



Photo Laurent.

*Un parc à bois avant chargement sur grumier. Le terrain alluvionnaire et sableux n'est pas toujours favorable.  
A woodyard before loading on a logging truck. The alluvial and sandy soil is not always favorable.*

# INDONESIAN MERANTIS WHERE DO YOU COME FROM AND HOW ARE YOU HARVESTED ?

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## RÉSUMÉ

*Dans une première partie l'auteur situe l'importance de l'Indonésie par quelques repères géographiques, économiques et par une présentation rapide du développement de la production, de l'industrie et du commerce des produits forestiers sur les deux dernières décennies en se focalisant, en fin de chapitre, sur Kalimantan.*

*La seconde partie est consacrée à la présentation de l'activité d'exploitation forestière sur terre ferme à Kalimantan : le cadre naturel de la forêt, les entreprises qui y opèrent (leur organisation, leur structure, leur importance, leur méthode), les techniques d'exploitation qu'elles mettent en œuvre et le type de matériel qu'elles utilisent.*



*Un chapitre présente les méthodes et techniques du transport fluvial des Meranti et autres bois flottables produits à partir de cette forêt.*

*La productivité et les prix de revient de ce type d'exploitation et de transport fluvial font l'objet d'un chapitre spécial.*

*La troisième partie, dans un souci d'élargissement de la perspective, rappelle quels sont les objectifs et les axes majeurs de la politique indonésienne de développement de la production, de la transformation et du commerce de ses produits forestiers, tout en indiquant les besoins que cette volonté sous-tend.*

## SUMMARY

### INDONESIAN MERANTIS : WHERE DO YOU COME FROM AND HOW ARE YOU HARVESTED ?

*In the first part of this article, the author situates the importance of Indonesia in geographical and economic terms, and briefly describes the development of forest production, timber industry and trade over the last two decades, with special reference to Kalimantan at the conclusion of this account.*

*The second part deals with mainland forest harvesting in Kalimantan : the natural forest environment, the undertakings operating there, (their organization, structure, size and methods), the techniques of working employed, and the type of equipment used.*

*A section is devoted to the methods and techniques of river transportation of Meranti and other floatable woods produced by this forest.*

*Logging and river transportation costs and productivity ratios are considered in a special section.*

*The third part provides a broader picture, reviewing the broad lines and objectives of Indonesian policy regarding the development of forestry production, timber processing and the timber trade. The needs which this policy is designed to meet are indicated.*

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## INTRODUCTION

### *Geographical and economic characteristics*

*The Indonesian archipelago, which includes 13,677 islands, stretches from 5° North latitude to 11° South, and from 94° East longitude to 141°, covering 1,919,300 km<sup>2</sup> (3.5 times the area of France) in South-East Asia and extends across more than one eighth of the earth circumference. Its climate is tropical.*

*Its numerous inhabitants (about 165 million people in 1985) are concentrated on a small number of islands (56 % of islands are uninhabited), Java being the most important. One fourth of the population lives in urban areas that are often extremely large.*

*Its economy, which has the fastest growth rate in the ASEAN countries after Singapore, is going through a very active phase of industrialization. Its GDP (78.3 billion dollars in 1983) is by far the highest in South-East Asia.*

