Peserta Training di Jepang.

Tahun	Jenis training	N a m a	F u n g s i	Subyek Training
1977	Junior Course	1.W.Bambang Wahyono Soerjosoebagjo.	Ajun/KBT di KPH Cepu, Unit I.	Exploitasi hutan dan potret udara.
		2.M.Marinus Ezerman.	Kasi Pendidikan Pusdik Madiun.	s.d.a.
		3.Djasmadi.	K.I.P.K.J. Cepu, Unit I.	Maintenance.
1978	Senior Course	1.Ir Hartono Wirjodarmodjo M A.	Direktur Produksi Perum Perhutani.	Kehutanan di Jepang.
		2.Ir Soeroso Sd.	Kepala Biro Produksi Unit I.	s.d.a.
		3.Ir Syarief M. Kemal.	Wk. Kepala Unit II.	s.d.a.
		4.Ir Soedjadi Martodiwirjo.	Kepala Biro Perencanaan Unit II.	s.d.a.
	Junior Course	1.Ir Bambang Soeharianto.	KBKPH di KPH Madiun, Unit II.	Logging mekanis.
		2.Soedibjo.	KPH Pekalongan Brt Unit I.	s.d.a.
		3.R.Adi Hartono.	Adm/KKPH Lawu, Unit II.	s.d.a.
1979	Senior Course	1.R.Djoemhadi.	Pimpinan Proyek M L P.	Kehutanan di Jepang.
		2.Karjadi.	Ajun/KSKPH Pekalongan Barat Unit I	s.d.a.
	Junior Course	1.Eddy Muryanto.	Unit II.	Skyline logging.
		2.Kadarisman.	KPH Pekalongan Brt.	Skyline logging.
		3.Ir Rochmadi H.S.	KBKPH di KPH Purwodadi.	Skyline logging.
1980	Senior Course	1.Soehardi.	Kasi Exploitasi Unit I.	Kehutanan di Jepang.
		2.Rachmad.	Kasi exploitasi Unit II.	s.d.a.
	Junior Course	1.Ir Prijanto.	KBKPH di KPH Randublatung, Unit I.	Skyline logging, mesin-mesin.
		2.Syaifoer Rachman S.	KBKPH di Pekalongan Barat, Unit I.	Kehutanan.
		3.Soenarjo.	KPH Gundih, Unit I.	s.d.a.
		4.Soebarjo.	KPH Purwodadi, Unit I.	s.d.a.

Tahun	Jenis training	N a m a	F u n g s i	Subyek Training
1981	Junior Course	1.Ir Bambang Soeharianto.	Counterpart MLP.	Logging mekanis dan transportasi.
		2.M.Marinus Ezerman	s.d.a.	s.d.a.
		3.Djoko Soemanto.	KPH Purworejo, Unit I.	s.d.a.
		4.Iwan Maulana.	KPH Pekalongan Barat,Unit I.	s.d.a.
1982	Senior Course	1.Ir Moch Rochmadi	Kepala Biro Perencanaan Unit I.	Kehutanan di Jepang.

Jumlah Senior Course 9 pengiriman.

Junior Course 17 pengiriman.

DAFTAR ANGGARAN
DAN REALISASI PENGELUARAN & PEMBANGUNAN
PROYEK MLP DI MADIUN

LAMPIRAN 5.

U R A I A N	APRIL-DESEMBER 1978. RP	1979 RP.	1980 RP.	1981 RP.	1982 JAN S/D MEI RP.	JUMLAH RP.
R A B	-	71.877.283,-	61.507.707,50	113.455.000,-	53.653.500.-	300.493.490,50
I. BELANJA UMUM. (Pos Aa, Ab, B, Ca, Cb).	1.849.954,16	13.660.930,61	20.219.143,70	31.225.419,44	14.739.723,18	81.695.171,09
II. BELANJA PEMELIHARAAN. -Penelitian,Penyuluhan & Pendidikan Kehutanan (Pos I).	810.033,-	50.723.510,60	3.089.187,93	53.867.983,85	10.008.217,50	118.498.912,88
-Obyek perlengkapan (Pos J,M,Na,Nb).	690.515,-	19.261.709,61	18.536.334,03	29.671.718,86	14.829.521,80	82.988.799,30
JUMLAH II	1.500.548,-	69.985.220,21	21.625.521,96	83.539.702,71	24.867.719,30	201.487.712,18
III.CAD. PENYUSUTAN.	-	1.368.437,-	1.997.735,75	1.757.735,75	-	5.123.908,50
JUMLAH ROUTINE(I S/D III).	3.350.502,16	85.014.587,82	43.842.401,41	116.522.857,90	39.607.442,48	288.306.792,77
IV. PENGELUARAN PEMBANGUNAN.	-	13.489.370,-	3.892.987,50	-	-	17.382.357,50
JUMLAH SELURUH PENGELUARAN.	3.350.502,16	98.503.957,82	47.735.388,91	116.522.857,90	39.607.442,48	305.689.149,27

CATATAN : - Tahun 1978 tata usaha keuangan Proyek MLP masih tergabung dengan pembukuan Pusdik.
- Tahun 1979 & 1980 sesuai dengan hasil audit di Madiun & audit gabungan di Jakarta.
- Tahun 1981 dari Perni 40.A. yang belum diaudit.
- Kelebihan/pelampauan anggaran th 1979 & 1981 disebabkan pengoperan biaya (RC) dari Direksi berupa biaya inklaring dll. serta pembuatan prasarana pendidikan di KPH Pekalongan Barat & KPH Lawu Ds.

FINAL REPORT
ON THE MOUNTAIN LOGGING PRACTICE PROJECT IN JAVA

JUNE 15, 1982

Japan International Cooperation Agency

The Mountain Logging Practice Project in Java, which was started in April, 1978, and its cooperation period extended for one year and two months in April, 1981, came to its end in June, 1982, completing its mission.

I think the project has been implemented quite smoothly and achieved the results expected in the beginning fairly satisfactorily. This is a fruit of the strong support, understanding and cooperation of Perum Perhutani and the authorities concerned of the government of Indonesia. The strenuous efforts of the counterparts and other personnel involved in the project as well as the passionate endeavors of the Japanese experts for the transfer of technology are also responsible for smoothly carrying out the project activities. The sincere and positive attitude of the trainees in their attempts to acquire techniques was another factor which contributed to the project's success.

We will be watching with high hopes and expectations even after this technical cooperation project because we believe it is of great importance that the transferred technology will take firm root and develop in the direction most suitable to this country. And we will never cease to hope that the transferred technology will not only be widely utilized in the real forest exploitation work but also contribute to the modernization of forestry in Perum Perhutani and in Indonesia as well.

I hope that the relationship between our countries in the sector of forestry and forestry technology will become tighter through this cooperation and ensure mutual development of forestry.

In the last place, I would like to express my heartfelt appreciation to the personnel and authorities concerned with the project for their continuous and unswerving help and support.

June 15, 1982

Mountain Logging Practice
Project in Java

Tatsuka Numata
Team Leader

CONTENTS

I. SUMMARY

This project with its purpose to transfer mechanical logging technology to the employees of Perum Perhutani was started in April, 1978, and came to an end in June, 1982.

During those 4 years and 2 months cooperation period, 16 long-term experts and 5 short-term experts were dispatched from Japan and 8 counterparts and other personnel such as clerks were assigned to the project.

The project office was located at the forestry training center of Perhutani in Madiun, East Java. In the suburbs of Madiun, a 200 ha Demonstration Forest was established for the fundamental field practice. A 2,000 ha pine forest was designated as the Model Logging Operation Forest in West Pekalongan District Forest in Central Java.

The method of transfer of technology was to be by training and a total of 60 Perhutani employees received 18 months of training in three phases.

Necessary equipment, of which the total value was about 380 million Yen, was supplied during the cooperation period by the government of Japan through JICA to ensure effective transfer of technology. Other than that, JICA provided financing for the necessary expenditures for the project management and also gave financial assistance for the construction cost of some facilities.

By the end of the project, the total number of persons concerned with the project who were trained in Japan reached 25.

The project was implemented smoothly as planned. In May, 1980, twelve trainees graduated from the first-phase training course, in May, 1981, twenty four from the second-phase, and in June, 1982, twenty four from the third-phase, completing the respective curriculum.

The backbone of the training content was complete mastery of rudimentary techniques of mechanical logging, integration of individual techniques and their application, work safety, improvement of work efficiency, etc. As regards the transfer of technology, it is considered that satisfactory results were achieved as was stated in the report of the final evaluation which was conducted in January, 1982.

The only regrettable thing was that the start of the operation of the projected paper mill in Central Java which was the background of this project has been greatly delayed.

In the original plan, the paper mill should have been in operation sometime during the cooperation period, and the OJT in the Model Logging Operation Forest was scheduled to be on a somewhat large scale. However, actually very small-scaled logging in the framework of training was carried out without the expected vast demand for the pine logs.

