical transfer.

Whenever specific items to be discussed arise, some lecture or dispute is prepared for RP-Counterparts by Japanese Experts, if necessary. Moreover, seminars and field practices are held when Japanese short-term experts are dispatched.

As many visitors and trainees make their observation in this project, there are so many chances for counterparts to give them lectures.

This can serve as good training for RP-Counterparts because they have to be acquainted with various items including technical matters which can be applied for other projects.

#7. Technical Exposition

1. Planting Materials

The selection of planting materials is one of the most important items for reforestation and afforestation. Planting materials may be discussed under three major groups: fast-growing species, pines and broad-leaved species for long rotation.

Fast-growing species:

Fast-growing species could be promising planting materials from a viewpoint that the grassland of the catchment should be rehabilitated with forest stands as soon as possible. The group includes: Albizia falcata, leucaena leucocephala (Giant Ipil-ipil and so-called local ipil-ipil), Gmelina arborea, Casuarina equisetifolia, Samanea saman, and Eucalyptus deglupta, all of which are very popular in the Philippines.

In addition, three exotic eucalypts and Acacia auriculaeformis were introduced from Australia. Three eucalypts are E. camaldulensis, E. tereticornis, and E. torelliana. E. camaldulensis is the most widely distributed of all eucalypts. It occurs along or near almost all of the seasonal watercourses in the arid and semi-arid areas. E. tereticornis is closely related to E. camaldulensis, although the natural distribution is different from each other. E. torelliana is the only species in tropical Australia which grows in competition with rain forest vegetation.

However, the performance of scattered existing plantations of fast-growing species is not so hopeful unless the plantations are subjected to good care including fertilization. The plantations may not aim at timber production at the beginning, but later they require the treatments from ecological and managerial viewpoints and consequently produce timber. Therefore, planting materials should desirably be the species suited for future demand. From this point of view, pines and broad-leaved species with long rotation are more desirable. The former is the material for long-fiber pulp as well as lumber and the latter is for lumber. The variation in planting material is very desirable in order to meet various demands anticipated and also to protect the stands from various damages.

Pines:

Pines were expected to be one of the most hopeful candidate species for the project site consisting mainly of devastated grassland, because it is well-known that pines are rather tolerant to infertile site.

In the Philippines, there are two indigenous pines: one is Pinus kesiya (Syn: P. insularis, P. Khasya; Benguet Pine) and the other is P. merkusii (Mindoro Pine). Natural distribution of both species is shown in Fig. 4. P. kesiya grows in the highlands of Northern Luzon (Mountain Provinces and adjacent several provinces) and the total area of its natural stands reportedly amounts to nearly 200,000 hectares. In the Pantabangan area,

natural stands of P. kesiya are also scattered above 700 meters a.s.l. in the Sierra Madre Mountains. Generally, it grows well between altitude of 800 to 2,500 meters a.s.l., but in Zambales, some natural stands are reported at much lower elevations. In the Philippines, P. kesiya seems to have been used for reforestation since early twenty century. Both in Carranglan and San Jose Reforestation Projects, it is reported that some 1,000 hectares of P. kesiya plantation have been established after 1940. Probably because of repeated fire, however, the area of existing stands is very much limited, and their performance is also not so good. A few provenances in Thailand were also introduced and outplanted in 1978.

On the other hand, P. merkusii is distributed both in Zambales, Luzon and in Mindoro. In Zambales, it grows from 100 meters a.s.l. and forms either a pure stand or mixed stand with some dipterocarps. Reportedly, P. merkusii has two varieties: continental and island varieties. The former has grass-stage during seedling development. It is reported that P. merkusii in the Philippines belongs to the former, which may have decreased the value of the species in reforestation. However, there are the cases in which there is no significant difference in growth between both varieties after eight to ten years.

Besides those two native pines, three exotic pines have been taken up for trial. Two of them are tropical pines: Pinus caribaea and P. oocarpa which have been planted at various parts

of the world. For P. caribaea, P. caribaea var. hondurensis and P. caribaea var. bahamensis, were introduced. Another one is P. elliottii var. elliottii which is naturally distributed in higher latitudinal area.

In the tropics, there are thirty-three pine species (Critchfield and Little, 1966). Eight species among them are distributed in the Southeast Asia and the remaining in the Central America. Natural distribution of selected pines is shown in Figs. 4 & 5.

More species should be tried but there is a difficulty in obtaining the seeds. Additional two pines, P. patula and P. eldarica, were introduced later and they will be planted in 1979. Critchfield and Little (1966) classified P. eldarica as a variety of P. brutia. Its natural distribution is confined to Caucasus, but it is reported that this species grows fairly well under very dry condition.

Broad-leaved species for long rotation:

The broad-leaved species for lumber are a group to be considered for the multiplicity of planting materials. The following species are taken up from this viewpoint: Pterocarpus indicus (narra), native to the Philippines, and Tectona grandis (Teak) and Swietenia macrophylla (large-leaf mahogany) with both of which, there are more experiences in the area. Under long rotation, Eucalyptus deglupta will be one of this group.

Dipterocarp species which had thrived in the area before should be most suitable to the area. However, techniques for the artificial regeneration of dipterocarps have not been established yet, although there is the case in which man-made dipterocarp stand was established by well-programmed planting and tending scheme.

Others:

To contribute to the living improvement of the residents in the vicinity, fruit trees may be included into the list of planting materials. In fact, cashew-nut trees have been planted for rather large area under the previous special project of MNR (the present priority project of PROFEM).

Fig. 4 Natural Distribution of *Pinus kesiya* & *P. merkusii*

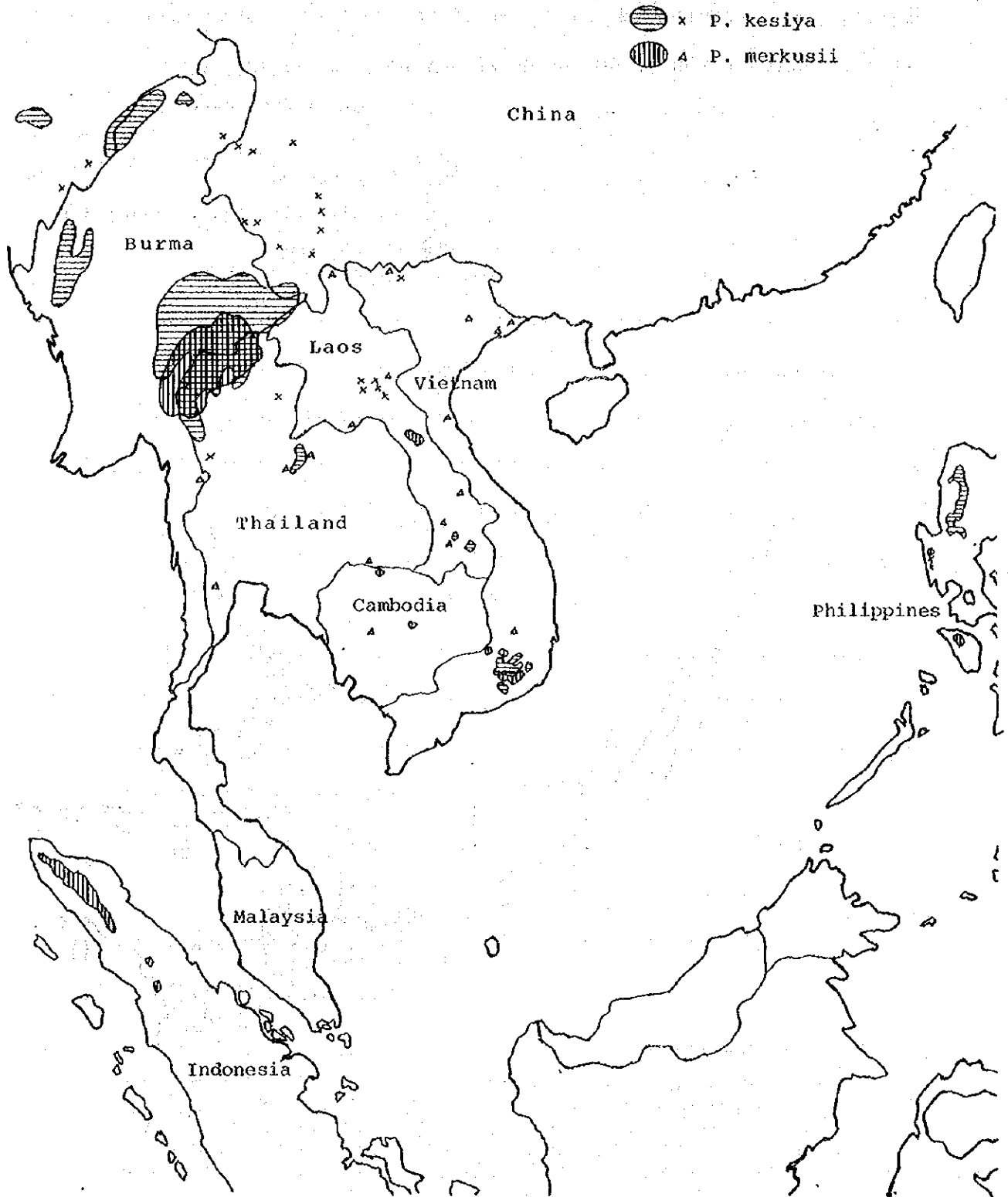



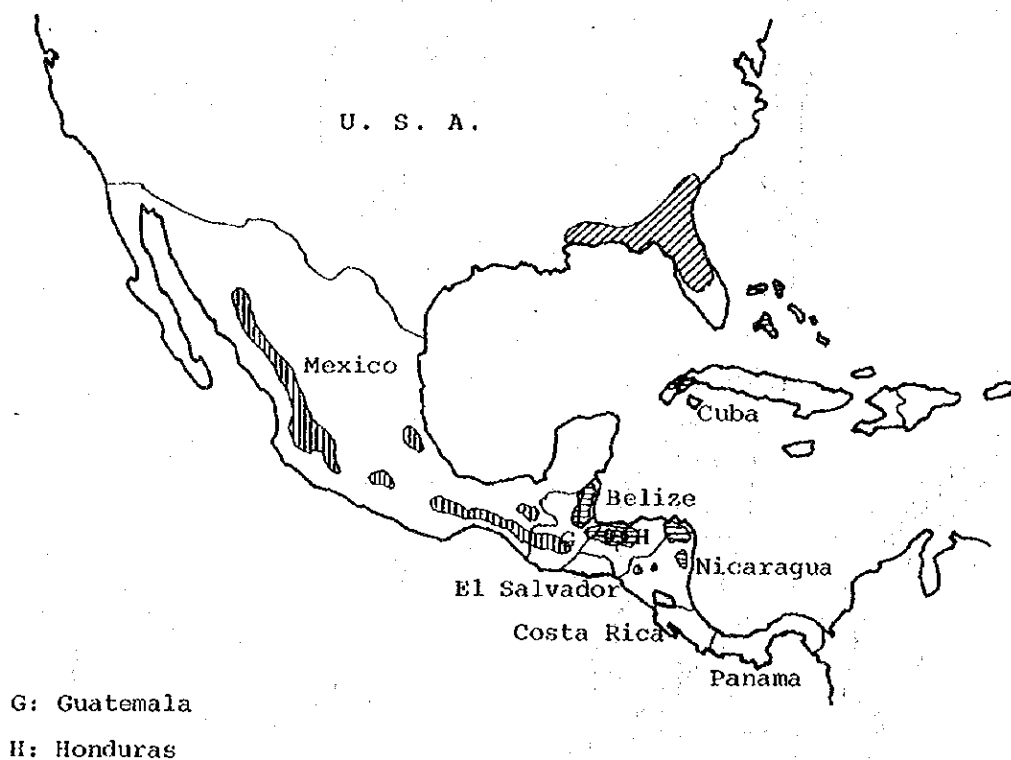


Fig. 5 Natural distribution of *Pinus caribaea*, *P. elliottii*,
& *P. oocarpa*

-  *P. caribaea*
-  *P. elliottii* (var. *elliottii*)
-  *P. oocarpa*



2. Raising of Seedlings

The ultimate objective of nursery operation is to provide healthy and resistant seedlings for the establishment of a certain plantation. It is for this aim that various nursery techniques are presently developed in order to ensure whatever goals of the plantation are to be reached.

1) Size of healthy seedlings:

It is very common in a tropical area to raise the seedlings in pots in order to avoid the disturbance in their root system as well as to prevent seedlings from being dried up when outplanted. If possible, a larger size of pot is preferable for healthy seedlings. This provides sufficient area for lateral growth of the root system.

However, effective management is disturbed by the difficulty of hauling seedlings when using larger pots in the nursery. For this reason, the size of pots is automatically limited to some extent. In addition, larger seedlings which seem to be strong may not always possess good root system to provide sufficient water to complement the loss due to evaporation. It shows that larger seedlings are not always good as planting stock.

Hence, the appropriate size (13)* of seedlings should be well-balanced to the development of root system raised in a limited size of pot. This can serve as an indicator of healthy and resistant seedlings.

* Seedling with bigger assimilative organ (leaf) and smaller non-assimilative organ (root and stem) is apt to cause water stress. Theoretically, seedling with higher rate of root system to assimilative organ is required. Besides a certain height is required to suppress grass. (Refer to Table 1 & Charts 1, 2).

