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5. Asuming the extraction of the pine forest in Pakalongan Barat
（Unit I，ロッフマディ）

6. Some note on various logging trials and practices and their application possibility for supplying raw material of paper mill
（Unit I，生産課）

7. Some experiences of logs skidding in the mountainous area in Java
（林産試験場 スナルソ）

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ローヴィングセミナー実施経過報告

I 経　　緯

１９８０年９月に本プロジェクトのエバリュエーションが実施されたが、そのジョイントエバリュエーションミーティングにおいてインドネシア側から、最終エバリュエーションの項目に、社会・経済および環境に及ぼす影響を入れてほしいとの強い要望があった。

さらに、１９８１年５月に開催された第３回ジョイントコミッティーでは、プルフタニ総裁からインドネシアにおける機械集材技術の適応性、汎用性等について、広く林業関係者を参集してセミナーを開催したい、との提案があった。日本側はこの考えに賛同し、派遣が計画されている社会経済および功程分析に係る短期専門家に合わせて、時期・場所等をプルフタニが設定するよう申し入れた。

Ａ１フォームの到着が遅れたため、１１月２５日～１２月２３日という短い期間ではあったが、社会経済、功程分析の短期専門家として林試の中村三省、辻井辰雄両氏が派遣された。

１１月２７日のプルフタニへの表敬訪問の際、ハルトノ総裁に派遣の目的を説明しローヴィングセミナーについて言及したところ、急きょその場で開催が決まった。

両短期専門家は、極めて限られた日程ではあったが、各種調査を行いその結果をセミナーで発表した。

II 日時・場所

１９８１年１２月１６日		スマランへ集合
	１７日	プロジェクト現場視察、現地討論会
	１８日	バトラデンにおけるセミナー
	１９日	閉　　会

詳細については別添参照。

III 参　加　者

インドネシア側	プルフタニ生産部長	スリョノ（座長）
	○林産試験場長	スナルソ
	○ボゴール農科大学教授	ラハルジョ
	ガジャマダ大学教授	スミトロ
	プルフタニ計画課長	アタン
	〃　生産監督課長	スジャディ
	〃　工業課長	ダールマワン
	〃　Unit I 次長	エフェンディ

	プルフタニUnitⅠ 生産課長	プルノモ
○	〃 〃 計画課長	ロフマディ
	〃 〃 生産課スタッフ	アンソルディン
	〃 〃 計画課スタッフ	クスティト
	〃 〃 計画課ジョグジャ支所長	スヤント
	〃 〃 生産課係長	カルヤディ
	〃 〃 西プカロンガン営林署長	ルジョノ
	〃 〃 西バニュマス営林署長	アバス
	〃 〃 東バニュマス営林署次長	プンジャヒタン
	○MLPプロジェクトマネージャー	ジュマディ
○	〃 〃 カウンターパート	バンバン スバギョ
○	〃 〃 〃	バンバン スハリァント

日本側	プロジェクトリーダー	沼田手束
	〃 短期専門家	中村三省
○	〃 〃	辻井辰雄
○	〃 専門家	鈴木康之
	〃 〃	梶谷辰哉
	〃 〃	勝久彦次郎

注○印は発表者

Ⅳ セミナーの経過

１２月１６日スマランのメトロホテルに集合した参加者は、１７日早朝プロジェクト現場のある西プカロンガン営林署管内プミジャワ担当区に向けて出発し、正午前に到着した。プロジェクトのレストハウスにおいてプロジェクトマネージャーのジュムハディ氏、現場担当カウンターパートのバンバンスハリァントより当地におけるＯＪＴの概要説明があり、参加者からは熱心な質問が数多くあった。そして引き続き集材作業現場を視察し、土場に搬入してくる材を目の前にしながら討議が行われた。その後バトラデンへ向かったが、途中外国樹種植栽試験地を見学した。

１２月１８日はバトラデンにあるプルフタニの保養所会議所において８時よりセミナーが開催された。プルフタニの生産部長スリョノ氏が議長となり会議を進行した。

発表者は順にプロジェクトマネージャーのジュムハディ氏、カウンターパートのバンバンスハリァント、辻井辰雄氏、中村三省氏、UnitⅠ計画課長ロッフマディ氏、林産試験場長スナルソ氏、ボゴール農科大教授ラハルジョ氏であり、それぞれの発表のあとには数十分間の質疑応答

があった。短期専門家辻井、中村両氏の発表に対しても数多くの質問が投げかけられた。

１２月１９日はセミナーの結論を議長が英イ両国語で読みあげ、疑問点、追加したい点があれば、プルフタニへ文書で送るよう述べ閉会となった。

今回のセミナーでは、紙パ工場に大量の原料を供給するという至上命令を達成するには機械集材の導入が不可欠であるとの意見が参加者全員から出ており、日本人専門家は大変心づよく感じた。

V 添付資料

別添1. ローヴィングセミナー案内状

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9. セミナー結論

別添－1

PERUSAHAAN UMUM KEHUTANAN NEGARA
(PERUM PERHUTANI)
Jalan Jendral Gatot Subroto 17 - 18 Tromolpos : xxx232/KBY.
Jakarta - Selatan

No. : 006.8./DIR. JAKARTA, 1 Desember 1981.
Lampiran : 1.
Perihal : Roving Seminar on Mountain Logging.

Kepada Yth.

Mr. Katsuhisa, Liaison
J I C A M L P
MADIUN.

Dengan hormat,

Berkenaan dengan Rencana " Roving Seminar on mountain logging " bersama ini disampaikan hal-hal sebagai berikut :

1. Perum Perhutani tanggal 16 s/d 19 Desember 1981 yang akan datang bermaksud akan menyelenggarakan " Roving seminar on mountain logging " dengan perincian penjelasan terlampir.

2. Dalam hubungan dengan roving seminar ini dari fihak Jica (Jepang) telah mengirimkan 2 (dua) orang expertnya :

   Mr.Dr Sansyo Nakamura
   Forestry and Forest Products Research Institute.

   Mr.Tatsuo Tseijii
   Chief, Laboratory of Forest Operation & Forest Mechanization Division, Forestry & Forest Products Research Institute.

   yang akan menyampaikan sebuah makalah untuk tujuan seminar tersebut.

3. Kecuali makalah tersebut juga dimohon untuk menyusun makalah (dalam bahasa Inggris) ;

- Unit I .....

- Unit I Jawa Tengah.
- M.L.P.
- Ir Soenarso Sastrodimedjo dari LPHH.
- dan lain-lain.

4. Berhubung dengan hal tersebut bersama ini dengan hormat kami mengundang Saudara untuk dapat hadir dan turut berpartisipasi dalam seminar yang dimaksud.

Atas perhatian Saudara sebelumnya kami mengucapkan diperbanyak terima kasih.

DIREKSI PERUM PERHUTANI
Direktur Utama,

Ir HARTONO WIRJODARMODJO M.A.
NIP. 080024471

E D A R A N

(Roving Seminar on Mountain Logging)

1. Latar belakang.

1. Lampiran dari " The Record of discussions on extention of the period of technical Cooperation for The Mountain Logging Project in Java, ATA 184 " (tanggal 18 April 1981) yang berupa :
" Minutes of Meeting of the Third Joint Committee of Mountain Logging Practice Project " Point 4.1. menyatakan sebagai berikut :

4.1. Roving Seminar.
Perhutani wants to have a roving seminar discussing about cable logging from the scientific point of view, and then compile all the thing about this cooperation in a book as a document, so the young generation is able to read it in the future.
The seminar is also meant to have conclusion wether cable logging is applicable throught Indonesian archipelago or only a part of some islands.
The participants are Japanese experts, Indonesian experts and foreign experts as well.
The Japanese party agrees with this idea, and requests Perhutani to organize the seminar.

1.2. Kecuali hal tersebut Pemerintah dalam waktu dekat (1985) akan mendirikan "Pabrik Kantong Semen Cilacap" yang berkapasitas 90.000 ton/tahun dpl.:
input log : 540.000 m3 /tahun atau
2.100 m3/hari (1 tahun = 250 hari kerja).
Pekerjaan "Logging" akan dilakukan di KPH Pekalongan Barat, Banyumas Timur dan Banyumas Barat.
Produksi 540.000 m3/tahun ini ± hampir sama dengan seluruh produksi jati dari Unit I dan U nit II.

1.3. Berhubung dengan point 1 dan 2 tersebut diatas sangat tepat kiranya " roving seminar " ini dapat membahas masalah logging untuk keperlu an pabrik tersebut.