### *Important figures concerning the forests*

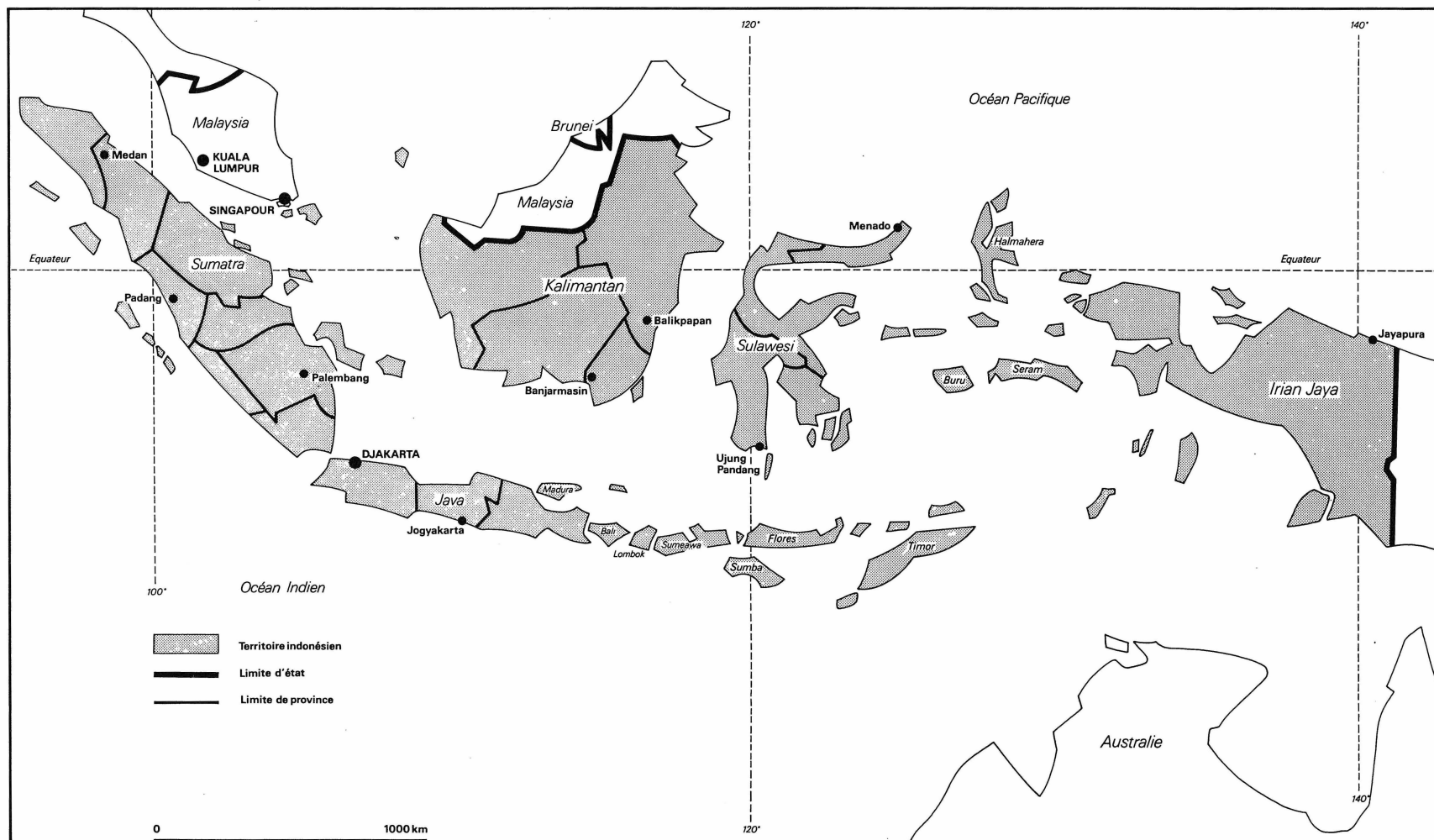
*Indonesia is one of the three major countries endowed with tropical forests.*

*Its sizeable resources (57.8 % of the country is covered with forest), and its industrial and commercial dynamism give Indonesia a promising future.*

*Its resources are estimated (at the end of 1985) to be nearly 111 million hectares, nearly all of which are hardwood forests (only 0.3 % of the forests is planted with softwoods), 61 % of which (67.7 million hectares) are considered to be accessible and manageable.*

*Under the present logging conditions and techniques, 33.2 million hectares are considered to be economically inaccessible because of their topography, and another 10 million hectares (reserves) cannot be harvested due to regulations and legal restrictions.*

## CARTE DE L'ARCHIPEL INDONESIEN - INDONESIAN ARCHIPELAGO



More than likely, nearly all the manageable areas have already been granted by concessions.

In volume, the potential commercializable timber could be approximately 830 million m<sup>3</sup>, i.e. 10.3 % of world resources.

Irian Jaya and Kalimantan hold more than 90 % (respectively 60 and 31.6 %) of Indonesia's resources. The Celebes and the Molluccas have half of the rest (5.4 %). Sumatra is now only left with 2.7 % of the total.

Timber production in Indonesia is among the three highest in the tropical world (with those of Malaysia and Brazil).

