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**REPORT ON PRELIMINARY SURVEY
ON MOUNTAIN LOGGING
PRACTICES IN JAVA TECHNICAL COOPERATION PROJECT**

December 1977

Japan International Cooperation Agency

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PREFACE

The relations between Indonesia and Japan in the field of forestry have been deepening in recent years. It gives us a great pleasure to note in particular that their cooperation through the Japan International Cooperation Agency in the field of forestry technology, such as forestry development and silviculture, is under study.

Against this background, the Japan International Cooperation Agency dispatched a preliminary survey team for technical cooperation in the logging in mountainous areas of Java for 20 days from June 28, 1977.

The purpose of this technical cooperation project is to extend cooperation in logging technology centering around the skyline skidding technique utilized for the felling, gathering and transporting of pine trees in mountain areas, particularly, in the Province of Java. This technology has been developed in Japan, as a technology necessary for the intensive management of forests by maintaining multi-purpose functions of forests, such as conservation of land, soil and water resources, in steep mountain areas. We are convinced that this technology will meet the increasing necessity in Indonesia of harmonizing effective utilization of forests and land conservation.

This report summarizes the views of the survey team how to conduct the technical cooperation. It is our sincere hope that the substance of this report will serve for the formulation of a technical cooperation project, thus making possible the closer interchanges between forestry technicians in Indonesia and Japan and further deepening of the understanding in both countries about forestry.

My deep appreciation is due to all the parties concerned in Indonesia, government agencies of Japan as well as to the members of the survey team who have extended various forms of cooperation in the implementation of this survey.

December 1977



Shinsaku Hogen
President
Japan International Cooperation Agency



講義及び実習を行う予定のプルフタニのマデューン研修所
Perhutani's Training Institute at Madiun



マデューン市街 city of Madiun



研修所内部 condition of
Training Institute



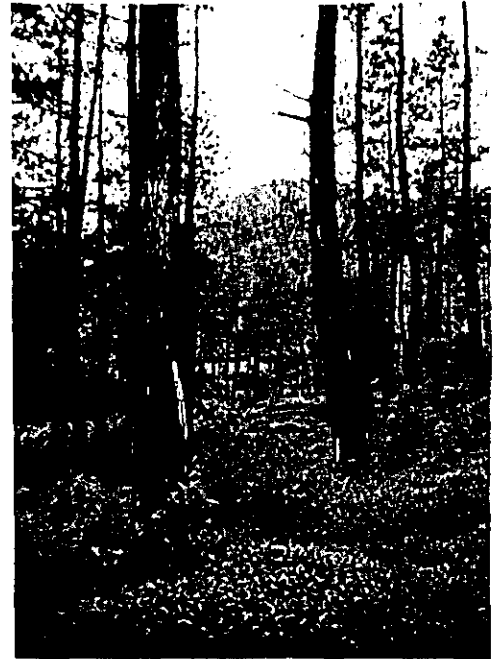
演習林(ラウ営林署)
demonstration Forest at Lawu



トンバンサリの様子(ラウ営林署)
agricultural condition at Lawu Forest District



モデル事業林を置くブカロンガン営林署管内（スラマト山）
model logging operation forest at KPH
Pekalongan Barat (G. Suramat)



伐期に達したメルクシーマツ林
pine forest



モデル事業林の状況（ブカロンガン営林署）
model logging operation forest
(KPH Pekalongan Barat)



マツヤに採取の状況
condition of gum rosin taking



Moga の市場（ブカロンガン営林署管内）
market at Moga (KPH Pekalongan Barat)



ブカロンガン営林署庁舎
KPH Pekalongan Barat office



アガチスの集材の様子 (Pekalongan 営林署)
logging work of agathis at KPH Pekalongan Barat



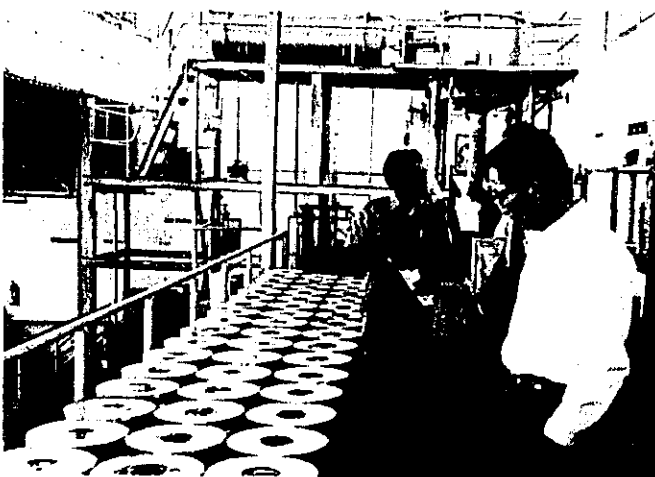
メルクシーマツの人力集材 (マッチ用材) (Lawu 営林署)
logging work of pine forest at KPH Lawu



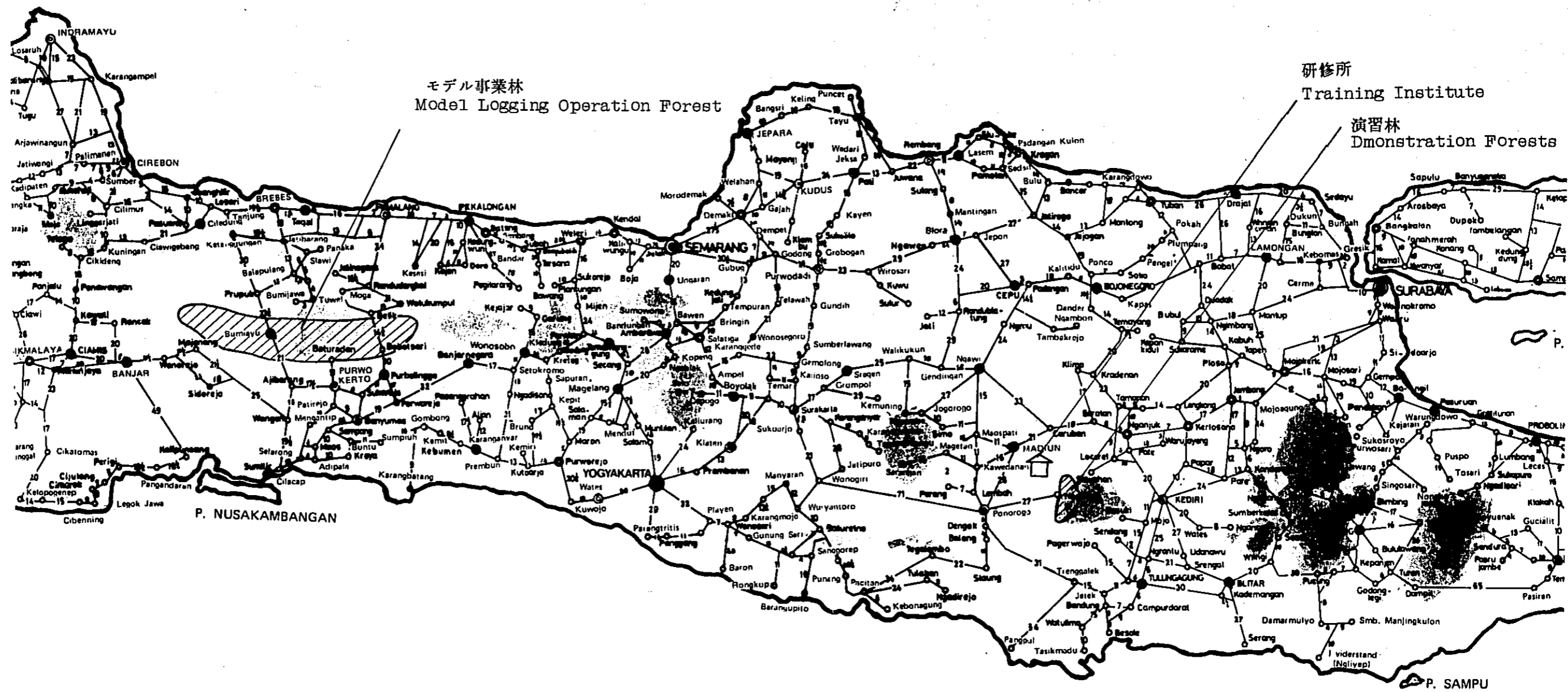
マホガニーの造林地
man made mahogani forest



チークの造林地 (80年生)
man made teak forest



ブルフタニのガムロジン精製工場 (スクン)
Perhutani's factory for gum rosin



ジャワ山岳林収獲技術協力事業位置図

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1. PURPOSE OF THE SURVEY

1-1 Background of Request for Cooperation

In order to domestically produce paper, the supplying of which had thus far been dependent upon imports, the Government of Indonesia planned to establish a new pulp and paper mill and instructed the Perum Perhutani (State Forestry Corporation) to supply the mill merkusii pines for materials in the production of paper.

According to Indonesia's plan, this pulp and paper plant is scheduled to be constructed on a hill near the Port of Cilacap in the Province of Central Java.

For this, the Perum Perhutani has decided to prepare a total of 100,000 ha of merkusii pine forests, including those distributed in the areas placed under the jurisdiction of East Banyumas, West Banyumas, West Pekalongan and Purworjo forest district and those in areas where planting will be done in the future, and to carry out felling projects and re-develop forests in order to assure the continued supplying of merkusii pine trees.

However, merkusii pine production forests are distributed in steep areas, more than 700 meters above the sea level, around Mt. Sulmat, and furthermore they are sporadically distributed in small areas which are mingled with terraced upland fields, so that it has been made clear that there is a need to adopt a skyline logging technique in which special heed should be paid to the fostering of water sheds and the soil conservation for the logging and utilization of pine trees. The merkusii pine trees in these areas have a cut, about one meter above the ground, to collect pine resin, so that a considerably large number of merkusii pine trees have been blown down. Therefore, there is a need to make a re-study of the resources available at present.

In the light of this situation, the Perum Perhutani requested for Japan's technical cooperation, as it had become necessary to master logging and skidding techniques and grasp

forestry resources in order to re-examine the plans for the logging of merkusii pine trees.

1-2 Circumstances Leading to Request for Cooperation

° In August 1976, Niro Namura, director of the Japan International Cooperation Agency's forestry development cooperation department, visited Indonesia to make a survey on the way in which technical cooperation in forestry should be stepped up between Indonesia and Japan. He was requested to extend technical cooperation in the formulation of a logging plan of merkusii pine forests in the area placed under the jurisdiction of the West Pekalongan District Forest Office in the Province of Central Java.

° In response to this request, it was decided to carry out a Forest Inventory for Pine Forests in Central Java in order to extend technical cooperation in the formulation of a logging management program - which included a road network plan, designing of a model logging system and a 10-year logging plan - and aerophotographing, mapping and photo analysis required for this program in respect of the merkusii pine trees in the areas placed under the jurisdiction of the West Pekalongan District Forest Office in the Province of Central Java. To discuss ways of formulating the program, a survey team headed by Tadao Mishima, president of the Federation of Logging Association, visited Indonesia in December 1976. The Perum Perhutani strongly requested for technical cooperation not only in the formulation of the program but in its implementation as well. It also requested for the inclusion of trial logging and necessary machinery in a survey of forestry resources.

° As it turned out to be a categorical imperative to supply raw materials to the Notog pulp and paper mill by skidding merkusii pine trees in mountain areas, the Indonesian side expressed its intention of requesting for technical cooperation in the transfer of a sky-line logging technique in some way or the other.

° In March 1977, the letter sent by Mr. Soedjarwo, Director General of Forestry, requesting the implementation of technical

Cooperation in relation to the establishment of a training institute to master mountain logging techniques, dispatch of related technical experts and offer of machinery.

° In April 1977, as a part of the forestry resources survey which had already been started, the Bapenas List ATA-184 (Forest Inventory for Management and Logging Plan Raw Material Supply to Central Java Pulp and Paper Mill) was worked out by the Indonesian side and the dispatch of a survey team was requested to deliberate on the substance of the project.

The substance of the Indonesian side's request in respect of a project for the training of sky-line logging techniques may be summarized as follows:

* In order to supply raw materials to the projected pulp and paper mill and contribute to the development of forests in Indonesian mountain areas, the mountain logging techniques will be trained.

* The training will be conducted for staffers of the Perum Perhutani and the Directorate General of Forestry.

* In the training, the facilities available at the Madiun Training Institute of the Perum Perhutani and the merkusii pine trees in the area placed under the jurisdiction of the Lawu District Forest Office near Madiun will be put to use in providing lectures and on-the-job training.

* Upon completion of a six-month course, the trainees will be engaged in the logging of merkusii pine trees in Central Java.

1-3 Purpose of the Survey

In order to survey the feasibility of a technical cooperation project designed to transfer mountain logging techniques primarily for merkusii pine trees in the Province of Central Java, Indonesia and at the same time to discuss the way in which the technical cooperation should be stepped up in response to the aforementioned calls, the Preliminary Survey on Technical

Cooperation in Mountain Logging Techniques in Java was carried out. Now that the general conditions of forests in the Province of Central Java had been checked in the forest inventory conducted from December 1976 to June 1977, the preliminary survey was conducted in the form of an on-the-spot check on the Madiun Training Institute where sky-line logging techniques, the mainstay of the technical cooperation, would be carried out the training, merkusii pine trees within the jurisdiction of the Lawu District Forest Office where practical training would be carried out, and also the site of on-the-job training at the Pekalongan District Forest Office. With the Indonesian side, the buildings and machinery required for this project were studied, and discussions were made on essential points in the training curriculum and also on the way in which the training should be stepped up. A discussion was also carried out on the draft of a record of discussions, which would serve as a guideline for the implementation of the project.