Table 1. Size of Sample Seedlings

Local Name	Scientific Name	Class	Number of Seedlings	Height Range	Diameter Range of Root Collar
Agoho	<u>Casuarina equisetifolia</u>	I	5	70 - 93 cm	-
		II	5	45 - 65	2.9 - 4.2
		III	5	30 - 52	2.8 - 3.4 *
		IV	5	28 - 53	1.8 - 3.0
Giant Ipil-ipil	<u>Leucaena leucocephala</u>	I	5	72 - 100	8.9 - 9.5
		II	5	55 - 75	5.1 - 7.9
		III	5	32 - 50	4.0 - 4.9 *
		IV	5	18 - 23	2.6 - 4.5
Mahogany	<u>Swietenia macrophylla</u>	I	5	19 - 29	3.4 - 5.2 *
		II	5	15 - 30	2.6 - 4.2 *
		III	5	12 - 15	2.9 - 5.1
		IV	5	8 - 12	3.1 - 3.7
Narra	<u>Pterocarpus indicus</u>	I	5	32 - 39	4.1 - 5.0
		II	5	22 - 32	3.7 - 4.3 *
		III	5	16 - 23	3.2 - 4.0 *
		IV	5	10 - 15	1.7 - 2.5
Slash pine	<u>Pinus elliottii</u>	I	5	32 - 34 cm	3.4 - 4.1 mm
		II	5	23 - 26	2.4 - 4.0
		III	5	15 - 21	2.1 - 4.0
		IV	5	10 - 15	1.6 - 2.3
Caribbean Pine	<u>Pinus caribaea</u> var. <u>hondurensis</u>	I	5	26 - 29	1.9 - 2.6
		II	5	23 - 26	1.8 - 3.2 *
		III	5	14 - 23	1.1 - 2.5 *
		IV	5	12 - 14	1.4 - 2.0
Benguet Pine	<u>Pinus kesiya</u>	I	5	21 - 25	2.5 - 3.5
		II	5	18 - 21	2.4 - 3.0
		III	5	14 - 18	1.9 - 2.2 *
		IV	5	13 - 15	1.1 - 1.6
Oocarpa Pine	<u>Pinus oocarpa</u>	I	5	15 - 22	2.1 - 3.6
		II	5	15 - 21	2.0 - 2.3
		III	5	13 - 15	1.5 - 1.6 *
		IV	5	12 - 13	1.5 - 1.6 *
		V	5	9 - 10	0.9 - 1.6

Note: Classes with the symbol (*) are tentatively evaluated as appropriate size.

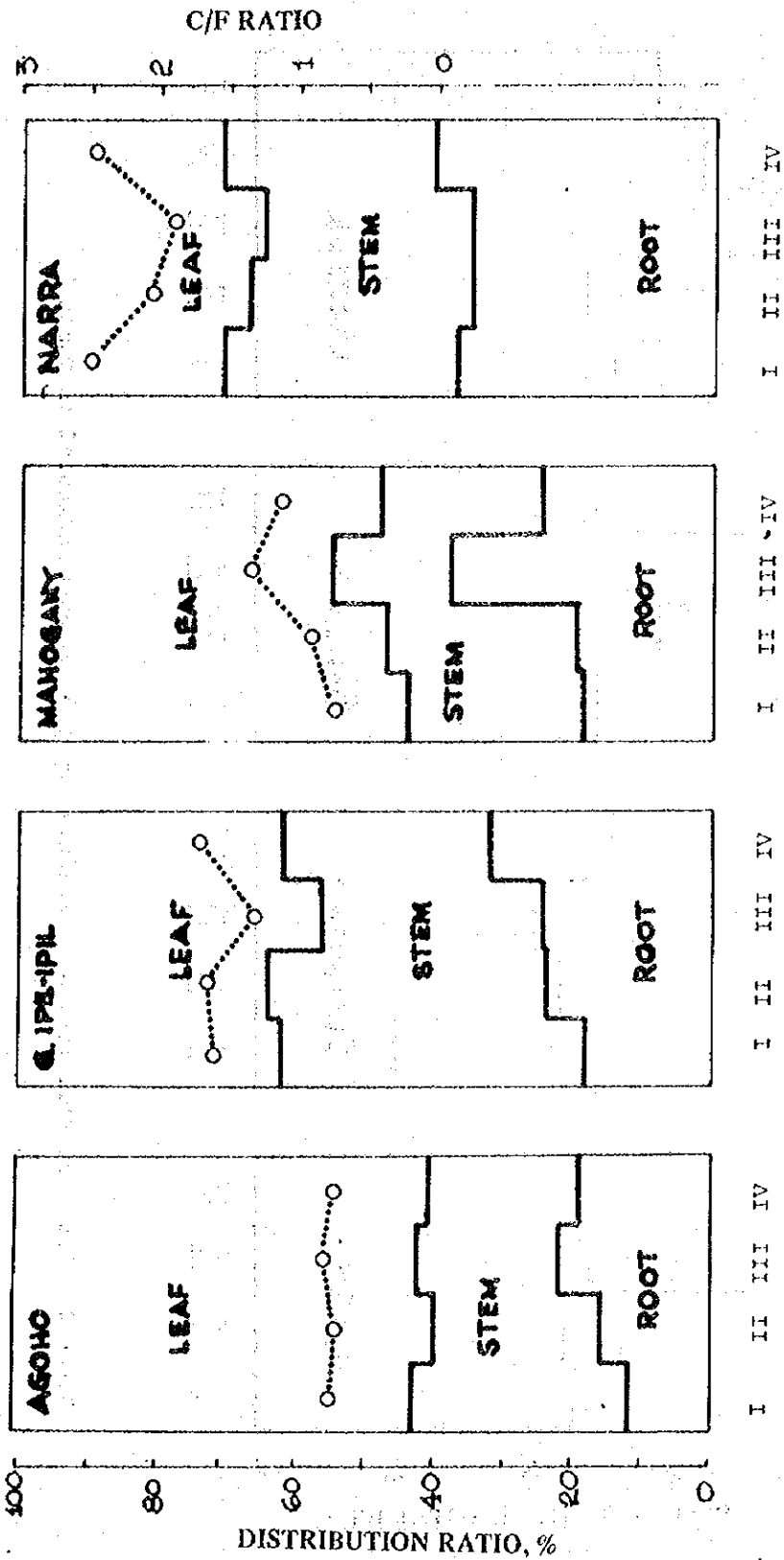


Chart 1. Ratio of leaf, stem, and root by the classes indicated in Table 1

C: Weight of non-assimilative organ
 F: Weight of foliage

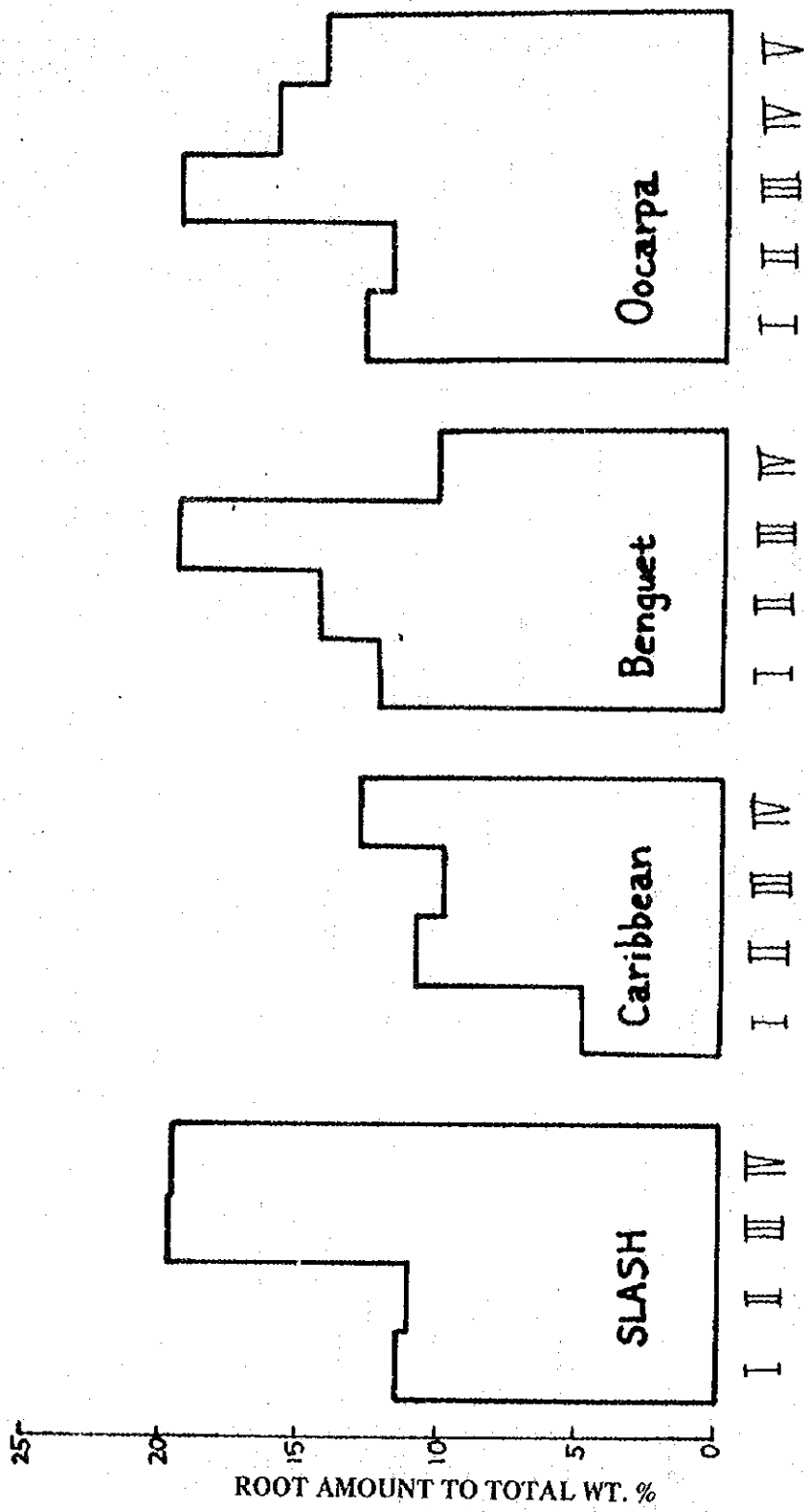


Chart 2. Ratio of root in pine seedlings, by the classes indicated in Table 1

2) Seed Box:

Another aspect in raising seedlings in the nursery is to decide whether seeds are to be germinated in seed boxes followed by transplanting into pots or seeds are to be sown directly into pots. Generally, direct seeding method is much practical in reducing large requirement of labor force and preventing disturbance of root system during transplanting.

On the other hand, in the case of fine seeds like bagras, or seeds with low germination percentage, transplanting method is more advisable. Because with such seeds, direct seeding method may produce a number of vacant pots. The use of fine sand as a medium is best required in order to ease transplanting into pots from the seedbox.

As to the time of transplanting, it would be better to transplant before the development of lateral roots to minimize damage of weak root system. For pine seeds, the proper time to transplant is when the seed is away from the ground and when the hypocotyl grows nearly 2 cm from the ground.

3) Top Soil:

Mixture ratio of top soil and sand for pots is also important in raising of seedlings. High ratio of top soil may provide more soil nutrient for the growing seedlings but the developing root system is affected by less aeration which may be a major cause for inducing damping-off.

On the contrary, high ratio of sand provides better aeration for the root system but less nutrients. Thus, it is the matter of techniques employed in the nursery on the well balance of these two

factors with the aim of not impairing aeration and at the same time supplying nutrients needed by the seedlings.

In the Philippines, the ratio 3:1 of soil and sand is predominant based on long experience. In the absence or the difficulty to collect top soil in open lands, the necessity of applying fertilizers arises. The fertilization test in determining the appropriate dosage in nursery operation showed that the dosage of two (2) grams per pot is much better than one (1) gram per pot as evidenced by its color and healthiness. Although the dosage of four (4) grams per pot is prevailing at PICOP, Mindanao, it doesn't always show better effect than others. The fertilizer in use is the complete fertilizer (14-14-14). However, it is observed that application of nitrogen alone or phosphorous alone shows very good effect on seedling growth. In fact, the result of soil analysis generally indicates very little nitrogen and phosphorous in the soil. In case of phosphorous, the effect may also be explained by the tendency of phosphorous to be washed out easily by heavy rainfall.

Although the dosage may be affected by fund availability, the recommendable dosage in our nursery is two (2) grams per pot for fast-growing species, narra and mahogany and one (1) gram per pot for pines, so far.

As to aeration, it is necessary to provide proper aeration to root system, in order to prevent damping-off. The consequent

occurrence of damping-off in nursery is reduced by appropriate measure of promoting aeration. For instance, the use of coarse medium or inserting stick into pots could be helpful, particularly to pine species.

4) Shade

Shade, reducing light intensity and lowering soil surface temperature, is advisable to attain higher germination percentage. But as far as hardening of seedling is concerned, stronger seedlings are produced without shade. Last 1977, this project succeeded in raising strong and healthy seedlings without shade except mahogany at Tala-talan nursery.

Generally when temperature rises up to a certain point, decrease in photosynthetic activity is observed. This implies the usefulness of shade could partly be attributed to higher photosynthetic activity of the seedling from the practical point of view. On the other hand, the rise in temperature can also be controlled by watering. Practically, raising seedling without shade is best recommended in order to produce healthy and strong seedlings provided proper watering is conducted.

As in the case of mahogany seedlings raised in Piut, they required appropriate shade of at least 70 percent of relative light intensity. This may assure higher germination percentage as well as strong and healthy seedlings.

3. Spacing

Generally speaking, spacing may be determined by the managerial object, operational treatments especially the degree and frequency of thinning, the characteristics of the species, etc.

The present object establishing forest stands in this area is to rehabilitate the devastated grassland as soon as possible and protect the reservoir from siltation. From this point of view, it may be desirable to plant by less spacing, but there should be a certain limit from an economical viewpoint. For the first year, 2 x 2 m (2,500 seedlings/ha) was adopted, which seems to have been an ordinary spacing in the area. Further modification can be based on the performance of the plantation established.

Although the information concerned is still very limited, data which have been collected in the plantations established in 1977 indicate that some modification may be necessary for a few species.

For teak and yemane with larger leaves and wider crown, wider spacing can be adopted because earlier crown closure can be expected unless the site concerned is poor.

Narra does not usually form erect stem, at least for early growth. Such a species should be planted by closer spacing so that straight boles can be formed. Experimental plots with closer spacing, are expected to provide useful data from this viewpoint.

For Giant Ipil-ipil, one of the fast-growing species, wider spacing may also be recommended if the site is good enough or if the area is properly fertilized in case of poor site.

For direct seeding, the seed quantity to be sown should be studied. For this, it will be worthwhile examining the number of seedlings and their performance at the area regenerated naturally.

Two ways were also tried for sowing, which are dibbling and broadcasting. In the former, three to five seeds each were dibbled into 10,000 spots per hectare, based on various observations in Japan. Broadcasting is not recommendable, because most of the seeds broadcasted easily move to lower place by rainshower.

Tentative recommendation for spacing of major species is summarized in the following table.

With major species, experimental plots with closer spacing were established in the central trial plantation, which will be the field where tending systems can be examined.