After expanding very fast from 1965 to 1973, and then being at a relative standstill at a very high level (20 to 25 million m<sup>3</sup> per year) until 1980. Indonesia's forest production to be exported as logs was limited drastically by the government. The latter also instigated a strict policy in order to develop local industries, particularly plywood, a sector in which Indonesia now ranks second after the USA.

Exports of forest products are the second source of foreign currency after oil and natural gas.

In 1974, Indonesia produced 19.1 % of the world's tropical logs and supplied 40.5 % of the international market. But it deliberately slowed down its exports of raw materials and, in 1982, its percentage in relation to the rest of the world had dropped to 9.3 % for production and to 10.5 % of the international market's supplies.

Since January 1st, 1985, all log exports have been forbidden.

Conversely, Indonesia has developed its own plywood industries to a great extent on a very logical basis :

Even though Indonesia's production of plywood did not exceed 9,000 m<sup>3</sup> in 1973, the 98 producing units which operated in July 1985 represented a capacity of 6,096,740 m<sup>3</sup> per year, and were expected to produce about 4,500,000 m<sup>3</sup> of boards in 1985.

Twenty-seven other mills were being built and sixty-four other projects were in a more or less advanced stage (licences granted, being processed or requested).

At the end of 1985, 109 units were operational and represented a productive capacity of 6,500,000 m<sup>3</sup> per year.

At the beginning of 1986, the Minister of Forests announced that the number of units was now 125.

In total, if only the existing situation and the projects established in mid-1985 were taken into account. Indonesia might very soon have at its disposal a productive capacity of 10,169,000 m<sup>3</sup> per year, i.e. 363 times the capacity of the 1973 existing infrastructure (28,000 m<sup>3</sup> per year).

In 1985, 2,637,784 m<sup>3</sup> were exported during the first nine months, that is, a 24.6 % increase as compared to the same period in 1984. It is interesting to note that Indonesia had only exported 1,000 m<sup>3</sup> in 1975.

As far as lumber is concerned, at the end of March 1984, there were only 293 importants sawmills in Indonesia. They used 83 % of their productive capacity of 7,955,000 m<sup>3</sup> per year. 73.1 % of the existing production (an average of 6,622,000 m<sup>3</sup> per year between 81 and 85) is consumed on the national market (4,844,000 m<sup>3</sup> per year).

Indonesia's forecasts for plywood and lumber production demonstrate the will of the nation to continue industrialization even if it slightly slows down the pace.

The following figures are, obviously, only forecasts, but past experience has shown that it would be unwise not to take them into account.

On the contrary, they might even be higher as early as 1986.

Considering the yield of processed products that is usually expected. Indonesia will consume a very large quantity of logs in the next few years :

1986 : 30,000,000 m<sup>3</sup>,

1987 : 32,500,000 m<sup>3</sup>,

1988 : 36,000,000 m<sup>3</sup>.

#### INDONESIA'S FOREST INDUSTRIES : DEVELOPMENT OF PRODUCTION AND EXPORTS

(1,000 m<sup>3</sup>)

Year	1964	1967	1970	1973	1976	1979	1982	1983	1984	1985
Logs	• Production (1,000 m <sup>3</sup> )	4,180	4,860	10,780	26,297	23,800	25,500	22,773	25,833	26,370
	• Exportations	135	582	7,834	19,095	18,105	18,205	3,220	2,992	1,646
	X/P (%)	3.2	12.0	72.7	72.6	76.1	71.4	14.1	11.6	6.2
Lumber	• Production	1,801	1,800	1,701	1,411	3,022	3,408	6,798	6,317	6,610
	• Exportations	8	8	44	330	656	1,342	1,462	1,793	2,198
Plywood	• Production CP 10 <sup>3</sup> m <sup>3</sup> (functional capacity)	3	3	7	9	214	624	2,487	3,140	3,711
					(28)	(405)	(1,809)	(3,292)	(4,528)	(5,330)
	• Exportations CP 10 <sup>3</sup> m <sup>3</sup>	—	—	—	0	13	117	1,232	2,106	3,046

(Source : FAO data rectified when necessary according to ISA, APKINDO and Ministry of forests data.)