1-4 Composition and Schedule of Survey Team

The composition and schedule of the survey team are as follows

The Member of the Team

(Head of the Team)

Tadao	MISHINA	President, Japan Federation of Logging Association
Hiroaki	ONO	Senior Officer, Forestry Administration Dep. Forestry Agency, Ministry of Agriculture and Forestry
Kazuji	SENDA	Head, NUMATA Forestry Technics Development Station, MAEBASHI Regional Forestry Office, Forestry Agency, Ministry of Agriculture and Forestry
Hiroshi	MIYATA	Member, Japan Federation of Logging Association
Nobumitsu	MIYAZAKI	Vice Head, Development Div., Forestry Development Cooperation Dept. JICA

Schedule		
<u>Date</u>	<u>Trip</u>	<u>Remarks</u>
June 28 (Tues.)	Tokyo - Jakarta	
June 29 (Wed.)	Stay in Jakarta	Courtesy call to, and made arrangements with, the Japanese Embassy.
June 30 (Thurs.)	Stay in Jakarta	Courtesy call to, and made arrangements with, the Perum Perhutani.
July 1 (Fri.)	Do.	Courtesy call to Planning Bureau, Directorate General of Forestry.
July 2 (Sat.)	Do.	Courtesy call to, and made arrangements with, the Planning Bureau, Ministry of Agriculture and Forestry.
July 3 (Sun.)		Collected data.
July 4 (Mon.)	Jakarta - Surabaya - Madiun	Courtesy call to, and made arrangements with, the Surabaya Regional Forestry Office.
July 5 (Tues.)	Stay in Madiun	Surveyed the demonstration forest of the Madiun Training Institute.
July 6 (Wed.)	Madiun - Baturaden	} Surveyed pine forests in Central Java and model logging operation forest. Courtesy call to, and made arrangements with, the Semarang Regional Forest Office.
July 7 (Thurs.)		
July 8 (Fri.)	Baturaden - Semarang	
July 9 (Sat.)	Samarang - Jakarta	
July 10 (Sun.)	Stay in Jakarta	Collected data.

<u>Date</u>	<u>Trip</u>	<u>Remarks</u>
July 11 (Mon.)	Stay in Jakarta	} Discussions with the Perum Perhutani, Directorate General of Forestry and Ministry of Agriculture and Forestry.
July 12 (Tues.)	Do.	
July 13 (Wed.)	Do.	} Preparation of an interim Report.
July 14 (Thurs.)		
July 15 (Fri.)	Do.	Reported to the Directorate General of Forestry.
July 16 (Sat.)	Jakarta	Reported to the Japanese Embassy.
July 17 (Sun.)	Tokyo	Returned to Japan.

2. BASIC CONCEPT OF TECHNICAL COOPERATION PROJECT

2-1 Premises

The man-made forests of merkusii pine trees in Central and East Java, which are placed under the jurisdiction of P.N. Perum Perhutani consist mostly of mountain forests with slants of over 15 degrees with the exception of some of those in the flatland. Furthermore, the topographical and forest conditions are such that merkusii pine trees in the man-made forests have to be logged in steep areas in sharp contrast to the Kalimantan flatland - primarily, Dipterocalpacial - where trees large in diameter are cut. The conventional technical system in which large machinery is used for tropical rain forests is totally unsuitable for the given situation.

Farms are situated in most of the periphery of the man-made forests of merkusii pine trees, and the annual precipitation exceeds 3,000 millimeters. Furthermore, some of the soils are such in nature that rainwater does not readily percolate the underground. In regard to the forest conditions, the forest are not those whose plantation is carried out in a large area at one time. They consist of small-area forests with irregular locations, some of them being isolated. The standing trees for skidding work are 30 centimeters in breast height diameter, 20 meters in tree height and 1.2 in raw lumber gravity. Consequently, the stem volume is 0.65 cubic meters, or 780 kg in weight.

In order to carry out logging effectively under these conditions, it is necessary to make full use of the sky-line logging techniques with the aid of machinery power. What calls for the highest degree of attention in this conjunction is the necessity of carrying out the sky-line logging work so as not to destroy the peripheral farms, preventing an erosion and maintaining the water sources.

In case machinery is put to use, there will be no need for full mechanization as in the case of a depopulated area outside

Java. Instead- attention ought to be paid to the question of employment for local inhabitants. Care must be exercised to set to it that there will be an increase in employment. This sounds a bit contradictory to the mechanization, but the fact that practically no pine lumber has been produced in the past but that there is the necessity of producing it in massive quantities is spontaneously tied in with an expansion of employment.

With all these factors taken into consideration, an attempt will be made in this report to study the way in which technical cooperation should be in transferring the techniques for mountain logging, the main purpose of this cooperation project.

2-2 Basic Concept

The skidding techniques employed by the Perum Perhutani for teak trees are dependent upon cattle and manpower. In regard to merkusii pine and agathis trees, the skidding is reliant on manpower in most instances. Skidding techniques in the sky-line skidding system are studied at universities and experiment stations but their practical use has not been experienced in the past.

The sky-line skidding system was introduced to Japan for the first time in 1913. The skidding machines available in those days were too heavy to practical use. In the 1930's, skidding machines of the kind which was suitable for Japan's topographical conditions made their appearance, laying the foundation for the development of the skidding machines which are available in Japan today. But it is just recently, or after 1955, that the use of skidding machines has spread all over Japan. Insofar as the skidding techniques are concerned, Japan is counted as one of the world's most advanced countries today. The reason is that the majority of the forests in Japan are situated in mountains and no logging means other than the skyline skidding system are inconceivable. The logging methods in old Japan included the drifting of logs on rivers, the transport aboard a sleigh over the snow or ice or the sliding over the logs, suggesting that the lumber transport was dependent upon cattle power and manpower. But the use of rivers was prohibited due to the construction of

dams. Other logging methods were not efficient. Besides, because of the danger and heavy work involved in these types of logging and the lack of cattle power, there was no alternative but to shift to the skyline logging system.

Since 1945, on the other hand, it has become a practice for highly skillful machinery technicians to take part in the development and improvement of forestry machines, making it possible to produce lightweight, small, high-performance logging machines. Skidding machines and wire ropes have been tremendously improved. In parallel to these developments, a wide variety of sky-line setting systems have been worked out and put to use all over Japan.

To start the logging of merkusii pine trees in Indonesian mountains, there is a need to carry out the training in which the Japanese sky-line logging methods which have been developed through the aforementioned process may be transferred to Indonesia over a short period of three or four years. Given below is the basic concept of the way in which technical cooperation should be stepped up for the transfer of the sky-line logging system.

2-2-1 Techniques to be Mastered

a) Felling and Bucking

Needless to say, it constitutes the main part of the technical cooperation to master sky-line logging techniques. The logging work constitutes only a small part of the management of forests, so that the whole process extending from felling to replantation is taken into consideration. It is necessary to consider how the sky-line logging system should be incorporated in the whole technical system.

Before logging, felling has to be carried out. Depending on the felling process, the scale and process of logging are influenced. Therefore, there is a need to study whether the felling process should be incorporated in the techniques to be mastered in the training. At the work places of the Perum Perhutani, two-man saws are in use at present. If it is assumed here that the Japanese techniques will be put to

use as they are, the introduction of chain saws is conceivable. When thought is given to the fact that a large number of relatively skillful workers may be employed and that the past experience shows the productivity of 5 m³ a day per worker, there is some doubt about the profitability of introducing chain saws. The use of chain saws is of advantage for trees large in diameter, but it has not been established that their use is of advantage for trees small in diameter. From the standpoint of manpower, manpower has been reduced to an exceedingly great extent, and the exceedingly great decrease may pose a social question. A rapid shift to the use of chain saws will be inadvisable when the employment of local inhabitants is taken into consideration. While coping with the social conditions, such as the employment of local inhabitants, it will be desirable to shift gradually to the utilization of chain saws. Therefore, we wish to carry out the training on the assumption that manpower will be utilized in felling.

b) Logging

The logging work has been carried out by manpower on a small scale in the past primarily for the production of match sticks and fuels. The material wood was short in length and logging could be done by manpower to the full extent. In a situation where large quantities of wood have to be collected and transported to a pulp and paper mill at a constant pace, it is indispensable to work for the introduction of machine power at all cost. In fact, this constitutes the major part of the training incorporated in the technical cooperation project.

Two mechanized logging methods are conceivable. One is the sky-line logging system in which all boles are lifted high in the air and transported to the road side, and the other is the tractor logging system in which small tractors are used at relatively gentle slopes.

With the topographical and forest conditions taken into consideration, it seems that the sky-line logging system may

be used for the greater part of the project area. With regard to logging by tractor, new types of tractors have been developed and put to use at the relatively gentle slopes of mountain forests in addition to the large tractors that have been used outside Java. Now that tractor logging does not require such complicated and sophisticated techniques as in the case of the sky-line logging system, it is desirable that the new types of tractors be introduced at gentle slopes as much as possible.

In regard to the technical cooperation called for at present, therefore, it is advisable to work for the transfer of the sky-line logging techniques on the basis of the aforementioned factors, first, and also to carry out training in tractor logging.

2-2-2 Points of Attention for Compilation of Training Program

The technical cooperation centers around the acquisition of sky-line logging techniques.

Unlike other types of forestry work using machinery, the sky-line logging techniques are such that it is necessary to master not only the knowledge about logging machines and their accessories and their handling but also about the special knowledge and skills for the setting of skylines. This familiarization may be likened to the mastering by one and the same technician of all the process extending from designing to construction and further to operation in respect of a plant.

In the case that training will be carried out on the assumption that all these techniques will be mastered over short periods of time, any theoretical studies should be minimized, and the training curriculum should be worked out so that actual work may be mastered hand to hand.

From this point of view, the points to which attention ought to be paid during the course of the training are given below for each technical subject:

* Logging Machines and Accessories

In regard to logging and accessories, the training will center around the acquisition of techniques which will make it possible to handle simple machines, such as manipulation, handling, routine check and regular maintenance. For this purpose, the minimum degree of general, basic knowledge about the structure and performance of machines and equipment will be taught. As for the training method, teaching aids, such as cutted machines, will be used. The training will be conducted with actual machines and equipment with special emphasis on the assembly and disassembly of machines, so that the training may prove fruitful over short periods of time.

For the designing and production of machines or their major repairs, including the overhaul, special techniques including a sophisticated knowledge about machines are required. As the maintenance of machines is included in the technical cooperation project, it is necessary to train specialists in the repair of machines, but we would consider that the availability of several such specialists will be sufficient to meet the immediate requirements.

For the training of specialists in machine repair, there is a need for special training. For this reason, it would be advantageous to conduct a practical training at some Japanese plant which is fully equipped with machines and equipment.

* Skyline Setting

In order to engage in logging in the sky-line logging system, the most important thing is the sky-line setting technique, for which much knowledge and experience are necessary. When a sky-line is to be set, the area is fully surveyed to find out what kind of sky-line system is most suitable for the given situation. Then land surveying will be carried out to prepare a blueprint. On the basis of this blueprint, a sky-line will be set. The sky-line setting

procedure is as follows:

- (1) Preparation of Sky-line: The substance of the blueprint will be fully familiarized. While checking the blueprint against the area, an attempt will be made to ascertain the location of supports, stumps and logging machines as well as the location of the unloading site. At the same time, it is necessary to check and maintain the machines and equipment which will be put to use.
- (2) Felling of Interfering Trees: The standing trees and other obstacles to the sky-line will be felled or removed in advance.
- (3) Installation of a stand for the logging machine.
- (4) Installation of the logging machine: The machine has to be fixed so that it will not accidentally move during the work. Then there will be a need to prepare a sunshade and a shelter from the rain.
- (5) Installation of supports.
- (6) Installation of various blocks.
- (7) Extension of a lead rope.
- (8) Extension of a haul-back line.
- (9) Extension of a sky-line.
- (10) Fixing of the sky-line.
- (11) Installation of a carriage.
- (12) Fixing of a lifting line.
- (13) Stretching of the sky-line.
- (14) Fixing of the heel line.
- (15) Check and adjustment of the sky-line.
- (16) Final check of the sky-line.
- (17) Trial run.

The setting of the sky-line will be completed in the aforementioned sequence. When training is provided on the setting of sky-lines, it is necessary to master knowledge about simple surveying techniques as well as computing

techniques for the designing of sky-lines. Insofar as the setting of sky-line is concerned, there will be a need to master the technique while engaging in the actual sky-line setting technique. Nowadays, simulators and other teaching aids are available. It will be of advantage to engage in on-the-job training after the outline of the skyline setting technique is studied with these teaching aids.