On account of this, the MLP graduates were not given a very good complete view of their possible utilization, which eventually can lead to the degrading and diffusion of their acquired techniques. They could not have a chance to experience confrontation with various problems which will possibly arise in a large-scale log production and to make effort to overcome those.

On the premise that the paper mill is put into operation in the near future, the problems will be to take solid measures to maintain and develop the transferred technology from the end of the project to the start of the large scale, commercial-base log production, and to prepare as early as possible very scrupulously for the smooth transition.

The details of these problems will be expounded later. But the most important and urgent matter is to establish a new organization for the maintenance and development of the transferred technology and for the cultivation of

technicians and to consolidate the executive function of it toward the huge-scale production.

The ultimate purpose of this technical cooperation is that the transferred technology should take root and develop in a direction harmonious to the situation in Java. It is hoped that strong efforts will be made to achieve this goal.

II. IMPLEMENTATION OF THE PROJECT

II-1 Background of the project

There are approximately 540,000 ha of man made Merkusii pine forests in Java planted for the primary purpose of rosin extraction. Most of those forests are over 30 years of age and regarded to be overmature, rosin production being on the decline. Therefore, the necessity for regeneration is strongly felt. However, the demand for pine logs today is very limited as they are used only for match sticks, crates, electric poles, etc. and also partly supplied to the pulp mill in East Java to be mixed with bamboo and bagasse.

On the other hand, there has long been a national-level plan to establish a pulp and paper mill in Central Java with the capacity of about 90,000 ton per annum, and the government decided to utilize those pine logs as raw material. Notified of this governmental intention, Perum Perhutani, which is in charge of the administration and management of the forests in Java, designated about 100,000 ha of pine forests in Central Java which were under the administration of three district forest offices such as KPH Pekalongan Barat to be the supplier to the pulp and paper mill.

But in fact, those pine forests are scattered in mountainous areas more than 700 m elevation above sea level. In view of the enormous difficulty of extraction of vast amounts of logs by conventional man-power logging, introduction of mechanical logging was considered.

In August, 1976, when a project-finding mission was dispatched by the government of Japan, the President Director of Perum Perhutani requested Japanese cooperation on making a yield plan of those pine forests. In response to this request, Japan International Cooperation Agency (JICA) dispatched a mission and it was agreed that the scope of work was to be aerophotographic survey and mapping, and making a yield plan for the 35,000 ha forest in West Pekalongan District Forest which would be the first area to be harvested. Then in March, 1977, aforementioned survey

was conducted under the name of "Forest Inventory for Management and Logging in Central Java"

Also in March, 1977, the government of Indonesia submitted a request to the government of Japan for the cooperation on establishing a "Mountain Logging Center" and this request was acknowledged by BAPPENAS and listed as "ATA-184, Forest Inventory for Management and Logging Plan for Raw Material Supply to Centra Java Pulp & Paper Mill".

In June 1977, a preliminary survey mission visited Indonesia to clarify the details of the requested technical cooperation. In November/December, 1977, another mission was dispatched in order to report the findings and achievement of the preceding survey on forest inventory and to sign the "Record of Discussions for Mountain Logging Practice Project in Java".

The project actually started on April 20, 1978, with the arrival of two experts, namely Mr. Takikawa, the team leader, and Mr. Handa.

II-2 Purpose of the project and its activities

(1) Purpose

The purpose of the project is to transfer mechanical logging technology, mainly skyline logging techniques, needed in the mountainous forest in Java to the employees of Perum Perhutan

(2) Method

Transfer of technology is to be achieved by training. Ther are three phases of training courses overlapping 6 months with each other. The curriculum is the same in each training course, which lasts 18 months.

(3) Training program

According to the revised Master Plan which was decided at the second Joint Committee Meeting in December, 1979, sixty trainees were to complete the MLP training course (originally

planned as 72).
The realization is as follows:

the first phase training course : 12 trainees, Nov.1978-May 1980
the second phase training course : 24 trainees, Dec.1979-May 1981
the third phase training course : 24 trainees, Dec.1980-June 1982

Each phase is comprised of four stages as follows:

(a) the first stage
Lectures of basic theories are given and the trainees practice fundamental skills for three months.

(b) the second stage
The trainees put into practice what they learned in the first stage. Proficiency in the basic procedures assuring work safety is aimed at the same time for three months.

(c) the third stage
The third stage is a 6-month on-the-job training (OJT) at the actual forest exploitation site in Central Java.

(d) the fourth stage
The fourth stage is an extension of the third stage also lasting 6 months. Imagining huge-scale commercial mechanical logging, efficiency is also stressed and the trainees are supposed to become technically independent in this final stage.

(4) Project sites and the facilities

(a) Project center
The project center is located in the Madiun Forestry Training Center (Pusdik Kehutanan Madiun). The first stage of the training takes place here using its classrooms and affiliated fields.
The facilities attached to the project are as follows:

(i)	Team leader/Project Manager room	40 m2
(ii)	Expert/Counterpart room	63 m2
(iii)	Secretary/Copy room	28 m2
(iv)	Classroom	110 m2
(v)	Dormitory	
(vi)	Workshop	300 m2
(vii)	Warehouse	110 m2, 120 m2
(viii)	Training yard (some part of the yard was prepared by JICA's MI scheme)	3000 m2
(ix)	Garage	170 m2
(x)	Oil house	24 m2

(b) Demonstration forest

The Demonstration Forest (200 ha) is located at Ngebel about 45 km from the project center where second stage training takes place. It is under the administration of Lawu District Forest.

The facilities are as follows:

(i)	Access road (1 km was constructed by JICA's MI scheme)		3.5 Km
(ii)	Rest house		50 m2
(iii)	Warehouse		40 m2
(iv)	Oil house		30 m2
(v)	Advance camp	expert/counterpart	102 m2
		trainee	60 m2

(c) Model Logging Operation Forest

The Model Logging Operation Forest where OJT takes place is located in Bumi-Jawa, under the administration of West Pekalongan District Forest. The area is 2,000 ha and about 420 km from the project center.

The details of the facilities are as follows:

(i)	Access road		6 km
(ii)	Rest house		115 m2
(iii)	Warehouse		140 m2
(iv)	Oil house		30 m2
(v)	Garage (built by JICA)		195 m2
(vi)	Advance camp	expert	150 m2
		counterpart	90 m2
		trainee	130 m2

(5) Organization

The organization of the project is as illustrated in figure 2.

(6) Experts

According to the original dispatch plan there were to be 10-12 long-term experts in the fields of logging planning, logging technique, forestry machines including a team leader and liaison officer in the middle of the cooperation period.
But the realization was usually 8 and the maximum number was 9.

Other than the above-mentioned fields, it was made possible to dispatch short-term experts in such fields as wood/forest product processing, soil conservation, forest protection, forest survey and other forestry technical fields which were deemed necessary. Actually the fields of the short-term experts who were eventually dispatched were forestry machinery, socio-economics and cost analysis.