Tentative Recommendation for Spacing

Group	Species	Good Site	Poor Site
Fast-growing species:	Giant Ipil-ipil	3 x 3	2 x 3
	Yemane	3 x 3	3 x 3
	Acacia	2 x 2	2 x 2
	Agoho	2 x 3	2 x 2
	Eucalypt	3 x 3	3 x 3
Pines	Benguet Pine		
	Caribbean Pine		
	Oocarpa Pine	2 x 2 (2 x 3)	2 x 2
	Slash Pine		
	Mindoro Pine		
Other broad-leaved species	Teak	3 x 3	3 x 3
	Narra	3 x 3 (2 x 2)	2 x 3 (2 x 2)
	Mahogany	2 x 2	1.8 x 1.8

Unit: meter

4. Outplanting and Digging

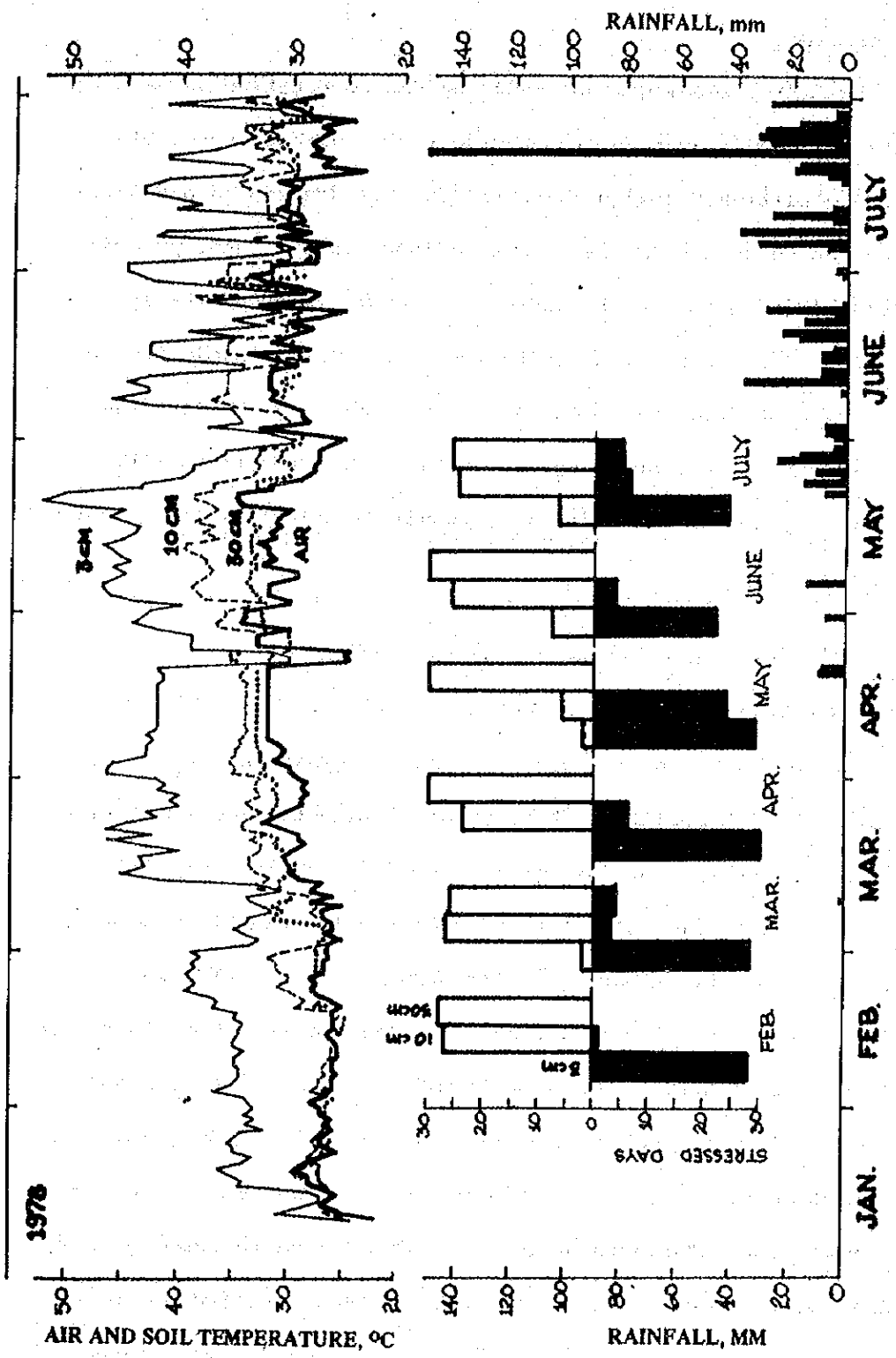
Digging holes or planting seedlings may look like a simple work, but the men practicing in the field, are aware of the difficulty of digging holes in hard earth during the dry season.

In this project, the standard size of planting hole is 20 cm (diameter) x 30 cm (depth). Though it is possible to make a hole of 6 cm (diameter) x 15 cm (depth) the same as pot size, 30 cm (diameter) x 30 cm (depth) method may have some advantages; namely,

- a) The wide ploughed hole helps the development of root system, improvement of physical soil structure for plants and enhancement of soil aeration.
- b) In the ploughed hole, the seedling can easily develop its root system up to 30 cm depth where the soil temperature is stable. This may favor the development of root system.
(Refer to the figure on page 43)
- c) The surface soil in the project site is more fertile below 30 cm than above 30 cm. Thus improved growth of the seedlings is expected after their roots grow down to the depth below 30 cm.
- d) Planting method is easy. Dig and plant is one of the planting method employed. However, in the case of afforestation in grassland where there is inferior soil physical structure, pre-digging method is preferable at the same time advisable for fertilization work.

The determination of appropriate planting period is mainly the determination of its termination time. In case of large scale afforestation project for a number of years, planting may be apt to be continued until the end of rainy season in order to complete the target goal. Although planting is commonly done during rainy season, the problem is the difficulty to predict the period of rainy season and also rainfall distribution. In addition, a severe dry season follows immediately after the rainy season.

In this project, it is observed that planted trees grow slowly even in the early dry season. Although healthy seedlings are raised to be resistant to drought, one month with favorable rainy condition is still needed to assure initial growth after outplanting. This means that planting should be completed by the beginning of September so as to have at least one month before dry season will come. According to the climatic record, dry season has started in October some year.



Seasonal trends of daily rainfall and air and soil temperatures at 3 p.m.

Wider painted columns indicated as "stressed days" show the monthly total of the day on which soil temperature at each depth exceeds air temperature over 5°C. The expression "stressed day" is based on the fact that the growth of tree seedlings decreased with higher soil temperature than air temperature, which was proved by the experiments under controlled environment at the phytotron of the Forestry and Forest Products Research Institute, Japan.

5. Weeding

Generally, weeding means reducing the competition between the grass and seedlings so as to provide the seedlings preferable growth condition. Though there are some tendencies to pay little attention to weeding activity due to insufficient fund, priority should be given to weeding activity in order to assure early performance. In other words, it is very essential to avoid the waste of investment which was made once. We, foresters, cannot just bear to observe the seedlings which have survived through the serious dry season, be dying as a result of defeat by competition with the grasses.

1) Determination of necessity for weeding:

Essentially, weeding is very necessary until such time the seedling can suppress the grass around it. That is to give the seedling enough condition whereby full sunlight is utilized in its maximum, necessary for fast growth.

As far as sunlight factor is concerned for planted seedlings, weeding necessity in samon vegetation will not be relatively much as long as the seedling height is more than 30 cm. This is due to the small leaf area index of samon and in fact, relative light intensity is about 70 per cent at 40 cm above the ground which is rather higher. This characteristic, hence, could be considered as one of the advantages of the vegetative unity of samon. On the contrary, the production structure of cogon is located up to the upper portion and its leaf area index is also relatively large.

Consequently, the relative light intensity in cogon society is low (30% at the same height). Weeding in cogon, therefore, is much needed to let seedlings receive more light and also essential for the improvement of soil structure and for enough supply of nutrients.

The speed of decomposition of weeded grass is rather faster in the tropical region where temperature and humidity is high. This makes it wise and advisable for reforestation of infertile open grass land to return the organic matters into the soil by weeding.

2) Time and Frequency of Weeding:

As the rainy season starts, planted seedlings begin to grow vigorously and simultaneously the grasses also start to grow and ultimately threatens the early growth of the seedlings. From this viewpoint, the correct time for weeding is the beginning of the rainy season judging from weeding objectives of artificial removal from competition. However, if we have to consider the washing out of decomposed matters, weeding during the middle of the rainy season, that is, from August to September, can be considered to be more practical because planting activities are almost completed by then. The difficulty of recruiting sufficient labor force will not be also encountered. If weeding can be completed by the middle of the rainy season, it is expected that decomposition can be accelerated and also decomposed matters can gradually penetrate into the soil as nutrients.

Frequency:

We have to conduct weeding many times until the seedlings can suppress the grass in their competition. But this can be decided based on the species, its growth and the method of management. For instance, the species with wide-shaped-leaf like teak requires short period to establish its own stand. It was observed that weeding around the end of the rainy season for the first two consecutive years is sufficient enough for their survival. Likewise, the frequency of weeding for fast-growing species can be expected to be lesser because of their capacity to grow faster. However, fast-growing species planted in infertile soil cannot grow fast as it should, so there is more weeding frequency in this kind of plantation.

When fertilizer is applied, the condition becomes different. Observation shows that Giant Ipil-ipil seedlings having a height of 30 cm below with 25 grams fertilizer applied could grow up to 150 cm by the end of the following rainy season. This proves the tremendous effect of fertilizer on fast-growing species.

Consequently, application of fertilizer affects the frequency of weeding. In order to determine the frequency of weeding comprehensively, there are various factors to be considered, such as species, kind of vegetation, and artificial treatments like fertilizer application to promote growth speed.

It is very advantageous if weeding frequency is reduced. The followings are ideal measures leading to minimal weeding activity in every plantation:

- a) Use of big vigorous seedlings.
- b) Use of wide-shaped-leaf species.
- c) Application of fertilizer (especially fast-growing species).
- d) Use of herbicide.
- e) Introduction of cultivation planting.

3) Method of weeding:

Weeding operation is usually carried out by manpower, by machine (i.e. bush cutter) and by chemicals. The different methods are described based on the different sizes of seedlings to be weeded.

a) Clear Weeding:

Clear weeding becomes a measure towards fire protection because the fuel, in grass form, is removed. In spite of this advantage, however, there are also some disadvantages. The environment is suddenly changed under serious climatic condition. Clear weeding is rather expensive for it requires much more labor forces. Besides, it may promote the occurrence of surface erosion.

b) Spot Weeding:

This method of weeding is very common in controlling competition against the grass, with minimum change of environments surrounding the seedlings. It is also helpful to minimize the mortality caused by drought. Not to mention the

difficulty in supervision and less defense to forest fire, it is a very practical way to carry out in large scale plantation effectively and economically.

c) Strip Weeding:

Strip weeding, as implied, is substitutional remedy to clear weeding and spot weeding. The direction of strip should be subjected to careful study. Following the contours might be practical from a viewpoint of operation and also advisable for erosion control. So far, however, our observation found out that no erosion has been encountered with regards to vertical strip weeding.

We would like to note that it is better to make strip due north so as to avoid direct heat from the sunlight in favor of the seedlings as well as to sustain water content in the soil.

S P E C I E S	First year	Second year	Third year
Fast growing species			
Giant Ipil-ipil	○	○	○
Agoho		(x)*	(x)*
Acacia			
Pines			
Benguet Pine			
Caribbean Pine	○	○	x
Oocarpa Pine			
Long rotation broad leaf species			
Teak			
Yemane	○	○	x
Narra			
Mahogany	○	○	○
Eucalyptus			(x)*

Remarks:

* Available when fertilizers are applied.

○ Needed

x Not needed

6. Fertilization

The purpose of fertilization in the field of forestry differs from that in agriculture. The latter aims at the increase of crop yield, while the former aims mainly at the acceleration of early growth.

In fact, the yield of forest crop, especially for a long term, is mostly dependent on land productivity and its artificial control by fertilization will not pay from an economical point of view.

However, fertilization in plantations may have a remarkable effect in increasing their initial growth, which will be helpful in reducing the frequency of weeding and also in accelerating crown closure. Thus, fertilization may hasten the establishment of ecological circulation system.

Generally, the more infertile the forest soil, the more effective the fertilization. As a matter of fact, the fertilization test areas at the Central Trial Plantation have been showing the effects of fertilization.

1) Time of Fertilization:

Principally, the most favorable time for fertilization is when the root system has developed enough for active absorption of soil nutrients. Approximately, three (3) to four (4) weeks after out-planting is the proper time for fertilization.

The succeeding year, fertilization should be done at the beginning of the rainy season as the root system has fully developed already.

2) Dosage of Fertilizer:

The dosage of fertilizer is determined by species, seedling size, and site condition. Generally speaking, however, the standard of nitrogen per seedling is: 6-10 grams for conifers, 10-20 grams for broad-leaved species, and 4-6 grams for the species with root modules. It is also preferable to apply the required amount little by little for certain times taking into account the absorption mechanism of trees. Furthermore, the supply of soil nutrient and solution speed of fertilizer must be considered for dosage determination.

Based on observation of fertilization test in the Central Trial Plantation using 20-10-10 and 14-14-14 fertilizers, 25 grams and 50 grams of fertilizer proved to be more effective than the least amount of 15 grams of fertilizer. As there are no remarkable differences between the 25 grams and 50 grams of fertilizers, thus, 20 - 30 grams of fertilizers is advisable economically and practically.

		A m o u n t				
Type of Fertilizer	1st year	2nd year	3rd Year and after	1st year	2nd year	
Pine Species	10 gs	20 gs	50 gs	1 month after	1 month after	start of rainy season
Species having root nodule fungi	20 gs	30 gs	50 gs	-do-	-do-	-do-
Fast growing species	30 gs	30 gs	50 gs	0do-	0do-	-do-
REMARKS	*preferably, fertilizers of higher phosphorous content					

7. Diseases, Insects, and Animals

During the last two years, some damages due to diseases, insects, and animals were observed, although none of them was fatal. The pathologist, who came to the project as a short-term expert, prepared a manual for forest tree diseases during his stay. This manual has been a good guide especially for nursery operation. In addition, another pathologist and two entomologists under the program of the Tropical Agricultural Research Center, Japan, came to the project and left useful comments from a practical viewpoint. The facts which occurred both in nurseries and plantations are summarized as follows.

Nurseries:

Most serious disease was damping-off observed with pine seedlings. This was especially serious at a part of the Baluarte Central Nursery. However, most of infected seedlings could be recovered by the timely application of "Tachigaren (hydroxyisoxazol)" solution. Further careful attention should be necessary to protect seedlings from damping-off because the nurseries are getting older. An insect to defoliate pine seedlings was also observed at tentative Talatalan Nursery. However, no serious damage occurred through applying "Sumithion (MEP)". With large-leaf mahogany seedlings, a kind of die-back was observed, which was almost prevented by the application of Bordeaux solution.