* Safety Work

The skyline logging system, whether it be carried out with a machine or in a setting methods, is theoretically built up. For the trainees to go as far as to familiarize with this theory, there is a need to study a broad range of basic sciences, such as mathematics and physics. Therefore, the study of sophisticated knowledge and techniques should be limited to specialists. In this training, the most important thing is to aim at learning the minimum degree of knowledge and technology necessary to operate logging machines and set sky-lines. In this sky-line logging system, there would arise grave accidents fatal to man's life, should it not be operated properly. In Japan, therefore, restrictions are imposed on work in the sky-line logging system under the Labor Safety Law. The Japanese Forestry Agency has also worked out safety standards to ensure safety in the sky-line logging work. In this training, too full heed must be paid to the safety aspect.

* Logging by Tractor

For logging in mountain areas, the sky-line logging system alone is insufficient. It will be much more effective to use tractors for logging on relatively steep slopes. Even in the skyline logging work, it will be necessary to learn knowledge and technology about tractors in order to do simple earthwork and also simple repair and maintenance work on forest roads in relation to the construction of work roads and stands and the installation of logging machines.

The tractors are either of a crawler or wheel type. In the logging work for which the former type is used,

articulated frame steering four-wheel skidding tractors are most useful. Judging from the road, topographical and forest conditions, neighboring farmlands and necessity of erosion control on the main island of Java, there is a need to avoid using large tractors and make use of tractors of the kind which is as small as possible and developed for use in forestry.

In this training, therefore, studies will have to be conducted on this type of tractors.

To carry out training on the operation of the tractors, there will be no need for such special technology as are employed in the sky-line logging system. As in the case of logging machines, it will be necessary to master basic knowledge about operation and manipulation, routine check and regular maintenance work as well as logging by tractor.

2-3 Training Method

The training method is worked out in such a manner as to satisfy under the requirements of the Indonesian side.

It is desirable to divide the training into four phases:

- (1) Lectures on the minimum necessary degree of basic theory and indoor on-the-job training;
- (2) Practical training of basic work in demonstration forests;
- (3) Demonstration in a model logging operation forest (under the guidance of a Japanese expert); and
- (4) Self-study in a model logging operation forest (practices for the trainees' independence), and to provide training gradually so as to enable the trainees to work on their own. For each phase of the training, the facilities available presently for the Perum Perhutani should be put to use as much as possible. Agreement has been reached between the survey team and the Perum Perhutani that the facilities of the Madiun Training Institute be put to use for Phase 1, above, by remodelling them if necessary, that a demonstration forest be prepared in the merkusii pine forests of the Lawu

District Forest Office for Phase 2, and that a model logging operation forest be developed within the area placed under the jurisdiction of the Pekalongan District Forest Office in the Province of Central Java.

At the Madiun Training Institute, lectures will be provided on the basic knowledge primarily with a simulator, a cutted engine and illustrations, and practical training carried out for the assembly and disassembly of machines and the basic driving and operating method.

In the Madiun demonstration forest, practical training will be provided for the setting of a model sky-line. This practical training will be provided by constructing access roads by tractor, installing stands for logging machines and doing simple repair work on forest roads. The term for Phases 1 and 2 is six months.

In compiling the curriculum, an attempt will be made to absolutely avoid providing only lectures in short periods of time and to compile the curriculum in such a manner as to closely associate lectures with practices.

Unlike general forestry training, this training is carried out with respect to machines, something difficult to know about, and also uses hardly comprehensive figures as in the case of computing for designs, so much so that it is desirable to provide lectures after the trainees are accustomed to actual machines and equipment. Particularly, as practices are conducted outdoors for training in the demonstration forest, demonstrations should be conducted on fine days, whereas lectures should be given on the rainy days. Otherwise, it would be impossible to complete the given basic training within a short period of only six months.

For practices in the assembly, disassembly and driving and manipulation of machines, the trainees should be divided into groups of four. Should each group consist of more than four persons for one machine, some of them would be unable to familiarize themselves fully with the machine. If the group is too small, it would sometimes be impossible to assemble or disassemble the machine in a smooth manner. In this sense, the

appropriate number of trainees for one group is four. For the setting of skyline, a large number of personnel are required, so that it is desirable to carry out demonstrations with each group consisting of 12 persons. The setting of skylines is a very dangerous work. For practical training, therefore, it is necessary to acquaint the trainees with the safety factors to the full extent in advance.

In regard to Phases 3 and 4, it is to be noted that there exist a variety of skyline setting systems and that the setting varies even for one and the same system, depending on the given topographical and forest conditions. Therefore, whatever is to be mastered at the Madiun Training Institute will not necessarily be usable in other areas as they are, so that it is necessary to undergo familiarization training when demonstrations are carried out in the Pekalongan model logging operation forest. By experiencing four times of setting, the trainees will be able to use the acquired knowledge and skills in practice on their own. For this, a training period of one year is required. In the first half of this training period, the trainees will be placed under the close guidance of Japanese technicians, but in the second half they will be able to get around all right with occasional checks by the Japanese technicians. In any event, the training will be carried out in the Pekalongan model logging operation forest on the assumption that the trainees will eventually conduct the logging work at their own responsibility with the help of workers, each group consisting of four personnel.

2-4 Trainees

The purpose of this training is to transfer logging techniques in Indonesian mountain areas. For a successful transfer, it is necessary to train the persons who will be able to work out plans for logging work, prepare designs and provide guidance and supervision; persons who will be able to drive machines and use workers in the actual skyline setting work; and persons who will be to repair the machines; and persons who will be able to equip themselves with necessary special techniques. The training will

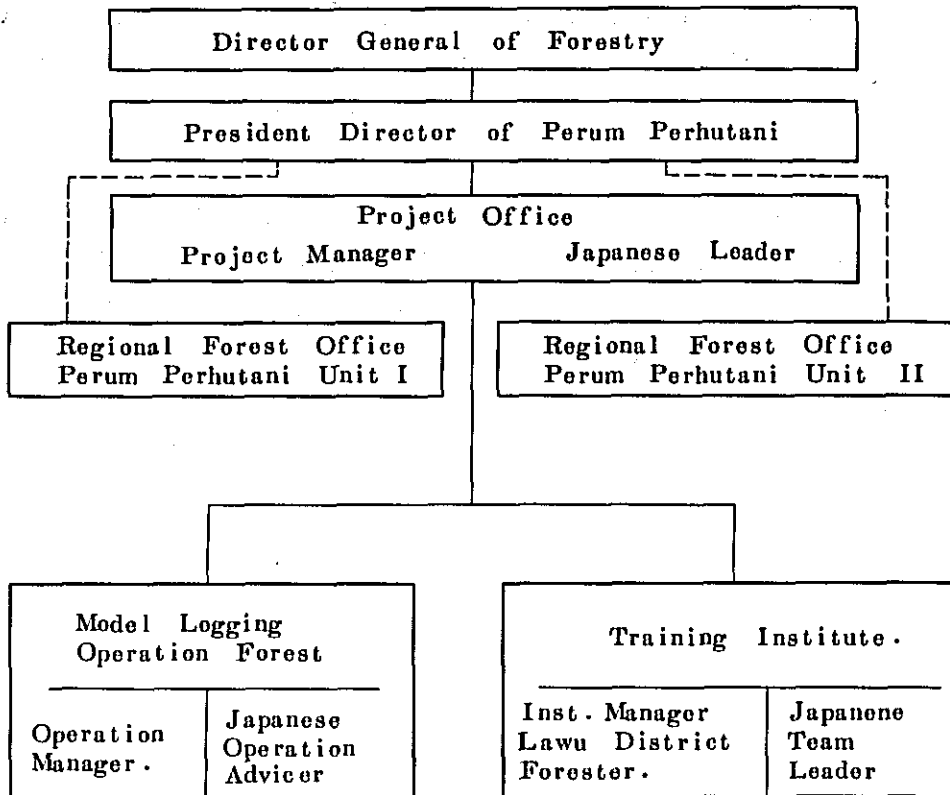
extend over a long period of one-and-half years, but this period is just enough to acquire the basic knowledge. To acquire skills as specialists and become leaders in the future, trainees will have to be sent to Japan for further training. From the viewpoint that has thus far been introduced, it is necessary to select trainees.

2-5 Training Organization

To enable the trainees to study and master the knowledge about machines and their driving techniques as well as the setting of sky-lines - all these being hardly comprehensible, there is a need for close coordination between Indonesia and Japan and besides a considerably large area of demonstration forest and model logging operation forests are required, so that the training could not be carried out by the Madiun Training Institute alone. For the implementation of this project, therefore, it is necessary to establish an organization which will be comprised of representatives concerned of the Governments of Indonesia and Japan.

In regard to the executing entity, a proposal has been made by the Perum Perhutani as indicated in the following chart, and the Japanese forestry survey team has agreed to this proposal in principle.

Organization Chart: ORGANIZATION FOR INDONESIA - JAPAN MOUNTAIN
LOGGING PRACTICE PROJECT.



The person who will assume the supreme responsibility for this technical cooperation project is the Director General of Forestry, whereas the responsibility for setting aside a budget and implementing the project rests with the President Director of the Perum Perhutani.

The role which will be played by each suborgan of this organization is as follows:

(1) Project Office

The Project Office will be established at Madiun, and the Indonesian Project manager will hold himself responsible for management and technology in respect to the project. In order to

provide the Indonesian Project manager primarily with technical assistance, the leader of a team of Japanese experts will be stationed in the Project Office.

(2) Joint Committee

The Joint Committee which is to deliberate on concrete plans and deal with newly arising problems in respect of the implementation of the technical cooperation project.

(3) Training Institute

The facilities available in the Perum Perhutani Training Institute at Madiun will be put to use in establishing a training institute for this technical cooperation project. The Institute Manager, who is representative of the Indonesian side, will assume the responsibility for the execution of training in a demonstration forest to be prepared in the area placed under the jurisdiction of the Lawu District Forest Office. For the implementation of the training, experts as their assistants will be dispatched in from Japan. The Team Leader, representing all these Japanese experts, will assume all responsibility for this project on the Japanese side.

(4) Model Logging Operation Forest

A model logging operation forest will be prepared in the area placed under the jurisdiction of the West Pekalongan District Forestry Office in the Province of Central Java. Training in the model logging operation forest will be carried out under the guidance and supervision of the Indonesian Operation Manager with counsel given by the Japanese specialists dispatched from Madiun. One of the Japanese experts will become operation adviser for the model logging operation forest to serve as liaison and coordination officer with the Japanese experts to make arrangements for the dispatch of Japanese experts to Pekalongan and provide technical counsel on local issues.

(5) Others

The Japanese experts, assigned to the Madiun Training Institute, will step up training at Madiun along with their Indonesian counterparts. Wherever necessary, they will make trips to the model logging operation forests in Pekalongan to provide technical guidance and assistance.

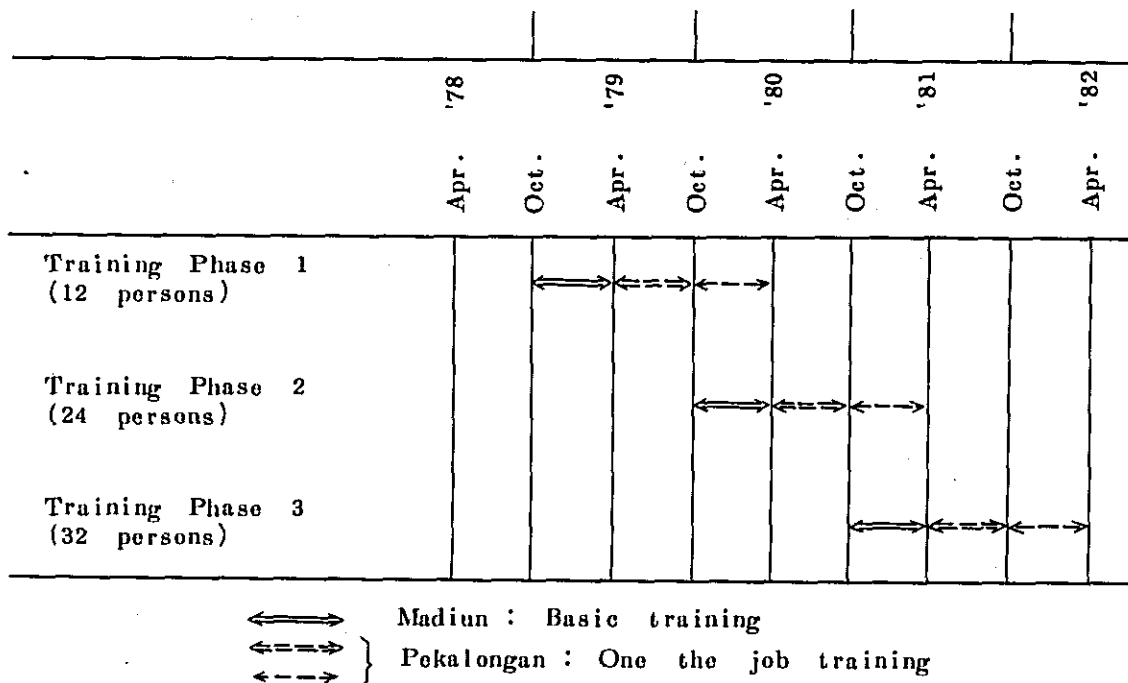
3. SUBSTANCE OF PROJECT

3-1 Training Program

On the basis of the aforementioned basic concept, the following training program will be formulated in table 1.