PRODUCTION AND SALES FORECASTS FOR INDONESIAN SAWN TIMBER AND PLYWOOD  
(Sources : ISA and APKINDO data)  
(in 1,000 m<sup>3</sup>)

Year	Plywood			Sawn timber			Total of processed products
	Export	Local	Total	Export	Local	Total	
1986	3,597	1,225	4,822	2,500	7,400	9,900	14,722
1987	4,217	1,347	5,564	2,750	7,800	10,550	16,114
1988	4,966	1,482	6,448	3,000	8,400	11,400	17,848

If the preceding amounts are added to the quantity of logs intended for the international market, Indonesia will have to produce about 35 or even 40 million m<sup>3</sup> of logs a year. Its wish to create employment and export more processed products will entail the need for more capital that could be generated by exporting part of the production as logs, particularly from the province of Irian Jaya.

Thus, it becomes clear that forest harvesting and management is extremely important to Indonesia.

That is the reason why we thought it interesting to present the forest logging methods that we observed recently when we were engaged in research in the provinces of South and center Kalimantan. The reader will be able to compare Indonesian methods to those he has witnessed in other regions or on other continents.

Even though the information included in this article is relatively recent, some of it, particularly in the micro-economic sector, may already be obsolete. If this is the case, we apologize and hope the reader will forgive us.

However, we welcome any comments and remarks the reader may have about this article.

## Kalimantan

The island of Borneo is divided into four entities — Sabah and Sarawak which belong to Malaysia, Brunei which is an independent state, and Kalimantan, the biggest of the four (539,460 km<sup>2</sup>), which is a part of Indonesia (28 % of the total territory).

The coastal alluvial plains are very broad, and the only highlands can be found in the northern center of the island. Three-quarters of Kalimantan does not exceed an altitude of 1,000 m. The highest point is the Müller mountains, 2,988 m, located in the North-West of Saraminda and Balikpapan.

The equatorial forest that covers that part is almost entirely unpopulated. The 4.5 % of Indonesia's population who live in Kalimantan are concentrated in the fluvial and maritime harbors.

Kalimantan has an equatorial climate (an average temperature of 27 °C) regulated by monsoon winds. Hence, rainfall is rather high and regularly spaced out throughout the year (from 2.5 to 4 m of precipitation a year, with more rainfall in the highlands).

A dry monsoon coming from the East reduces the amount of rainfall from June/July to October/November, depending on the region, and the humid monsoon coming from the West lasts from November to April/May.

The island is drained by several rivers that are navigable all year long for most of their length. Those rivers are the only convenient means of access to the interior of the island.

Craft of five to ten thousand tons regularly sail the Barito to Banjarmasin, the Kapuas to Kuala Kapuas, or the Mentaya to Sampit, navigating several dozen kilometers inland.

78 % of the surface of Kalimantan is forested : 63 % are moist forests, and 15 % are bush fallows and low-grade forests.

At the end of 1985, the FAO estimated that there were 34 million hectares of moist forests in Kalimantan including :

- 5,800,000 ha of virgin exploitable forests with mainly hardwood trees,
- 18,260,000 ha of partially harvested forests,
- 300,000 ha (approximately) of forests with mainly conifers,
- 9,660,000 ha forests that cannot be harvested for various reasons given present conditions.

Virgin exploitable forests could produce 261 million m<sup>3</sup> according to the present standards of production, but the total potential in timber could be as high as 5,649 million m<sup>3</sup>, if less restrictive, but realistic basis of assessment were adopted.

Most exploitable areas have already been included in forest concessions whose production is intended, more and more, for first-processing units located near the resources and not, as formerly was the case, for the exportation of logs to foreign countries or for processing in mills located in Java (as early as mid-1981, 57 % of the surfaces granted in concessions in Indonesia — 29,164,000 ha — were located in Kalimantan).

*The size of the concession operators is surprising : a group may often own five (or even more) different companies operating in various zones and holding a total of several hundred thousand hectares in concessions, for the average concession is 100,000 ha.*

*In 1983/84, out of the 521 forest exploitation companies in the country, 292 (56 %) operated in Kalimantan, and produced 64 % of the total national output.*

*The industrial transformation of Kalimantan can be summed up by a few figures :*

*— 55 operational units which produce plywood (56.1 % of the 98 mills in the country in mid-1985),*

Province	Number of companies	Percentage of the national output of logs
West Kalimantan	58	8 %
Central Kalimantan	113	23 %
East Kalimantan	106	28 %
South Kalimantan	15	5 %
Total Kalimantan	292	64 %