Fig. 1

BIRD'S-EYE VIEW OF THE PROJECT

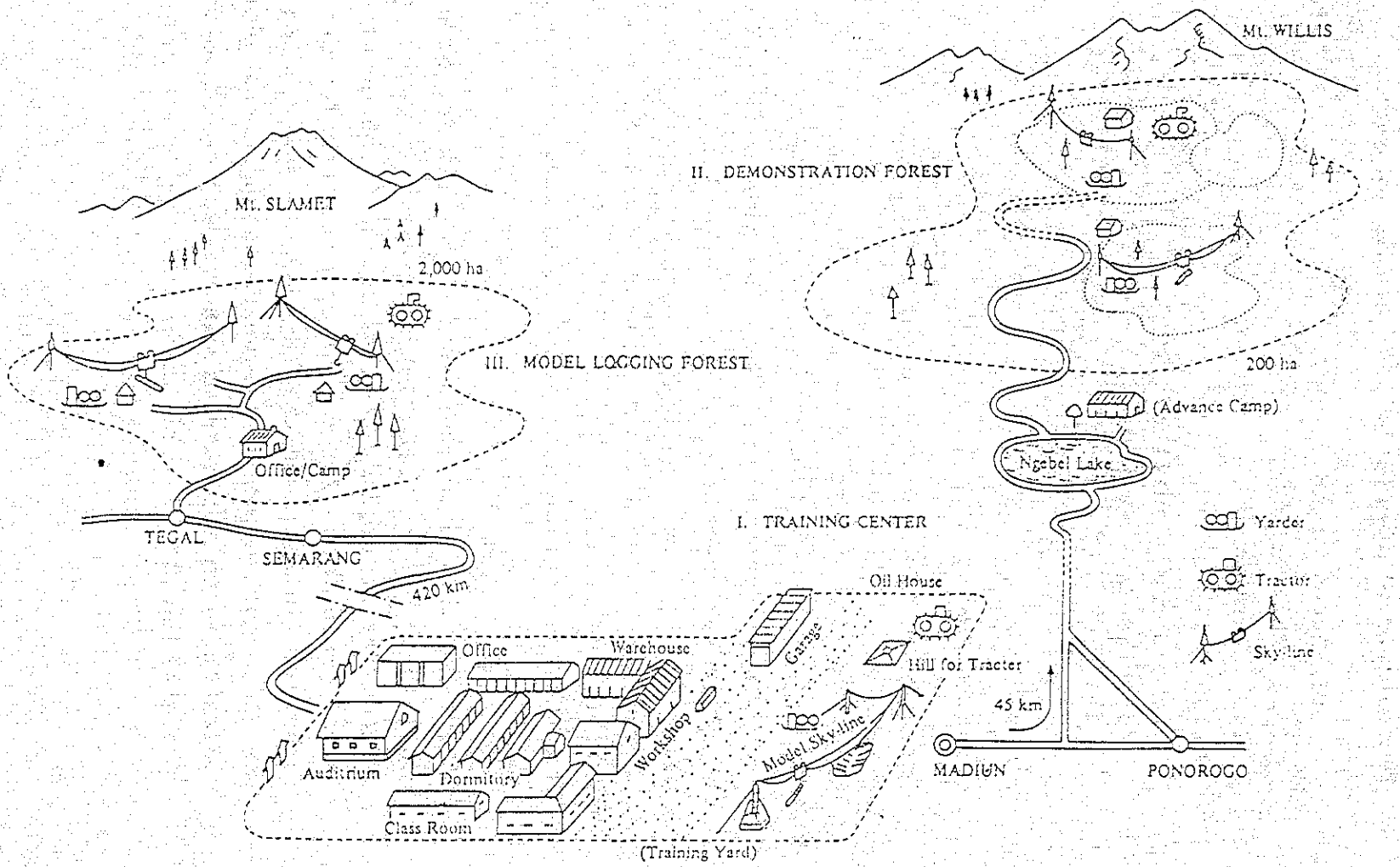
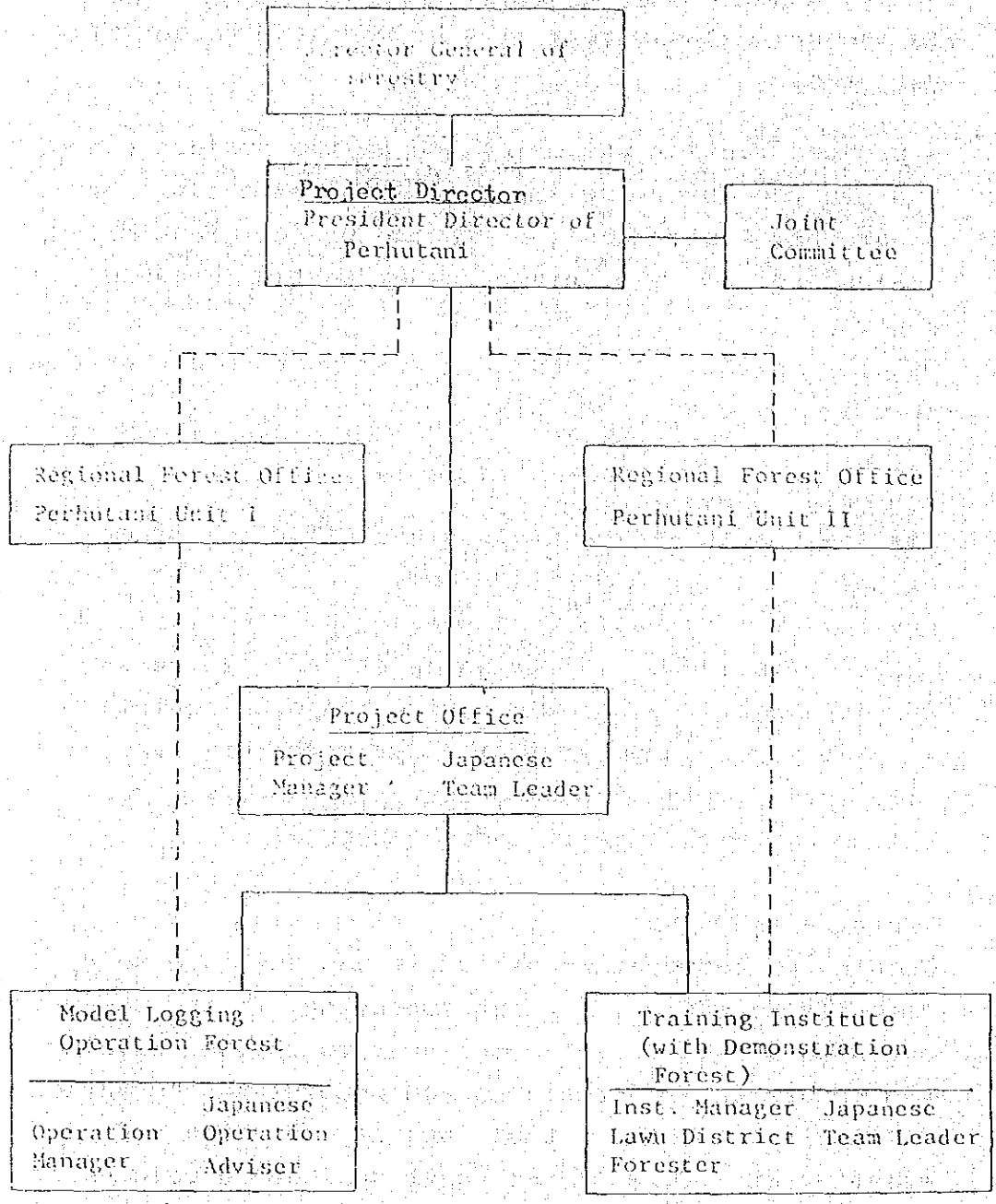


Fig. 2 ORGANIZATION CHART FOR
TROPICAL LOGGING PRACTICE PROJECT



(7) Indonesian personnel

The person ultimately responsible for the project is nominally the Director General of Forestry as illustrated in the organization chart but the virtual superintendent is the project director, the President Director of Perum Perhutani.

A project manager was allocated at the project center and presided over the implementation of the project. Counterparts were assigned to the project in similar fields and in commensurate number to the Japanese experts.
Other than that, a clerk, drivers, workers and watchmen were employed as necessary.

(8) Equipment supply

For the smooth implementation and effective transfer of technology essential equipment was supplied by the government of Japan. Considering the special characteristics of the training project of mechanical logging which necessitates a wide range of equipment, a variety of equipment from heavy machinery, vehicles, wire rope, tools and spare parts to multifarious office equipment and trainees' accessories.

(9) Training in Japan

Within the cooperation period it was possible to transfer mechanical logging technology to the counterparts to a fairly high level, but to further develop and mature their techniques and understand the various difficulties of the actual logging operation and relation with forest road construction and reforestation, and to deepen their knowledge of machinery maintenance training in Japan was carried out.

From among the graduates of the MLP training course some selected persons who were expected to become counterparts and some employees of Perum Perhutani who were expected to take positions requiring initiative in the actual log production after the project were also sent to Japan to receive similar training. Furthermore, senior officials of Perhutani who are concerned with the implementation of the project were also received in the training in Japan so that they understand the general aspects of Japanese forestry especially in mechanical logging work.

(10) Model infrastructure scheme by JICA

The Japanese government assists with local costs in the improvement of infrastructure such as forest roads which are the basis of the implementation of the project and later become models and demonstrate the effect of the project widely to the local communities.

It was also possible for JICA to provide financial support to the local budget in case of certain exigencies.