For this training, it is assumed that 60 to 70 technicians will be trained in about four years, as consideration is given to the cost and time required to prepare necessary equipment and materials necessary for the training and the number of technicians necessary for the logging of merkusii pine trees in the Province of Central Java - those who will be brought up in this training and whose training is the immediate purpose of the technical co-operation project.

Table 1 Training Program



The curriculum which makes it possible to step up the training in an effective manner is indispensable. The following 10 courses will be introduced below with special reference to the six months' training which will be provided at Madiun.

(1) Structure and Performance of Engines

For the training, engines of the one and the same type will be prepared as much as possible. Using a cuted engine and other teaching aids for a representative one, training will be provided primarily on general knowledge but no training will be conducted in regard to sophisticated techniques, such as assembly and dis-assembly. In areas where automobiles run, the engines may readily be repaired at simple repair shops. The curriculum includes the following: Outline of structure of engines. Operation and specification of four-cycle engines. Fuel and combustion. Lubrication and lubricants. Function of each component of the engine's main body: cylinder head, cylinder block and liner piston and piston ring, connecting rod, connecting rod bearing, crank shaft, journal bearing, flywheel, ring gear, valve, valve switch mechanism, oil pump and other lubricating mechanism. Fuel mechanism: injection pump and other accessories, air intake and exhaust mechanism. Electric mechanism: starter motor, electric charge, remaining heat, battery.

(2) Structure and Performance of Logging Machine and Handling of Accessories and Equipment

Outline of structure of logging machine, line pull speed of yarding drum, line speed, rope capacity, and brake capacity in respect of logging machine.

As regards accessories and equipment, loading block, heel block, guide block, saddle block, carriage, shackle, clip, skyline crank, choker hook, tightening tool, and telephone equipment.

(3) Assembly and Disassembly of Logging Machine

With four persons as a group, a logging machine will be disassembled to the extent that the outline of the drum, brake and transmission mechanisms may be understood by the trainees. The curriculum includes the following.

Transmission mechanism:	Main clutch, coupling.
Brake mechanism:	Drum, lining, master cylinder, wheel cylinder.

Drum mechanism: Drum clutch, endless drum and capstan.

Upon completion of the assembly, practical training will be conducted in the driving and manipulation.

(4) Basic Knowledge about Logging Skyline

The use of a simulator makes it possible to learn the general aspect of logging with a logging machine. The curriculum includes the following:

Mechanical logging device and roping method, logging plan; Tyler, Endless Tyler, Falling block and other basic systems and their characteristics; allocation of personnel, work plan; strength of standing trees and supports, strength of stumps.

(5) Basic Knowledge about Wire Rope

In the sky-line logging work, the wire rope is the most important material. The knowledge about the wire rope must be learned to the full extent, as any mistake in its selection and handling could give rise to a grave accident. The curriculum is as follows:

Outline of wire rope: Nomenclature of each part, stranding and appellation, characteristics, simplified signs, composition and use, cut-off load and weight.

Handling: Unloading, transport, storage and undoing.

Care about use: Seizing, cutting, sheave and drum, fleet angle, percussion, oiling, abrasion and corrosion, strength of spring and spring.

(6) Computation and Inspection of Maximum Tension

A number of theoretically introduced coefficients are used for the computation of the maximum tension. To understand their theory, there is a need for special knowledge. These coefficients are prepared in advance and shown in a table, so that they are

usable as they are for practical purposes. All that is necessary here is to master the computing method.

Based on surveying at sky-line site in training area:
Computation of tension of sky-line, lifting line, endless line and whole line; preparation of curve diagrams of original wire rope configuration and load locus; inspection of tension on support and anchor and wire rope tension.

(7) Safety Work

The skyline system is a very dangerous work, so that special care must be exercised for the safety. Before practical training, therefore, it is necessary to pay full heed to the safety before practical training and get the trainees familiarized with it at the training site during the training. The curriculum is as follows: Shown in work standards for mechanical logging work: Notes to be taken by workers. Safety and security: Attire, work in inclement weather, fire prevention, signs for caution, dangerous areas and work prohibited, riding prohibited, protection of structures, signals, warning signals and signs, care about tree climbing and work at high places, handling of auxiliary machines, inspection of wire rope, driving and manipulation of logging machine, loading work, unloading work, emergency measures, procedure for safe withdrawal.

(8) Structure and Performance of Tractor

The tractors come in the crawler and wheel types. The most important thing about the performance about a tractor is its traction theory. A large number of coefficients are used for the computation of the traction, and it is necessary to master the method of computing the traction with these coefficients. The following curriculum will be followed in respect of the structure of the crawler type:

- | | |
|---------------------|-----------------------|
| 1. Dezer baland | 6. Transmission |
| 2. Tractor chain | 7. Steering apparatus |
| 3. Tractor carrier | 8. Clutch |
| 4. Suspension | 9. Differential gear |
| 5. Hydraulic system | 10. Final drive |

- | | |
|------------------------------------|--|
| 11. Frame and other outer fittings | 15. Each device of fairlead |
| 12. Attachment | 16. Oil for working |
| 13. Electric wiring | 17. Brake oil |
| 14. Winch | 18. Procedure for construction of work roads |

In respect of the wheel type, the computation of the traction is done in the same manner as in the crawler type, but the steps are different. The curriculum is given below:

- | | |
|-----------------------------|--|
| 1. Frame assembly | 8. Lever |
| 2. Wheels and drivings | 9. Hydraulic system |
| 3. Power train | 10. Electric system |
| 4. Brake system | 11. Winch |
| 5. Central greasing system | 12. Bulldozer |
| 6. Pedal | 13. Procedure for tractor logging work |
| 7. Fuel and greasing system | |

(9) Disassembly and Assembly of Tractor

The tractor is similar in structure to a daily used automobile, so that the experience in the disassembly and assembly of a logging machine is usable. Therefore, emphasis will be placed on different points. The following curriculum will be followed, and basic driving and manipulation will be practiced after the assembly.

- | | |
|-------------------------------|---|
| Power transmission mechanism: | Main clutch, clutch control, transmission. |
| Differential gear: | Control gear, steering and brake. |
| Track carrier: | Frame, roller, top idler, front idler, recoil spring. |
| Track chain: | Towing winch. |

(10) Practical Training in Demonstration Forest

The curriculum for practical training in the demonstration forest is as follows:

Sky-line for logging machine: Reconnaissance, surveying, designing, preparation of sky-line, transport of logging machine and other equipment, thinning of obstructive trees, preparation

of machine stands, installation of logging machine, installation of guide block for haul back, drawing of lead line, drawing of haul back line, drawing of sky-line, fixing of sky-line, assembly of heel block, installation of carriage, fixing of lifting line, stretching of sky-line, fixing of heel line, inspection and adjustment of each part of sky-line, inspection of sky-line, trial run, wire rope splice.

Training for driving and manipulation of logging machine:
Logging training: Safety work method: Withdrawal work: Training for timber yard and construction of work roads with crawler tractors: Training for logging with wheel tractors.

As this phase of practical training is instrumental in assuring the success of the whole training, emphasis will be placed on this phase. Lectures and practical training will be repeated in a hand-to-hand method.

The procedure given in Appendix 1 will be followed for the designing of, and procedure for, the sky-line.

By combining the aforementioned courses and studying the necessary number of hours and the training period, the following table 2 is worked out.

This allocation of hours is one idea of the survey team, and a final decision should be made by seeking counsel from Japanese experts and Indonesian counterparts considering of the degree to which the technology is mastered by the trainees.

Table 2 Training Subjects and Number of Days
Required for Training

Training Subject	Number of Days Required
1. Orientation	1
2. Structure and performance of engine	5
3. Structure and performance of logging machine and handling of auxiliary equipment and machines	8
4. Basic knowledge about sky-line for logging	7
5. Basic knowledge about wire rope	3
6. Computation and inspection of maximum tension	5
7. Safety work	5
8. Structure and performance of crawler type tractor	5
9. Structure and performance of wheel type tractor	4
10. Disassembly and assembly of logging machine	12
11. Disassembly and assembly of tractor	12
12. Practical training (Lawu)	66
Total	133 (6 months)

Note: The number of days required for the training is computed according to the Perum Perhutani Training Institute's regulation of holidays, etc.

As regards the way in which training should be stepped up at Pekalongan, the training at Pekalongan is an on-the-job training. By working out plans and carrying them out by themselves, the trainees will primarily strive to make mastery of whatever they have learned at Madiun. Studies should be carried out and decisions made by the Joint Committee and other organizations to work out realistic measures by taking note of the achievements of Madiun's training.

Practical training scheduled for Pekalongan will be planned carried out by the trainees themselves, because the incessant

guidance and supervision of Japanese experts would drive the trainees to depend upon the experts and discourage them to master the technology by themselves. Needless to say, there will be a need for exhaustive guidance and counsel from the Japanese experts during the first six months of the training period of about one year at Pekalongan.

3-2 Dispatch of Experts

It is desirable that the dispatch of Japanese experts be carried out in the following table 3:

(1) Fields of Long-term Experts

(i) Team Leader

The Team Leader will control all Japanese experts and see to it that the project is carried out in an effective and smooth manner.

(ii) Management of Logging

(iii) Logging Operation

(iv) Forestry Machinery

In these fields, Japanese experts will provide guidance and training to trainees as lecturers.

(v) Other Experts

Having much experience and high skills in the field of logging operation the other experts will teach trainees in the demonstration forest and model logging operation forest. During the period of October 1979 through March 1981, the training of the first and second phases and that of the second and third phases will be overlapped, so that there is a need to increase the number of persons to be dispatched.

(vi) Liaison officer

The Liaison officer will take charge of necessary liaison and coordination for a smooth implementation of the project.

(2) Fields of Short-Term Experts

In relation to practical training and other matters at Madiun and Pekalongan, problems may crop up in the fields where no response can be done by logging experts.

For example, as regards the relations between the collection of rubber resin from the merkusii pine trees which are supposed to be felled and the felling and logging techniques, between logging and sand and mud outflow preventing techniques, there may be a need for cooperation from technical experts, even if for a short period.

In the wood fabrication, forestry conservancy, forest development, forest protection, forest survey and other necessary fields, there may be a need for the dispatch of experts for a short period.

3-3 Training in Japan

(1) Fields of Training

In order to carry out the project in a smooth and effective manner, there will be a need for Japan to accept trainees in the following fields for a further improvement of the logging theory and technology.

(i) All Aspects of Felling and Logging

For the persons who will engage in supervisory work at workshops in the future, comprehensive management techniques necessary to carry out felling and logging will be taught.

(ii) Sky-line Logging, and Tractor Logging

For the persons who are capable of becoming OJT leaders, the technical applications which could not be locally taught will be instructed.

(iii) Machine Control

The mechanism of logging machines and the techniques for their maintenance will be taught in order to bring up technicians in charge of machine maintenance and control.

(2) Training Period and Number of Trainees

With due consideration given to the effective implementation of the project and the number of technicians required when logging in mountain forests is carried out as a business, it is desirable that the trainees should be accepted and trained in Japan 16-20 counterparts during the cooperation period.

As the Indonesian side has expressed its desire to dispatch about one-third of the trainees at Madiun and Pekalongan to Japan for a theoretical study, there is a need to explore the possibility of accepting trainees larger in number than those envisioned in the aforementioned acceptance and training plan,

as long as Japan's system of acceptance and training and the capacity of the training institutes permit.

3-4 Materials and Equipment Necessary for Training

The materials and equipment necessary for the training at Madiun and Pekalongan, to which reference has been made earlier, are given below.

For the selection of the materials and equipment, it is necessary to pay heed to the following points because the purpose of the training is to master techniques for logging and other machines and also because of the necessity of raising the effects of the training and maintaining and controlling the machines.

- (1) The engines should be of one and the same type as much as possible. Diesel engines low in fuel cost should be selected.
- (2) The mechanical structure should be such that the assembly and disassembly may be done with ease.
- (3) The machines should be of such structure and performance as to satisfy the conditions of mountain forests.
- (4) The machines should be of the kind which has been developed for use in forestry.
- (5) The accessories should be of such a type as to match the main machine.
- (6) The machines should be lightweight, compact and good in performance.
- (7) The driving and manipulation should be simple. Given above are the general conditions for the selection of machines. The thing to which special attention ought to be paid is the necessity of strictly refraining from diverting for other purposes the machines to be used in the training, because some of them are similar to those used in civil engineering and agriculture.

The main necessary materials and equipment are enumerated in Table 4 and 5. The conditions which should be equipped to the machines are given below.

* Logging Machine and Auxiliary Equipment

The logging machines come in various types. The types of logging machines suitable for the logging of merkusii pine trees in the mountain forests of Java Island are limited when the conditions for their use are taken into consideration.

The adoption of full-stem logging operations in most cases makes it possible to carry out mechanical logging operations in an effective manner. The stem volume is 0.65 cubic meters and the weight 780 kg per tree on the average. Topographically, logging will be of a rope extension or endless Tyler system, so that the span will be somewhere between 500 and 1,000 meters. Dual-phase logging would be necessary when the span is over 1,000 meters.

Therefore, as regards the logging machines and accessories which will be used in the training, it is necessary to put these conditions into consideration and select the kind of top-level machine which may assure stabilized production. The basic conditions for the selection of materials and equipment have already been elucidated. In addition, the following selection standards are required.