*— 119 very large sawmills (40.6 % of the 293 mills in the country) with a productive capacity of 3,588,300 m<sup>3</sup> per year (45.1 % of national capacity).*

Province	Plywood		Sawmills	
	Number	Capacity (1,000 m <sup>3</sup> per year)	Number	Capacity (1,000 m <sup>3</sup> per year)
West Kalimantan	14	701.7	3	54.0
Central Kalimantan	5	374.0	40	1,278.5
East Kalimantan	23	1,427.0	22	730.8
South Kalimantan	13	785.3	54	1,525.0
Total Kalimantan	55	3,288	119	3,588.3

## THE DRYLAND FOREST IN KALIMANTAN

*Upland forests can be found on the hills, the foot-hills of the high lands and on the upper regions of watersheds, whereas the swamp forest is located on alluvial plains (in the South, extending as far as 150/200 km inland as the crow flies).*

*In most cases, the upland forest consists of high-grade dipterocarp forest whose homogeneity and high potential in terms of technological uses, is unequalled in the natural forests of other regions of the planet.*

*This forest includes :*

*— about 450 species of dipterocarps, the largest variety in the world, particularly in the following kinds : Shorea, Hopea, Dipterocarpus, Vatica, Dryobalanus, Cotylelobium, Upuna ;*

*— for the species currently exploited, the potential of the trees more than 50 or 60 cm in diameter (according to the species), is usually between 60 and 90 m<sup>3</sup> per hectare, and, in some cases, 110 is not exceptional. Three quarters of these trees belong to a few species that are commercialized under the name of Meranti.*

*Half the trees are removed at the first felling, when,*

*most of all, the Merantis are selected (80 to 95 % of the total).*

*Of course, in such dense stands, the exploited trees, and the logs they yield, are not of exceptional size : usually 10 to 12 m<sup>3</sup> per tree, but a quarter to a third of the logs are larger than 1 m in diameter.*

*As far as forest harvesting is concerned, the potential of this forest is relatively well-known by the nation, even though the maps which are available and used locally are often very approximative. Before granting an annual allowable cut, the Indonesian government forces the logger to make an inventory of existing trees (and controls 10 % of it). In this inventory, trees are classified by exploited species (about ten in general), and by the category of the diameter (For those trees larger than 20 cm in diameter, a count and volume estimate is made).*

*For the last thirteen years where the statistics are known, upland species belonging to the Merantis and Keruing/Kapur groups have respectively contributed 60.9 % and 8.4 % to Indonesia's exports of forest products (i.e. nearly 113.7 and 15.7 million m<sup>3</sup>).*