II-3 Implementation of the project

(1) Training

The basic concept of carrying out the training was to transfer as much technology as possible within the cooperation period needed in the logging work, which is one process of forest exploitation, introducing machinery (yarder & tractor) according to the basic plan of "Report on Preliminary Survey on Mountain Logging Practices in Java Technical Cooperation Project" (Dec. 1977, JICA)

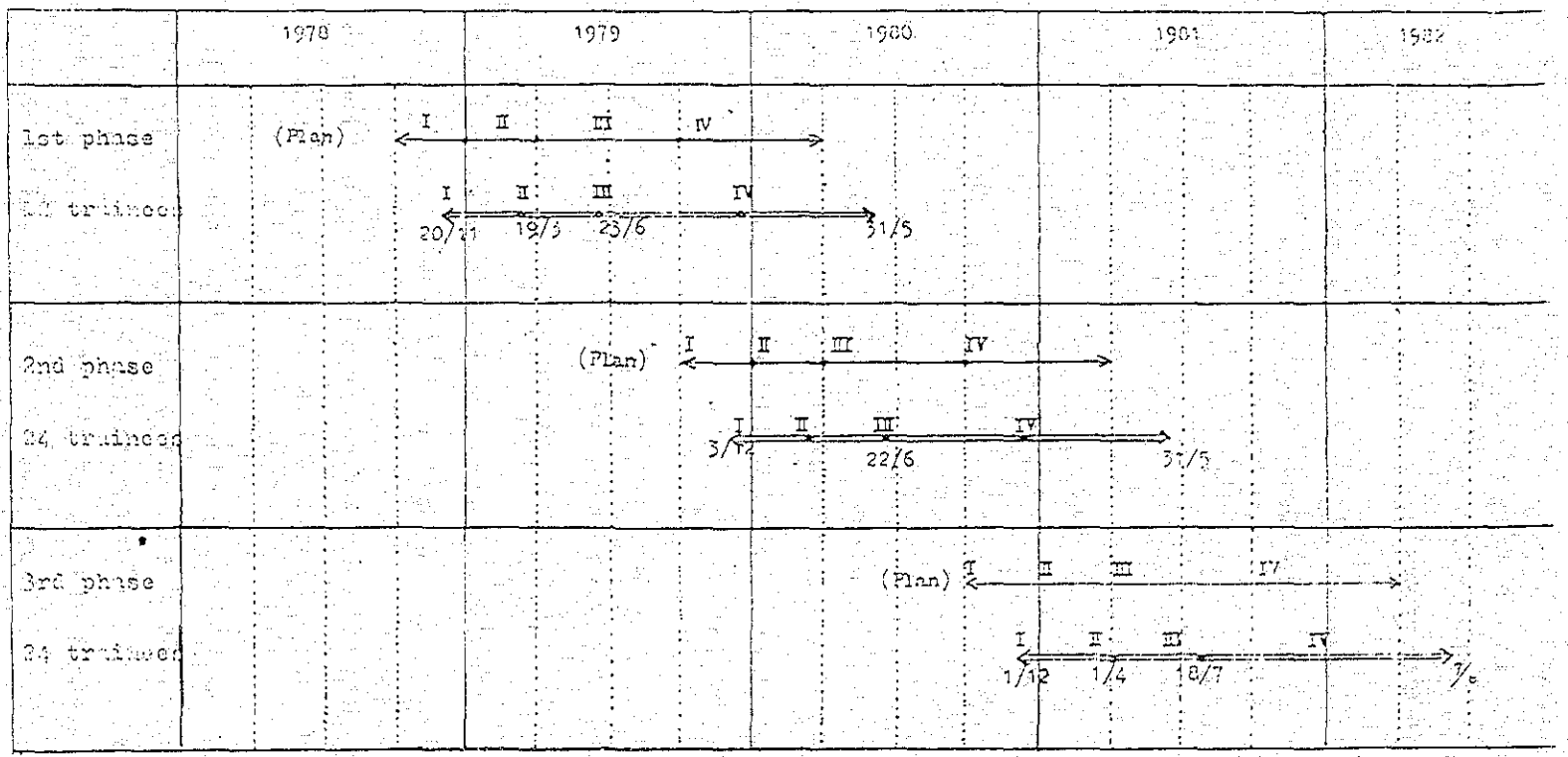
The Japanese experts taught the trainees through the counterparts. Upgrading of the technical level of the counterparts wasexpected at the same time.

Although the project started on April 20, 1978, with the arrival of two experts, the first seven months were spent for the preparation such as coordination and exchange of ideas and opinions on basic plan of the implementation of the project, mutual communication with the counterparts, drawing up curricula, arranging textbooks and so on.
Various facilities necessary for the project activities were prepared during this period.
On November 11, 1978, the first phase training course actually started for 12 trainees. It ended May 30, 1980, finishing all the curricula from the first to the fourth stage according to the training plan. The second and the third phase training courses started on December 3, 1979, and December 1, 1980, respectively for twelve trainees in each phase ending May 30, 1981, and June 7, 1982. The comparison of the training plan and its realization is illustrated in Table 1.

a) The first Stage

Lectures of basic theories were given and fundamental skills were practiced in this stage. In the first phase training course, the experts gave lectures in English and the counterparts interpreted into Indonesian. But, in the second phase training

Table – 1 MASTER PLAN AND REALIZATION



I : First Stage
II : Second Stage
III : Third Stage
IV : Fourth Stage

course, both languages were equally used. Then, in the third phase, since it was considered more effective and the technical level of the counterparts was regarded fairly high by then, only some important or new subjects were lectured on by the experts in Indonesian while instructions similar to the past two trainings were given by the counterparts.

Especially, in the first stage of the third phase training course, instructions were clarified as follows:

(i) When the same textbooks as in the first or the second phase training course were used, or in the case that the subjects were what the counterparts already had sufficient knowledge or technical ability, the counterparts were mainly in charge of giving lectures or instructions to the extent that they could.

(ii) The counterparts gave supplementary explanations to the experts' lectures in order to avoid misunderstanding due to the insufficiency of the experts Indonesian and to make the trainees' understanding deeper and clearer.

(iii) From time to time, the degree of understanding of the trainees was confirmed by asking questions or having them summarize the contents of the lectures.

(iv) Simple and most suitable words were used as much as possible to facilitate the trainees' understanding.

(v) The utilization of many visual aids such as tables, figures, and illustrations was promoted.

The curriculum was drawn up on the basis of the plan in the aforementioned "Report On Preliminary Survey On Mountain Logging Practices In Java Technical Cooperation Project" and applied to the first and the second stages of the first phase and the second phase training course. It was characterized by its stress on complete mastery of fundamental techniques. However, when the

interim evaluation was conducted in October, 1980, there came strong requests from Perum Perhutani for work efficiency and the economical aspects of the training to be streesed. So, in the third-phase training course, in compliance with the requests, slight revision was made to the curriculum. Logging plan making was given importance so that the trainees would acquire independency and initiativeness needed in the actual logging work after the project.

The training subjects of the first and the second stage are shown in Table 2

There was a slight difference between the first phase and the second phase curriculum, yet a common characteristic was that the training proceeded, based on the construction and performances of the machines, from SKL logging to the tractor skidding. Complete acquisition of each fundamental individual technique was the core of the training, where integration of those individual techniques in terms of planning, designing, was given secondary importance.

In order to ensure thorough acquisition, fundamental skills and techniques were repetitiously taught and practiced. Applicatio and variation of those fundamental techniques were deemed less important.

The training subjects of the third-phase training course is also illustrated in Table 2. In this phase, the concepts of productivity, efficiency and economy were added and the training was not supposed to be merely a one-way transfer of techniques but also provide an opportunity to view the independent technician after this project. In the curriculum it was expected that the trainees could learn comprehensive concepts of the logging work and its multiplicity. The trainees seemed to have considerable curiosity in the subjects dealing with the construction of machines, but in the lecutre and practice these subjects were touched rather lightly because there was one very highly-skilled mechanic among the counterparts and also maintenance of machinery is satisfactorily coped with in Indonesia. On the other hand, logging planning was repetitiously taught in a wide range of activities. The plan-do-see circle, which was the weakest point of the trainees, was taught at every opportunity in the course of the whole training course.

The textbooks used in the lectures and the fundamental practices are listed in the Table 3.

le - 2 Training subjects

(1st & 2nd phase)	(3rd phase)
Common a) Construction and performance of engines b) Basic knowledge of wire rope c) Work safety d) Logging plan Skyline logging a) Introduction of skyline logging b) Construction, performance and auxiliaries of yarder c) Design of skyline d) Setting and withdrawal of skyline e) Yarder operation practice f) Disassembling and reassembling of yarder Tractor skidding a) Construction and performance of tractor b) Tractor operation practice c) Tractor skidding method d) Disassembling and reassembling of tractor	1. Basic knowledge of logging a) Kinds of logging b) Skyline logging c) Tractor skidding 2. Machinery and auxiliaries a) Construction and performance of yarder b) Construction and performance of tractor 3. Basic knowledge of wire rope 4. Design of skyline a) Setting procedures b) Survey practice c) Computation in designing 5. Setting/withdrawal practice 6. Work safety 7. Yarder operation practice 8. Tractor skidding practice 9. Construction and performance of engines 10. Disassembling/reassembling of yarder and tractor 11. Logging plan a) Selection of logging method b) Production planning c) Allocation of workers d) Cost analysis e) Production control (Time study)

Table - 3

The list of main text books

I. SKL logging (in Indonesian language)

1. Logging di hutan pegunungan (Mountain logging)
2. Beberapa cara Logging (Various logging methods)
3. Pengenalan sistim Skyline (Knowlege of skyline system)
4. Sistim komunikasi (Methods of communication)
5. Peralatan pada sistim Skyline (Equipment for skyline system)
6. Standar Kabel baja (Standard of wire rope)
7. Cara menjalin Eye-Splice (Methods of Eye splice)
8. Survey dengan Compass (Compass survey)
9. Proses pemasangan sistim Skyline (Setting process of skyline system)
10. Tehnik memanjat pohon yang betul (Proper tree-climbing technique)
11. Cara operasi Yarder dan metode Logging (Yarder operation and logging method)
12. Desain Skyline (Design of skyline sistem)
13. Untuk keselamatan kerja (For saftey work)
14. Struktur dan cara kerja Yarder (Structure and performance of yarder)
15. Sistim-sistim Skyline Logging (Various systems of skyline logging)
16. Rencana Logging sistim Skyline (Logging plan for skyline system)

II. Tractor logging (in Indonesian language)

1. Traktor dalam kegiatan di hutan (Introduction to tractors in forest work)
2. Struktur Traktor (Structure of tractor)
3. Kemampuan Traktor (Performance of tractor)
4. Cara operasi Traktor (Method of tractor operation)
5. Traktor-Logging (Tractor logging)
6. Keselamatan kerja Traktor-Logging (Work safety in tractor logging)
7. Rencana Logging Traktor-Logging (Logging plan for tractor logging)

b) The second stage

The trainees applied the knowledge and skills acquired in the first stage. However, as their technical level was not yet sufficient, trainees were divided into two groups and given very intensive guidance by the experts and the couterparts.