- (1) Engine: Water-cooled, six-cylinder diesel engine with maximum output of 105 ps/2,400 rpm.
- (2) Weight: About 2,500 kg.
- (3) Number of drums: Two-drums with one endless drum.
- (4) Rope capacity: 1,370 m with 10 mm in rope diameter, 950 m with 12 mm in rope diameter.
- (5) Line pull: 3,370 kg with one speed and 520 kg with four speeds in forward rotation, 2,810 kg with one speed and 430 kg with four speeds in backlashing for the average rope diameter.

- (6) Line speed: 115 with one speed and 500 with four speeds in forward rotation and 135 with one speed and 460 with four speeds in backlashing for the average rope diameter at 2,400 rpm.

Incidentally, auxiliary equipment should be selected, so that they match the logging machine.

A wide variety of wire ropes are produced at present, but attention is invited to the possibility of a grave accident taking place when the rope is cut off in the mechanical logging work. Furthermore, wire ropes are used more frequently than in any other industrial work. As tests are carried out at forestry experiment stations in Japan, the results of these tests should be noted for the selection of wire ropes of the kind which is most suitable for the used machine.

Some of the wire rope manufacturers produce special high-performance wire ropes according to the JIS (Japan Industrial Standard) specifications for use in forestry. All these points should be taken into consideration.

* Wheel Type Tractors

The crawler type of logging machines used to be the only one available in the past. Recently, wheel type tractors equipped with special structures have been developed and have taken the place of the tractor type to give full play to their performance. Particularly in the mountain forests of this area, the highest degree of attention ought to be paid to landslides, for which the performance of the wheel type is more powerful.

The structure of this type is as follows:

- (1) Super-low pressure, large-diameter wheels.
- (2) All-wheel driving system.
- (3) No-spin differential gear: When the wheel of one side slips and races, the gear of this wheel will automatically come off, transmitting the power to the remaining wheels and preventing a dispersion of the power by racing.

(4) Structure of articulating frame: The structure is such that the frame is divided into the front and rear parts and both parts are connected so that they may revolve on a thick spindle at the center.

(5) Adoption of oscillated front tire suspension: The right-hand left-hand wheels are designed in such a manner as to allow them to see-saw on a beam. The four wheels are always in contact with the ground even when the machine is operated on an irregular terrain.

A tractor of the aforementioned structure should be selected.

* Crawler Type Tractor

Large crawler tractors cannot be put to use in the mountain forests of this area. Wheel-type tractors will be used for logging, whereas crawler-type tractors will be used primarily for the construction of timber yards and work roads and occasionally for logging. For the selection of tractors, the following conditions should be put into consideration:

- (1) High slope climbing capability.
- (2) Slipping minimized.
- (3) Good vertical stability.
- (4) Equipped with a towing winch.

The crawler-type tractors for use in forestry is different from the one used in general civil engineering work in the sense that the latter type is used primarily on gentle slopes but the former on relatively steep slopes, and there are calls for their usability on slopes with as great an incline as possible.

Bulldozers for use in civil engineering work are so designed that they push mud with its front edge near the ground surface, whereas those for use in forestry are used in towing logs with its rear part at relatively high places. These points should be taken into consideration.

* Vehicles for Transport Materials, Equipment and Lumber

The truck which is used in the movement and transport of a logging machine and its related materials and equipment, like

the dump truck to which reference has been made earlier, should be a 6-ton 6-wheel-drive truck with a 2.9-ton suspension crane. Another 6-ton 6-wheel-drive truck is considered appropriate for an auxiliary truck for the transport of materials and equipment and for logging operations.

* Personnel Carriers

When trainees undergoing practical training under the guidance of Japanese experts in the demonstration forests, a micro-bus and a four-wheel personnel carrier (of the jeep type) capable of running on an irregular terrain are required. The micro-bus should preferably be a four-wheel-drive one.

Table 4 List of Necessary Machines

Machine	Purposes of Use
Set of yarder	* Practical training of sky-line logging work (including practical training of sky-line stretching and removal)
Crawler-type tractor	* Practical training of logging work with crawler-type tractor. * Practical training of assembly and disassembly and familiarization with structure and technology.
Wheel-type tractor	* Practical training of logging work with wheel-type tractor. * Practical training of assembly and disassembly and familiarization with structure and technology.
Tractor shovel	* Construction of access roads.
Dump truck	* Construction of access roads.
Truck with crane	* Transport of materials and equipment.
Truck for transport	* Assistance in the transport of materials and equipment and practical training of lumber transport.
Micro-bus	* Trips to and from work site for Japanese experts and trainees.
Jeep	* Land surveying and liaison.

Machine	Purposes of Use
Cuted engine	* For lecture on structure of internal combustion engine (particularly, diesel engine).
Skyline logging simulator	* Grasping of all aspects of skyline logging work and preliminary training for sky-line logging work.
Audio-visual aids	* Slide projector, blow-up projector, 8mm and 16mm cine projectors.
Spare parts	* Spare blocks, wire ropes, etc.
Office equipment	* Table-type computer, type-writer, copying machine, etc.
Generator	* For use in the Pekalongan office.
Transceiver	
Small buzz saw	
Bike	
Fire extinguisher	* Fire for materials and equipment.
Chain saw, etc.	* For use in teaching and forestry work.

On the asseption that training will be carried out at Madiun for six months and Pekalongan for another 12 months, the plan for the effective utilization of materials and equipment is studied as shown in Table 2.

3-5 Facilities for Training

(1) Madiun Training Institute

As some of the facilities available at the Perum Perhutani Training Institute at Madiun are repaired and used, basic training will be carried out in the first six months of the unit training period of one-and-a-half years, and the following facilities will be required there.

i) Stand-by Room for Japanese Experts and Counterparts

A separate room will be prepared for the Team Leader. For the Japanese experts and counterparts, there will be a need to prepare one office room on the first floor with facilities for a total of 24 persons and also space and facilities for small conferences.

ii) Classroom

As regards the classroom scheduled to be put to use, it is necessary make available increased lighting from the ceiling.

iv) Hall for Practical Training

In this hall, lectures on the disassembly and assembly of logging machines and tractors, practical training in respect of their structure and lectures on the handling of related equipment will be provided. For this purpose, it is necessary to bring into this hall up to eight logging machines or six remodelled as indicated below:

Ferro-concrete should be spread all over the floor to a depth of more than 30 centimeters (Fig. 1). Forty steel boards for the installation of equipment (20 cm in width x 5 cm in thickness x 180 cm in length) and 10 steel pipes (60 mm in diameter x 6 mm x 1,800 mm) will also be required.

The following teaching aids and facilities will be installed at places in the hall which will not impede the practical training (e.g., both sides of the classroom).

(1) Cuted engine

- (4) Parts cleaning stand
- (5) Battery charger
- (6) Press
- (7) Powder fire extinguishers (12)

For this classroom, too, there is a need to increase lighting from the ceiling.

v) Storeroom (For storage of tools and parts)

The room closet to the hall for practical training will have to be set aside for the storage of tools and parts necessary primarily for the disassembly and assembly of logging machines, tractors, etc., and walls and shelves should be arranged in this room as indicated in Fig. 2. Particularly in respect of the tools, one set should be prepared for each machine, and it is desirable that the tool table and wall should be differently colored for each team so as to prevent the mixture of one set with another and any loss which would impede the training.

vi) Storehouse (For storage of equipment for use in practical training)

This storehouse is used primarily for the storage of machines and equipment associated with sky-line logging and their spare parts, which will be put to use in the basic training and also in the practical training the demonstration forest.

This storehouse may presumably be usable as a point for the replenishment of equipment for the demonstration forests of Lawu and Pekalongan. The arrangement of shelves in this storehouse is shown in Fig. 3. Unlike Storeroom 1, this storehouse will be used primarily for the storage of relatively big materials and equipment, so that it is necessary to prepare entrances for these equipment. As in the case of Storeroom I, it is desirable to increase the lighting (Fig. 3).

vii) Pit for Maintenance and Check of Tractors, Etc.

In order to carry out the disassembly, assembly, maintenance and check of tractors and other machines in an efficient manner and facilitate the loading and unloading of the things brought in by truck, it is necessary to prepare a pit with one side

forming a slant of 25 to 30 degrees and the other side vertically cut out. The pit and the peripheral area within a radius of about 10 meters should be paved with concrete to a depth of about 30 cm.

viii) Garage

This garage will be used for trucks, micro-buses, jeeps and other vehicles. The structure is light-weight ferro-concrete as shown in Fig. 5, and neither walls nor doors are necessary in particular.

ix) Oil Storehouse

For the control of 400 liters of diesel oil, 200 liters of mobile oil, 60 liters of washing oil, grease and other oils necessary for the training at one place, an oil storehouse should be constructed in a place 10 meters away from other equipment and buildings to prevent a fire.

Full heed must be given particularly to ventilation, and the building materials must be non-inflammable. The floor must have a slope of 1% and waste oil ditches.

For fire fighting, it is necessary to prepare four powder fire extinguishers and 10 bucketful of sand or some substitute. It is indispensable for them to satisfy the requirements of the local fire services law.

(2) The application training which follows the one elucidated in (1), above, will be carried out in the demonstration forests of Lawu and Pekalongan. The facilities required for the forests are enumerated below:

(2)-1 Facilities Necessary for Lawu Demonstration Forest

i) Hut for Rest

A temporary cottage for rest will be prepared at an appropriate place of the demonstration site for lunch, rest, talks, etc..

ii) Cottage for Equipment

A small cottage for equipment will be constructed to a place as close to the demonstration forest as possible to control the equipment, tools and parts which will be brought out to the

demonstration site every day. In principle, it is desirable to have one such cottage for each logging machine, and the cottage has to be a movable one with locks. Depending on the situation, it is possible to construct it along with a garage, to which reference is to be made below, for the concentrated control and storage of equipment, parts and tools for several logging machines (Fig. 6).

iii) Garage

It is desirable to install a garage for the purpose of making preparations for the stretching of a sky-line and its removal and movement as well as for its temporary storage in addition to the primary purpose of storing vehicles at all times. No doors are particularly necessary, but it is desirable to post a night guard at times.

iv) Oil Storehouse

There is a need to prepare a well-ventilated, non-inflammable small cottage at a place near the garage mentioned in iii), above, or 10 meters away from other buildings for the concentrated control of oils necessary for the demonstration. The storage should be limited to the necessary minimum amount to prevent a fire, and there is a need to prepare full fire fighting facilities (Fig. 7).

(2)-2 For the model logging operation forest of Pekalongan,

It is desirable to prepare an office equivalent to a workshop for the production of crude wood and a billet for Japanese experts who will visit to provide counsel and guidance, whenever necessary. It is desirable that these facilities be prepared at a place within about 10 km from the demonstration site.

It is desirable that the billet will stand comparison with the Guest House situated in Dukuh Tengh and have separate rooms for at least five experts, as it is fully furnished with electricity, water and a flush toilet (Fig. 9).

In respect of a billet for the trainees, it is desirable that an appropriate billet be made available or rented at a place not far away from the demonstration forest.

Other facilities, the same as those available at Lawu and mentioned in i) through v), above, will also be put to use.