2. Tujuan Seminar.

Seminar on mountain logging bertujuan dapat memberikan alternatif pemecahan yang lebih quantitatif tentang system logging dalam rang ka mensupply pabrik Kantong Semen Cilacap

3. Waktu dan tempat.

Rabu tanggal 16 Desember 1981 sore semua peserta berada di Semarang.
Kamis tanggal 17 Desember 1981 semua peserta meninjau lapangan (Bumi Jawa) dan diskusi, bermalam di Baturaden.
Jum'at tanggal 18 Desember 1981, Seminar.
Saptu tanggal 19 D esember 1981, Penutup.

4. Peserta :

Indonesia : LPHH : Ir Soenarso Sastrodimedjo.
IPB : Ir Rahardjo S. Soeparto.
GAMA : Dr Ir Achmad Soemitro.
PHT : Bp. Dirut, Bp.Dir Prod., Kadiv Prod., Kadiv. Can. , Kadiv Pengembangan, Kadiv Industri. Ka U nit, Karo Prod., Karo Can. MLP 2 orang.

Jepang : - 2 expert Jica.
- 6 MLP

5. Makalah (dalam bahasa Inggris)

a. Makalah Utama : 1 paper dari Jica.
+ 20 halaman 1 paper dari MLP-
1 paper dari Unit I.

b. M akalah Penunjang : LPHH Ir Soenarso Sastrodimedjo - tentang be berapa pengalaman penyaradan kayu dipe gunungan di Jawa.

c. Makalah bebas : sumbangan tulisan bebas dari peserta lain.

6. L ain-lain :

Segenap biaya menjadi tanggungan Perhutani sesuai dengan ketentuan yang berlaku di lingkungan Perum Perhutani.

TENTATIVE PROGRAMME AND TIME TABLE FOR ROVING SEMINAR ON MOUNTAIN LOGGING

Wednesday, 16 December 1981.

Afternoon : Registration.

Thursday, 17 December 1981.

07.30－12.00 : Field trip to MLP activities at Bumi Jawa, Pekalongan Barat Forest District.
12.00－13.00 : Field Discussion.
13.00－14.00 : Lunch.
14.00－16.00 : Departure from Bumi Jawa to Baturraden, Purwokerto.

Friday, 18 December 1981.

07.00－08.00 : Breakfast.
08.00－09.00 : Opening and Presentation of first paper from MLP.
09.00－10.00 : Discussion.
10.00－10.15 : Tea Break.
10.15－11.00 : Presentation of second paper from JICA.
11.00－12.00 : Break.
12.30－13.30 : Discussion.
13.30－14.30 : Lunch.
14.30－15.15 : Presentation of third paper from Perhutani Unit I Central Java.
15.15－16.15 : Discussion.
16.15－16.30 : Coffie or tea break.
16.30－17.15 : Presentation of forth paper from Forest Research Institute, Bogor.
17.15－19.00 : Free (No session).
19.00－20.00 : Dinner.
20.00－20.45 : Discussion.
20.45－21.30 : Presentation of fifth paper from .....
21.30－22.00 : Discussion.

Saturday, 19 December 1981.

07.00－08.00 : Breakfast.
08.00－09.00 : Report of the conclusion of the seminar and closing.
09.00－14.00 : Departure from Baturraden to Semarang.
15.15－ : Departure from Semarang to Jakarta by Plane.

IMPLEMENTATION OF THE SKYLINE LOGGING

IMPLEMENTATION OF THE SKYLINE LOGGING.

Contents :

This paper is prepared for the roving seminar on Mountain Logging at Baturaden from 16 to 19 December, 1981, by the Project Manager of the MLP.

IMPLEMENTATION OF THE SKYLINE LOGGING.

I. Introduction.

The Mountain Logging Practice Project, abbreviated as the MLP, was established by Perum Perhutani(Forest State-Corpotation), based on its decision letter dated November 8 , 1979 No 502/Perum Perhutani/X/1979. It is an institution for the implementation of the agreement between the Japanese government, represented by JICA(Japan International Cooperation Agency) and the Indonesian government, represented by Perum Perhutani. In the agreement, JICA promised to train a number of employees and officials of the Perum Perhutani until they become able to do the skyline logging work in the mountainous regions. The cooperation period is from April 1978 till June 1982.

The reason for the cooperation is in connection with the establishment of the Cilacap paper factory. According to Perum Perhutani, this factory will use 2100 cubic metres of pine wood daily. Because the method of logging influences the amount of wood that can be supplied daily, and because the skyline system can be an efficient logging method, it was decided to have the skyline system introduced by the Japanese and adopted by the Indonesians.

In this paper some technical terms (underlined) are used. The explanation can be found in the last part(part X) of this paper.

II. Organisation of the MLP project and the training program.

According to the agreement, JICA will transfer the technology of skyline logging and supply the necessary machines equipment and experts. The experts will act as instructors, while the counterparts from Perum Perhutani will assist them. Although JICA will pay the cost of machines, equipment and experts, Perum Perhutani has to take care of the operational cost of the training.

The MLP project office is in Madiun, because there is a training centre of Perum Perhutani. The Japanese Experts also stay at Madiun.

The training program for skyline logging is divided into three stages :

- the fist stage is three months theorical lectures in the class, in the Forest Training Centre in Madiun;
- the second stage is practical lecture for three months in the Lawu forest District ;
- the last stage is advanced practice for one year in Bumijawa, west Pekalongan Forest District.

During the training , the students stay in dormitory, They are studying and practicing and not working; so it is not required of them to achieve the normal standard of between 20 - 25 cubic metres per day per yarder by a crew of four persons. It is enough for them, when they can install the equipment and operate the machine. Their highest daily achievement is 15,9 cubic meters, please refer to attachment no 1 and 2 .

III. The cooperation .

Up till now the cooperation has been running well . The training program will be finished in the scheduled. Twelve persons graduated in June 1980, followed by 24 persons in June 1981 and the third trainees will graduate in June - 1982. The third trainees are now practicing in Bumijawa. They will be examined in June 1982 and after that their diplomas will be delivered.

During the cooperation JICA never complained, except about the procedure of grant requesting. It is very complicated, because it has to pass many institutions.

IV. Utilization of the equipment and the ex-trainees.

Facing the establishment of the paper mill in Cilacap the yarders and the ex-trainees must be utilized.
Ready for use are yarders consisting of :
12 big yarder , type Y 32 E with power of 105 HP ,
3 medium yarder, type Y 252 E with power of 67 HP,
3 small yarder, type Y 12 E with power of 12 HP.

When all yarder are used, a limited logging capacity can be calculated, in this case only the same like 12 big yarders, because the medium size must be calculated as reserve machines while the small yarder must be neglected. It serves only as assistance for the big yarders. In big operations, there are always defective machines or machines in need of repair. With this assumption, the daily logging capacity is only : 12x20 = 240 cubic meters, which is only $11\frac{1}{2}$ % of the whole need. The rest, $88\frac{1}{2}$% or 1860 cubic meters, must be done manually.

A skyline can only be erected by 4 trained persons. So 12x4 = 48 trained persons (operators) are needed,for skyline operation. Now there are 36 trained persons(graduated - students) and 24 for the comming graduction, so the total of trained persons will be 60. That is sufficient to operate all yarders for skyline logging.

When it is proved later on that skyline logging is suitable, the additional operators will be recruited from the local foremen or from the local workers. But this will be carried out only when the graduated students are able to achieve the normal standard.

Last June the real operation began. Four ex-trainees are doing the skyline logging in the felling area of 1981.

They have to open to the skyline logging as there is already a full activity in raw material supply for the paper mill. But up till now the result is not satisfactory.

Although it is applicable in flat areas, it is more economical to use in hilly slopes more than 45%. In such heavy regions logging by manual is a very hard work or it is impossible to carry out.

Before using the skyline, the Pine forest should be surveyed. That is why a survey team is formed consisting of staff members from the FMP and the Planning department, assisted by the local Ranger. The aim of the survey is to - know :

a. Where the Pine forests with slope more than 45% are located,
b. how wide they are ,
c. how to construct the forest roads which will be used for transporting the machines and equipment into and for transporting the forest products out of the forest.

Based on this survey, it may be possible to make a complete detailed plan for logging, consisting of :

- the total needs for the skyline,
- the total needs for buffaloes and cows for conventional yarding,
- how much manpower will be used.

During the detail logging plan compiling, it would be better to utilise the 12 skyline unit for logging in the rountine felling centre of the Forest District.