In each phase, they were trained in the following subjects working on two skylines:

(i) survey & design of skyline
(ii) setting & withdrawal of skyline
(iii) operation of yarder & logging work
(iv) work safety

Toward the end of the second stage, difference among the trainees' degree of acquisition of techniques and aptitude for each skill began to appear. However, subsequent instruction was focussed on bringing up the level of the less proficient trainees. Teaching methods in the Demonstration Forest were as follows:

(i) To ensure work safety, remarks on safe procedure are given at congregation and dismissal of the trainees at the start and the end of the day's work.

(ii) Make the trainees accustomed to wearing accessories such as helmets, whistles, gloves, work shoes, etc.

(iii) Make them accustomed to keeping the working area neat and clean, for example, improvement of foot-holdings, storage of unneeded tools, etc.

(iv) Work instructions are to be transmitted correctly to all the trainees through leaders of each group. Experts try to use clear and concise words and make the trainees recite if the matters are especially important.

(v) Make them always maintain the standard of work.

(vi) Responsibility for equipment management is to be largely borne by the trainees.

(vii) Whenever possible, the counterparts come to the front and take the initiative of the training.

c) The third stage

The third stage was the so-called OJT in which the trainees were put into the actual forest exploitation work of West Pekalongan District Forest and applied their skills obtained in the first and the second stage. Yet, since their technical level was not sufficient, rather intensive guidance was given. The composition of each working group was 6, and the Japanese experts tried to be present in the training site without intermission to the extent possible.

In this stage, integration of techniques was to be learned by the trainees. That was how to adequately combine individual techniques which constitute the comprehensive mechanical logging technology and apply them to the real operation sites which differs from place to place. Furthermore they were expected to experience the importance of team play when working in a group, each person executing his own task properly.

Whenever some insufficiency was noticed concerning the trainees' work, supplementary guidance was given. Each working group carried out setting, checking, logging, withdrawal of skylines, road construction and skidding by the tractors.

Some of the weak points noticed in OJT were as follows:

1. Insufficient understanding about miscellaneous but fundamental items, ex.
   - the way to install guy-lines
   - the way to attach clips
   - ceasing of wire-rope
   - splice of nylone-rope
   - theory of heel-block
2. Insufficient understanding about designing and drawing
3. Unconcern to arrangement of works
4. Unskillful to eye-measurement of log volume
5. Imperfect daily check.

In the end of this stage, degree of aptitude to specific work and also capability of the trainees became clear. Nevertheless, due rotation was kept so that each trainees was not fixed to one position and could experience all the work involved, paying due consideration to upgrade the high-capability trainees at the same time.

d) The fourth stage

Although this stage is an elongation of the third stage, such training method was taken that, imagining the large-scale actual forest exploitation, the trainees could virtually become technically independent. So, much of the OJT was entrusted to their own thinking and judgment. Four trainees were put together into one group, which is the standard composition in actual logging work, and a leader was chosen from among them in order to clarify the responsibilities of each person and to establish a well-organized command system.

In this stage efficiency had to be given due consideration, yet there lurked the danger of neglecting safety. Instructors were obliged to find a relatively careful way of keeping the balance of efficiency and safety.

However, in the third phase training course, keeping in mind the firm request from Perhutani on the economic aspect, productivity enhancement was strived for, for example conducting a time study and setting target for the daily/monthly work.

Also in the third phase training course, since it was acknowledged that the degree of acquisition of the techniques by the counterparts and their experiences in OJT was fairly high, all the training activities were completely entrusted to the counterparts during the middle of the fourth stage for about 50 days. As a result of it, as had been expected, training was carried out without the slightest faltering. It was a delightful achievement for the Japanese experts and made us harbor a great expectation about the establishment and the development of the transferred techniques after this project.

The location of the skylines in the Model Logging Operation Forest in the third and the fourth stage, each phase respectively, is illustrated in Figure 2.

(2) Experts

The Japanese experts were roughly divided into two groups according to their time of dispatch, the 8 experts in the first group in charge of the first half of the cooperation period and the 8 experts in the second group for the latter half. To avoid disorder that might be caused by the change of all experts at one time, their periods of service overlapped by a few months.

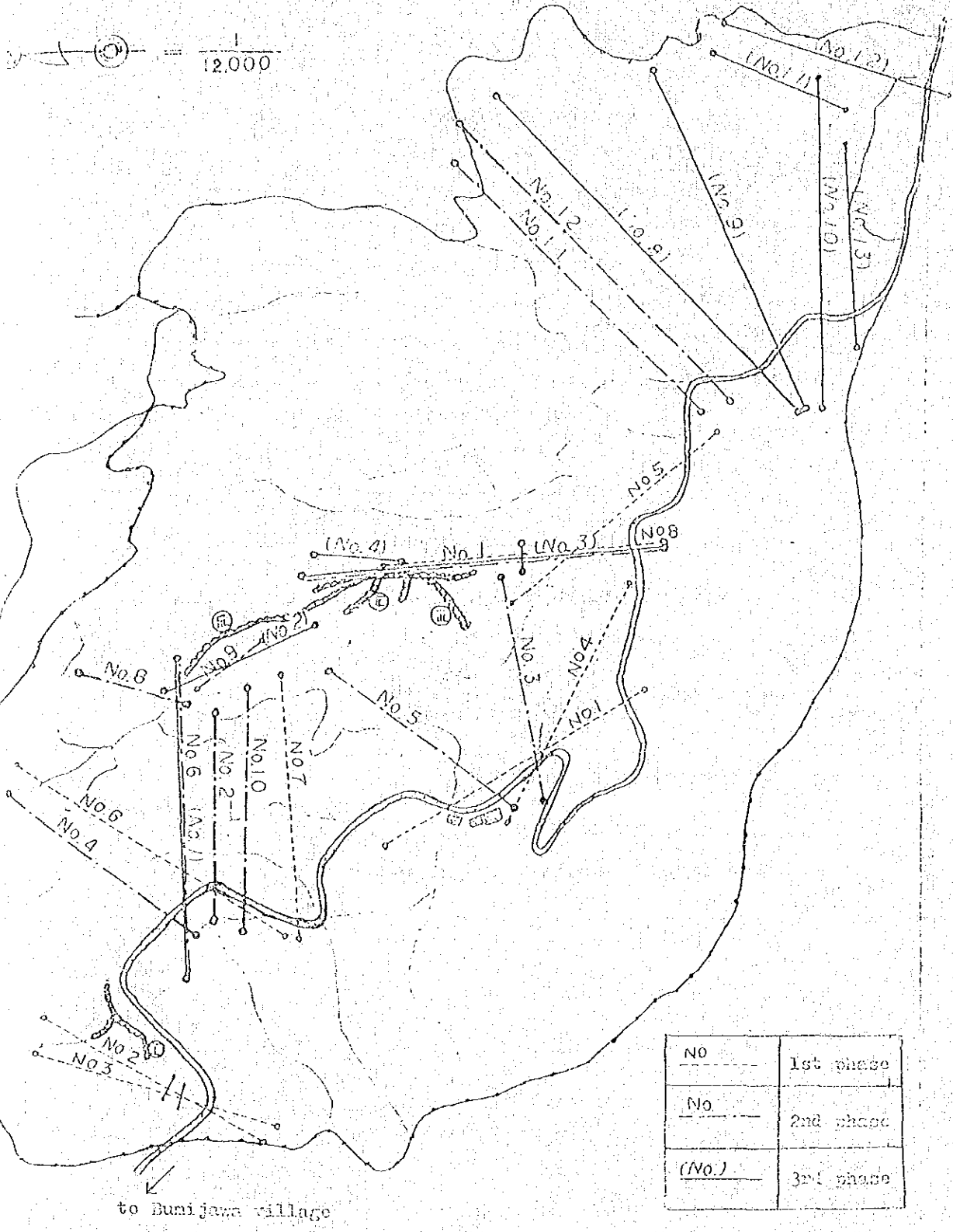
As to the terms of duty of the second dispatch experts, since the cooperation period was decided to be until June 19, 1982, it was arranged that all the six remaining experts leave Indonesia together on the same day June 20, 1982, extending the terms of duty of the team leader and the liaison officer until the end of the cooperation period and cutting short the terms of duty of 4 experts.