Plantations:

Some damage due to defoliators was observed with bagras and teak

seedlings, although both were not fatal. Defoliators seem to be some of leaf roller moths. In the mahogany plantation of the Central Trial Plantation, some dead seedlings were observed in late 1977. The stem of such a seedling had been invaded at its portion just above the ground. According to the identification of a specialist, the damage was made by some small animals --- most probably, by field rat.

8. Forest Fire Control

1) Fire Occurrence in Upper Pampanga River Basin Area:

In this area, the period of dry season in which we need to take caution against fire is about eight months from October till May. The most dangerous months are February to April as shown in Table(p. 60). Reported burned area during the dry season in 1977 - 1978 is 5,400 has in total.

The damage caused by fire is mostly seen in young tree plantations burned. Teak or Yemane is considered as resistant species against fire because of their lively sproutability, but, even in case of such species, the growing stock above the ground will seriously be damaged by fire and, therefore, the quality and growth of stem will severely be affected.

2) Present Status of Fire Control Measures:

In this area, there is no fire control organization except the one established by UPRBMUMD.

Preventive forest fire control measures taken by UPRBMUMD are watching and patrolling by forest guards and fire fighters, construction of fire break and education of rural people.

As fire fighters plan an important part in fire control, the training of new and experienced fire fighters is held every year.

Existing problems are as follows:

- (1) Because of the limited budget, the needed number of fire fighters is not employed all through the season.
- (2) After the construction of fire break, re-brushing for maintenance is needed.

- (3) Existing look-out towers are not utilized well.
- (4) Rural people are lacking in understanding the importance of fire prevention.
- (5) The actual tendency of kaingineros is not known well.
- (6) Burning permit system is not followed well by pasture owners and agricultural land owners.

Once either watchman or patrol detects fire, he immediately informs the nursery office or the district office. Therefore, the nursery laborers and the district staffs rush to the place where the fire occurred. The common fire fighting method is the direct attack to the flames with branches.

Problems on fire fighting are as follows:

- (1) After fire detection, it takes time to report to the office due to the lack of communication system and transportation.
- (2) Likewise, it takes time to start fire fighting due to the lack of transportation.
- (3) Fighting with branches is effective only at initial stage or for smaller fire.
- (4) If fire is larger and progressive, there is no way, so far, to put out fire except natural extinction.
- (5) Number of fire fighter is not enough for actual fighting and laborers are not organized and trained well.
- (6) Equipment for fire fighting are not fully provided.

3) Fire Control Program of the Project:

Considering existing situation, Special Fire Control Program was made for the project. (Refer to Annex 8)

Fire control works have been managed based on the program.

This program should be renewed referring to later experiences and the collected data.

a) Organization

In this project, one protection officer was assigned to conduct fire control works. With the progress of afforestation activities, expertized protection officers will be needed in each Parcel to get information about burning for kaingin and pasture and to educate rural people.

Fire fighters play the most important part for fire control in the field. Therefore, the number of them should be increased, and at the same time the intensive training for them is requested. Considering the efficiency of personnel management and budgetary allotment, the proper number of fire fighters is computed as one person per five hectares of plantation area.

The labor cost for this amounts to 480 pesos per hectare.

$0.2 \text{ person/ha} \times 10 \text{ pesos} \times 30 \text{ days} \times 8 \text{ months} = 480 \text{ pesos.}$

This amount is 16% of afforestation cost per hectare (P3,000).

It is not small amount but we should realize that the con-

tinuous investment for protection will be required to undertake the afforestation project in this area.

During dry season, Project Leader and all of the staff should join the protection activities like patrolling and extension. Because it is one of the most effective measure to appeal the necessity of fire prevention to the people.

b) Fire Prevention

(1) Fire break

Fire break is constructed from the end of rainy season to early dry season. To keep its function, it should be re-brushed at least 2 times a dry season. Main fire break is constructed surrounding the plantation area with 20-30 meters width. Moreover, outer and inner fire breaks with a certain interval are constructed with 15-20 meters width depending on the necessity. Fire break attached to forest road will be effective. With strong wind, fire can easily jump 10 meters of distance on the slope and make spot fires.

Ridge of hill is the place adequate for construction of fire break because it is the turning point of wind direction and also it is the point that the fire produces ascending current. This current has high possibility to weaken the spreading of fire.

(2) Education and Involvement of the Community

Display of streamers and signboards, distribution of T-Shirts, showing of educational and campaign movies and attendance to barangay meeting have been done so as

to make the people conscious of the importance of fire prevention.

The only way of successful education is to continue those activities without interruption. And from time to time, we should show our willingness to cooperate with the community.

(3) Watching and Patrolling

Not to speak of the reason, the best way is to employ as many fire fighters as we can. They should be well trained and expertized on their duty.

c) Fire Fighting:

(1) Communication and transportation

The principle of fire fighting method is the early detection and the initial extinction. Accordingly, communication systems and vehicles should be equipped. However, we should realize that the main point for selection of equipment is not only their function but also their durability for a long-term operation.

The existence of well arranged forest road network will help to extend the accessibility to the scene and to extinguish the fire promptly.

(2) Fire suppression

There are several possibilities to attack a fire. But, practically, the direct attack to the flames with branches or swatters is the only way in the existing circumstances. Though it is, we should study available methods introducing other equipment and facilities.

FIRE OCCURRENCE BY MONTH

Month	No. of Fires			Area Burned (Has.)			Total
	Inside Ref. Project	Outside Ref. Project	Total	Inside Ref. Project	Outside Ref. Project	Total	
October, 1977	-	1	1	-	3.00	3.00	3.00
December	2	3	5	71.79	1.50	73.29	73.29
January, 1978	1	6	7	40.00	820.00	860.00	860.00
February	6	29	35	240.80	1,506.50	1,747.30	1,747.30
March	5	18	23	430.50	1,653.00	2,039.50	2,039.50
April	3	4	7	159.00	331.00	490.00	490.00
May	1	5	6	0.50	139.50	140.00	140.00
Grand Total	18	66	84	948.59	4,457.50	5,403.09	5,403.09

Fire Report, R3-D3

FIRE OCCURRENCE BY YEAR

Calendar Year	No. of Fires		Total	Area Burned (Has.)		Total
	Inside Ref. : Project	Outside Ref. : Project		Inside Ref. : Project	Outside Ref. : Project	
1973	4	113	117	405.00	6,169.00	6,574.00
1974	1	114	115	13.05	3,956.76	3,969.76
1975	8	194	202	200.75	3,329.80	3,530.50
1976	8	178	186	187.00	3,388.50	3,575.50
1977	28	54	82	254.13	2,422.30	2,676.43
1978	16	62	78	376.80	4,450.00	5,326.80
Grand Total	65	715	780	1,936.63	23,716.35	25,652.99
Average	11	119	130	322.7	3,952.8	4,275.5

Fire Report, R3-D3

FIRE OCCURRENCE BY CAUSE FOR CY - 1973-1978

Cause	No. of Fires			Total	Area Burned (Has.)			Total	Percent- age (%)	Percent- age (%)
	Inside Ref. Project	Outside Ref. Project	Project		Inside Ref. Project	Outside Ref. Project	Project			
Kaingin Making	99	99	99	99	4,426.00	4,426.00	4,426.00	12.7	17.3	
Range Preparation	274	274	274	274	8,205.00	8,205.00	8,205.00	35.1	32.0	
Hunting	112	112	112	112	2,856.00	2,856.00	2,856.00	14.4	11.1	
Carelessness	32	146	178	178	920.50	4,234.00	5,154.50	22.8	20.1	
Incediary	10	28	38	38	491.00	1,829.76	2,320.76	4.9	9.0	
Others	23	56	79	79	525.13	2,165.60	2,690.73	10.1	10.5	
Grand Total	65	715	780	780	1,936.65	23,716.36	25,652.99	100.0	100.00	

9. Erosion Control

1) Selection of methods:

In developed countries the usages of highly developed machinery and finished products are very common as materials of erosion control due to the shortage of available labor in mountain area and of natural raw materials like boulders.

The Philippines is very rich in her labor forces and natural raw materials for erosion control works. These are the advantages for erosion control works in the country.

First consideration should be given to the availability of natural raw materials in selection of methods for erosion control facilities.

Items to be used for erosion control are as follows:

- | | | |
|-----------------|---|---|
| Sand and gravel | : | available in market and also possible to be collected in Carranglan river and other places. |
| Boulder | : | -do- |
| Stone | : | unfinished stone |
| Peg | : | available in the forests |

2) Availability of vegetative method

Since vegetative method is a sort of seeding or planting, the work should be undertaken in rainy season.

Selection of applicable grass species is not easy due to short experience. Apparently, it takes time for cogon and samon to germinate.

Our project site suffered from intensive rainfall in a very short time, so prompt and uniform germination is strongly needed to avoid movement of seeds sown.

From this viewpoint, vegetative bag with barnyard grass is one of the promising methods for vegetative work.

As to the replacement of grass stumps, mountain turf is tolerant enough for drought although there is a little difficulty in the collection.

3) Construction of check dam

It is very difficult to find out economical dam site in this area because of its characteristics of terrain with many small creeks, U-shaped, where overflow can take place easily even in small rainfalls.

As eruptive rocks and tertiary stratum prevailing within this area are easy to be weathered, subsidiary check dams are needed, so that further erosion could be avoided.

<u>Kind of Grass</u>	<u>Germination</u>	<u>Stub Divide</u>	<u>Time for Seed Collection</u>	<u>Availability</u>
Samon	x	0	June	0
Cogon	x	0	June	0
Talahib	x	0	Late September	0
Cyperaceae	0	-	Mid-June	x
Barnyard	0	0	Mid-June	x
Turf (mountainous)	-	Sodding (June to September)	-	x
Turf (lowland)	0	-	-	-
Kentucky 31 Phenix	0	-	-	-

(Note) 0: easy; x: difficult

10. Forest Road Construction:

1.) Forest Road network and road density:

There are two kinds of forest road: one is an access road which is utilized as a main road for multiple purpose and the other is operational road which is utilized only for a short term operation.

Communities and towns should be connected to each other by access roads so as to transport laborers, equipment and materials. Therefore, it is advisable to make access road which is all-weather and permanent.

Making the road network plan, the total distance of forest road should be decided based on a certain road density computed under the consideration of the management purpose and set-up. In the RP-Japan Project, it is programmed to construct 52 km of access road and 74 km of operational road with 16 m/ha of road density.

2.) Route Selection:

The soil in the area has a geological characteristic which is to be eroded easily. During dry season, the surface soil becomes non-cohesive and it will be easily washed out by rain, and, therefore, a route of forest road should be selected considering a topography not to make embankments.

As to the inclination of ridges in the area, since it is gentle comparatively, it is advisable to construct a forest road passing ridges.

3.) Road Construction:

In most of the area except Parcel III, the outcrop of bed rocks is not observed. So the construction work of forest road is not so difficult if attention is given to the road side gradient to avoid a road side erosion.

As to the drainage work, it is advisable to make open cross drainage canals as many as possible because a heavy rain during rainy season brings about unexpected water flows in abundance. Attention of embankment should be given to stabilization.

The slope tamping in filling portion is not so effective during dry season due to lack of water content in soil. So, if necessary, it is preferable to undertake a slope tamping work during rainy season.

As to cutting of upper embankment, vertical cutting method instead of standard cutting with a certain angle can be advisable especially in the conglomerate zone of Parcel I and in fine granular soil of Parcel II-B because of the high permeability of soil which causes surface erosion easily.

#8. Fundamental Problems to be Studied

Our project under the parasol of ProFEM is expected to increase its plantation year by year while individual techniques are always devised so as to systematize them into integrated techniques for the effective application to the afforestation of open grassland.

1. Relation to other reforestation projects

The proposed site of RP-Japan project has been reserved as three parcels indicated in the map. Parcels I and II are under the jurisdiction of the D3 district, while Parcel III is under the jurisdiction of the D9 district.

From the organizational viewpoint, the reforestation projects in the area are as follows: under ProFEM, Upper Pampanga River Project, one of the priority projects, covers the whole watershed of Upper Pampanga River including Talavera River. This priority project includes San Jose Reforestation Project, Carranglan Reforestation Project, Pantabangan Reforestation Project, and RP-Japan Afforestation Project under the Bureau of Forest Development. It also includes the reforestation project of the National Irrigation Administration.

Therefore, a close coordination should be required among those reforestation projects, especially, prior to planning.

2. Labor Forces

This matter can be divided into quality and quantity. For the implementation of the scheduled plan, the requirement of labor forces will be reaching up to 2,300 laborers per day at its peak, based on the calculation made by Central Office.

On the other hand, census conducted in 1975 shows that Carranglan Municipality has more than 3,000 potential labor forces. With this, there might be a close competition between the government sector and the private sector. Private sector refers to farm managers who recruit laborers during planting season, and government sector includes different reforestation projects being conducted within this area.

Since planting site gradually proceeds to remote area, we will encounter lack of laborers unless transportation facilities will be provided particularly for those who come from adjacent municipalities.

Furthermore, we have to study the system of supervising more than 2,000 laborers at one time. This will lie on the type of administration we can introduce or the organization system for better management and effective supervision. For instance, we can institutionally improve the present crew leader system so as to let the crew leaders devote themselves for supervision willingly. Introduction of contractual basis to reforestation projects may as well be possible. Furthermore, scheme of family approach can provide some hints towards better supervision.

To meet large target goals, mechanization will plan an important role in the near future at the same time giving the rural people a chance to work.

The need of harmonizing these questions will be of help in arriving to a decision.

3. Link to Agriculture Policy

From the viewpoint of multiple-use-management of forest or wise utilization of forest lands, range use and agricultural use of forest lands can be welcome provided reasonable measures are followed. This is so because the project site is very gentle in its terrain and the presence of pasture lands as well as kaingin management are partially conducted.

Precaution measure on protection and fire control activities can still be taken by our side if the plantation is small in area. With regard to larger plantation, protection will be difficult because we cannot give full attention to various fires occurring in the vicinity. Fire for pasture has been justified, but very often, it spreads over adjacent forest lands accidentally without notice.

Agricultural political check of fires in pasture land is badly needed for the recognition of this area that it needs to be planted (being a critical watershed area).

Periodic recheck of pasture leases, introduction of high yield grass species to minimize expansion of area occupied, enclosure of pasture to some extent, and full adoption of family approach, all of these will be of help to prevent destruction of forest from danger of fire.