Fig. 1 Floor of the hall for practical training

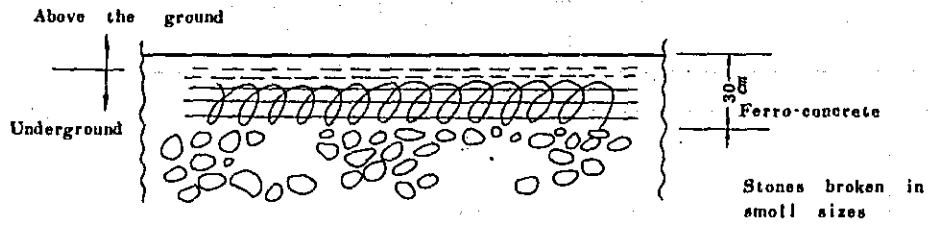


Fig. 2 Stoveroom

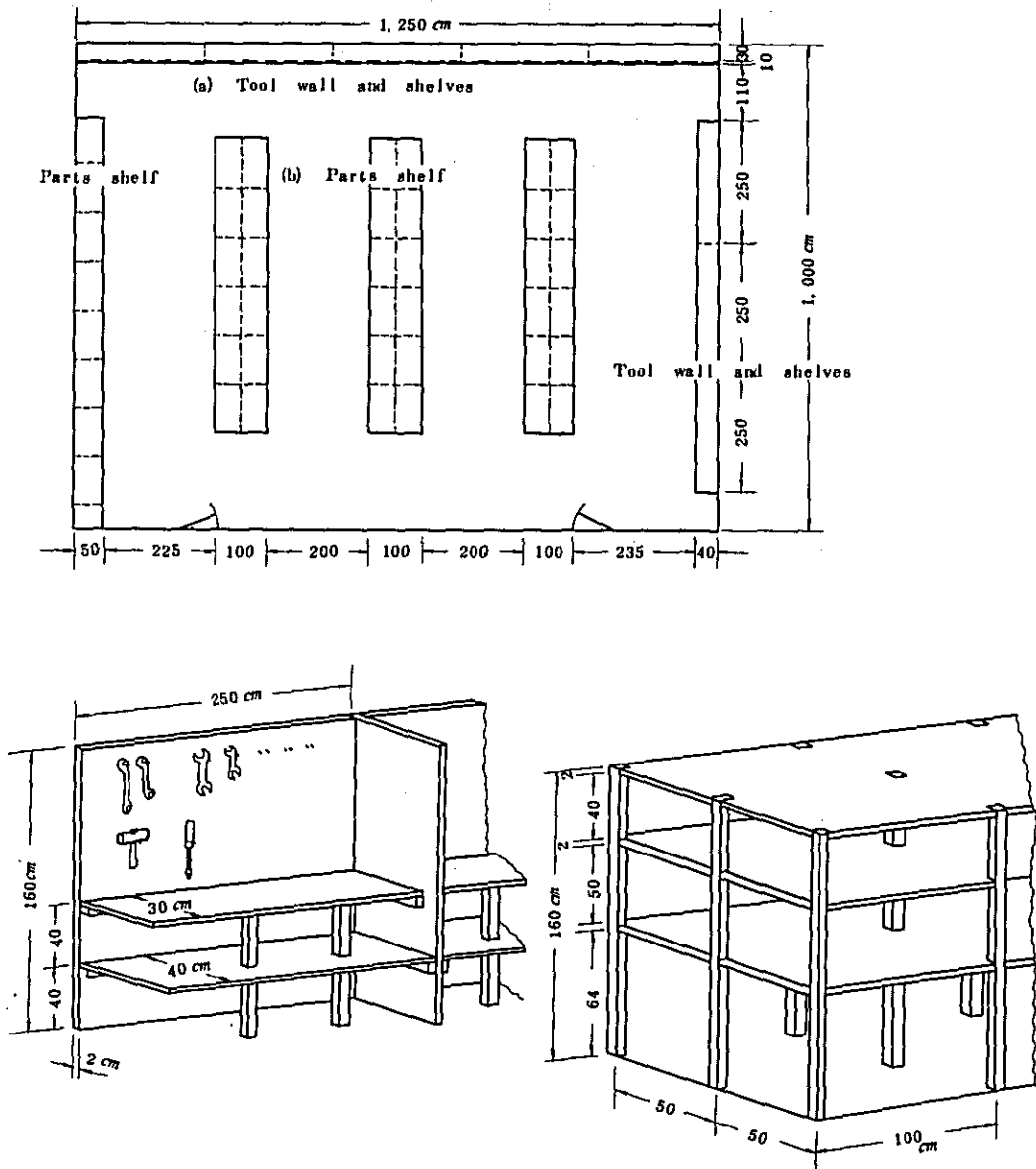


Fig. 3 Stove house

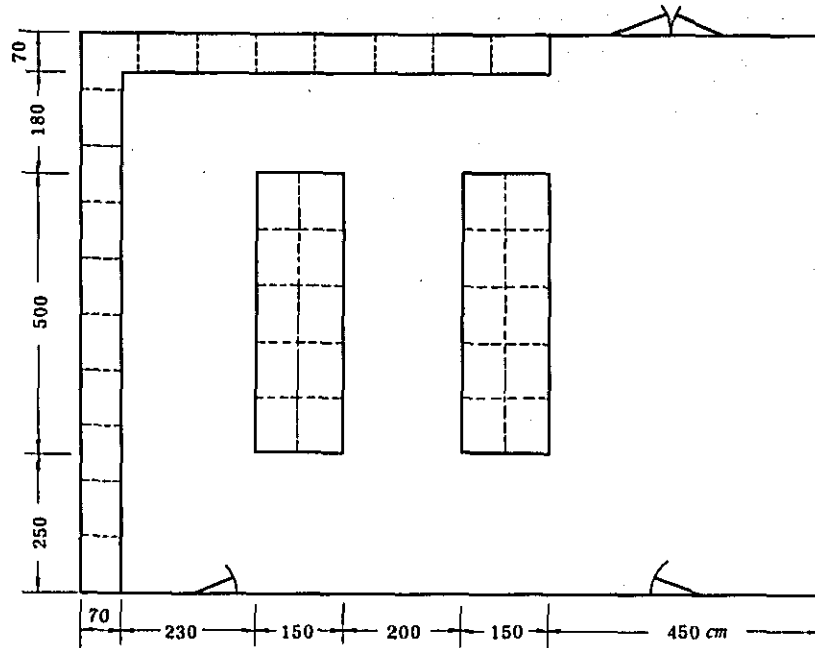


Fig. 4 Pit

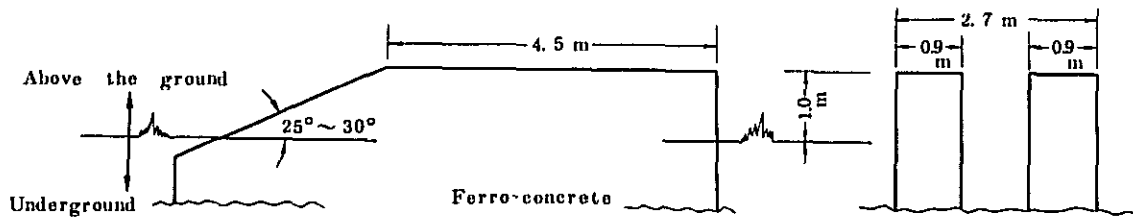


Fig. 5 Garage

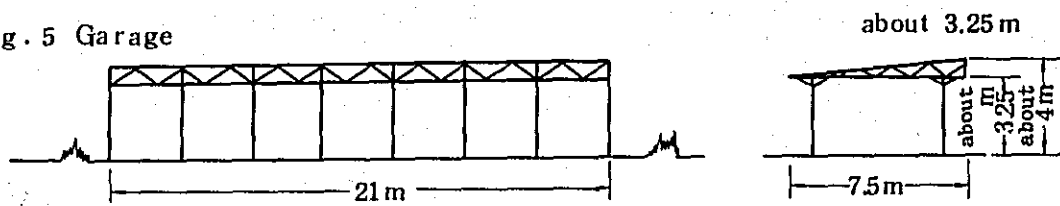


Fig. 6 Cottage for Equipment

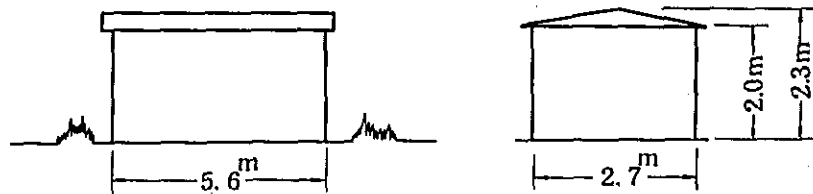
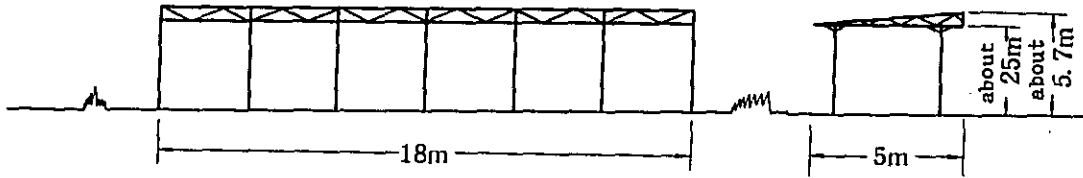


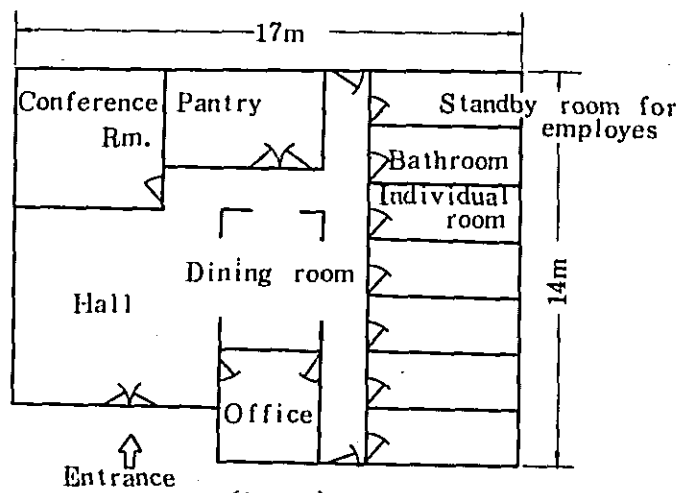
Fig. 7 Garage



About

(Fig. 8)

Fig. 8 Pekalongan Office



(Fig. 9)

Reference Materials

1. Interim Report of the Survey Team
2. Record of Discussions for Mountain Logging Practice in Java.

1. Interim Report of Survey Team

July 15th, 1977

Mr. Soedjarwo
Director General of Forestry R.I.

Subject: Interim Report by Japanese Preliminary
Survey Team for Technical Cooperation
Project in Mountainous Logging Practice
in Java

Dear Sir,

We would like to present you the summarized results of our preliminary survey concerning the technical cooperation project in mountainous logging practice which had been conducted from 28th June to 14th July 1977, including field survey in Madiun, Lawu and Pekalongan area.

Since it is not possible, at this stage, to go into details of planning the implementation please allow us to present you only outline of the plan as shown in the following papers.

The detailed results of this survey will be stated in our final report to be submitted later on.

Doubtlessly, your thoughtful consideration on organizational and financial arrangements needed for successful implementation of the project is very much essential and will be highly appreciated.

Respectfully yours,

Peference Materials

1. In terim Report of the Survey Team
2. Record of Discussions for mountain Logging Practice in Java



Tadao Mishina
Head of the Japanese Preliminary
Survey Team for Cooperation
Project on Mountainous Logging
Practice in Java

1. Terms of reference of the survey team are:

1. To conduct a detailed field survey on the technical cooperation project necessary for training of mountainous logging practice in Java.
2. To have discussion with the authorities concerned of the Republic of Indonesia on planning and implementation of the project.

2. Outline of results of the survey and comment on it by the Japanese Survey Team are as follows:

Two point to be kept in our mind, in mountainous logging in Java are:

1. To pay serious attention administratively and technically to "erosion control", "flood control" as well as "water-resource maintenance".
2. To study over future problem on employment of surrounding inhabitants before adoption of needed mechanical logging systems.

According to the above reasons, in case of a comparatively steep terrain, so called "Sky-line system" by yarder, which is able to carry logs of full trunk length from a felling site to loading point beside a hauling road, is strongly recommended.

The other hand, however, in a moderate terrain, yarding by wheel-typed tractor equipped with low-pressure tyres may be advisable because of it's higher efficiency, and in this case for it's incidental operation such as construction of spur-road or loading platform crawler-typed tractor might be used.

In the above tractor operation, in general, in a terrain such as the surveyed forest areas a big size tractor is not advisable because of it's topography and fear of occurrence of damage to ground conditions.

Considering employment problems, radical introduction of light machinery such as "chain-saw" is also not so advisable.

Concluding the aboves, we would like to emphasize that the point of the cooperation being projected is "training of mountainous

logging consisting of SKY-LINE SYSTEM mainly and tractor system incidentally.

Even though the sky-line system has been introduced to Japan from U.S.A. about 80 years ago already, it's effective penetration into all parts of Japan has just started since 1955.

However it may be noted that Japan is one of the most advanced countries in technology of sky-line logging systems in the world nowadays.

Reasons of the fast developing technology mentioned above in Japan are, firstly as Japan has been covered with comparatively steep forests quite same as Indonesia's forests conditions, she has been unavoidably forced to adopt such a system like a "sky-line system" and simultaneously starting with 1945 both functions and efficiency of Yarder's itself, wire-ropes as well as other accessories such as carriage are developed and improved very fast through good tie-up between industrial and forestry engineers after repeating of bitter experiences of "try and error".

Needlessly speaking, of course, the most essential element to make the training successful is good cooperation both physically and mentally between both countries and besides the following matters should be kept in our mind:

1. Being different from other systems like a tractor yarding or high-lead (ground) yarding, sky-line system requires higher skilled technicality for it's operation, negligence or ignorance of an established rules and regulations for the operation will invite serious danger of life of workers.
2. As success of operation of the system fully depends upon adequacy of setting of cables we have to spend a considerable training hours for a practice of it's setting work.

And it might seem that it's setting methods are consisting of so many types and varieties, but the fundamental types well used are not more than 2 or 3 actually and not so hard to be understood.

However, of course, each terrain is very different each other and various, so knowledge and skill of setting of cables should be

given through "hand to hand" training rather than "black-board" to trainees.

It is said, in Japan, that it needs minimum 3 years, in average, to train a skilled "sky-line" operator, who is capable under any of terrain conditions, meantime just merely for driving of yarder/ tractor machine itself 3 months might be more than enough supposedly.

We jointly, together with Perhutani's key personnel observed and tentatively came to the following conclusion that for the most effective training in the shortest time it is very essential to have the following schedule per each batch of trainees:

1. Initial 6 months, in Madiun

Desk lesson and mechanics:	Perhutani's Training Center, Madiun
Cable setting practice:	Low pine forest, 30 km from Madiun

2. Following 12 months, in K.P.H. Pekalongan Barat

On-the-job training

(Note) Trainings in Japan:

- 1) UPGRADING: Out of trainees, the selected personnel will be dispatched to Japan for further theoretical field and or instructor course for a few months.
- 2) REPAIR: For repair training which requires special instructors and facilities, the trainees concerned will be dispatched to Japan, for min. one year.