The dispatch record of the experts is shown in Table 4.

Fig. 2

The location of skylines in Model Logging Operation Forest

(1st phase → 3rd phase)

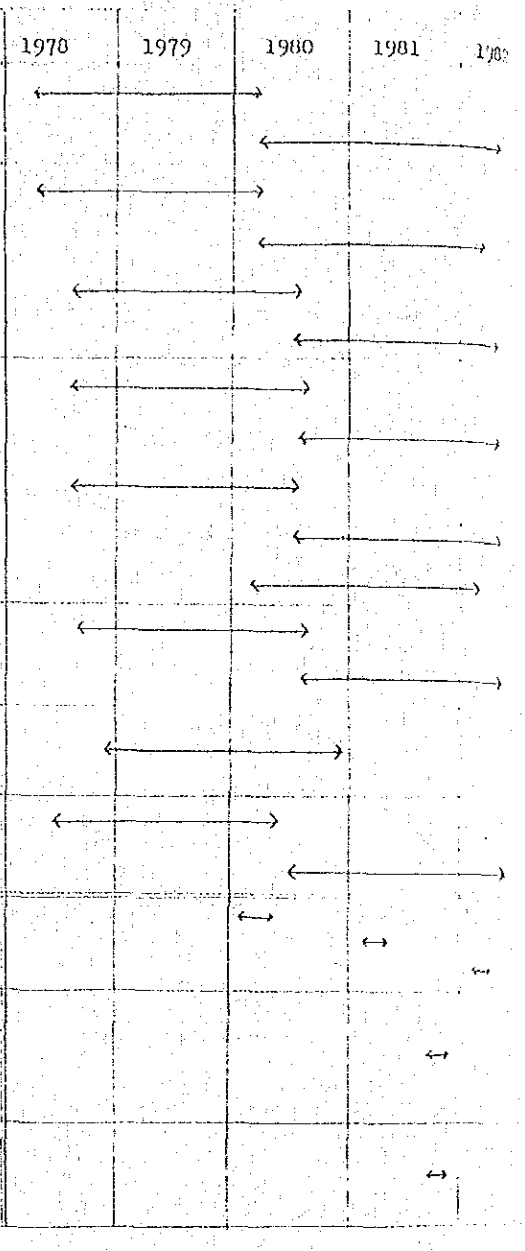


No ------	1st phase
No ---·---	2nd phase
(No.)	3rd phase

Table - 4

Record of dispatch of experts

	Specialty	Name	Term of duty
Long-term expert	Team leader	Katsuhiro Takikawa	Apr,20,'78 - Apr,19,'80
		Tatsuka Numata	Apr,15,'80 - Jun,21,'82
	Logging plan	Tsutom Handa	Apr,20,'78 - Apr,19,'80
		Yasuyuki Suzuki	Apr,15,'80 - Apr,14,'82
		Hiroshi Shimoyama (Logging)	Jul,25,'78 - Jul,24,'80
		Tatsuya Kajiya	Jul,4 ,'80 - Jun,21,'80
	Skyline logging	Koji Oyamada	Jul,25,'78 - Aug,24,'80
		Minoru Itoh	Aug, 8,'80 - Jun,21,'82
		Seiji Ueno	Jul,25,'78 - Jul,24,'80
		Yutaka Toida	Jul, 4,'80 - Jun,21,'82
		Ichio Ohshima	Mar,10,'80 - Mar, 9,'82
	Tractor logging	Juro Kokura	Aug,25,'78 - Aug,24,'80
		Yoshikazu Tsukida	Aug, 8,'80 - Jun,21,'82
	Forestry machines	Ichiro Sasaki	Dec, 8,'78 - Dec, 7,'80
	Liaison officer	Kenzo Naka	May,20,'78 - May,19,'80
		Hikojiro katsuhisa	Jun, 6,'80 - Jun,21,'82
Short-term expert	Forestry machines	Terunori Gohda	Jan,29,'80 - Apr,30,'80 Feb,23,'81 - Apr,22,'81 Feb, 3,'82 - Apr, 3,'82
	Socio-economic study	Sansho Nakamura	Nob,25,'81 - Dec,24,'81
	Cost analysis	Tatsuo tsujii	Nob,25,'81 - Dec,24,'81



(3) Counterparts

In the latter half of the cooperation period the number of counterparts reached the same as the number of Japanese experts, yet when the training course started there were actually 3 including the project manager. So, the nature of the training was obliged to be that of an expert-led type also on account of the technical level of the counterparts at the time. This experts leading trend continued toward the middle of the cooperation period. But in the third phase the initially desired training system of experts - counterparts - trainees pattern was put into effect.

The list of the counterparts is shown in Table 5.

Table - 5 List of counterpart

Name	Date of birth (Age)	Final education	Former posision	Training in Japan	Date of Asigyment	Allocation	Instruction field
Ir. Bambang Wahjono Soerjosoebagio	Sep, 5,'49 (32)	Forestry division in Gaja mada univ.	Vice administrator of KPH CEPU	Jun. - Sep.,'77	Apr.'78	・MLP training center	・Lectures and practices in general
Matheus Marinus Ezerman	Jun, 6,'53 (28)	Forestry academy	Trainee section chief in PUSDIK	Jun. - Sep.,'77 Aug. - Nob.,'81	Apr,'78	・MLP training center (Trainee section chief in PUSDIK)	・Administrative work of MLP ・Training in general
Ir. Bambang Soeharjanto	Jan,18,'49 (33)	Forestry division in Gaja mada univ.	Forest ranger of Ponorogo in KPH MADIUN	Aug. - Nob.,'78 Aug. - Nob.,'81	Dec,'78	・Model logging operation forest in Bumijawa (Practice superviser)	・Practice in general in model logging operation forest
Djasmadi	Aug,25,'51 (30)	Machinery division in technical high school	Cepu national wood processing factory	Jun. - Sep.,'77	Oct,'78	・MLP training center	・Machinary maintainance ・Forest road construction by tractor
Soedibjo	Oct,10,'51	Electricity division in technical high school	KPH PEKALONGAN BARAT	Aug. - Nop.'78	Apr,'79	・Ngebel demonstration forest ・Model logging operation forest	・Practice of mechanical logging
Kadarisman Alias Ardjawidjaya	Aug,30,'49 (32)	Machinery division in technical high school	KPH PEKALONGAN BARAT	Oct. - Dec.'79	Jan,'80	〃	〃
Eddy Murjanto	Dec,22,'49 (32)	Mechanic division in Tuban high school	Production department in Unit II	Oct. - Dec.'79	Nob,'80	〃	〃

(4) Support by JICA to the implementation of the project

JICA has been providing various support to the project in terms of finance and equipment as shown in the Table 6.

(a) Equipment supply

The major equipment supplied to the project is as below shown in the Table 7 :

(b) Model infrastructure scheme

Under the said scheme, JICA provided the project with financial aid (grant) to construct infrastructure for smooth implementation of the project.

(i) Acess road in DF with 1,010 m long and 6 m wide, of which construction cost was Rp.18,200,000

(ii) Practice yard in Pusdik compound, of which construction cost was Rp.8,886,000

These two facilities were used for the training course along with other facilities provided by Perhutani.

(c) Extra financing

Toward the end of the cooperation period, the number of heavy machines and vehicles increased, which created a pending problem for their management and storage at the project site in Bumi Jawa. In response to the request from the project, JICA provided extra financing, with which a garage was constructed (195 m2) for the total cost of Rp. 4,946,000.