Afforestation efforts which we have been making will be in vain unless the integrated measure against the fire is prepared and implemented effectively by everybody with the participation of rural people, especially, most of whom are farmers.

4. Technical Problem to be Studied

One of the ultimate aims of trial plantations is to select appropriate species which can grow well in a certain area given to us. In other words, technical problems on selection of appropriate seedlings suited for the area arise. For instance, growth response will vary with provenance. Central Trial Plantation is supposed to provide in a way that every information including provenance response can be gained so as to be able to give the answer to all the questions which we will encounter.

1) Seed procurement:

Even if different studies make the selection of species scientifically possible, the results will not be useful for reforestation projects unless there is an available channel to secure the seeds to be needed.

Under the present condition that there is little commercial route for procuring seeds, we have to establish production areas or seed orchards and to collect seeds to be needed throughout the nation. Appropriate channel to get sufficient seeds should be prepared by all means and as soon as possible. We have introduced

Caribbean pine which is expected to be one of the promising species in this open land. However, it is said that introduced

Caribbean pine can bear the cones but the seeds may not be germinable. This complicated matter should be studied when we establish seed orchard.

2) Introduction of bare root seedlings:

It is a very common practice in the tropical area to raise the seedlings in pot in order to protect the root system from disturbance and to secure higher survival in plantation. Moreover, we have encountered the difficulty of hauling seedling to planting site. To haul a seedling from nursery to planting site means to simultaneously carry the soil of 500 grams. In establishing plantation of 400 hectares, the soil of 500 tons has to be hauled. This is already a part of civil engineering to be changed into real forestry. Bare root system has been adopted so far in Teak, Yemane and Mahogany to some extent to ease the difficulty of hauling. But this requires longer time to raise seedlings, and production program in nursery has to be re-arranged. The study on bare root with other species should be conducted in such a way that root pruning or staying more than two years can be tested to strengthen root system. From this point, bare root seedlings of Giant Ipil-ipil were tested in Tala-talan plantation to observe field response. And the trial plantation of direct seeding was established to follow the response.

3) Mycorrhiza:

It is said that the presence of mycorrhiza is inevitable for vigorous growth of pines. Since natural stands of Pinus kesiya can be found in a part of Parcel II-B and adjacent area at the altitude above 800 m a.s.l., it is probable that spores of mycorrhiza are disseminated naturally, at least, to Parcel II-B.

However, frequent occurrence of fire might be affecting the viability of mycorrhizal spores. It is also said that there is no way to identify mycorrhizal spores in soil so far.

To make sure, in this project, the surface soil in the pine stands in Sta. Fe or Puncan has been hauled and one tablespoonful of the soil has been applied into one pot. Cultivation of mycorrhizal soil near the nurseries and minimal quantity of mycorrhizal soil to be applied should be studied to minimize the labor for hauling mycorrhizal soil.

As pine plantations are being extended year by year, it is hopeful that the necessity to apply mycorrhizal soil to pot media will disappear very soon. The best way is to culture mycorrhizal soil near each central nursery by establishing pine plantations. The further study on the necessity of hauling mycorrhiza soil should be conducted to justify the hauling of soil.

4) Waterlogged spots scattered in the grassland:

The grassland in the area is dominated by samon (Themeda triandra), cogon (Imperata cylindricum), and talahib (Saccharum spontaneum), among which there seems to be a habitat segregation. This segregation appears to be attributable to soil moisture. Generally speaking, samon is an indicator grass for rather dry site, but even within the vegetation dominated by samon, there are often observed waterlogged spots.

It is sometimes difficult to determine all of such spots before planting. To observe carefully, most of such spots are located on concave slopes although those are not necessarily recognizable. At such spots, glei formation is usually observed on soil profile and this formation is impermeable. Seedlings planted at such spots eventually come to death, probably by the middle of the following dry season, after their roots have decayed.

Rainfall in the rainy season of 1977 was much less and so the spots as mentioned above could not necessarily be detected during the planting season of the year.

After the plantations had been established, therefore, several waterlogged or damp spots were recognized. Pine seedlings or seedlings of some other species planted at such spots eventually resulted in death and so some spots were replanted with narra or agoho seedlings in 1978 which may thrive on damp soils.

As no major species prefer damp conditions, soil condition may be improved by constructing open drains, if possible. In the whole grassland amounting to nearly 50,000 hectares, there are a great number of damp spots like those. Therefore, relatively large damp spots should be removed from planting plan, based on site classification. On the other hand, small damp spots may be included into some subcompartment under planting plan, but the spots concerned should not be planted even if the subcompartment including such spots is supposed to be planted.

If planted trees grow satisfactorily and a new ecosystem including those trees is formed, such small damp spots may probably be improved spontaneously. Therefore, such small damp spots had better not be planted forcibly.

5) Growth characteristics of *Pinus caribaea* var. *hondurensis* in plantation

There have been a number of reports or observations on fox-tail phenomenon of pines in lower tropics. In the Central Trial Plantation, however, different growth response was observed with both *P. caribaea* var. *hondurensis* and *P. oocarpa*. In stead of fox-tail phenomenon, bush-form branching was observed for nearly 30% of sample seedlings. It is apparent that bush-form branching is due to the lack of apical dominance, although the causes for the phenomenon have not been studied yet. Followup survey is certainly needed for further discussion.

Summary of the data

		(Number)	(Percentage)
Branching	Normal	46	66
	Bush-form	24	34
Terminal bud on leader shoot	1	53	76
	2	8	11
	4 +	9	13
Needle type	A	44	63
	J & A	12	17
	J	14	20

(Note) Number of sample seedlings: 70

A: adult; J: juvenile

J & A: with both adult and juvenile needles

6) Firebreak and line network:

Various measures are certainly required in order not to cause any fire damage, but it seems to be very difficult to exterminate the occurrence of fire completely. Therefore, the establishment of integrated fire protection scheme is necessary to minimize the damage caused by fire. There are three approaches in fire protection for forests and plantations: operational approach including patrol activities, structural approach, and educational approach.

Among those approaches, structural approach is the most difficult one. For example, either appropriate density or disposition of firebreak network is not clarified yet. The density may be defined both by length and width, the latter of which should be closely related to the kind and height of vegetation. How to construct and maintain firebreak is also very important.

In our project, plantations have been segregated from grassland by firebreak or fireline in combination with forest roads and evergreen vegetations along creeks or gullies.

An idea to be studied is to divide the plantations into blocks by firebreak belts, so that the spread of fire can be minimized even if fire occurs.

A N N E X

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Annex 1. Record of Rainfall in Central Trial Plantation

Baluarte, Carranglan, N. E.

	May	June	July	Aug	Sept	Oct	Nov	Dec
	1977							
1	0	1.5	4.0	5.5	4.3	0	0	0
2	0	0	9.0	0	12.1	0	0	0
3	0	2.6	30.0	17.6	15.1	0	0	0
4	0	23.4	30.0	31.3	18.3	0	0	0
5	0	3.4	18.0	4.3	7.8	4.2	0	0
6	0	0	0	0	7.2	2.8	0	0
7	0	0	13.3	10.9	0	0	0	0
8	0	0	23.6	0.3	0	0	0	0
9	0	0	9.5	20.9	0	0	0	0
10	0	0	0	0	8.7	0	0	0
11	0	0	0	1.2	29.5	0	0	0
12	0	1.5	88.0	0	10.6	0	0	0
13	0	18.0	10.0	0	76.5	0	0	0
14	0.2	0	0	5.0	0	0	27.0	0
15	0	0	0	0	1.5	0	127.7	0
16	0	6.5	0	6.5	58.8	0	11.5	0
17	0	4.2	0	1.1	22.2	0	3.0	0
18	0	0	31.6	0	23.5	0	0	0
19	39.0	0	12.3	51.7	19.2	0	0	0
20	1.3	0	17.2	11.4	6.9	0	0	0
21	3.2	0	0	56.5	0.3	0	0	0
22	0	0	17.2	4.2	1.5	0	0	0
23	6.2	0	25.6	1.2	11.7	0	0	0
24	9.2	0	34.4	0	37.1	0	0	0
25	84.5	0	48.2	0	31.5	0	0	0
26	3.3	0	13.3	0	0.3	0	0	0
27	7.2	0	0	0	16.2	0	0	0
28	1.1	6.5	0	3.8	13.3	0	0	0
29	5.6	11.0	0	1.0	0	0	0	0
30	2.8	38.1	0	47.7	28.4	0	0	0
31	4.5	/	0	6.3	/	0	/	0
Total	168.1	93.3	428.6	287.1	475.5	25.3	169.2	0

Record of Rainfall in Central Trial Plantation
Baluarte, Carranglan, N. E.

1978

	Jan.	Feb	March	April	May	June	July
1	0	0	0	0	0	5.2	4.9
2	0	0	0	0	0	7.9	0
3	0	0	0	0	0	8.1	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	8.0
6	0	0	0	0	15.0	0	32.5
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	39.2
9	0	0	0	0	0	3.0	0
10	0	0	1.8	0	0	0	5.5
11	0	0	0	0	0	3.8	27.6
12	0	0	0	0	0	10.0	5.6
13	0	0	0	0	0	9.6	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	1.0	0
16	0	0	0	0	0	20.0	0
17	0	0	0	0	0	4.9	3.4
18	0	0	0	0	0	0	7.5
19	0	0	0	0	0	18.0	20.0
20	0	0	0	0	0	23.5	17.5
21	0	0	0	9.4	0	0	0
22	0	0	0	10.1	8.2	16.0	152.0
23	0	0	0	0	0	4.4	5.0
24	0	0	0	0	15.8	30.9	29.0
25	0	0	0	0	2.3	1.5	32.5
26	0	0	0	0	12.6	0	30.4
27	0	0	0	0	0	0	17.9
28	0	0	0	0	25.7	0	5.0
29	0	/	0	7.9	17.1	0	4.6
30	0	/	0	0	4.7	2.0	0
31	0	/	0	/	1.0	/	29.0
Total	0	0	1.8	27.4	102.4	169.8	477.1

Annex 2 Description about seeds of introduced species

Pinus caribaea var. hondurensis

No.	Location	Latitude	Longitude	Elevation	Stand
1	Poptun, Peten Guatemala Sirsirtara	16°15'N	89°20'W	350 m	Natural
2	La Mosquitia R. Honduras	15°08'N	84°07'W	20 m	Natural
3	Azacualpa, Olancho R. Honduras Los Limones	14°25'N	86°06'W	240 m	Natural
4	El Paraiso R. Honduras	14°05'N	86°46'W	660-750 m	Natural

P. oocarpa

1	Jocon, Yoro R. Honduras			400-600 m	Natural
2	Campamento, Olancho R. Honduras La Esperanza	14°32'N	86°37'W	762-800 m	Natural
3	Comayagua R. Honduras Siguatepeque	14°15'N	88°12'W	1000-1905 m	Natural
4	Comayagua R. Honduras	14°35'N	87°47'W	1300-1400 m	Natural

P. elliottii var. elliottii

1	Georgia, U.S.A.	31°30'N	82°40'W	100 m	Natural
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P. caribaea var. bahamensis

Bahama Is.

(P. eldarica)

Caucasus

(P. patula)

Mexico

Acacia auriculaeformis

Australia

Eucalyptus camaldulensis

Australia

E. tereticornis

Australia

E. torelliana

Australia

Cinnamomum camphora

Miyazaki, Japan

Notes 1. Lot Nos. 2 to 4 of P. caribaea var. hondurensis and Lot Nos. 2 to 4 of P. oocarpa were used for the research item (13) Provenance Study.

2. Species in parenthesis are still not in use. Those species will be outplanted in 1979.

Annex 3. Accomplishment on Plantation Made During Last Two Years

Location	Planted 1977	Diminished 1977-78	Established 1978			Total Plantation by 1978	Breakdown by Species		
			Replanted	Newly Planted	Total		Fast- Growing	Pines	Long Rotation
Central Trial Plantation	180.16	21.35	21.35	22.70	44.05	202.86	74.62	62.37	65.87
Parcel I			-	348.10	348.10	348.10	118.97	123.41	105.72
Parcel II-B	30.00	30.00	30.00	380.85	410.85	410.85	86.30	168.60	155.95
Parcel III				31.00	31.00	31.00	31.00	-	-
Total	210.16	51.35	51.35	782.65	834.00	992.81	310.89	354.38	327.54

₪

Annex 4.