Repeatedly concluding, point of the training is minimizing desk-lessons, to share more hours as much as possible to "hand-to-hand" training in a pine forest.

Basing on the above point of general view, here by, we would like further to submit your good also a draft of RECORD OF DISCUSSION for your perusal in advance, per attached in this occasion.

(Draft) RECORD OF DISCUSSION
MOUNTAINOUS LOGGING PRACTICE IN JAVA

1. (1) For the purpose of yielding pine-logs to supply the raw materials from mountainous forests of the State Forest Corporation (Perum Perhutani) to the pulp and paper mill at Notog, which is being planned under the Economic and Social Development Plan of the Government of the Republic of Indonesia, both the Government of the Republic of Indonesia and the Government of Japan will cooperate together in implementing a technical cooperation project in the mountainous logging thereat.

Object of the project is to transfer suitable technology for a mechanical logging system needed for mountainous forest operation through establishment of a "Mountainous Logging Training Center".

The master plan of the project is specified in Annex I.

- (2) The project will be implemented according to guidance by annual work plan to be formulated by the Joint-Committee specified in Article 8.

2. (1) In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide at their own expenses services of Japanese experts as listed in Annex II through normal procedures under the Colombo Plan Technical Cooperation Scheme.
 - (2) The Japanese experts mentioned above and their families will be granted in the Republic of Indonesia, privileges; exemptions and benefits will not be less favorable than those granted to experts of third countries or of any international organization such as the United Nations performing similar missions.
3. (1) In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to provide, at their own expenses, such Equipments, Machineries, Vehicles, Instruments, Tools, Spare Parts and other Materials required for implementation of the Project as listed in Annex

IV through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

- (2) The articles referred to the above will become property of the Government of the Republic of Indonesia upon being delivered, on condition of C.I.F., to the Indonesian authorities concerned at port(s) and/or international airport(s) of disembarkation, and those are to be utilized exclusively for the implementation of the Projects in consultation with Japanese Team Leader referred to in Annex II.
4. (1) In accordance with laws and regulations in force in Japan, the Japanese authorities concerned will take necessary measures to receive the Indonesian technical staffs and other personnel engaging in the Project for technical training or study tour in Japan through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
 - (2) The Indonesian authorities concerned will take necessary measures to ensure that knowledge and experience thus acquired by the Indonesian personnel through the technical training and study tour in Japan to be utilized effectively for implementation of the Project.
 5. (1) The Indonesian authorities concerned will take necessary measures to provide at their own expenses:
 - (a) the services of the Indonesian technical staffs and other personnel as listed in Annex V.
 - (b) acquisition of land and buildings as listed in Annex VI as well as other incidental facilities required therefor.
 - (c) supply or replacement of articles necessary for the implementation of the Project other than those provided by the Japanese authorities concerned under Articles 3 (1).
 - (d) suitable furnished housing accommodations for the Japanese experts and their families.
 - (2) The Indonesians authorities concerned will take necessary measures to meet:

- (a) custom duties, internal taxes and any other charges, if any, imposed in the Republic of Indonesia in respect of the articles as referred to in Article 3 (1).
 - (b) expenses necessary for transportation within Indonesia, of the articles as referred to Article 3 (1) as well as for installation, operation and maintenance thereof.
 - (c) All running expenses necessary for implementation of the Project.
 - (d) transportation facilities and grant of the travel allowance for the Japanese experts for the official travels in the Republic of Indonesia.
6. The Indonesian authorities concerned shall undertake to bear claims, if any, arisen against Japanese experts engaged in the Project resulting from, occurring in the course of, or otherwise connected with, discharge of their official function in the Republic of Indonesia, except for those claims arising from willful misconduct or gross negligence of Japanese experts.
7. The Director General of Forestry, Ministry of Agriculture of the Republic of Indonesia will be responsible for the administrative matters for the implementation of the Project and the Japanese experts will provide primarily technical guidance and advice for implementation of the project.
8. For the successful implementation of the Project, a Joint Committee will be established as specified in Annex VII.
9. (1) The period of technical cooperation under their Record of Discussions will be effective four (4) years starting from the date of arriving of the first Japanese experts dispatched specified in Article 2, after signing to this Record of Discussions.
- (2) This Record of Discussions will serve as a basis for the implementation of the Project.

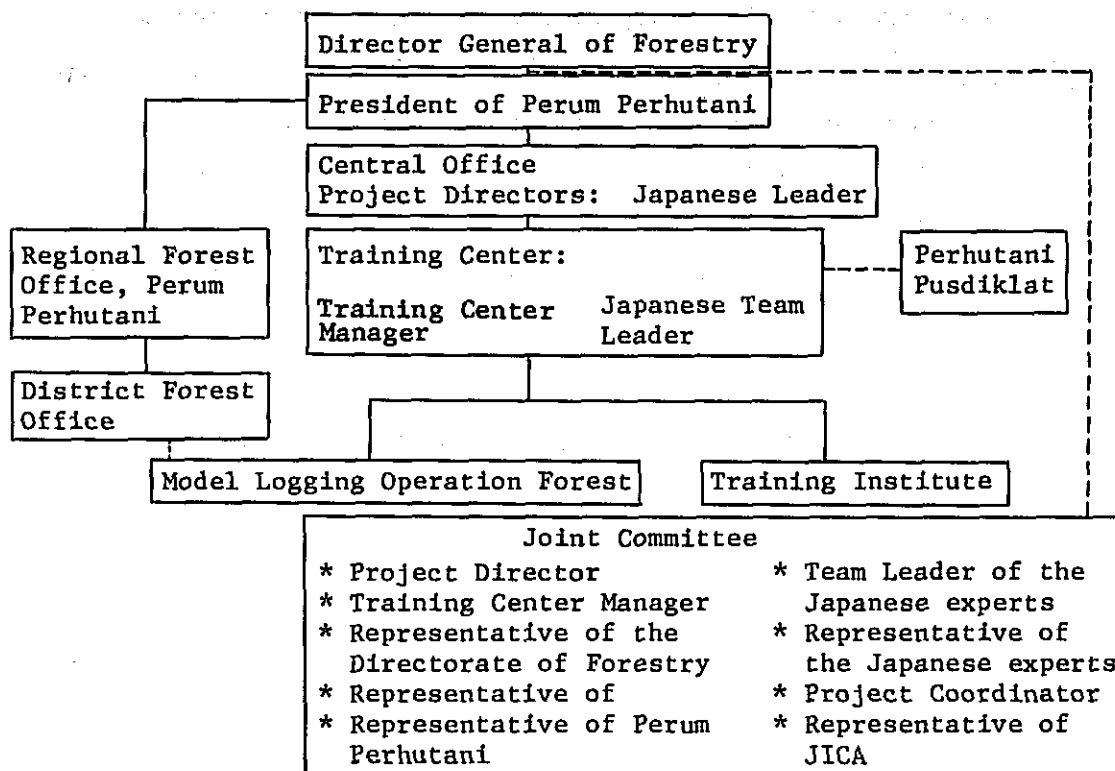
Annex I THE MASTER PLAN OF THE PROJECT

Object of the Project will be implemented through the development and training of mountainous logging technology by the organization as shown in the attached chart.

The activities of the Project will be:

1. Trainees will work later on as technical staffs for leader of logging operation in Perum Perhutani's working sites mainly.
2. Lecture of basic theory and elementary training for mechanical logging system and repair work will be implemented at Training Institute at Madiun.
3. Practical training for mechanical logging operation will be implemented in model logging operation forests in West Pek-longan.
4. Training will be done 6 months at the Training Institute first and then the 12 months in the model forests.
5. In principle practice training will be implemented under supervision by Perum Perhutani's own organization by way of so called "on-the-job" training.
And Training Institute will dispatch needed instructor(s) there from time to time when necessity arises.
6. The synopsis of the training items are as follows, and details of the training curriculum will be determined through discussion with the Japanese experts and their counterparts.
 - a. Design and work of skyline-logging
 - b. Design and work of tractor-logging
 - c. Design and work of access road construction
 - d. Operation of logging equipments/machines

Attached Chart: ORGANIZATION CHART FOR INDONESIA-JAPAN
MOUNTAINOUS LOGGING TRAINING CENTER PROJECT



Annex II LIST OF THE JAPANESE EXPERTS

CATEGORY	FIELD OF SPECIALTY
1. Team Leader	All round
2. Experts	Management of logging, logging operation and forestry machines.
3. Associate Experts	
4. Project Coordinator	
-Liaison Official-	

- Note: 1. Team Leader will belong to the Training Institute and concurrently be appointed as representative of Japanese side at Central Office of the Project.
2. Besides the above, short-term experts for the same fields as well as wood-processing, soil conservation, forest protection, forest survey and other forestry technical fields will be dispatched, if necessary, upon mutual agreement of both parties.

Annex III PRIVILEGES, EXEMPTIONS AND BENEFITS

- (1) Exemptions from income tax and charge of any kind imposed on or in connection with the living allowance remitted from abroad.
- (2) Exemption from import and export duties and other charges imposed in respect of personal and household effects as well as one motor-car for each expert which may be brought into the Republic of Indonesia from abroad.
- (3) Free medical care for Japanese experts and their families in the area concerned.

Annex IV ARTICLES TO BE PROVIDED BY THE JAPANESE AUTHORITIES CONCERNED

1. Machinery, Equipment and Materials necessary for the Skyline Logging.
2. Machinery, Equipment and Materials necessary for the Tractor Logging.
3. Machinery, Equipment and Materials necessary for the Access Road Construction.
4. Machinery, Equipment and Materials necessary for the Audio-Visual and other Lectures and Practices.
5. Equipment, Tools, Spare Parts and Materials for repair works.
6. Vehicles
7. Other necessary equipment, Tools and Materials to be mutually agreed upon.

Annex V INDONESIANS TECHNICAL OFFICIALS AND OTHER PERSONNEL

1. Project Director
2. Training Center Manager
3. Technical Officials
 - (1) Counterparts

Field
Management of Logging
Logging Operation
Forestry Machine
 - (2) Associate Counterparts

4. Clerical and service personnel including typists, clerks and drivers.
5. Laborers.

Note: Number of personnel by the above and period of the respective personnel will be adjusted according to necessity from time to time.

Annex VI LIST OF LAND, BUILDING AND FACILITIES TO BE PROVIDED BY THE GOVERNMENT OF THE REPUBLIC OF INDONESIA

1. Land

* Training Institute

- a. Land for the buildings and facilities ("Perhutani Pusdiklat" buildings and facilities will be utilized).
- b. Demonstration Forest approximately 200 Ha (Lawu Forest District).

* Model Logging Operation Forest approx. 2,000 Ha (K.P.H. West Pekalongan)

2. Buildings and Facilities

* Central Office: Office Room mainly

** Training Institute

- a. Lecture Room, Practical Training Room and Administrative Office.
- b. Warehouse for Forestry Equipments/Machines
- c. Workshop
- d. Garages
- e. Warehouse for Equipments and Materials
- f. Generator House
- g. Dormitory for Trainees
- h. Guest House
- i. Facilities in the Demonstration Forest such as Office Room, Warehouse for Machines and Equipments, etc.

*** Model Logging Operation Forest

- a. Administration Office
- b- Dormitory for Instructors/Trainees
- c. Garages
- d. Warehouse for Equipments and Materials
- e. Generator Houses
- f. Pump Houses

Annex VII COMPOSITION OF THE JOINT COMMITTEE

- | | |
|-----------------|--|
| (1) Chairman | Director General of Forestry |
| (2) Members | |
| Indonesian side | 1) Project Director |
| | 2) Training Center Manager |
| | 3) Representative of the
Directorate General of
Forestry |
| | 4) Representative of Perum Perhutani |
| Japanese side | 1) Team Leader |
| | 2) Experts designated by Team Leader |
| | 3) Project Coordinator |
| | 4) Representative of JICA |

Note: A Secretary of the Embassy of Japan may attend the meeting of the Joint-Committee as an observer.

2. Record of Discussions for Mountain Logging Practice in Java

RECORD OF DISCUSSIONS BETWEEN THE JAPANESE FORESTRY
SURVEY TEAM AND PERUM PERHUTANI CONCERNING TECHNICAL
COOPERATION FOR MOUNTAIN LOGGING PRACTICE PROJECT IN
JAVA, ATA - 184.-

In pursuance of the preliminary survey which was conducted in June and July 1977, the Japanese Forestry Survey Team, organized by the Japan International Cooperation Agency (hereinafter referred to as JICA), and headed by Mr. Mishina visits the Republic of Indonesia from November 29 to December 9, 1977, for the purpose of discussing with PERUM PERHUTANI, State Forest Corporation of the Republic of Indonesia (hereinafter referred to as PERHUTANI), concerning the desirable measures to be taken by both Governments for the successful implementation of the Mountain Logging Practice Project.

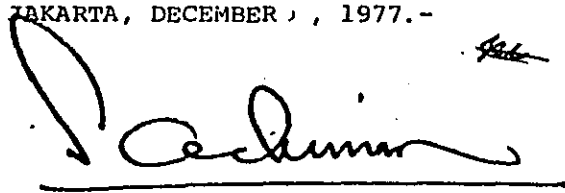
As a result of the discussions, the Team and PERHUTANI agreed to recommend to their respective Governments to carry out the matters referred to in the attached document concerning the technical cooperation for the Mountain Logging Practice Project in Java, as a follow up of the Forest Inventory for Management and Logging for raw material supply to Central Java Pulp & Paper Mill.