V. Road Construction in the forest.

Skyline logging is not applicable in the forest when there are no roads for bringing the machines and equipment into the cutting area. But in the non teak Forest District, forest roads are very few.

There are some aggravating circumstances in forest road contruction in connection with the volume of wood that has to be logged, as follows :

1. The topography of pine forests is steep, therefore
   a. Construction costs are higher
   b. The technique of execution is rather difficult, because it needs more digging and bunking work and also more bridges need to be built.
   c. It needs a long time before being ready for use in order to let the bunking soil stabilize and the landslides stop and it also takes time to do recontruction of drainage damaged by the land slide.
2. The number of experts and equipment for road construction are limited
3. The advantages of forest roads are mainly for the interest of Perum Perhutani, therefore it is rather difficult to get the funds from another service body.
4. The forest road construction sites are usually located in remote places, that are not interesting for contractors or builders.

Considering the difficulties mentioned above, the forest roads network should be constructed as soon as possible, but the real problem is the execution itself. Because the actuators and supervisors are limited, development of forest road network seems to be clumsy. We don't know the starting point. To trust a fund the development may be late, because it needs a redemption to earn. It will takes time.
To make the development of forest roads go smoothly, I would to suggest a temporary forest road called " jalan tebangan " (felling road).
It is very important and it is enough if this simple forest road is able to be used for transportation of machinery and forest products (by trucks).
In fact the Jalan tebangan can be handled by the field officials. Those people will guide the trucks. They decide and mark the route by brushing, doing necessary bunking or digging. Then the driver drives the truck after him while he judges the direction, curve and the slopes gradient.

There are not any bridges. To cross the creek truck should be driven on the smoothed provil of the creek. Of course some times the provil needs to be flattened. In case of the construction of bridge cannot be avoided, the problem is how to get the attentiveness from the government.

By everyday use of this road and with the necessity maintennce, part by part, the " Jalan tebongan" is usefull. In the future this kind of road may be improved according to the intensity of production and management.

VI. Performance of ex-trainees.

Productivity in the real operation of ex-trainees on July 1981 is rather low because of their mental situation. Up to now, after their graduation they do not get any promotion. Their future seems to be dark.

They are doing kind of detached work, but in fact they do not get the rights of detached employees.

If they move to the work side permanently, it means sacrifice their families, because houses etc. will not be provided. In addition living in the new place needs alot of adaptations followed by expenditures.

As fas as I can observe, what they have complained about is true. In this occasion I want to warn that it is time to consider about implementation of skyline. we have to reach a good completion before this cooperation with the Japanese government ends.

The important one is, the status of ex-trainees should be as detached employees. This condition will last untill the paper mill has been established. After that we may consider, the suitable organisation according to the paper mill needs.

Seconly, the ex-first trainees came from some District forests around Jawa. To handle the skyline operation in Pekalongan Barat D/F they have to leave their families. I suggest sending them alternately and after they have reached the production target, they can be allowed to come home and be replaced by another group of trainees.

Considering this temporary task , detaching should be legalized by head quarters. By this way, we can present an appreciation for their 18 months training.

VII. Organization of the Project in the future.

At the near end of cooperation with JICA, truly we have to think about the way out of the MLP Project. We are in the phase of harvesting fruits now, that means we have to implement the skyline logging.
First of all is to be sure what will we do. By this roving seminar presented by the Japanese professors and some other experts, the measures to be taken probably the best one.

In the scheme of using skylines in the future, I propose to continue the existing organization of the MLP Project. The training centre needs to be moved from Madiun to Bumijawa because Bumijawa has the history of introduction of skyline logging and is located in the centre of the working area.

The name of the project may be changed, but it is only to distinguish the MLP Project and the Transmissional Project

The task of the Transmissional Project is to renew the MLP's graduates for the future as skillful skyline logging operators with great ability.

VIII. Evaluation.

What are the results of technical cooperation with JICA and what will we do with the machinery and skills we have gotten.

1. Tranfer of technology as the aim of the cooperation has already been reached. We will be able to proceed on the skyline logging training, but the problem is how to implement the skyline logging system in the real operation.
2. In the utilization of the training result, the challenge is to renew the operators and road construction.
3. The key of the success of skyline logging is the machine mindedness. This idea has to be brought up among the operators.

By this roving seminar , Perum Perhutani has already tried to utilize the skyline system. The next steps are to build up the continued organization and to renew the actuators. Good luck !

IX. O t h e r s

By the way of remarding, the engine will run smoothly with better maintenance. This proposal needs excellent mechanic, who know forestry well and also work and live contentedly in the remote place.

Therefore the mechanics should be chosen among Perhutani's employees. These personell will be trained in the field of skyline machinery.

X. Vocabulary for some technical term in this paper

1. Skyline : the span of iron cable used as a line of carriage, the one from which the logs hang in the air.
2. Yarder : a sort of winch driven by power.
3. Accesories of skyline : many kinds of accesories used in skyline system such as guide block, carriage shackle etc.
4. Skyline unit : the unit consist of No. 1,2 and 3.
5. Experts : the persons with the specialized knowledge or skill
6. Counterparts : Perhutani's employees who are appointed to accompany the experts in lecturing and to do the transfer of technology.
7. Skyline logging : skidding by skyline system
8. Operators : the persons who handles the machine. In this paper it means the ex-trainees who were trained in the Mountain Logging Practice project.
9. Setting : to set the yarder, skyline system and accesories.

I. CONCLUSIONS

1. Up to now the PLP has been working for nearly three and a half years and it has trained 36 trainees in two period - trainings. In the present third training there are 24 trainees. Now they have to study for seven more months.
2. After the trainees have finished their training we send them back to their former jobs. Last June four of them were employed in the real operation, but their work is not satisfactory yet.
3. During the training, their work result has just reached 15,9 cubic metres per day per yarder. While in Japan the standard with the same unit is about 20 until 25 cubic - metres. According to a counterpart's observation -- he has just come back from Japan -- the actual product is 13 until 34 cubic metres.(See the third attachment).
4. By the end of the cooperation with the JICA in June 1982, we are sure able to continue the training and to train skyline operators.
5. Although skyline logging can be done on a flat area, it will be more advantageous if it is done on the area with its steep about 45%. It's not known yet, whether the operation of skyline logging in such a area will cost less than when the logging is done in a conventional way. Anyhow, we have to practice it as we have machines and have prepared the workers.
6. Towards the building of a paper mill, it is necessary to make a survey to choose a suitable place to get the wood and log them with a skyline. Besides making a survey of the place, we have to think of how to make transportation roads.
7. Besides operators and surveyors, we also have to prepare the maintance workers and the skyline machines. Because of their specifications, the machines have to be prepared carefully and should be placed in a wide area in the forest.

8. The transportation roads should be prepared for in advance so that it will give us time to improve the condition of the roads when there is an evalance or a poor drainage. It frequently happens on the new digging or a new pile of soil.

9. Because of its high cost it isn't necessary to build a permanent road, a temporary road will do. Of couse the road must be strong enough for trucks loaded with sky-line machine unit and forest products. The condition of the road must be improved gradually to match the intensities of the felling of trees and management.

INTERIM REPORT
OF
THE SHORT－TERM EXPERTS
ON
SOCIO－ECONOMIC STUDY
&
COST ANALYSIS

FOR
THE ROVING SEMINAR
Dec. 16－19, 1981
SEMARANG－BUMIJAWA－BATURADEN

In the Joint Evaluation Meeting which was held in September, 1980, it was requested from the Indonesian side to include socio-economic and environmental impact from the implementation of mechanical logging in the final evaluation of this Project.

Moreover, in the third Joint Committee Meeting in last May, the Indonesian side proposed to have a roving seminar with the theme of applicability of the mechanical logging to the Indonesian forestry, which the Japanese side welcomed the idea.

In consideration of the above-mentioned circumstances, two short-term experts in charge of socio-economic study and cost analysis were dispatched from JICA for the term of one month in accordance with the stipulation of the Record of Discussions. Their principal purpose ~~is~~ was to collect necessary information and data conducting a pre-survey in those fields in order to make the coming final evaluation an effective and successful one.

This interim report prepared for the Roving Seminar could only cover the very general matters concerning mechanical logging because of the very limited time.

We appreciate very much the helpful support of the Perhutani personnel in the survey and the investigation.