Central Trial Plantation Area by Species

Compartment	A	B	C	D	E	F	G	M	N	O	P	Q	R	Total
Giant Ipil-ipil	:	7.00:	:	:	:	:	:	:	:	:	:	11.04:	:	18.04
Local Ipil-ipil	:	:	7.67:	6.00:	:	:	2.30:	:	:	:	:	:	:	15.97
Acacia	:	6.57:	:	:	3.90:	:	:	:	:	:	:	:	:	10.47
Agoho	:	3.13:	:	:	:	8.90:	:	7.86:	:	:	:	:	:	19.89
Yemane	:	2.50:	:	:	2.00:	:	:	:	:	:	:	:	:	4.50
Bagras	:	:	:	:	:	:	:	2.00:	:	:	:	:	:	2.00
E. torelliana	:	:	:	:	:	4.00:	:	:	:	:	:	:	:	4.00
E. tereticornis	:	:	:	:	:	3.25:	:	:	:	:	:	:	:	3.25
E. camaldulensis	:	:	:	:	:	3.25:	:	:	:	:	:	:	:	3.25
Benguet Pine	5.67:	:	5.92:	:	:	:	3.00:	:	:	:	:	:	:	14.59
Mindoro Pine	:	:	:	:	:	1.71:	:	1.04:	:	:	:	:	:	2.75
Caribbean Pine	:	:	:	8.93:	:	2.50:	:	:	:	:	4.00:	:	:	15.43
Oocarpa Pine	:	:	:	:	14.60:	6.50:	2.50:	:	:	:	:	:	:	23.60
Teak	9.00:	:	7.69:	:	:	:	3.00:	9.29:	:	:	:	:	:	28.98
Mahogany	:	3.27:	:	:	:	:	:	4.00:	:	:	7.77:	:	:	15.04
Narra	:	:	9.00:	:	:	:	2.17:	:	2.68:	:	:	:	:	13.85
Alibangbang	:	:	:	:	:	6.50:	:	:	:	:	:	:	:	6.50
Camphor	:	:	:	:	:	:	:	:	0.75:	:	:	:	:	0.75
Total	14.67:	19.20:	18.19:	15.36:	14.93:	20.50:	34.70:	9.71:	5.17:	24.19:	3.43:	11.04:	11.77:	202.86

As of 31st October 1978

Annex 4. (Appendix) Scientific and Local Names of the Species Planted in the Central Trial Plantation

(Scientific Name)	(Local Name)
Leucaena leucocephala	Peruvian type
	Giant ipil-ipil
	Hawaiian type
	Local ipil-ipil
Samanea saman	Acacia; rain-tree
Pterocarpus indicus	Narra
Bauhinia malabarica (Pileostigma malabaricum)	Alibangbang

Eucalyptus deglupta	Bagras
E. torelliana	Cadaga
E. tereticornis	Forest red gum
E. camaldulensis	River red gum

Pinus kesiya	Benguet pine
P. merkusii	Mindoro pine
P. caribaea var. hondurensis	Caribbean pine
P. occarpa	Oocarpa pine

Casuarina equisetifolia	Agoho
Gmelina arborea	Yemane
Tectona grandis	Teak
Swietenia macrophylla	(Large-leaf) mahogany
Cinnamomum camphora	Camphor

LIST OF EXPERIMENTS AND RESEARCH ITEMS

SUBJECTS	DESCRIPTION OF THE WORK	SITE	AREA	OBJECTIVES
1. Fertilization trial	a) Benguet Pines, Teak and Mahogany were applied with different kinds of fertilizers like 14-14-14, 20-10-10, 13-12-12 on the dosage of 50 grams, 25 grams and 15 grams.	C.T.P.	0.05 ha	To determine the best fertilizer suited for each individual species and also the applicable amount of dosage which will have better results.
	b) Caribbean pine near Gate II (CRP) was applied with wood ace fertilizer (BPV) at the dosage of 6 tablets, 3 tablets and 0 tablet.	C.T.P.	4.00 ha	To check what is applicable amount of dosage or tablets per seedling.
2. Density trial	The density of the following species with corresponding number of seedlings were under observation:			To check and to determine the density of the different species on the different spacing.
	a) Mahogany - 5,000 seedlings	C.T.P.	10.00 ha	
	b) Narra - 10,000 seedlings			
	c) Giant Ipil-iplil)			
	d) Acacia)			
	e) Yemane) 1,600 = 2 x 3			
	f) Pines) spacing			
	g) Narra) 1,100 = 3 x 3			
	h) Teak) spacing			

SUBJECTS	DESCRIPTION OF THE WORK	SITE	AREA	OBJECTIVES
3. Interplanting	a) Giant Ipil-ipil was planted in between Mahogany. b) Giant Ipil-ipil was planted (direct seeding) in between Eucalyptus.	C.T.P.	3.00 ha 14.00 ha	To make comparison in growth response between interplanting and ordinary planting.
4. Direct seeding	a) Giant Ipil-ipil planted by dibbling	Parcel II-B	70.00 ha	To determine if direct seeding of Giant Ipil-ipil by dibbling will be successful in the plantation.
	b) Local Ipil-ipil planted by broadcasting	C.T.P.	3.00 ha	To find out what will be the result of broadcasting type of Ipil-ipil (local).
5. Cultivation	The following species were planted on cultivated area: a) Giant Ipil-ipil b) Agoho c) Benguet Pine d) Caribbean Pine e) Narra f) Mahogany	Parcel I	0.05 ha	To check and determine the species response on cultivated area.
6. Natural regeneration trial	Alibangbang was observed on natural regeneration and reproduction.	Parcel I	0.05 ha	To determine regeneration and reproduction of alibangbang by natural means.

SUBJECTS	DESCRIPTION OF THE WORK	SITE	AREA	OBJECTIVES
7. Bare root trial	a) Giant Ipil-ipil was planted by bare root. b) Mahogany was planted by bare root.	Parcel I Parcel II-B	0.05 ha 4.00 ha	To determine the growth response when bare-root seedlings are planted.
8. Mycorrhiza and without mycorrhiza	a) Caribbean Pine was planted without mycorrhiza. b) Caribbean Pine and Benguet Pine study regarding mycorrhiza was established.	Parcel II-B C.T.P.	4.00 ha 1.60 m ²	To determine what will be results of planting with and without mycorrhiza soil.
9. Removal of pot medium	Seedlings of Benguet Pine, Caribbean Pine, Mahogany, and Yemane were planted with pot media removed just before outplanting.	C.T.P.	90 m ²	To see the effect of removal of pot media on the root growth at planting site.
10. Size of seedlings	Seedlings with different sizes were planted (small, medium and large), 10 - 15 cm, 16 - 25 cm, and above 26 cm respectively.	C.T.P.	160 m ²	To determine what is the best planting size of seedlings.
11. Size of pots	Pots of both 3" x 6" and 4" x 6" were used for Caribbean pine.	Parcel I	5.00 ha	To determine the possibility of a good result and advantage of a 3 x 6 pot.
12. Direction of weeding	A part of plantation in Parcel I and Parcel II-B were strip-brushed along the slope or contour.	Parcel I Parcel II-B	10.00 ha	To determine what is the best technique in strip brushing.

SUBJECTS	DESCRIPTION OF THE WORK	SITE	AREA	OBJECTIVES
13. Provenance Study	Three (3) provenances each of both Caribbean and Oocarpa pines were planted.	C.T.P.	16.00 ha	To determine better provenances of introduced pine species for the area.
14. Study of grass growth	Samon vegetation is studied on the rate or speed of growth, reproduction and decomposition.	C.T.P.	96 m ²	To study the rate of growth and reproduction of Samon to determine the best time of weeding.

Annex 6.

LIST OF MACHINERIES RECEIVED UNDER TECHNICAL
COLLABORATION AID

	<u>1st</u> (1977.8)	<u>2nd</u> (1977.11)	<u>3rd</u> (1978.4)
1. Machineries for Nursery Practices:			
1.1 1 ton Wheel Tractor			
1.2 4 ton Truck		2	
1.3 1 ton Forklift			
1.4 Irrigation System		1	1
1.5 Shade House		1	1
1.6 Green House			1
1.7 Potting House	1	1	1
1.8 Generator (medium)		1	1
1.9 Plastic net		30	
1.10 Seeds		30 kg	115 kg.
1.11 Fertilizers	6 tons		19.0 tons
1.12 Pesticides	99 kg 70 l		
2. Machineries for Planting Works:			
2.1 5.5 ton Crawler Tractor		1	1
2.2 2.5 ton Wheel Tractor		1	
2.3 Hand Auger		5	5
2.4 Bush cutter	10		10
2.5 Chain saw	2		
3. Machineries for Forest Road Construction:			
3.1 16 ton Bulldozer		1	
3.2 12 ton Bulldozer			

	<u>1st</u>	<u>2nd</u>	<u>3rd</u>
3.3 12 ton Dozer Shovel		1	
3.4 Motor Grader			1
3.5 Road Roller			
3.6 Dump Truck		1	1
3.7 Backhoe			
3.8 Materials for Bridges			
3.9 Culvert			1
3.10 Materials for Erosion Control Works		1	1
3.11 Surveying instruments			1
4. Machineries for Fire-fighting:			
4.1 Pump			3
4.2 Pump Tractor			
4.3 Fire-fighting tools			
5. Machineries for other uses:			
5.1 Research:			
(1) Seed Stocker (Refrigerator)	1		4
(2) Microscope		1	
(3) Germinator		1	
(4) Automatic balance		1	
(5) Pressure chamber		1	1
(6) Tension meter		1	
(7) Rainfall Recorder			1
(8) Pluviograph			20
(9) Water level recorder			2
(10) V notch			2
(11) Hygrothermometer			1

	<u>1st</u>	<u>2nd</u>	<u>3rd</u>
5.2 Office			
(1) Typewriter	1 (E)	1 (M)	
(2) Copying machine	1		1
(3) Filing cabinet	2		5
(4) Locker	2		2
(5) Blackboard		2	2
(6) Clock		2	
5.3 General			
(1) Generator (Large)	1	1	
(2) Switchboard		1	
(3) Batteries		3	
(4) Garage-jack		1	
(5) Charger		1	
(6) Pump			
(7) Generator (Portable)			2
6. Vehicles & Communication System:			
6.1 Jeep (4-wheel drive)			
(1) Wagon type	2		
(2) Hard top		2	
(3) Pick-up			1
6.2 Motorcycle		3	3
6.3 Communication system			
(1) SSB			2
(2) VHF			4
(3) VHF (Transceiver)			6

Annex 7.

EMBASSY OF JAPAN

MANILA

September 9, 1977

Honorable Jose I. Leido, Jr.
Secretary
Department of Natural Resources
Diliman, Quezon City


Dear Honorable Leido:

Recently Mr. Isamu Imai, a member of the House of Representatives of Japan, has visited Pantabangan with a group of his associates during his observation tour of projects in the Philippines which are assisted by Japan.

During his one day visit to the RP-Japan Afforestation Project, Director Briones together with Japanese experts made a briefing to Mr. Imai on the Project and he was very much impressed by its significance to the country and by the progress of its implementation. When he learned, however, that some Filipino farmers who breed and pasture cattles in the neighboring area are in the habit of burning weeds for the coming season, Mr. Imai suggested that the fact should be brought to the knowledge of the proper authorities concerned because it poses a fatal threat to the Afforestation Project since burning weeds could be a possible cause of forest fires and literally nullify all the efforts done to the Project.

It would be highly appreciated if the matter could be given due attention so that appropriate measures could be taken by the authority or authorities concerned to prevent forest fires in that area and ensure the success of the Afforestation Project.

Sincerely yours,


KIYOHISA MIKANAGI
Ambassador

Annex 8.

Republic of the Philippines
Ministry of Natural Resources
OFFICE OF THE MINISTER

29 November 1977

Ambassador Kiyohisa Mikanagi
Embassy of Japan
M a n i l a

Dear Ambassador Mikanagi:

Thank you for your letter of 9 September 1977. I am most grateful for your deep concern on the continuous progress and safety of the RP-Japan Technical Cooperation Project in the Afforestation of the Pantabangan Area. I am equally thankful for the keen observation made by Mr. Isamu Imai and his group of associates on the danger posed to the project by the practice of burning pasture areas surrounding the project by pasture lessees for purposes of inducing growth of young grass for feeding their cattle.

We assure you that this Office is as equally concerned as you are in the effective protection and maintenance of the established plantation within the historic and precedent setting RP-Japan project in afforestation in the Philippines. If only to emphasize my point on the degree of importance of our protection effort in this area, attached is the outline of the fire protection scheme now being implemented thereat.

With close supervision over the implementation of this fire control program, the project area could be well secured from occurrence of fire.

Best regards to you and your staff.

Very truly yours,

(SGD.) J. ANTONIO AGUENZA
Acting Assistant Secretary

True copy:
eat/11/21/78

SPECIAL PROGRAM ON FOREST FIRE CONTROL
FOR RP-JAPAN PROJECT

I. Introduction and Objectives

The great need of a fire control plan during the fire season has always to be considered on reforestation activities. Aiming at protection of established plantations, the RP-Japan Project will try to challenge the occurrence of forest fires which usually happens in plantation and ranges of this district. Thus, forest fires will be anticipated and be prevented within the project.

II. The Fire Control Organization

The fire control organization shall be set in a way that smooth operation or procedure shall be maintained. It will consist of personnel, fire tools, transportation and other facilities, which maybe found necessary in the prevention and suppression of forest fires.

To effectively implement its objectives, the different personnel shall be assigned in their specific jobs to perform various activities within the Central Trial Plantation.

<u>Personnel</u>	<u>Number</u>	<u>Activity</u>
Forester	1	Supervision and extension
Plantation guards	3	Foot Patrol and extension
Firefighters	15	Firefighting and foot patrol through 24 hours
Laborers	5	Maintenance of firelines using bush cutter.

In addition to regular personnel, volunteers or cooperators from the vicinities of the plantation shall be requested to act as emergency firefighters. Thus, there are three forces in the control of fire: the Project's firefighters, emergency firefighters and firefighters of the District.

III. Activities

The concentration of fire protection activities is in Baluarte Central Trial Plantation. The different activities shall be the following:

a. Prevention Engineering

1. Construction of firelines

Construction of firelines in November and February will be undertaken by the firefighters at 15 meter wide. They shall be guided by a forest protection map.

2. Construction of Stations

Simultaneously with the construction of firelines, the firefighters start constructing the tree watch towers which will also serve as their quarters in performing 24 hour duty. Guided by the same map, the watch towers will be set up in strategic places for detection purposes.

3. Installation of Water Source

Firefighters shall construct water ponds. Pre-fabricated water tanks shall be installed at the places where water is not easily available, so that fire-fighting could be undertaken much easier.

b. Forest Fire Control

1. Patrol

Plantation guards as well as the firefighters shall from time to time monitor within the area for detection of forest fire and report it immediately to the nearest fire station.

2. Public

The participation of the public is inevitable to fire control. Thus, proper encouragement should also be done.

3. Transportation

For immediate mobility and early action on any and all fires, the fire control organization must be given the priority in the use of transportation facilities.

4. Communication System

Like transportation the fire control organization shall establish a sort of wireless communication system which will emanate from the firefighters to the extent of reaching the Central Office by the use of walkie-talkies and wireless radios.

c. Prevention, Education and Extension

1. Contacts

From time to time, during the fire season, meetings will be held by the authorities concerned on fire prevention. Campaigns should be held even to the remote areas.

2. Sign boards

To better gain the attention of every individual, signboard, streamers and poster shall be put up in strategic places outside the plantation area.

3. Towels, stickers

As a form of reminder, towels and stickers shall be distributed to individuals. It will bear a slogan on fire prevention.

IV. Fire Tools and Equipment

The following are the tools and equipment needed in the prevention and suppression of fires.