(5) Local Cost

The local cost disbursement by Perhutani for the project management was as shown in Table 8 :

Table - 6

Budget for KLP project by JICA

(1,000 yen)

Item	1978	1979	1980	1981	1982	Total
Supplied equipment	82,592 (Rp.2,772,514)	101,666	115,417	82,417	-	381,855
Model infra scheme	17,600	-	-	-	-	17,600
Extra budget	-	-	-	1,840	-	1,840
Project management	3,159	3,276	4,896	5,160	1,440	17,931

( ) ; Local procurement

Table - 7 List of main supplied equipment

Item	1978	1979	1980	1981	Total
Yarder (Large)	3 (Y-32)	6 (Y-32)	3 (Y-32)		12
(Modium)			2 (Y-252)		2
(Small)	1 (Y-12)		2 (Y-12)		3
Tractor (Crawler)	1 (CT-35)	1 (CT-35)			2
(Wheel)		1 (T-20)	1 (T-50)		2
Micro bus	2 (9 persons)	2(15 persons)	1(25 persons)	2(15 persons)	7
Truck	1 (4 ton)	1 (1.5 ton)			2
Crane truck	1 (TM-D)	1 (TS-D)			2
Four wheel drive car	2(Land cruiser Light ban	1(Mitsubishi jeep	2(Land cruiser		5
Shovel dozer			1 (D-50S)		1
Log loader				1 (510)	1
Moter cycle		2(Yamaha)	2(Suzuki)		4
Chain saw		6(Dormer 123)		5(Dormer 133)	11
Copy machine	1	2	2	1	6
Generator		4			4
Wire rope	25,200 m	41,000 m	54,000 m	98,000 m	218,200 m
Accessories	✓	✓	✓	✓	✓
Spare parts	✓	✓	✓	✓	✓
Office equipment	✓	✓	✓	✓	✓
Tools	✓	✓	✓	✓	✓
Value(1,000 Yen)	* 82,592	101,666	115,417	82,160	[illegible]

* Exclusive of local procurement.

Table - 8 Local cost disbursement

(1,000 rupiah)

year	1978		1979		1980		1981		1982	
item	budget	realization	b	r	b	r	b	r	b	r
general			15,251	13,660	16,230	20,014	27,651	31,195		
training & education			28,143	26,562	24,349	26,230	54,250	48,967		
maintenance & repair			28,484	19,262	20,536	20,029	31,554	29,728		
construction			15,890	13,489	-	7,135	-	-		
total			87,768	72,981	61,115	73,608	113,455	109,890		

For the fiscal year 1978, MLP project financing was dealt in the same framework as Pusdik Kehutanan Madiun, so, budget and its realization by MLP itself is unknown.

(6) Training in Japan

From 1977 to 1981 the number of trainees received in Japan amounted to 25. It was deemed to be very worthwhile experience for them to deepen their understanding of Japanese forestry in general and especially observe sophisticated mechanical logging work in Japan. The list of the trainees in Japan is shown in Table 9 .

1977	Junior course 3	Ir.Rambang Soebagio	Vice administrator of KPH CEPU	Individual	Jun,27, - Sep,24,'77 (3 months)	Forest exploitation and forest aero photographic survey	MLP counterper
		M. Marinus Ezeman	Trainee section chief of PUSDIK	〃	〃	〃	〃
		Djasuadi	Cepu national wood processing factory	〃	〃	〃	〃
1978	Senior course 4	Ir.Hartono W, MA	Production derector of PERHUTANI	〃	1978 (3 months)	Japanese forestry in general	President derector of PERHUTAN
		Ir.Soeroso S.	Chief of production control division (PERHUTANI)	〃	1978 (3 month)	〃	Chief of Unit I
		Ir.Syarief M. Kamal	Vice chief of Unit II	〃	Jan,17 - Jan 30,'79 (1 month)	〃	Marketing derector of PERHUTANI
		Ir.Soedjadi Martodiwisjo	Chief of planning division (Unit II)	〃	1979 (1 month)	〃	
	Junior course 3	Ir.Rambang Soehardjanto	Forest ranger of Ponorogo in KPH MADIUN	〃	Aug,23 - Nob,18'78 (3 months)	Mechanical logging	MLP counterpart
		Soedibjo	KPH PEKALONGAN BARAT	〃	〃	〃	〃
		R. Adi Hartono	Administrator of KPH LAWU	〃	May,18 - Jun, 8'78 (1 month)	〃	Deceased
	Total 7						
1979	Senior course 2	Djoemhadi	MLP project manager	〃	Oct,27 - Nob,22,'79 (1 month)	Japanese forestry in general	MLP project manager
		Karjadi	Vice administrator of KPH PEKALONGAN BARAT	〃	〃	〃	Chief of exploitatio section (Unit I)
	Junior course 3	Eddy Murjanto	Chief instructor of Unit II	〃	Oct, 3 - Dec,25,'79 (3 months)	Skyline logging	MLP counterpart
		Kadarisman A. Ardjawidjaja	KPH PEKALONGAN BARAT	〃	〃	〃	〃
		Ir,Rachmadi H Soetiyadi	Forest ranger of JATIROH	〃	〃	〃	
	Total 5						

1980	Senior course 2	Sochardi	Chief of exploitation section (Unit I)	"	Mar,26 - Apr,15,'81 (1 month)	Japanese forestry in general	Deceased
		Rachmad	Chief of exploitation section (Unit II)	"	"	"	
	Junior course 4	Ir.Prijanto	Forest ranger of	"	Mar,19 - Jun,18,'81 (3 months)	Skyline logging Forestry machine	Vice administrator of KPH MAGERAN
		Syafoer Rachman S.	Forest ranger of KPH PEKALONGAN BARAT	"	"	"	Forest ranger of BUMIJAWA
		Soenarjo	KPH GUNDI	"	"	"	MLP graduate (I phase)
		Soebardjo	KPH PERWODADI	"	"	"	"
	Total 6						
1981	Junior course 4	Ir.Bambang Sochardjanto	MLP counterpert	"	Aug. 5 - Nob, 4,'81 (3 months)	Mechanical logging and transportation	MLP counterpert
		M. Marinus Ezerman	"	"	"	"	"
		Djoko Soemanto	KPH KEDU SE ATAS	"	Mar. - Jun. '82 (3 months)	"	MLP graduate (II phase)
		Iwan Maulana	KPH PEKALONGAN BARAT	"	"	"	"
1982	Senior course 1	Moch Rochmadi	Chief of planning division (Unit I)	"	1982 ( )	Japanese forestry in general	Planned
Total	Senior 9 Junior 17 Total 26						

(7) Joint Committee Meeting & Roving Seminar

A. Joint Committee Meeting

The composition of the Joint Committee stipulated in the Record of Discussion is as follows:

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.

(a) The first Joint Committee Meeting

December 15, 1978, at Jakarta

Agenda:

① Review of the Record of Discussions, coordination of the ideas of both parties.

② Project activities report until then, explanation and consent of actual training plan preceding the commencement of the first phase training course

③ Determining the major schedule.

(b) The second Joint Committee Meeting

December 21, 1979, at Jakarta

Agenda:

① Project activities report
② Presentation of 1980 plan
③ Discussion of pending problems

i) The number of the third-phase (Inspite of the master plan 32, it was decided to be 24, the same number as the second phase).

ii) The terms of duty of the second dispatch experts (then existing R/D stipulates the cooperation period as until April, 1981. However, it was decided that two-year terms of duty would be requested leaving the cooperation period extension problem to the evaluation team.)

iii) Augmentation of the number of trainees to Japan Strong request was made by the Indonesian side to increase the number of trainees to Japan so that the graduates from the MLP training course could have more opportunities to develop their acquired techniques.

(c) The Third Joint Committee Meeting
May 19, 1981 at Jakarta
Agenda:

① Project activities report

② Presentation of training plan and approval for the extended cooperation period from April 20, 1981 to June 19, 1982.

③ Proposal for holding a roving seminar in order to discuss the prospects and conceivable problems in widely introducing mechanical logging into the actual forest exploitation work of Perhutani after this MLP project.

B. The Roving Seminar

December 17-19, 1981, at Bumi Jawa, Baturaden

As proposed in the third Joint Committee meeting, taking the opportunity of the dispatch of two short-term experts on socio-economic study and cost analysis, a Roving Seminar was held with the theme of applicability and possible problems of employing mechanical logging in the Perhutani's scheme of supplying huge quantity of log as raw material to the projected paper mill.

The participants to this seminar were lots of personnel from Perhutani and Japanese experts as well as authorities in this sector from Bogor Agricultural Institute, The Forestry Department of Gajah Mada University, Forest Product Research Institute and presented their own views. As a conclusion of the seminar, it was imperative to introduce mechanical logging in order to supply the vast amount of logs and also the establishment of executive organization.