Madiun, Dec. 15, 1981

Team leader

MLP Project

(Tatsuka Numata)

I T I N E R A R Y

of

The Short-term Experts from JICA

on

Socio-economic Study & Cost Analysis

for

Mountain Logging Practice Project in Jawa

. Mr. Sansyo Nakamura (Socio-economic study)
Forest Management Laboratory Chief
Forestry & Forest Products Research Institute

. Mr. Tatsuo Tsujii (Cost Analysis)
Working Laboratory Chief
Forestry & Forest Products Research Institute

November 25, 1981 - December 24, 1981

Date	Schedule	Stay
Nov. 25 (Wed.)	Arrive Jakarta	Jakarta (President Hotel)
26 (Thrs.)	Courtesy Call to JICA Embassy of Japan	Jakarta (President Hotel)
27 (Fri.)	Courtesy Call to Perum Perhutani	Jakarta (President Hotel)
28 (Sat.)	Jakarta - Semarang Courtesy Call to Unit I	Semarang (Hotel Metro)
29 (Sun.)	Semarang - Tegal	Tegal (Hotel Karlita)
30 (Mon.)	Courtesy Call to KPH Pekalongan Barat	Bumi-Jawa (Expert's (Dormitory)
Dec. 1 (Tue.)	Field Survey in Bumi - Jawa	Bumi-jawa (Expert's (Dormitory)
2 (Wed.)	Field Survey in Bumi - Jawa	Bumi-jawa (Expert's (Dormitory)
3 (Thrs.)	Field Survey in Bumi - Jawa	Baturraden (Queen Motel)
4 (Fri.)	Observation of Planned Location of Paper Pulp Mill	(Cilacap)
5 (Sat.)	Cilacap - Yogyakarta	Yogyakarta (Hotel Ambarukmo)
6 (Sun.)	Yogyakarta - Madiun	Madiun (Hotel Merdeka)
7 (Mon.)	Courtesy Call to the Madiun Training Center	Madiun (Hotel Merdeka)
8 (Tues)	Working with the Experts	Madiun (Hotel Merdeka)
9 (Wed.)	Madiun - Sobeting - Solo	Solo (Sahid Sala Hotel)
10 (Thrs.)	Observation of Teak Forest Management in Cepu	Cepu (Guest House)
11 (Fri.)	Cepu - Madiun	Madiun (Hotel Merdeka)
12 (Sat.)	Report Working	Madiun (Hotel Merdeka)
13 (Sun.)	Report Working	Madiun (Hotel Merdeka)
14 (Mon.)	Report Working	Madiun (Hotel Merdeka)
15 (Tue.)	Report Working	Madiun (Hotel Merdeka)
16 (Wed.)	Madiun - Semarang	Semarang (Hotel Metro)
17 (Thrs.)	Roving Seminar	Baturraden (Queen Motel)
18 (Fri.)	Roving Seminar	Baturraden (Queen Motel)
19 (Sat.)	Roving Seminar	Baturraden (Queen Motel)
20 (Sun.)	Baturraden - Yogyakarta - Jakarta	Jakarta (President Hotel)
21 (Mon.)	Courtesy Call to Perum Perhutani	Jakarta (President Hotel)
22 (Tue.)	Courtesy Call to Embassy of Japan, Visit to Bogor Botani	Jakarta (President Hotel)
23 (Wed.)	Courtesy Call to Fly back	
24 (Thrs.)	Arr	

C O N T E N T S

SKYLINE LOGGING SYSTEM & ITS EFFICIENCY IN MERKUSII PINE FOREST IN CENTRAL JAVA

by
Tatsuo Tsujii

I. PURPOSE

Mountain logging Practice Project in Japan, which was started in 1970 in order to transfer the mechanical logging techniques especially by the skyline system, has entered its final stage. Therefore it is high time to analize and evaluate operational efficiency as a result of the acquisition of techniques and also production cost which is needed in making a working scheme. Especially, in the logging and transport of great quantity of logs to the paper and pulp mill which is scheduled to be established in Cilacap, it is anticipated that production management will become an important problem.

Our investigation is based on the request to analize the cost or efficiency of the actual skyline logging by such methods as work study or time study as basic data for working scheme and production management.

II. METHOD.....

II. METHOD

Usually, work study or time study needs a long period of field work and collecting data in connection with the factors which influence the productivity or cost. Yet, the investigation period this time was so limited that basic analysis by work study or time study was hardly done. So, the result of skyline logging in the Model Logging Operation Forest in Bumijawa became the main data from the analysis.

Each working process such as felling, bucking, skyline logging and truck transport was analized mainly by working time estimation and production per time unit estimation. Process of the analysis is as follows (see Fig.2);

1. Estimation of effective working time
2. Estimation of production per time unit
3. Commutation of production per day or other time unit
4. Estimation of time cost for labor and machinery
5. Commutation of direct unit cost
6. Estimation of other additional direct or indirect costs

General presumable factors to affect the working time or production are as follows:

___ Forest (tree, volume, topography, soil,etc.)
___ Climate (rainfall,etc.)
___ Techniques (working method, working system, equipment,etc.)
___ Socio- economic factors(labor employment situation, local economics,etc.)

In this report, the two factors which directly affect working time estimation and production per time unit estimation were closely examinned, yet not to their full depth.

III. FELLING.....

III. FELLING AND BUCKING

Manual work by two men using axe and hand-saw is the most common working system of felling and bucking in Java. A crew size (or one working group) of one felling site was comprised of 8 - 12 men.

In the felling work, undercutting of 7 - 8 standing trees by axe precedes the consecutive backcutting by hand-saw. After the felling comes branching and bucking.

Time study on working time per tree for one cycle of felling and bucking is shown in Table 1, in which handling tools, walking to the tree, preparation at stump site, undercutting, backcutting, branching, bucking and rest constitute the elementary work of one cycle and effective working time per tree is estimated. Long pauses or lost time are not counted in the estimation. Work factors in this estimation are 40 cm for tree diameter (D.B.H.), 25m for tree hight and 1.2 m^3 for tree volume.

Production per day is estimated as shown in Table 1 on the assumption that working time per day is 4 hours. However it is anticipated that working time varies according to those factors such as tree diameter, number of bucking volume per ha. So, it is desirable to collect a large quantity of data and then analize it.

IV. SKYLINE.....

1. [illegible]

Skyline logging system is a method to hang logs in the air from a cable and haul them from the felling site to the forest road side by a yarder. This system is considered very suitable to the mountainous area in Java.

Figure 1 and Table 1 show the result and record of the skyline logging of Pinus merkusii pine logs in the Todel Logging Operation Forest for about three years from 1979 to 1981, including setting and withdrawal of the skyline system. The main skyline system was Endless-Tyler system, while Falling-Block system and Pointing-Carriage system were only practiced as supplementary variation. Required labor for setting was ranging from 49.5 to 174 man-day in proportion to the span length ranging from 185m to 902m, where average labor required for setting per meter is 0.112 - 0.370 man-day.

Labor requirement in the sub-operation can possibly be reduced. Average production per day is 13.9 m^3 by the first phase trainees and 15.9 m^3 by the second phase trainees.

Figure 3 shows the relation between working time and production by the second phase trainees, 1980 (x) and 1981 (.) respectively. Production was increased in the later period, which indicates the improvement of the basic skills of the trainees during the training course.

Since there was not enough time to conduct a time study and work study on working time estimation and production per time unit estimation, the data of the second trainees' Endless-Tyler system was used in the estimation.

The major factors which affect the production by the skyline logging system are as follows;

-Number.....

- Number of logs per ha (volume per ha)
- Log size
- Yarding distance
- Skyline system
- Yarder size
- Effective working time

In this report, production per day was estimated by the volume per ha and production per time unit in the Endless-Tyler system which employed one operator, two loading men, one unloading man and one signal man.

Figure 4 shows production per day of the skyline logging system. In this diagram, production per day can be read by the volume per ha. Starting from the given volume per ha on the abscissa, going up vertically until meeting with the line, then go horizontally to the ordinate and read the working time per day, then again proceed horizontally to meet another line, then go down vertically to the abscissa where production per day can be read. For example, if the volume per ha is 200 m^3, production per hour is 2.75 m^3. Then, if the working time per day is 6 hours, production per day is reached as 16.5 m^3.

The data used in this analysis is obtained in the training course so the production per day remained rather low. However, the maximum value from the data can give us an estimation as follows ;

Volume per ha	Production per hour	Production per day
150 (m^3)	2.1 (m^3)	12.5 (m^3)
180	3.4	19.0
200	3.2	18.0
250	4.7	25.5

This.....

This estimation tells us that if the volume per ha is more than 250 m^3, production per hour is expected to be 4.7 m^3 and production per day more than 35,5 m^3. It can be used as production standard indicator.