# CLOSE SHOT ON KALIMANTAN

## GROS PLAN SUR KALIMANTAN

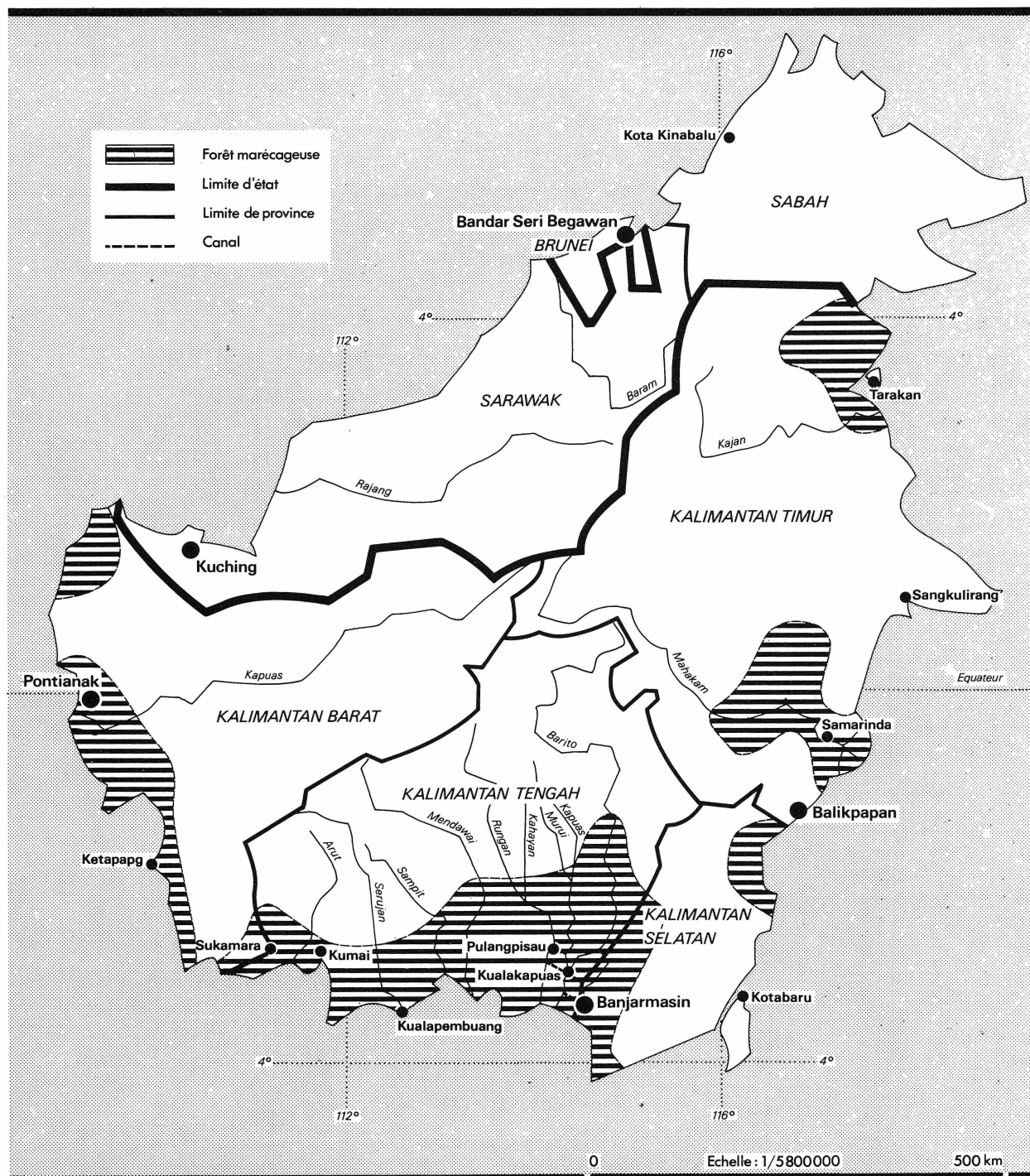






Photo Laurent.

*Rondins de Meranti en attente de transport.*  
Meranti logs waiting to be floated.

## VARIOUS MODES OF PRODUCTION ORGANIZATION

Following a trend that can be found in several countries in Asia, and which probably comes from the Asians' extraordinary power of adaptation the concessionary companies operate according to a variety of logging methods to harvest the areas they have been granted, either harvesting them all directly, or subcontracting part or the totality of the technical operations of production.

However, the most frequent case is a middle-of-the-road solution between the two extremes.

### *Direct logging*

All of the staff and the equipment belong to the company which performs all the operations (from prospecting to delivery to the mills).

Logging operations are directed from a base-camp

which includes the staff quarters, the offices, the workshops, and the warehouse for spare parts. This base-camp is usually situated near a river, and the floating wood yard for logs is often close to it.

We may include in this type of enterprise those companies whose staff can be divided into three categories :

- first, *the montly-paid staff* : usually executives and workers whose jobs have no direct link to the production (those involved in road building, maintenance, prospecting, domestic personnel, etc...) ;

- second, *workers on a daily basis* : this category includes skilled or unskilled laborers (trail-breakers, helpers, some heavy equipment assistant-operators, guards, etc...) ;

- last but not least (the highest percentage of the total personnel), *pieceworkers*, paid in relation to the amount of work they perform : this is how most of the productive operations are paid (felling, rafting and delivery of logs to the mills).