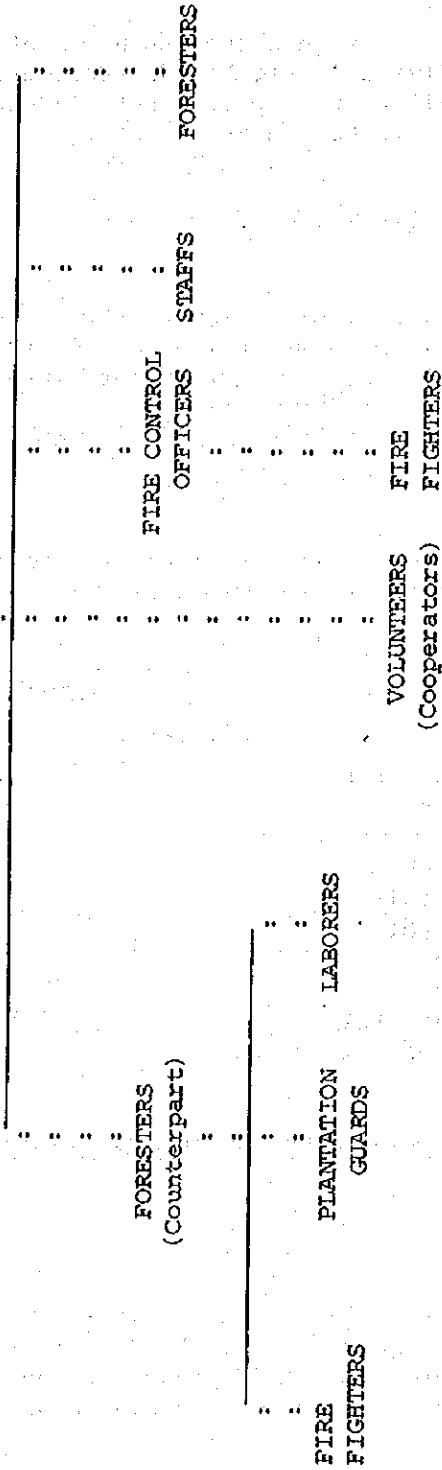
<u>Tools</u>	<u>Quantity</u>
1. Fire swatters	10
2. Fire rakes	10
3. Backpack pump cans	10
4. Flashlights	10
5. Walkie Talkie	3
6. Motor Cycle	3
7. Megaphone	2
8. Canteen	10
9. First Aid Kit	1
10. Fire Engine with Hose	3

V. Forest Protection Map and Organizational Chart

FIRE CONTROL ORGANIZATION CHART

PROJECT LEADER
(District Forester)

JAPANESE EXPERTS



Republic of the Philippines
Ministry of Natural Resources
OFFICE OF THE MINISTER

25 April 1978

Ambassador Kiyohisa Mikanagi
Embassy of Japan
M a n i l a

Dear Ambassador Mikanagi:

We regret to inform you that a fire of accidental origin has burnt about 30 hectares of established trial plantation of the RP-Japan afforestation project in Carranglan, Nueva Ecija. This constitutes about 10 percent of the total area of forest plantation of the said project.

I am writing you this letter to keep you informed of the development in the said project and to let you know that this office thru the BFD is doing everything possible under its limited resources to prevent the recurrence of fire in this particular project.

You are aware that as early as November, 1977 we have already instituted some measures to prevent fire occurrence in reforestation areas. These include, among others, the construction of a 15 meters wide firebreak around the plantation area, employment of foot patrols/ fire fighters to detect and suppress any fire that may threaten the plantation, including constant fire prevention campaign among the people residing in the vicinity. All these measures were rendered ineffective in the face of a massive fire which started from adjoining pasture land and spread to all directions aided by strong winds and dry cogon grasses. It took the total manpower of the District Office in Maringalo assisted by local inhabitants to put the fire under control.

At this juncture, let me assure you that everything is being done by this office to prevent another fire out-break in the remaining plantation of the project. Likewise, my staff is now studying the most effective fire prevention and fire fighting techniques to be implemented next summer to provide effective fire protection measures for our forest plantation thereat.

Very truly yours,

(SGD.) JOSE J. LEIDO, JR.
Secretary



Annex 10.

Republic of the Philippines
Ministry of Natural Resources
BUREAU OF FOREST DEVELOPMENT

1st Indorsement
13 April 1978

FOR : Dr. Sumihiko Asakawa
Chief Advisor,
RP-Japan Technical
Afforestation Project
BFD, Diliman, Quezon City

FROM : The Project Director

SUBJECT : Report on Tala-talan fire
that occurred on 25 March 1978

DOCUMENT ATTACHED :

1. Memorandum, dated 8 April 1978 of the District Forester, UPMUMD.
2. Memorandum of FIC Jose Natibo-oc, dated 26 March 1978.
3. Memorandum of Forest Guard Supervisor Jesus S. Mosquito, dated 3 April 1978.
4. Map showing the area of the Tala-talan fire.

REMARKS : The fire that occurred at Tala-talan on March 25, 1978 has burnt about 140 hectares of forest plantations within RP-Japan Afforestation Project and ProfEM area and 510 hectares of grassland.

The damage at the RP-Japan trial plantation is approximately 30 hectares.

The RP-Japan project fire fighters and the Upper Pampanga Multiple Use Management District joined hands and tried their best to combat the fire assisted by the local inhabitants who helped generously in putting out the conflagration. The fire was put under control after six (6) hours.

Investigation showed that the fire was accidental in nature which might be started from the adjoining pasture land and spread to the forest plantation creeping through dried cogon grasses aided by strong winds.

This report of burning is being referred to you for information and whatever action you may deem proper to take on the matter and for you to initiate some measures to prevent future fire occurrence in the RP-Japan Project.

(SGD.) BAGGAYAN

MEMORANDUM

FOR : The Director
 Bureau of Forest Development

ATTENTION : The Project Director
RP-Japan Afforestation Project

FROM : The District

DATE : 8 April 1978

SUBJECT : Report on Tala-talan fire that occurred on 25
March 1978.

DOCUMENTS

- ATTACHED :
1. Copy of the Memorandum of Forester-In-Charge Jose U. Natibo-oc to the Project Leader dated 26 March 1978.
 2. Copy of the Memorandum of Forest Guard Supervisor Jesus S. Mosquito to the District Forester dated 3 April 1978.
 3. Map showing the area of the Tala-talan fire.

REMARKS : This refers to the fire that occurred in Tala-talan, Carranglan, Nueva Ecija on March 25, 1978 at 10:30 in the morning that burned several hundred hectares of grasslands, including the ProfEM plantation and the RP-Japan trial plantation.

DAMAGE

The Tala-talan fire burned approximately 179,400 seedlings and 650 hectares of grasslands and plantation areas, broken down as follows:

	Area Burned: (Hectares)	No. of Seed- lings Burned
RP-Japan Trial Plantation - -	30	: 75,000
ProfEM Plantation - - - - -	110	: 104,400
Grasslands - - - - -	510	: -
T O T A L - - - - -	650	: 179,400

CAUSE OF FIRE

As per investigation report submitted by the Forest Guard Supervisor of this district, the fire is accidental in nature. There is a possibility, however, that the fire may have also been caused by range preparation.

This matter is being further investigated with the assistance of the Carranglan Police Force.

CONTROL ACTION TAKEN

The fire was discovered at 10:30 in the morning on March 25, 1978. The fire started from Dipa-an Creek inside a ranch and was progressing in the northerly direction toward the RP-Japan and PROFEM plantations.

Immediately after the discovery of the fire, firefighters and laborers assigned in Carranglan Reforestation Project were sent to the fire for initial attack. More men from the district office, San Jose Reforestation Project, and RP-Japan Project in Tala-talan were also dispatched. Help and assistance was requested from the residents in the area and they favorably responded. The barrio people who responded to the call for help were personally led by the Barangay Captain of San Agustin. All in all, there were about two hundred (200) persons/firefighters dispatched to suppress the fire.

The 200 firefighters did their best to control the fire. Every possible means of controlling the fire such as fireline construction, backfiring, spraying with water, and swatting, was applied. As the district could not provide the firefighters with fire tools and equipment, the firefighters used branches of trees, wet sacks, and other materials for swatting the fire out. Finally, after more than six (6) hours of hard and exhausting fight, the firefighters were able to control the fire, but only after it has burned around 650 hectares. The fire was declared controlled at 5:00 in the afternoon, and completely out at about 8:00 in the evening the same day.

It may be noted that despite the large number of men who suppressed the fire, still about 650 hectares were burned. This could be attributed to strong wind (10-15 miles per hour); dense, tall (70-130 cms. average height), dried and fast-burning fuels (mostly cogon and samon grass); high temperature (91°F); time of day (generally, the hours between 10:00 AM and 6:00 PM are bad burning conditions); steep topography (60%); frequent spotting (due to strong wind and convection action wherein sparks were carried to new fuels); rapid pre-heating of fuels (mainly due to strong wind and steep topography); high fire intensity (mainly due to dense and dry fuels); wide fire front (900 meters at 11:15 AM); high rate of spread (100 hectares per hour); lack of water; and lack of fire tools and equipment. Even the 15-meter wide firebreak that surrounded the RP-Japan trial plantation failed to stop the fire from crossing the plantation.

With this kind of conditions prevailing, control of forest fires will not be fast and immediate unless the firefighters are well trained and well equipped.

FOREST PROTECTION MEASURES ADOPTED
FOR THE 30-HECTARE RP-JAPAN TRIAL
PLANTATION AT TALA-TALAN BEFORE THE
FIRE OCCURRENCE

1. Constructed a 15-meter wide firebreak around the trial plantation.
2. Employed five (5) foot patrols/firefighters to patrol and protect the area from fire.
3. Constant fire prevention campaign among the people living in the area.

EMERGENCY MEASURES TAKEN TO PROTECT
FROM FIRES THE REMAINING FOREST
PLANTATIONS.

For RP-Japan Project

1. Employed additional firefighters and foot patrols for

the protection of the 180 hectares RP-Japan trial plantation at Baluarte. The foot patrols are required to patrol the area twenty-four (24) hours a day, seven (7) days a week.

2. Assigned one (1) service jeep to Baluarte trial plantation to patrol the area with firefighters twenty-four (24) hours a day, seven (7) days a week. This jeep, for the duration of the fire season, will not be used for any other purpose except fire control.

For PROFEM

1. Employed additional foot patrols to guard the plantations twenty-four (24) hours a day, seven (7) days a week.
2. Provided one (1) service jeep for each reforestation project for patrolling and for servicing the firefighters in case of fires.

For General Forest Protection:

1. Requested the UPLB College of Forestry Audio-Visual Unit to show pictures on the importance of forests in the population centers of the district. Tentative dates for film showing will be on April 18-22, 1978.
2. Employed the services of an audio-visual mobile unit to go around the barrios and population centers within the district area to broadcast an appeal for assistance in the prevention of forest fires and to disseminate information on the importance of forests and the destructive effects of forest fires. The mobile unit will make the rounds four (4) times a week until the end of the fire season.
3. Instructed the forest guards to intensify their campaign for fire prevention especially among the kainingineros in the district area. Instructed the PROFEM Secretariat of the district to conduct more meetings

- among the barrio people to disseminate not only PD 1153 but also to seek the help and assistance of these barrio people in the prevention of forest fires.
4. Employed the services of some of the Barangay officials of the Municipality of Carranglan, Nueva Ecija to assist the district in its fire prevention efforts. More Barangay officials will be hired later to boost the fire prevention program of the district.
 5. Put up additional fire prevention streamers in the strategic places within the district.

RECOMMENDATIONS: Listed hereunder are our recommendations to minimize, if not totally eradicate, fire occurrences within the district area:

1. Reject all new and renewal applications for pasture leases/permits within the Carranglan-Pantabangan and Talavera watersheds.
2. Cancel or relocate outside the Carranglan-Pantabangan and Talavera watershed areas all existing pasture leases/permits found within these watersheds. Range preparation is the number one cause of fires in this district.
3. Resettle all kaingineros in a place within the district area to have a closer supervision and control of their activities. Kaingin making is the number two cause of forest fires in this district.
4. Provide full support to the fire control organization of this district. The request for authority to employ 100 firefighters and prevention officers to protect our forests and plantations from destructive fires has been filed as early as January this year. No favorable response has been received up to this date on the request.

The Carranglan-Pantabangan watershed is a critical watershed because of the presence of the multi-million peso Pantabangan dam, and being the case, it should be given top priority in forest protection especially during the dry season wherein fire occurrences are frequent and rampant.

(SGD.) ROMEO B. BRIONES

MEMORANDUM :

FOR : The Project Leader
FROM : The Forester-In-Charge
DATE : 26 March 1978
SUBJECT : Fire Report at RP-Japan Trial Plantation
in Tala-talan

REMARKS : At approximately 11:00 A.M. 25 March 1978, we noticed smoke rising from Mt. Pinagloriahan at the side situated near Sitio Malibukong, Barangay Gen. Luna, Carranglan, Nueva Ecija. I immediately dispatched all my men from the nursery numbering sixty (60) persons.

We reached the fire at about 11:15 A.M. and noticed that is about 900 meters long. Wind, a strong breeze with velocity of about 10 to 15 miles per hour in the general direction of Northwest towards RP-JAPAN Trial Plantation and average topography of 60%. Vegetation are mostly dense cogon and samon grass with average height of 70 to 130 cms. and sparsely grown with trees. Humidity is approximately dry because it is high noon of the Holy Saturday, the dryest time of the year. According to nursery temperature records, it is about 91°F or 33°C.

For fire suppression, we used only branches of trees, bundles of cogon and sprinklers for we lack fire equipment needed for fast suppression of fire.

Due to the strong wind velocity, dense fire fuel, lack of fire equipments and far distance to water sources, we are not able to put out the fire till it reaches out Trial Plantation even though, we have 15 meters wide firebreak around the plantation and the number of men have grown to eighty eight (88) persons.

We were just able to contain the fire when it reaches the Bitawang Creek at about 5:00 P.M. 25 March 1978. By now, our Trial Plantation of 30 hectares have been all burned.

Pending result from official investigation, the source of fire was allegedly from the control burning being done at Manalo's ranch near Sitio Malibukong, Barangay Gen. Luna, Carranglan, Nueva Ecija.

ACTION
DESIRED : For your information and file.

(SGD.) JOSE U. NATIBO-OC

Republic of the Philippines
Department of Natural Resources
Bureau of Forest Development
UPPER PAMPANGA RIVER BASIN
MULTIPLE USE MANAGEMENT DISTRICT
Maringalo, Carranglan, Nueva Ecija

R3D-3, 2300

MEMORANDUM

FOR : The District Forester

THRU : The Assistant District Forester
Forest Protection & Development Division
The Assistant District Forester
Forest Resource Management Division

FROM : The Forest Guard Supervisor

DATE : 3 April 1978

SUBJECT : Submission of the Investigation Report in regards
with the Burned RP-Japan and PROFEM Reforestation
Project.