In the time study conducted in Panjewa, it was observed that time was lost in loading and unloading. Improvement of productivity will be obtained by the establishment of sequence of work and minimization of lost time.

V. TRUCK.....

V. TRUCK TRANSPORT (LONG DISTANCE)

Major factors which affect the production of truck transport are as follows ;

- Travel distance
- Travel speed
- Working time
- Loading capacity
- Road condition

The biggest factor to affect the production per day would be the number of round trips which is determined by travel distance, travel speed and working time.

Table 4 is an estimation of number of round trips per day by travel distance and travel speed. In this estimation, loading time is assumed as 2 hours, unloading time as 1 hour and return trip speed as 60 km/hour. The figure in the parenthisis is effective working time.

Actual travel distance from the Merkusii Pine forest to the paper and pulp mill in Cilacap is ranging from 60 - 120 km. Log transport by 4 ton truck (4 m^3) is supposed.

Production per day shows no differen in the case of travel distance 60 km and 120 km because the number of trips per day is 1 time in both cases. Nevertheless, the effective working time shows a difference.

number of round trip x loading capacity = production per day

1 x 4 m^3 = 4 m^3

VI. COST.....

VI. COST ANALYSIS

6-1 Assumption.

Basic conditions or assumption of the following analysis are as follws ;

1). Merkusii Pine log supply as raw material for pulp ..... 540,000 m^3/year or 2,100 m^3/day (1/2; skyline, 1/2; manual)

2). Cutting area of Merkusii pine ..... 44,000 ha

3). Average volume/ha ..... 250 m^3

4). Two types of working process

Felling and bucking --- Skyline logging --- Truck transport
(axe, hand-saw) (Endless-Tyler)

Manual logging

5). Travel distance between Merkusii Pine forest and the paper and pulp mill in Cilacap ....60 - 120 km

6). Effective working days per year ..... 250 days

6-2 Felling and bucking

- Production per day ..... 10 m^3/2 men (from Table 2) ; $\frac{10\ m^3/2\ men}{2}$ = 5 m^3/man

- Labor required for felling and bucking

$$\frac{\text{production per year}}{\text{number of working days x production per day}}$$

$$= \frac{540{,}000\ m^3/year}{250\ days/year \times 5\ m3/man} = 432\ man/day$$

- 432 man/day x 250 days/year x*Rp.550/man = Rp.59,400,000/year

- $\frac{Rp.\ 59{,}400{,}000/year}{540{,}000\ m^3/year} = \underline{Rp.110/m^3}$..(1) (* : The average wage of laborer)

6-3 Skyline logging system (Endless-Tyler)

- Production per day ..... 23 m^3/day.unit (from Fig.4)

- Necessary number of yarders

$$\frac{270{,}000\ m^3/year}{250\ days/year \times 23\ m^3/unit.day} = 47\ unit$$

allowing 10% for spare ..... 52 unit

-Purchase.....

- Purchase price of one yarder Rp.12,000,000/unit
- Service length ..... 6,000 hours/unit
- Recovery value (residue value) ..... 10 %
- Depreciation of yarder

• $\frac{\text{Rp.12,000000/unit - Rp.1,200,000/unit}}{\text{6,000 hours/unit}} = \text{Rp.1,800/hour}$

• 52 unit x 250 days/year x 4 hours/day x Rp.1,800/hour
= Rp.93,600,000/year; $\frac{\text{Rp.93,600,000/year}}{\text{270,000 m}^3\text{/year}} = \underline{\text{Rp.347/m}^3}$ ... (2

- Unit price per m^3 of carriage, block, clip, shackle, wire-rope etc. is calculated as Rp.1,200/m^3...(3) by the same process.

• Rp.1,200/m^3 x 270,000m^3/year = Rp.324,000,000/year

- Repair and maintenance cost of yarder is estimated at 40 % of the yarder price.

• $\frac{\text{Rp.12,000,000/unit x 0.4}}{\text{6,000 hours}} = \text{Rp.800/hour.unit}$

• Rp.800/hour·unit x 4 hours/day x 250 days/year x 52 uni
= Rp.41,600,000/year

$\frac{\text{Rp.41,600,000/year}}{\text{270,000 m}^3\text{/year}} = \underline{\text{Rp.154/m}^3}$ .....(4)

- Fuel and oil cost is assumed to be Rp.150/hour·unit from the past data.

• Rp.150/hour·unit x 4 hours/day x 250 days/year
= Rp.150,000/year unit

• Rp.150,000/year unit x 52 units = Rp.7,800,000/year

$\frac{\text{Rp.7,800,000/year}}{\text{270,000 m}^3\text{/year}} = \underline{\text{Rp.29/ m}^3}$ .....(5)

- Interest, insurance cost and import duties are excluded from the estimation, because it is hard to get the exact imformation.
- Labor cost (including setting and withdrawal)

Operator.....	1	Rp.30,000/month
Loading man	2	"
Unloading man	1	"
Signal man	1	"
T o t a l	5	Rp.150,000/month-unit

Rp.150,000/month·unit.....

• Rp.150,000/month·unit x 12months/year x 52 unit

= Rp.93,600,000/year ; $\frac{\text{Rp.93,600,000/year}}{\text{270,000 m}^3\text{/year}} = \underline{\text{Rp.347/m}^3}$ ..(6)

6-4 Track transport

- Production per day ..... 4 m^3/unit·trip
- Number of round trips ..... 1 trip/day

$$\frac{\text{540,000 m}^3\text{/year}}{\text{4 m}^3\text{/day·unit x 1 trip/day x 250 days/year}} = 540 \text{ unit/day}$$

- Lease fee for 4 ton truck ..... Rp.48/t·km·unit
- Average travel distance ..... 80 km/day·unit

• Rp.48/t·km·unit x 80 km/day·unit x 4 t/unit = Rp.15,360/day·unit

• Rp.15,360/day.unit x 540 unit/day = Rp.8,294,400/day

• Rp.8,294,400/day x 250days/year = Rp.2,073,600,000/year

$$\frac{\text{Rp.2,073,600,000/year}}{\text{540,000 m}^3\text{/year}} = \underline{\text{Rp.3,840/m}^3} \text{.....(7)}$$

6-5 Forest road construction

Needed forest road density for skyline logging system is estimated as 5 m/ha and road construction cost as Rp.17,000/m.

$$\frac{\text{540,000 m}^3\text{/year}}{2} = \text{270.000 m}^3\text{/year}$$

$$\frac{\text{270,000 m}^3\text{/year}}{\text{250 m}^3\text{/ha}} = \text{1,080 ha/year}$$

. 5 m/ha x 1,080 ha/year = 5,400 m/year

. Rp.17,000/m x 5,400 m/year = Rp.91,800,000/year

$$\frac{\text{Rp.91,800,000/year}}{\text{540,000 m}^3\text{/year}} = \underline{\text{Rp.170/m}^3} \text{ .....(8)}$$

6-6 Manual work (truck loading included)

- Production per crew (consists of 8 workers)

..... 2 m^3/crew

$$\frac{\text{270,000 m}^3\text{/year}}{\text{250 days/year x 2 m}^3\text{/crew}} = 540 \text{ crew/day}$$

. 540 crew/day x 8 workers/crew = 4,320 workers/day

4,320 workers/day x 250 days/year x Rp.550/worker

= Rp.594,000,000/year

$$\text{Rp.594,000,000/year} \div 270{,}000\ m^3/\text{year} \fallingdotseq \underline{\text{Rp.2,200/m}^3} \quad \ldots\ldots\ldots (9)$$

6-7 Total cost

-Unit price	Skyline logging	Manual logging
Felling and bucking	Rp.110/m^3 [(1)]	Rp.110/m^3 [(1)]
Logging	Rp.2,077/m^3 [(2)+(3)+(4)+(5)+(6)]	Rp.2,200/m^3 [(9)]
Transport	Rp.4,010/m^3 [$\frac{(7)+(8)}{2}$]	Rp.4,010/m^3 [$\frac{(7)+(8)}{2}$]
Total	Rp.6,197/m^3	Rp.6,320/m^3

-Total cost	Skyline logging	Manual logging
Felling and bucking	Rp. 29,700,000	Rp. 29,700,000
Logging	Rp. 560,600,000	Rp. 594,000,000
Transport	Rp.1,082,700,000	Rp.1,082,700,000
Total	Rp.1,673,000,000	Rp.1,706,400,000

VII. CONCLUSION

Raw material supply system with production per year 540,000 m^3 or 2,100 m^3 per day was studied in two working methods, skyline logging system and manual logging.