[illegible] - 10 [illegible]eting[illegible] organized by JICA

[illegible]	Date	Place	Purpose
[illegible] experts meeting; [illegible] sector of [illegible]culture, forestry [illegible]sheries	Dec.5-6,1978	Jakarta	exchange of information and opinions among experts,JICA and the Embassy on their activities and problems
[illegible] project leaders' [illegible]	Feb.14-20 1979	Tokyo	exchange of mutual experiences and discussion on the problems and the countermeasures for the better and effective technical cooperation
[illegible] experts meeting	Dec.14-15, 1979	Jakarta	same as the 2nd
[illegible] project leaders' meeting	Feb.19-25, 1980	Jakarta	same as the 8th
[illegible] experts meeting	Jan.22-23, 1981	Jakarta	same as the 2nd
[illegible]nt meeting with [illegible] experts in [illegible]	Feb.9-14, 1981	Java	discussion on effective transfer of technology and its establishment and development in the recipient countries
[illegible]th project leaders' meeting	Feb.18-24, 1981	Tokyo	same as the 8th
[illegible]th experts meeting	Dec.10-11, 1981	Jakarta	same as the 2nd
[illegible]th project leaders' meeting	Feb.8-13, 1982	Bangkok	same as the 8th

Table - 11 JICA missions

Name	Date	Leader	Purpose
Preliminary forest resources survey team	Nov.29-Dec.18, 1976	Tadao Nishina	Preliminary survey agreement on scope of the
Forest resources survey team in Central Java	[illegible]F.10-Apr.26, 1977	Tadao Nishina	Forest resources survey
Preliminary survey team	June28-July16, 1977	Tadao Nishina	Preliminary survey for the initiation of the project
R/D team	Nov.29-Dec.10, 1977	Tadao Nishina	Report of the preceding forest resources survey Signing Record of Discussion
Implementation design team	May7-June19, 1978	Hiroshi Shimoyama	Implementation design such as model infrastructure
Guidance team	Sep.3-9, 1979	Rio Shimokawa	Guidance and advice for the smooth implementation of the project
Machinery maintenance guidance team	Nov.22-25, 1979	Yoshiyuki Kawai	Guidance and advice on machinery maintenance
Evaluation team	Sep.15-Oct.3, 1980	Susumu Suzuki	Evaluation of two and half years technical cooperation
Guidance team	Nov.23-30, 1980	Takashi Matsuda	same as the year before
Machinery maintenance guidance team	Dec.19-29, 1980	Yukio Aoki	same as the year before
Machinery maintenance guidance team	Nov.10-22, 1981	Yulio Aoki	same as the year before
Evaluation team	Jan.20-Feb.3 1982	Heizaburo Tesuka	Final evaluation of the project

ble - 12 Visitor to the project

Year	Date	Visitor
1979	Jan.5-9	Study tour of JICA would-be expert
	Feb.23	Press tour
	May.10-11	Mr.Hisamune,vice president of JICA
	Oct.17	Study tour of JICA project leaders
	Oct.22	Study tour of Japan Forestry Improvement and Extention Association
	Nov.11	Experts of Konto river project
	Nov.27 Dec.2	Survey team on forest exploitation planning
1980	Feb.3-8	Study tour of JICA would-be expert
	Feb.19-25	Study tour of JICA project leaders
	July.3	Press tour
	July.25-26	Mexican foresters
	Aug.23-31	Study tour of Japanese National Forest employees
1981	Apr.25	Senior trainees of Cebu Forestry Training Center
	May.6	Experts of Konto River project
	June.15	Senior officials of Unit II
1982	Feb.16-18	Study tour of JICA would-be expert

III. EVALUATION OF THE PROJECT

III-1 Fundamental techniques

Complete acquisition of the individual techniques, which are all the important components of comprehensive mechanical logging technology is indispensable for the transfer of the desired technology. In that concern, from the first phase training course to the third, the training stressed the steady and thorough acquisition of those fundamental techniques. As a result, as far as these fundamental techniques are concerned, transfer of technology to the counterparts and to the trainees is considered to be highly satisfactory.

That means, as far as setting-logging-withdrawal of skyline and tractor skidding are concerned, they are now able to carry them out quite satisfactorily by themselves. As limited to the trainees, there still remains slight inproficiency in machine operation. That is to say, some roughness in operating machines was frequently noticed such as very sudden stops or driving with the unnecessary enhancement of the machine's power. To become skilled in machine operation through actual logging work would be necessary for the smooth implementation of actual logging work.

It has to be admitted that their ability in machinery maintenance is rather insufficient. All the trainees were given intensive machinery maintenance training by the short-term expert once in the first phase, and twice in the second and the third-phase training course. Basic care such as "to prevent machinery troubles obviately" or "to elongate the life of machinery by care" are not very familiar concepts to them. On this point, too, an improvement is expected to be gained through actual involvement in the logging work.

The above-mentioned fundamental techniques are applicable not only to mechanical logging but also useful in all the activities of forestry work done by Perhutani. Their

proper utilization is expected to promote the modernization and development of forestry and its related industries.

III-2 Mechanical Logging

(1) Integration of fundamental techniques

Mechanical logging work is not made possible with the setting-yarding-withdrawal of skyline and tractor operation only. One of the most essential things about mechanical logging is to find the most suitable systems for the variety of given sites with a wide range of topography, stand conditions, forest road density, logging distance etc. Proper integration of the fundamental techniques and their appropriate application is imperative for that.
In the training, Endless-Tyler system was the major system adopted. Hoisting-carriage system and Falling-block system were also adopted. Other than those, Running Skyline system was also set up, but it was only for the purpose of teaching the trainees a variation and it was not put into operation.

Tyler system and Mono-cable system were intended to be taught and experienced. However, this was not possible on account of the topography and the location of forest road for the former and the delay of receiving necessary equipment for the latter.

Which variation to adopt among these depends upon the various factors of the given stand to be harvested. However, the experience in these variational skylines was not deep enough. So, the ability to select a suitable skyline system should be upgraded through actual forest exploitation work.

Mechanical logging techniques are not only applicable to the logging of pine logs as raw material for pulp but also suitable to the logging of agathis. It may be of interest to Perhutani that the Running Skyline system or Mono cable system is applicable to the flat-land forest such as teak, yet needless to say, tractor skidding is the best for the logging work in flat land forest.

(2) Work efficiency

Introduction of mechanical logging technology, must mean not only the logging using machines but the improvement of efficiency or productivity is obtained from its introduction.
Especially in the real forest exploitation work, this becomes a crucial point.

In the first and the second phase of the training course, in consideration of the true purpose of the training, primary importance was put on thorough and steady transfer of fundamental techniques and integration of individual. So techniques and the pursuit of work efficiency was not so strongly tackled in reality.
In compliance with the request from Perhutani about work efficiency propounded in the interim evaluation conducted October 1980, training content of the third-phase training course included the efficiency aspect as well as aforementioned points.
Nevertheless, there always existed some impediment to hinder the exertion of expected or intrinsic merit of mechanical logging and to maintain it in the training in Model Logging Operation Forest as mentioned below.

a) Process before and after logging

Logging work is just a part of a series of connected processes. In the OJT site, it cannot be said that the processes before logging such as felling and bucking, and after the logging such as rebucking, loading, stacking and transport were very functionally linked and combined with the logging process. It was perhaps partly because those processes were done completely by manpower. Yet, even though felling was done manually, it was necessary to precede and prepare enough logs to meet the mechanical logging capacity. As for the log-congested platform, it is necessary to consider the introduction of a truck used exclusively for log transport (the truck employed today is 4 t, fixed sides so hard to use

on the loading platform) and a exclusively used log loader to dissolve the log congestion at the platform.

b) Teamwork

In teamwork such as mechanical logging, each person's work must be closely linked with each other, the machine being the center. In proportion to the improvement in machine operation skills, if this combination play becomes smoother through the actual logging work, higher productivity can surely be expected.

c) Preparation

For the effective and smooth work, it is extremely important to prepare for the next day's work, for example, preparation of necessary tools, equipment, fuel and oils, allocation of personnel and their tasks, etc. It is also important to minimize the loss of time, by preparing necessary tools near at hand to immediately cope with troubles or repair of machinery and skyline systems.

On these points, the trainees were repetitiously given advice all through the training course. But, they were at large apt to fall back into their old behaviour patterns, which was a great cause of loss of the effective working hours. The effective and proper preparation is not essential to the mechanical logging but to all the work efficiency.

d) Maintenance of machinery and skyline system

Machinery maintenance was already mentioned in the paragraph on fundamental techniques, but the same things apply to the maintenance of the skyline system. That is, to avoid and minimize the time lost for the repair of a problem, routine check should be conducted to prevent trouble with the skyline as well as with the machines.

Some points mentioned hitherto are impediments to the enhancement and maintaining of work efficiency. It is of substantial importance that all the persons involved in mechanical logging should have a deep understanding about the

importance of this matter. Some people still have the erroneous concept that the improvement of efficiency and the securing of work safety are unobtainable simultaneously. To correct this misunderstanding is also one of the problems that must be surmounted to ensure work efficiency.

(3) Work safety

Work safety was always considered one of the most important items in carrying out the training. When looking back at the training course, behaviour regardless of safety was frequently observed and, actually, some accidents did occur. The analysis of these accidents shows that all of them were caused by careless behaviour and none of them caused by the imperfectness of the skyline system. Although the accidents are to be regretted the basic reliability of the skyline system is a fact in its favor for the development of mechanical logging in this country.

When mechanical logging is employed on a larger scale in forest exploitation, ensuring work safety will become more and more important, but it is a misunderstanding to think that to consolidate work safety puts the brakes on the improvement of efficiency. In other words, it should be understood that efficiency is spontaneously obtained if enough attention is paid to the observation of work standards, safe behaviour, maintenance, good care of machinery and skyline system.