JAKARTA, DECEMBER , , 1977.-



TADAO MISHINA

Head of the Japanese
Forestry Survey Team



SOEKIMAN ATMOSOEDARJO

President Director of
Perum Perhutani

MOUNTAIN LOGGING PRACTICE PROJECT
IN JAVA

ATTACHED DOCUMENT

1. (1) For the purpose of transferring mechanical logging technology for yielding pine-logs as raw material to be supplied from mountainous forests of PERHUTANI to a pulp and paper mill which is to be established at Notog, the Government of Japan and the Government of the Republic of Indonesia will cooperate with each other in implementing a technical cooperation for the Mountain Logging Practice Project in Java (hereinafter referred to as "the Project"). The master plan of the Project is specified in Annex I.

(2) The Project will be implemented in accordance with an annual work plan to be formulated by the Joint-Committee referred to in paragraph 8.
2. (1) In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense the services of the Japanese experts as listed in Annex II through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

(2) In accordance with the laws and regulations in force in the Republic of Indonesia, the Japanese experts mentioned in (1) above and their families will be granted in Indonesia the privileges, exemptions and benefits as listed in Annex III within the framework of the Colombo Plan Technical Cooperation Scheme.
3. (1) In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at their own expense such equipment, machinery, vehicles, instruments, tools, spare parts and other materials required for the implementation of the Project as listed in Annex IV through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

- (2) The articles mentioned in (1) above will become the property of the Government of the Republic of Indonesia upon being delivered C.I.F. to the Indonesian authorities concerned at the ports or airports of disembarkation, and will be utilized exclusively for the implementation of the project in consultation with the Japanese Team Leader listed in Annex II.
4. (1) In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to receive at its own expense the Indonesian personnel engaged in the Project for technical training or study tour in Japan through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
- (2) The Government of the Republic of Indonesia will take necessary measures through PERHUTANI to ensure that the knowledge and experience acquired by the Indonesian personnel mentioned in (1) above through technical training and study tour in Japan may be utilized effectively for the implementation of the Project.
5. (1) In accordance with laws and regulations in force in Indonesia the Government of the Republic of Indonesia will take necessary measures through PERHUTANI to provide at its own expenses:
- (a) the services of the Indonesian technical officials and other personnel as listed in Annex V;
 - (b) land and building as listed in Annex VI as well as other incidental facilities required therefore;
 - (c) supply or replacement of articles necessary for the implementation of the Project other than those provided by the Government of Japan referred to in paragraph 3 (1);
 - (d) suitably furnished existing PERHUTANI housing accommodation for the Japanese experts and their families.
- (2) In accordance with laws and regulations in force in Indonesia the Government of the Republic of Indonesia will take necessary measures through PERHUTANI to meet;

- (a) customs duties, internal taxes and any other charges, if any, imposed in the Republic of Indonesia in respect of the articles referred to in paragraph 3 (1);
 - (b) expenses necessary for transportation within the Republic of Indonesia, of the articles referred to in paragraph 3 (1) as well as for the installation, operation and maintenance thereof;
 - (c) all operational expenses necessary for the implementation of the Project;
 - (d) expenses for transportation facilities of internal travel of the Japanese experts on duty.
6. In accordance with laws and regulations in force in Indonesia the Government of the Republic of Indonesia undertakes to bear claims, if any arises, against the Japanese experts engaged in the Project resulting from, occurring in the course of, or otherwise connected with, the discharge of their official functions in the Republic of Indonesia, except for those claims arising from willful misconduct or gross negligence of the Japanese experts.
7. The Director General of Forestry, Ministry of Agriculture of the Republic of Indonesia, will be responsible for the administrative matters for the implementation of the Project and the Japanese experts will provide technical advice and guidance for the implementation of the Project.
8. For the successful implementation of the Project, a Joint Committee will be established as specified in Annex VII.
9. (1) The period of the technical cooperation mentioned in this Record of Discussions will be three (3) years starting at the date of the arrival of the Japanese experts.
- (2) There will be mutual consultations between the authorities concerned of both Governments concerning the possibility of further cooperation thereafter.

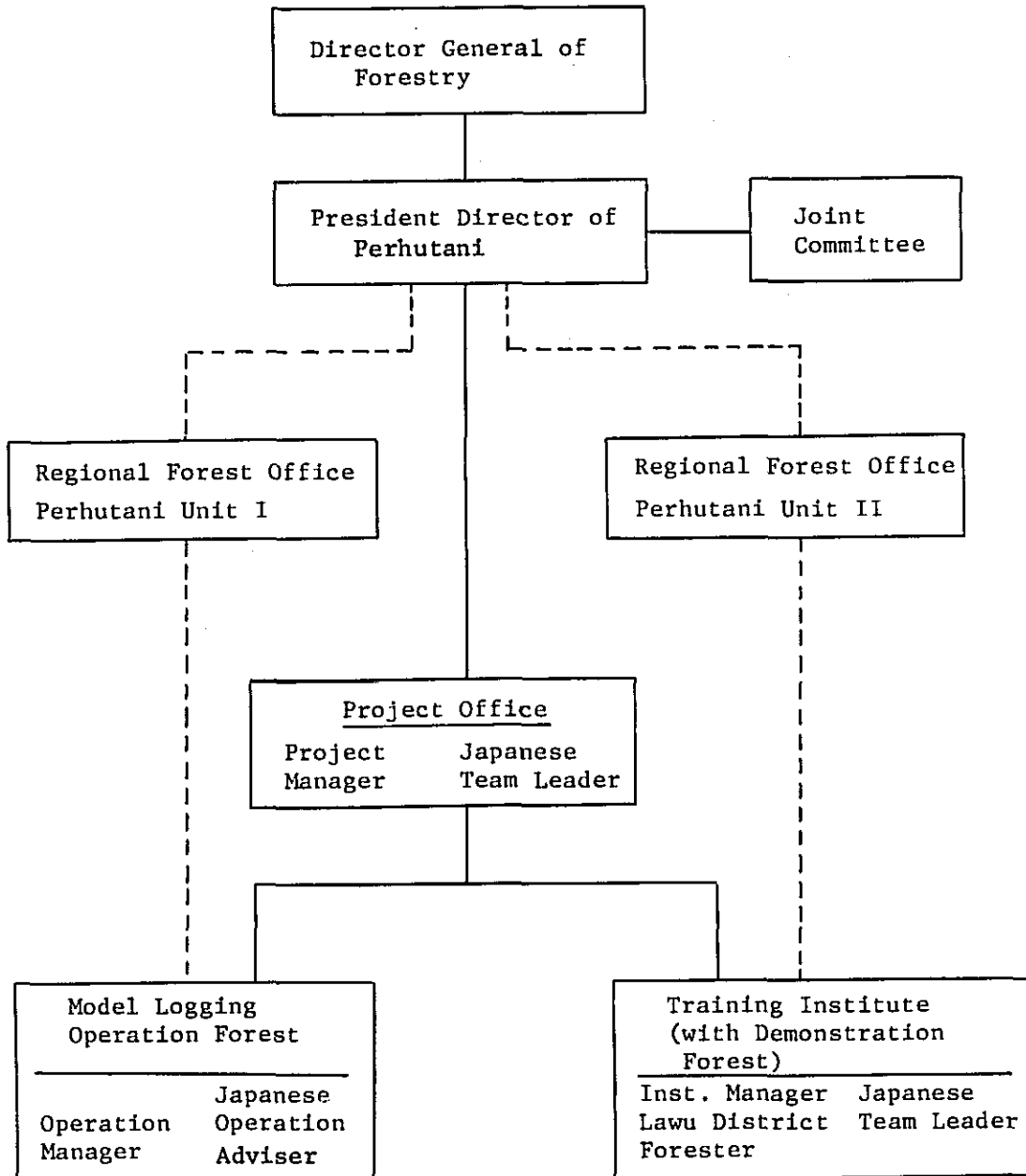
Annex I

THE MASTER PLAN OF THE PROJECT

The object of the Project is to develop and to practice mountain logging technology at the organization as shown in the attached chart.

1. A Project Office will be established in Madiun, and will control the implementation of the Project.
2. A Training Institute at Madiun and Demonstration Forests at Lawu will be established, and the lecture of basic theory and the elementary practice for mechanical logging system and repair work will be implemented there for 6 months.
3. A Model Logging Operation Forest approximately 2,000 ha will be established at Pekalongan Forest District, Central Java, and the practical training for mechanical logging operation after the lecture and practice mentioned in (1) above will be implemented there for 12 months.
4. In principle, practical training in the Model Logging Operation Forest, so called "on-the-job training" will be implemented under the supervision of PERHUTANI, and the Training Institute will dispatch requested instructors to the job site from time to time.
5. The synopsis of the training items are as follows, and details of the curriculum will be determined through discussion between the Japanese experts and their counterparts;
 - a. Design and practice of skyline-logging
 - b. Design and practice of tractor-logging
 - c. Design and practice of access road construction
 - d. Operation of forestry equipment/machinery
 - e. Maintenance of forestry equipment/machinery.
6. Graduates will work mainly as technical staff who will be the leader of logging operation in PERHUTANI's working sites.

Attached Chart: ORGANIZATION CHART FOR INDONESIA - JAPAN
MOUNTAIN LOGGING PRACTICE PROJECT



Annex II
THE JAPANESE EXPERTS

Category	Field of Specialty
1. Team Leader	
2. Experts	Management of Logging Logging Forestry Machines
3. Project Liaison Officer	

- Note:
1. Team leader will be assigned to the Training Institute and concurrently be appointed as representative of Japanese side at Project Office in Madiun.
 2. Above experts will be assigned to the Training Institute and one of those experts will be nominated by the Team Leader concurrently as the operation adviser of Model Logging Operation Forest.
 3. Beside the above experts, short term experts for the same fields as well as wood/forest products processing, soil conservation, forest protection, reforestation, forest survey and other forestry technical fields may be dispatched, if necessary, upon mutual agreement by both parties.

Annex III

PRIVILEGES, EXEMPTIONS AND BENEFITS

(In accordance with laws and regulations in force in Indonesia)

1. Exemption from income tax and charges of any kind imposed on or in connection with the living allowance remitted from abroad.
2. Exemption from import and export duties and any other charges imposed in respect of personal and household effects for each expert which may be brought into the Republic of Indonesia from abroad.
3. Free local medical services and facilities to the Japanese experts and their families in accordance with the regulations applied to Indonesian Government officials.

Annex IV

THE EQUIPMENT, MACHINERY AND OTHER ARTICLES

1. Machinery, equipment and materials necessary for the skyline logging.
2. Machinery, equipment and materials necessary for the tractor logging.
3. Machinery, equipment and materials necessary for the access road construction.
4. Machinery, equipment and materials necessary for the audio-visual and other lectures and practice.
5. Equipment, tools, spare parts and materials for repair work
6. Vehicles
7. Other necessary equipment, tools and materials to be mutually agreed upon.

Annex V
INDONESIAN TECHNICAL OFFICIALS
AND OTHER PERSONNEL

Category	Field
1. Project Manager	
2. Manager of Training Institute	
3. Operation Manager of Model Logging Operation Forests	
4. Counterparts	Management of Logging Logging Forestry Machine
5. Clerical and service personnel including typists, clerks and drivers	
6. Laborers	

Note: Number and period of service of the above mentioned officials and other personnel will be adjusted according to necessary from time to time.

Annex VI
LAND, BUILDINGS AND FACILITIES

1. Land

(1) Training Institute

- a. Land for the buildings and facilities ("Perhutani Pusdiklat" buildings and facilities will be utilized).
- b. Demonstration Forest approximately 200 Ha (Lawu Forest District)

(2) Model Logging Operation Forest approx. 2,000 ha (West Pekalongan Forest District)

2. Buildings and Facilities

(1) Project Office

(2) Training Institute

- a. Lecture Room, Practical Training Room and Administrative Office.
- b. Warehouse for Forestry Equipment/Machinery
- c. Workshop
- d. Garages
- e. Warehouse for Equipment and Materials
- f. Dormitory for Trainees
- h. Guest House
- i. Facilities in the Demonstration Forest such as Office Room, Warehouse for Machinery and Equipment, etc.

(3) Model Logging Operation Forest

- a. Administration Office
- b. Dormitory for Instructors
- c. Garages
- d. Warehouse for Equipments and Materials
- e. Generator Houses
- f. Pump Houses

Annex VII
COMPOSITION OF THE JOINT COMMITTEE

1. Chairman President Director of PERHUTANI
2. Vice Chairman Director of Programming
 Directorate General of Forestry
3. Members
 - Indonesian side
 - 1) Project Manager
 - 2) Manager of Training Institute
 - 3) Representative of the Bureau of Planning,
 Ministry of Agriculture
 - 4) Representatives of PERHUTANI
 - Japanese side
 - 1) Team Leader
 - 2) Experts designated by Team Leader
 - 3) Liaison Officer
 - 4) Representatives of JICA

Note: An official of the Embassy of Japan may attend the meetings of the Joint - Committee as an observer.

An official of the Government of the Republic of Indonesia assigned by the Director General of Forestry may attend the meetings of the Joint - Committee as an observer.