If the felling and bucking is done completely by axe and hand-saw, 432 m^3/day are needed. If one working group consists of 12 men, 36 felling areas are to be prepared.

In the case of skyline logging, felling should precede yarding.

If half of the total production is done by skyline logging system (270,000 m^3 per year), the estimation shows the necessity of 47 yarders in operation(52 yarders if spares are included).

Unless these 47 yarders are put into full operation, planned production cannot be ensured. Allocation of the skyline system and working period will become the substantial problem, so very scrupulous working schemes should be drawn up.

Manual logging needs 4,320 workers or 540 working groups per day. Securing these workers, their allocation or distribution and transportation to the working site will become an essential problem.

For the transport of logs to the paper and pulp mill, 540 trucks are need per day. Minute truck distribution plan should be made and forest road should be repaired and maintained in good condition.

In the last place, in order for the logging and transport of Merkusii Pine logs in exact quantity and for a long time, establishment of an organization to plan and control the management will be the most important thing above all.

Table 1 Record of Skyline logging (Model logging Operation Forest)

Phase	SKL No.	System	Span (m)	Setting			Logging						
				Employed days	Employed labour (man.day)	Employed labour per m	Logging hour (H)	Logging volume (m^3)	Logging volume per hour (m^3)	Logging volume per day (m^3)	Fuel consumption (ℓ)	Fuel consumption per m (ℓ)	Logging period
1st phase training	1	EndlessTyler					82	116	1.41	8.5	155	1.3	7 -9 , 1979
	2	〃					85	132	1.56	9.4	103	0.8	8 - 9 , 1979
	3	〃	616	18	115	0.186	219	489	2.23	13.4	430	0.9	10 - 12 , 1979
	4	〃	655	11	101	0.154	325	818	2.52	15.1	865	1.1	10,1979 - 3,1980
	5	〃	428	12	65	0.151	191	526	2.75	16.5	400	0.8	11,1979 - 2,1980
	6	〃	561	15	68	0.121	165	378	2.29	13.7	435	1.1	2 - 5 , 1980
	7	Falling Block	511	12	57	0.112	112	270	2.41	14.5	240	0.9	4 - 5 , 1980
	8	HoistingCarriage	624	15	84	0.135	42	88	2.10	12.6	120	1.4	5 , 1980
	Total				490	0.144	1221	2817	2.31	13.9	2723	1.0	
2nd phase training	1	HoistingCarriage	902	14.5	174	0.193	329	797	2.42	14.5	1482	1.9	9,1980 - 5,1981
	2	EndlessTyler	454	14	168	0.370	189	458	2.42	14.5	420	0.9	7 - 11 , 1980
	3	〃	614	8	96	0.156	110	271	2.46	14.8	445	1.6	8 - 12 , 1980
	4	〃	550	13.5	162	0.295	100	176	1.78	10.7	225	1.3	8 - 10 , 1980
	5	〃	390	13	91	0.233	122.5	295	2.41	14.5	198	0.7	8 - 11 , 1980
	6	〃	706	13.5	94.5	0.134	255	858	3.36	20.2	1125	1.3	11,1980 - 5,1981
	7	Cancelled											
	8	EndlessTyler	239	11	49.5	0.207	120	152	1.27	7.6	86	0.6	12,1980 - 2,1981
	9	〃	185	13	54	0.292	34	85.5	2.51	15.1	30	0.4	4 - 5 , 1981
	10	〃	512	11	55	0.107	112	393	3.51	21.1	435	1.1	12,1980 - 3,1981
	11	〃	770	26.5	132.5	0.172	149	542	3.64	21.8	822	1.5	1 - 5 , 1981
	12	〃	792	31	155	0.196	62	171	2.76	16.6	245	1.4	2 - 5 , 1981
	Total		6114		1231.5	0.201	1582.5	4200.5	2.65	15.9	5513	1.3	

Table 2 Working time for one cycle of felling, branching, and bucking

Working time per tree	
Elementary operation	Hour
Handling of tools	min. sec.
Wolking to the tree	30
Preparation at stump site	15
Under cutting	3 : 30
Back cutting	2 : 30
Branching	3 : 30
Bucking	15 : 30
Rest	(4 : 45)
Total	30 : 00

Crew size : Two workers

Working methode : Axe, hand-saw

Table 3 Production per day of felling, branching and bucking

Tree diameter	(cm)	40
Tree height	(m)	25
Working time per tree	(min)	30
Felling volume	(m^3)	1.2
Production per hour	(m^3)	2.4
Production per day	(m^3)	9.6

Table 4 Number of round trip per day

Average travel distance (km, one way)	Travel speed	
	40 km / hour	60 km / hour
60 km	1 round (5.5 hour)	1 round (5.0 hour)
80 km	1 round (6.3 hour)	1 round (5.6 hour)
100 km	1 round (7.2 hour)	1 round (6.3 hour)
120 km	1 round (8.0 hour)	1 round (7.0 hour)