*The pieceworkers are managed and paid by the forest exploitation company. These men are sufficiently stable in their jobs to be considered as the sole and steady employees of their company.*

*Even though the pieceworkers maintain the small tools they use (even chainsaws), and pay for their operating costs, they do not necessarily own them.*

*The heavy equipment (tractors, road-graders, front-end loaders, trucks, etc...), belong to the forest exploitation company which pays for their maintenance and operating costs (fuel, lubricants, spare parts).*

## **Exploitation by subcontracting part of the operations**

*This happens very frequently in the upland forest.*

*There are two types of subcontracts :*

*— the forest exploitation company subcontracts certain operations to concerns which have their own staff*

*and equipment. In most cases, they float the logs or transport them by barge on the river. Sometimes, they are also in charge of the felling and bucking of the trees ;*

*— the forest exploitation company hires « labor contractors » who supply them with production personnel for a standard fee based on the amount of cubic meters cleared. In this case the contractor is responsible for :*

- *the management of the staff he hires,*
- *the technical supervision necessary to perform the subcontracted operations.*

*The exploitation equipment is owned by the logging company which is also in charge of its maintenance.*

*Depending upon the company, the operations thus subcontracted may include :*

- maintenance,*
- road building,*
- felling,*
- hauling,*
- the loading of trucks,*
- road transportation,*
- floating and rafting,*
- river transportation.*

The front loader also installs the timber trailer which rides piggyback on the trailer truck when it is empty.

*Le chargeur frontal met aussi en place la remorque grumière transportée sur le camion tracteur durant le trajet à vide.*

Photo Laurent.



The number of operations may vary from one company to the other, but, in most cases, it only consists of road building, felling and hauling.

When there are several subcontracted operations, the « contractor » has a number of staff to supervise and manage the hired personnel.

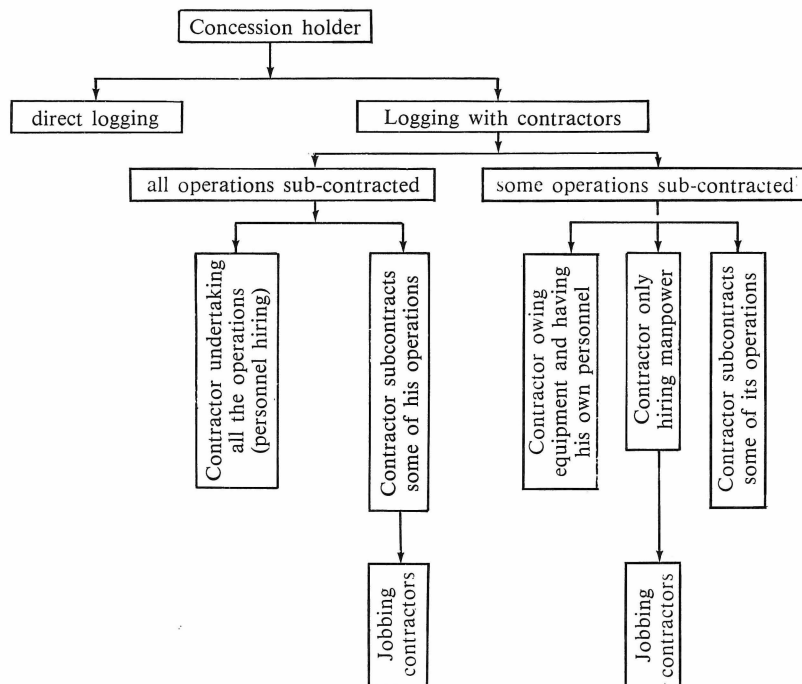
Lastly, when the company is not mechanized, or only partially mechanized (as in the exploitation of swamp forests), and when all the technical operations are entrusted to a « contractor », the latter is almost totally responsible for the production (1).

## Exploitation by subcontracting all of the operations

In several cases, the production is entirely entrusted to one or several subcontractors for a price fixed by each product unit (ton or m<sup>3</sup>) that has reached a certain stage of the production (rafting, in general). When there are several subcontractors, one is usually responsible for production and another one for river transportation. This occurs more frequently in swamp forests than in dryland forests (1).

## Recapitulation

We have summed up in the following diagram the various types of organization that can be encountered :



(1) See, in the next issue, the article on swamp forest harvesting.

(1) See the article on swamp forest harvesting.





Photo Laurent.

*Transport routier de grumes très longues : on les retrouvera plus tard sur parc en bordure de fleuve.*

Transporting very long logs by road : they will be shown later in the yard on the riverside.

## ORGANIZATION AND STRUCTURE OF THE COMPANIES

Forest exploitation companies are usually part of industrial or commercial vertical trusts (production-processing-trade), which are sometimes multinational (Japan, Korea, Singapore, Taiwan), and whose activities may include several sectors (wood, mining, ship-building, general trade...).