DOCUMENT
ATTACHED : Sworn Statement of:

1. Rodrigo de Guzman
2. Honorio Corpuz
3. Ernesto Alputan
4. Rogelio Ramos
5. Bernardo Catalan

REMARKS/

RECOMMENDATION : Submitting herewith the findings based on my actual investigation of the burned forest areas and plantation of RP-japan and PROFEM reforestation projects at So. Talatalan, San Agustin, Carranglan, Nueva Ecija on March 25, 1978 at about 10:30 A.M. to wit:

Together with Administrative Assistant Regino N. Pagurayan, we conducted the investigation on the 26th day of March 1978 at the fire site wherein the fire possibly started and we found out that it originated from Dipa-an Creek inside the ranch of a certain Emiliana Padilla vda. de Manalo of San Jose City. All efforts were made to establish prima facie evidence against the suspects but we were not able to pinpoint the culprits due to insufficiency of evidences, basing on the gathered sworn statements and actual site investigation.

Meanwhile in another development a certain Bernardo Catalan of the said ranch and employed with the BFD as plantation guard-foot patrol refused to continue his sworn statement, and about 12 hours earlier, planned and applied control burning 400 meters away from the origin of the fire. He was advised by the firefighters to secure burning permit before burning but allegedly told them that he will be responsible for whatever will happen and inform them further that if smoke or fire is seen emitting within the ranch they don't have to worry because by then a control burning will be underway. It was found later that He (Catalan) allowed his son in-law Rogelio Ramos Y Estipular to do the control burning on the 24th March 1978 at 8:00 o'clock P.M. and ended at 11:00 o'clock in the evening without his (Catalan) presence. It was earlier presumed that the forest fire which occurred on the 25th day of March 1978 originated from the said control burning but upon careful study and investigation it came out that it is no longer a part of it.

It is concluded therefore that the case of the burned forest areas and plantation is accidental in nature, hence, possibly caused by careless passersby.

In view of the foregoing, I am strongly recommending the filing of charges against the alleged owner of the ranch which is believed to be expired and to the persons liable in the illegal control burning.

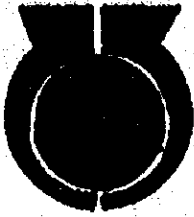
ACTION

REQUESTED : For your information and perusal.

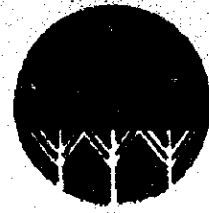
(SGD.) JESUS S. MOSQUITO

Copy furnished:

1. The Director BFD, Diliman, Quezon City
2. The Regional Director R-3, San Fernando, Pampanga
3. The Chief, Forest Protection & Infrastructure Division, Quezon City.
4. The Chief, Legal Division, Quezon City
5. The OIC, Reforestation & Afforestation Division, Quezon City
6. File



Republic of the Philippines
Department of Natural Resources
Bureau of Forest Development
RP-JAPAN TECHNICAL COOPERATION IN
AFFORESTATION OF THE PANTABANGAN AREA
Visayas Ave., Diliman, Quezon City



BFD SPECIAL ORDER)
NO. 104 :
Series of 1977)

March 29, 1977

SUBJECT: Establishing a Joint Committee to
implement the Technical Cooperation
Project for the afforestation of the
Pantabangan Area

1. In accordance with caption No. 8 of the Record of Discussions between the Japanese Forestry Survey Team organized by the Japan International Cooperation Agency (JICA) and the Philippine Government through the Bureau of Forest Development, Department of Natural Resources, concerning the Technical Cooperation Project for the afforestation of the Pantabangan area, a Joint Committee is hereby established and constituted to implement said Project as defined and provided for in the Record of Discussions, as follows:

<u>Japanese Side</u>	<u>Philippine Side</u>
1. Dr. Sumihiko Asakawa Chief Adviser	1. Rogelio B. Baggayan Project Director
2. For. Masanori Tanaka Team Leader	2. Romeo B. Briones Project Leader
3. Expert(s) designated by Chief Adviser	3. Mr. Arnold Caoili Representative, DNR
4. Hiroshi Gotoh Representative, JICA	4. Engr. Ramon Palomares Representative, NIA
5. Sohta Iwamoto Agricultural Attache Embassy of Japan Observer	5. For. Remilio C. Atabay Representative, FORI
6. Koichi Gotoh Observer, JICA	

Chairman - Director, Bureau of Forest
Development

2. The Joint Committee shall supervise and oversee that the duties and obligations of both parties are executed, implemented and complied with by the respective parties.

3. It shall approve an annual work plan and formulate guideline, criteria and standards with the concurrence of both parties, which are necessary for the smooth and successful implementation of the Project.

4. It shall monitor the development of the Project, submit recommendations as may be desired from time to time and render such reports necessary and as may be required.

5. It shall hold regular meeting every three months the date and venue to be determined by the Chairman.

6. This Special Order takes effect immediately.

(SGD.) EDMUNDO V. CORTES
Director

Annex 12.

Name List of Japanese Experts

Name		Position	Period
Sumihiko	ASAKAWA	Chief Adviser	24th Nov. '76 to 23rd Nov. '78
Masanori	TANAKA	Team Leader silviculture	-do-
Masayoshi	SHINAGAWA	Erosion Control	3rd Aug. '77 to 2nd Aug. '79
Osamu	TAKASAWA	Forest Management	-do-
Kota	YAMATE	Tree Breeding	28th March '77 to 27th June '77
Akira	KINUKAWA	Forest Management	-do-
Takao	KOBAYASHI	Forest Pathology	3rd Aug. '77 to 2nd Oct. '77
Teruhiko	KAWAHARA	Forest Ecology	-do-
Tadao	YOKOKOJI	Forest Machinery	30th Aug. '77 to 29th Sept. '77
Tomoyoshi	NAGANUMA	Nursery Facility	-do-
Masaharu	KONNO	Model Infrastructure	27th July '78 to 22nd Jan. '79
Yasushi	MORIKAWA	Forest Physiology	1st Aug. '78 to 30th Sept. '78
Hideo	YANASE	Erosion Control	30th Aug. '78 to 30th Oct. '78

Annex 13.

Name List of RP-Counterparts

Name	Position
Rogelio B. Baggayan	Project Director
Romeo B. Briones	Project Leader
Oscar M. Hamada, Jr.	Co-Project Leader
Elizardo B. Alberto	Co-Project Leader
Manuel H. Zambrano	Assistant to Project Leader Silviculture
Romualdo J. Villador	Assistant to Project Leader
Reginaldo R. Domingo	Erosion Control
Eriel B. Bumatay	Forest Management
Floro T. Tadena	Over-all Supervisor Silviculture
Meliton I. Vicente, Jr.	Protection
Laurino D. Macadangdang	Silviculture
James M. Jacob	Forest Management
Jose U. Natibo-oc	Silviculture
Romeo R. Clarete	Forest Engineering
Rafael Cadiz	Silviculture

Annex 14.

Name List of Trainees in Japan

Name	Position	Period
Rogelio B. Baggayan	Project Director	16th Oct. '76 to 6th Nov. '76
Romeo B. Briones	Project Leader	28th April '77 to 11th June '77
Felipe D. Buenaflor	Section Chief	15th Sept. '77 to 14th Dec. '77
Rafael Cadiz	Counterpart	28th March '78 to 27th June '78
Jonas Camat	-do-	-do-
Manuel H. Zambrano	-do-	13th Oct. '78 to 20th Dec. '78
Elizardo B. Alberto	Co-Project Leader	-do-

Annex 15.

Chronological Events

1973

- May - First approach of the Philippine Government to the Japanese Government was made for the afforestation in the Pantabangan Area.

1975

- April - The 1st Japan International Cooperation Agency (JICA) mission was dispatched for Basic Survey.
- Dec - The 2nd JICA Mission was dispatched for Planning Survey.

1976

- June - RD was signed (on the 18th).
- Nov - Two experts were dispatched (on the 24th).
- Dec - General survey was conducted in the proposed project area.
- Parcel I at Pantabangan was cancelled and transferred to Baluarte, Carranglan, Nueva Ecija.
- Nomination of Counterparts was suggested.

1977

- Jan - Baluarte Central Nursery was established (on the 3rd).
- Survey of Central Trial Plantation was conducted.
- Nomination of counterparts was finalized.
- Central Office of RP-Japan Project was completed (on the 17th).
- Nursery practices of Caribbean and Oocarpa Pines were started at Baluarte Central Nursery.

- Feb - Mission headed by Dr. Takehara was dispatched.
- Survey of Central Trial Plantation was completed.
- Chief, Technical Division, Japanese Ministry of Foreign Affairs visited the RP-Japan Project site.
- March - Observation of Benguet pine plantations and natural stands in Baguio was conducted.
- Site survey was conducted at the proposed Central Trial Plantation.
- Joint Committee was created by BFD Special Order #104.
- Two short term experts were dispatched for Forest Breeding and Forest Management.
- Technical Cooperation Center at Maringalo was almost completed.
- April - Planting Plan for Central Trial Plantation was prepared (dividing the area into compartment and sub-compartment).
- Application of fertilizer and chemicals was initiated.
- Detailed plan was prepared for the construction of forest road in the Central Trial Plantation.
- Two (2) counterparts went to Mindanao for observation and training.
- Vice-President of JICA headquarters visited the Project (on the 27th).
- Project Leader left for Japan for Training (on 28th).
- May - Supplementary supply of seedlings from other reforestation projects was arranged.
- Forest road construction at Central Trial Plantation was started by contractual basis.
- Planting site preparation was started (Digging, sticking).
- Participants of the 6th Multiple-Use Forest Management Training visited the RP-Japan Project.

- Start of hauling seedlings from other projects.
- Field discussion was held among Project Director, other RP-Counterparts and Japanese Experts.
- June - Start of planting activity (on 1st).
- Planting activity was suspended due to lack of rain (10th to 16th).
- Deputy Director General of Forestry Agency of Japan visited the Project.
- The 1st meeting of the Joint Committee was held at the Central Office (on 30th).
- July - Block 4-5 of Baluarte Central Nursery was washed-out due to heavy rain.
- Spacing trial of Narra and Mahogany was established
- Kick-off tree planting of the project was held at the Central Trial Plantation which was joined by Minister of Natural Resources and Ambassador of Japan to the Philippines (on 23th).
- 1st shipment arrived.
- Aug - Two long-term experts were dispatched for erosion control work and forest management.
- Two short-term experts were dispatched for ecology and pathology.
- Mission arrived to study the feasibility of the training center for forest conservation.
- Diet member Mr. Imai visited the project.
- One hundred and eighty (180) hectares in CTP were completed.
- Sept - Thirty (30) hectares of trial plantation in Parcel II-B (Tala-talan) were planted.
- Demonstration to operate bush cutter was conducted.
- Weeding and fertilization were conducted in CTP.
- Two short-term experts were dispatched - for nursery facilities and forestry machineries.

- First potting house was constructed.
 - Remaining of 1st shipment arrived.
 - Second mission for training center was dispatched.
 - Seminar on ecology and pathology was conducted by Japanese experts.
- Oct
- Nursery operation was started for 1978.
 - Forest road at CTP was extended by using the project machineries.
 - Mission was dispatched to survey and design the forest road for Parcel II and III.
 - 1st model for erosion control work was constructed at Baluarte Central Nursery.
- Nov
- The 2nd meeting of the Joint Committee was held at the Technical Cooperation Center, Maringalo, Carranglan, Nueva Ecija.
 - 7th Multiple-Use Forest Management Training was held in Maringalo, and its participants visited the RP-Japan Project.
 - The construction of forest road was started in Parcel II-B.
 - Tala-talan central nursery for Parcel II-B was temporarily established and nursery operation was started.
 - Three (3) temporary look-out towers were constructed at CTP.
 - Forest protection activity was started.
 - Ambassador of Japan requested the Philippine Government to initiate necessary measures for protecting RP-Japan trial plantations from fire.
- Dec
- The plantation survey (percentage of survival) was conducted.
 - Construction of fire break was made by using Bulldozer (CT 35) and bush cutters.
 - 2nd shipment arrived.

1978

- Jan - Demonstration in using the fire engine was conducted.
- Three (3) collapsible water tanks were installed at CTP.
- Automatic sprinkler was installed at the Baluarte Central Nursery.
- Feb - A potting house was constructed at Tala-talan Nursery.
- New Zealand Ambassador to the Philippines visited the Project.
- Motor Pool began to be constructed.
- Supplementary nursery operation was started at Piut nursery.
- March - Survey of planting site of Parcel I and Parcel II-B was conducted.
- Two part-time counterparts were assigned from Central Office.
- Construction of forest road in Parcel I was initiated by using the Bulldozer.
- An accidental fire burned 30 hectares of trial plantation in Tala-talan.
- Two counterparts were dispatched for training in Japan.
- Renovation work of the damage in July, 1977 was started at Baluarte Central Nursery by JICA fund.
- April - Planting site at Parcel III was surveyed.
- Plan for forest road of CTP, P-I, P-II-B, and P-III was made.
- Field discussion was made by the Japanese experts and RP-counterparts.

- Forest protection activities were intensified through posters, film showing, etc.
 - Water was hauled from Carranglan River, due to lack of water supply at the Baluarte Central Nursery.
 - 8th Multiple-Use Training was held and again the RP-Japan Project was visited.
 - Asian Regional Training for Reforestation and Erosion Control was conducted in Maringalo and the participants visited the project.
 - Technical Guidance Mission headed by Mr. Kohtari was dispatched.
 - The 3rd meeting of the Joint Committee was held at the Central Office. The members of the above-mentioned mission joined the meeting.
 - Project Leader and Team Leader of RP-Japan Project visited different reforestation projects to negotiate to get some seedlings for the project.
 - Field discussion with Project Director was held.
 - Planting activities were started.
- June
- 3rd shipment arrived.
 - Direct seeding was done in Parcel III (Compartment 100).
 - Extension of RD was signed.
 - Three (3) students from UP finished their field experience.
- July
- Two Assistants to Project Leader were nominated.
 - Forestry activities were observed in Palawan.
 - Short-term expert for model infrastructures was dispatched.
- Aug.
- The construction of model infrastructures was initiated.

- Short-term expert for tree physiology was dispatched.
 - Weeding and fertilization were started.
 - Planting activities were completed.
 - Renovation work at Central Nursery was completed.
 - Short-term expert on erosion control was dispatched.
- Sept
- Frequent landslide at Lomboy disturbed the trip between Quezon City and the project site.
 - JICA evaluation team was dispatched and visited the project.
 - Seminar on Tree Physiology and Problem of Afforestation was held in Maringalo.
 - Nursery operation at Parcel III was started.
- Oct
- 2nd Technical Guidance Team was dispatched.
 - Two (2) counterparts left for Japan for training.
 - Two (2) long-term experts were dispatched to take over the seat of the predecessor.

JICA