Including loading, hauling, unloading and return trip

Figure 1

Location of skyline
in
Model Logging Operation Forest

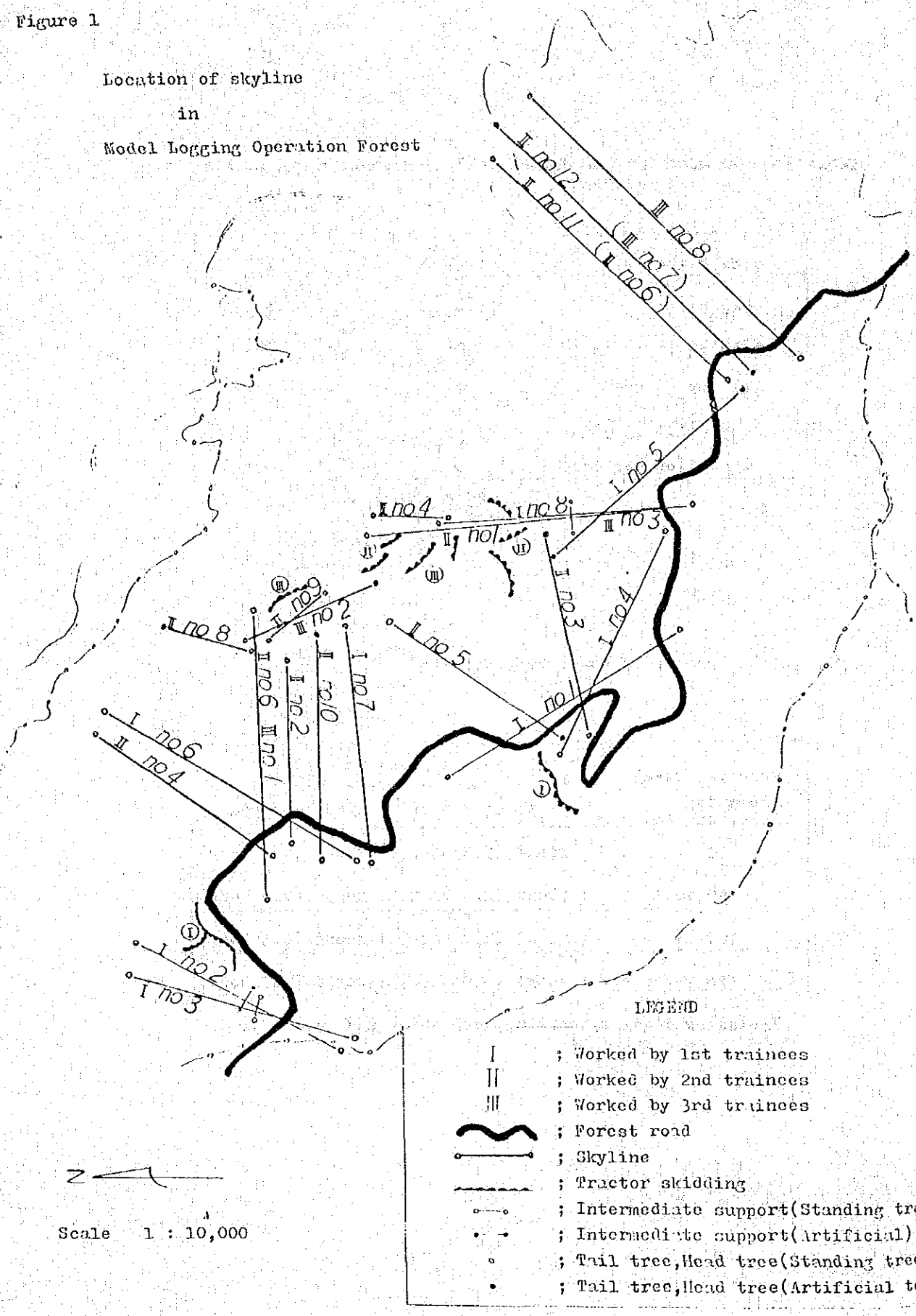


Figure 2 Computation of cost according to the scheme

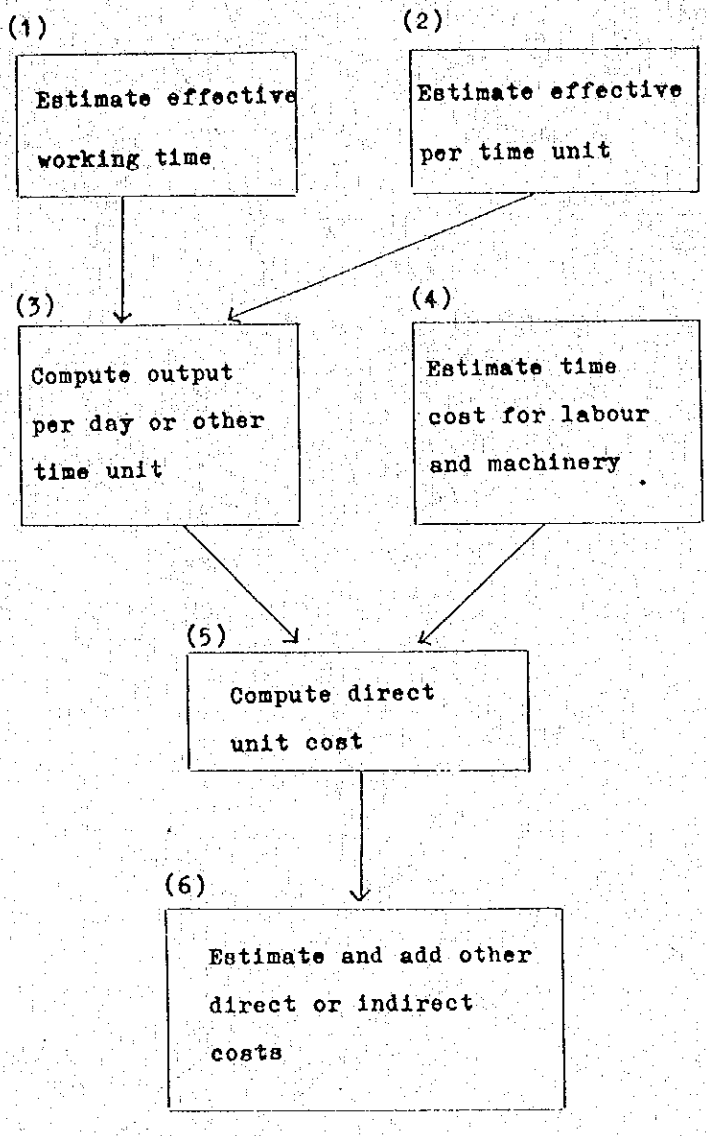


Figure-3 Relation between working time and production of skyline logging

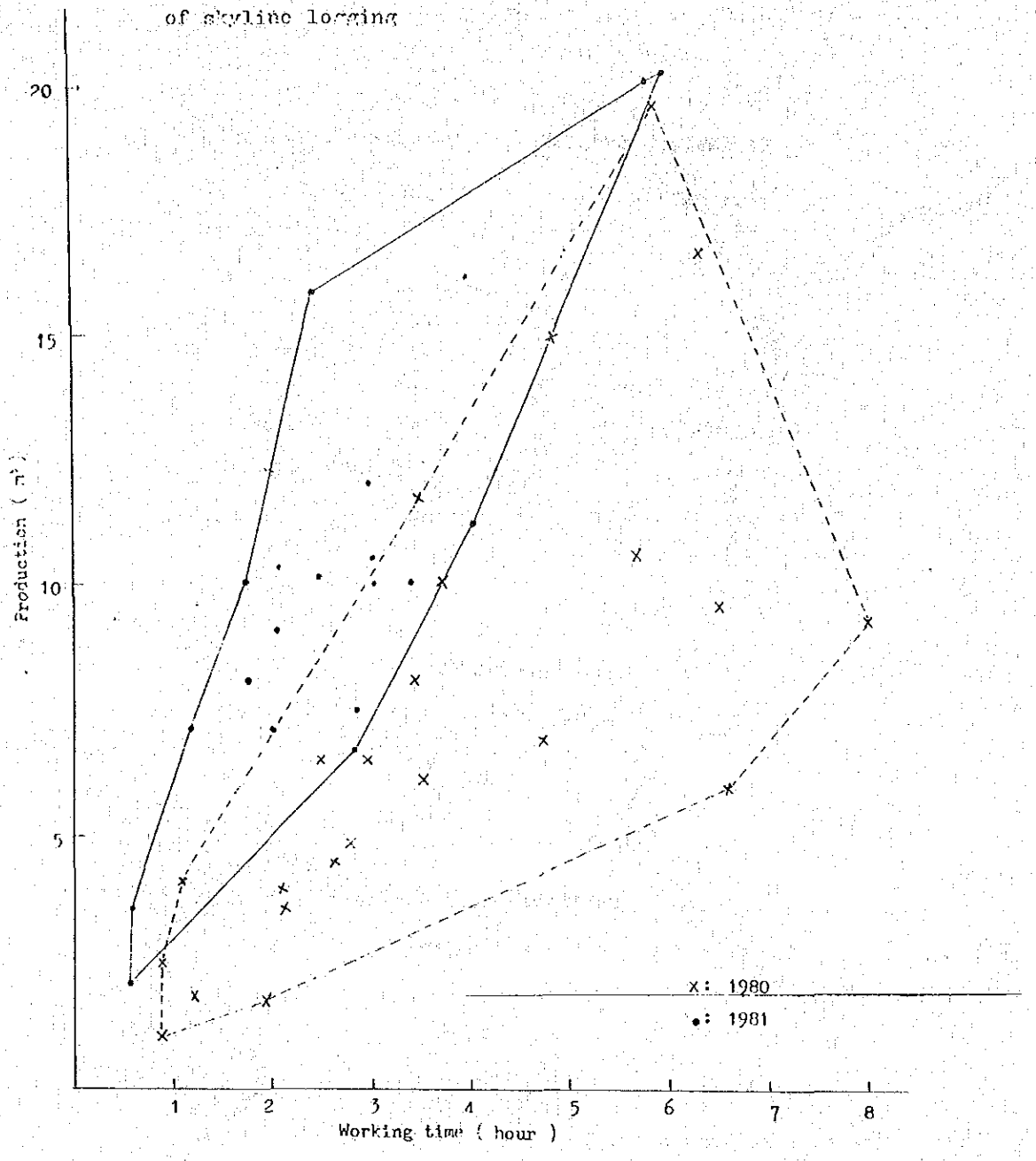
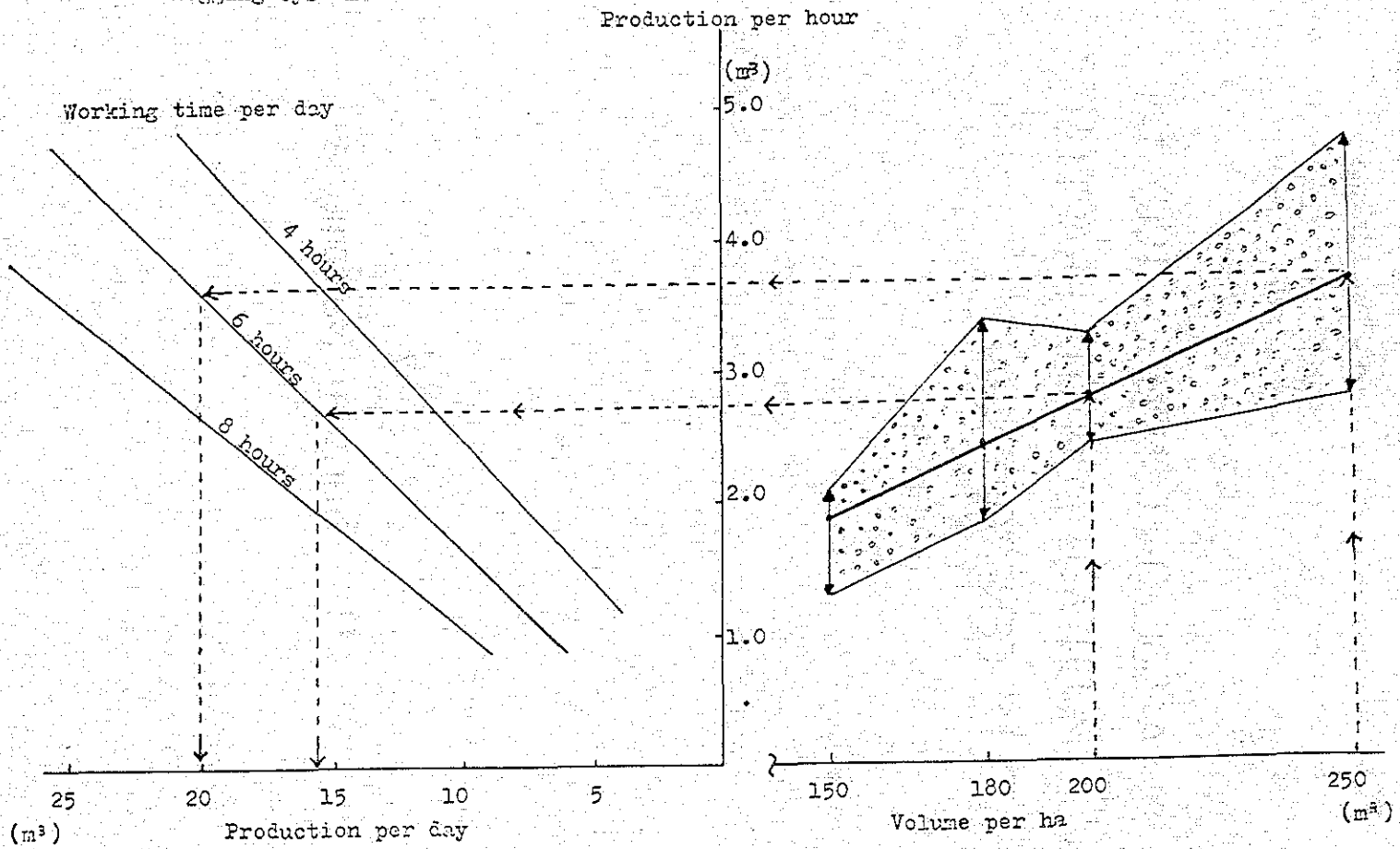


Figure 4 Production per day of skyline logging system



A SOCIO-ECONOMIC STUDY ON MOUNTAIN LOGGING PRACTICE IN CENTRAL JAVA

by
Dr. Sansyo Nakamura

I. PREFACE

Up to the present, establishment and development of mechanical logging in a form suitable to this country has been an important issue in Perum Perhutani, while actual mechanical logging work introduced from Japan has been carried out within a frame-work of training in Model Logging Operation Forest which is located in Pemali Jawa in West Pekalongan District Forest.

In this report, the author tried to study this issue from the viewpoint of local socio-economics, and to deduce general conclusions about mechanical logging from the very limited data and information obtained in a very limited time.

I would like to express my heartiest gratitude to the Perhutani personnel and the counterparts and the experts of the MLP Project for their warmest help and support in collecting data and drawing up this report.

II. Present.....

II. Present social conditions of Kecamatan Bumijawa and its development tendencies.

The following study is based on the statistical data obtained at Kantor Kecamatan Bumijawa.

Although Kecamatan Bumijawa is one of the administrative region, it also coincides with the BKPH Bumijawa under the forest administration.

Total land area of Kecamatan Bumijawa is 8,855 ha, of which rice paddies occupy 34% (3,099 ha), total of cropfield, grazing land, building, pond and swamp 35% (3,088 ha), forest 31% (2,421 ha).

Population composition by age and sex is as shown in table 1. Total population is 61,402 as of Oct.1,1981 of which 29,186 are male and 32,216 female.

Population density is 693/km^2, which is almost the same as the average of Jawa island 691/km^2. Population density of 1976 was 636/km^2. It is understood that the population increase ratio is rather high in this area.

Assuming labor age is from 10 to 60 years, Kecamatan Bumijawa has 40,443 labor population. The number of land-owning farmers is 14,652.

Another statistical figure shows there are 11,651 houses. It means 5 people are living in one house and three of them are laborers if the total population (61,403) and labor population (429,7) are devided by the number of houses.

The number of agricultural workers is 14,455. The fact that the total number of land-owning farmers and agricultural workers amounts to 68% of the total occupational population, and the rice paddies occupy 34% and forest 31% of the total land area shows that Kecamatan Bumijawa

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is an area of agricultural and forestry. In oroder to read the dynamic develoment tendency of Kecamatan Bumijawa, statistical figures on population and durable consumer goods as of Dec.1976, Jan.1981, Oct 1981 are comparatively studied (Table 2, Table 3). Between Jan.1981 and Oct.1981, the total population increased by 621, occupational population by 1318. The increase in the number of agricultural workers and merchants is rather distinguished.
The same trend is seen between 1975 and 1981. Population growth by birth is greater than decrease by death.

As for the durable consumer goods, television possession increased while radio possession decreased.
As of Oct.1981, radio possession is 1 per 145, television possession 1 per 344. Comparison between 1976 and 1981 shows that the possession of televisions, bicycles, motorcycles and auto mobils is slightly increasing.

Kecamatan Bumijawa has a typical character of the local Jawanese community in the respect that it has rather big population and its growth rate is also big.

With the help of Mr.Bambang Soeharijanto 10 agricultural or forest workers in Desa Batumerah where agricultural or forest workers occupies 81% of the total occupational population (1619) were randomly picked up to answer the questionnires. Its result is shown in table 4, which shows their income and living standard is relatively low.
For the develoment of this region, employment enlargement and improvement of living standard by income increase of the agricultural and forest workers is necessary.

III. .....

III. Comparison of man-power logging and mechanical logging in respect to employment and income

1. According to the information from Unit I as of Dec. 2,1981, forest as raw material supplier to the paper mill consists of 4 District Forest, namely;

District Forest	Total forest area	Target area for pine	Existing pine forest
Pekalongan Barat	40,778 (ha)	34,580 (ha)	22,817(ha)
Banyumas Barat	60,715	39,783	12,549
Banyumas Timur	46,049	28,713	8,934
Kedu Selatan	45,434	33,002	11,385
Total	192,976	136,078	55,685

Sources : 1. Data pointed hutan pinus, 26 April 1980 Biro Perencanaan

2. Rencana Persemaian Central-~~Pinus Merkusii,~~ 15 September 1980, Biro Produksi.

Annual production in the early stage is as follows ;

Year	raw material requirement	felling area	felling area in Dumajawa
1985	278,000 (m^3)	1,683(ha)	1,683 (ha)
1986	379,000	2,208	2,208
1987	427,000	2,181	1 108
1988	440,000	2438	
1989	463,000	2580	
Total	1,968,000	11,000	

Source: Ir. Rio Pramoedibyo, Penyediaan bahan baku (kayu) untuk pabrik kertas Cilacap, 1980

In 1985 and 1986 the felling area will be concentrated in Bumijawa which has sufficient mature pine stand.

On the other hand, the letter from Perum Perhutani for the "Roving Seminar on Mountain Logging" said

"The goverment is going to establish a cement bag factory in Cilacap in the near future with the capacity of 90,000 t annual pulp output which means log input per year is 540.000 m^3 or 2100 m^3 per day (one year = 250 work day).

Logging work will be done in West Pekalongan District Forest, East Banyumas D.F. and West Banyumas D.F. So, the following study is based on these given figures of the log volume.

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1). In the case of man power felling, bucking, skyline logging and loading to trucks;

--- 12 workers for felling and loading

--- 5 persons for skyline logging, 4 persons of whom are MLP graduates

Total 17 persons

A group of these 17 persons produces 25 m^3 log per day on the average.

The productivity is 25 m^3/17 man day = 1.47m^3/man day (= 0.68 man·day/m^3).

The wages of these 17 persons increase the income of the local community.

That is ; 12 workers for felling and bucking and

1 worker for mechanic : 600 Rp/man day

600 x 13 = 7800 Rp/day

7800 Rp/25m^3 = 12.48 Rp/m^3

4 MLP graduates for skyline logging : 35000 Rp/man.month = 1166 Rp/man.day

1166 x 4 = 4664 Rp/day , 4664 Rp/25m^3= 186.56 Rp/m^3

Total of 17 persons : 12.48 Rp/m^3+ 186.56Rp/m^3 = 199.04Rp/m^3.

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