The national headquarters are based in Djakarta, and the regional office in the capital of the province concerned (in this case, Banjarmasin). The latter supervises and controls the areas of production and gives them the necessary logistical support.

The concessions, whose output ranges from 40,000 to 160,000 m<sup>3</sup> a year, are supervised by Indonesians or, in exceptional cases, by expatriates (Koreans, Filipinos, ...).

The number of managers, executives and supervisors is always low and depends on the quantity and the importance of subcontracted operations. An extreme case is when the concessionary company keeps administrative control and management and hands over to the

subcontractor the supervising of all technical operations.

For instance, a concession producing 130-140,000 m<sup>3</sup> a year, is run by 8 executives and 10 to 12 administrative staff and has a total of 215-220 personnel (including those involved in rafting).

The two-way radio and outboard motor boat link the base-camp, set up near the river, to the regional office.

The lack of a sufficient road network on the island is compensated by an extensive system of navigable waterways. The concessions start near a river, with a base-camp which contains offices, workshops, warehouses, workers' quarters (1), dry and floating woodyards, and also sometimes a sawmill for the valorization of heavy wood.

(1) The exception is the lumberjacks and heavy equipment operators who live in small, mobile bungalows very close to the areas of exploitation.



*From that base-camp, the company builds a road network on the concession to drain off its production.*

*However, fluvial transportation is the rule for wood headed towards a harbor where it will be loaded on sea-going ships, or towards industrial processing units.*

*Two remarks should be made at this point, one concerning the length of the working week, the other concerning the typical organization of a concession.*

*Employees usually work 60 to 70 hours a week, sometimes more when production is very high (1). They do not always have one day off a week.*

*A survey (2) estimates effective working days, in this type of company and in that region, as follows — felling : 221 days a year, hauling : 183 days a year, hand-*

*ling : 231 days a year, road transportation : 193 days a year. Vacations and days of absence total 20 days a year per person.*

*Since most of the personnel are paid by piecework and often work in a team, production, and not the working time, is the controlling factor.*

*The concession is in the hands of a works manager, his assistant and the heads of department — planning and production, management and administration, maintenance, and general services (upkeep of the building, radio and communication, stocks, ...).*

*The organization chart, page 123, could be observed on a concession producing 100,000 m<sup>3</sup> per year. It is but one example, and variations can be found.*

## HARVESTING METHODS

*Upland forest management in Kalimantan is very similar to that of other tropical regions. However, we will not comment on the similarities, but, instead, we will try to highlight the few differences.*

### Prospecting and planning

*As has already been mentioned, before granting a yearly permit to cut trees, the Indonesian government assigns the logger the task of making an inventory of existing trees in each of the marketable species, classifying them by diameter :*

- the number of species taken into account varies from 3 to 12, but is often around 10 ;*
- there are usually three or four diameter categories : from 20 to 34 cm, from 35 to 49 cm, from 50 to 59, and 60 cm and larger.*

*The results of that inventory are transmitted to the forestry department which controls 10 % of it, and the allowed yearly cutting in surfaces and volumes (AAC) depends on the agreement of the logger's survey with that of the forestry department's, to within about 10 %.*

*If this does not happen, the procedure for granting a yearly cutting permit is stalled.*

### Civil engineering

*Concessions in Kalimantan are being exploited for the first time. Companies have had to create their own*

*road networks in order to drain off their production. These roads which provide access to the concession are primary or secondary, depending on their characteristics and how long the road is expected to be used.*

*The roads are designed to support 50 t convoys and are made of compacted earth, and sometimes improved by laterite or gravel, depending on what is locally available.*

*The density of the road network ranges from 10 to 15 km/1,000 ha. Main roads represent a quarter to a third of the total.*

*The equipment used to set up a road network (deforestation, earthmoving, excavation, leveling, shaping and the quarrying and transportation of the necessary materials), is identical to the equipment which is used in Africa. (Caterpillar D7G or Komatsu D80/D85 of 200 HP, Caterpillar D8K or Komatsu D155 of 300 HP are used when the terrain or the size of the trees makes it necessary.)*

*Lateral exposition to the sun is not forgotten. The table page 125 gives the requirements for heavy equipment by working hour for the various phases of deforestation, excavation and shaping.*

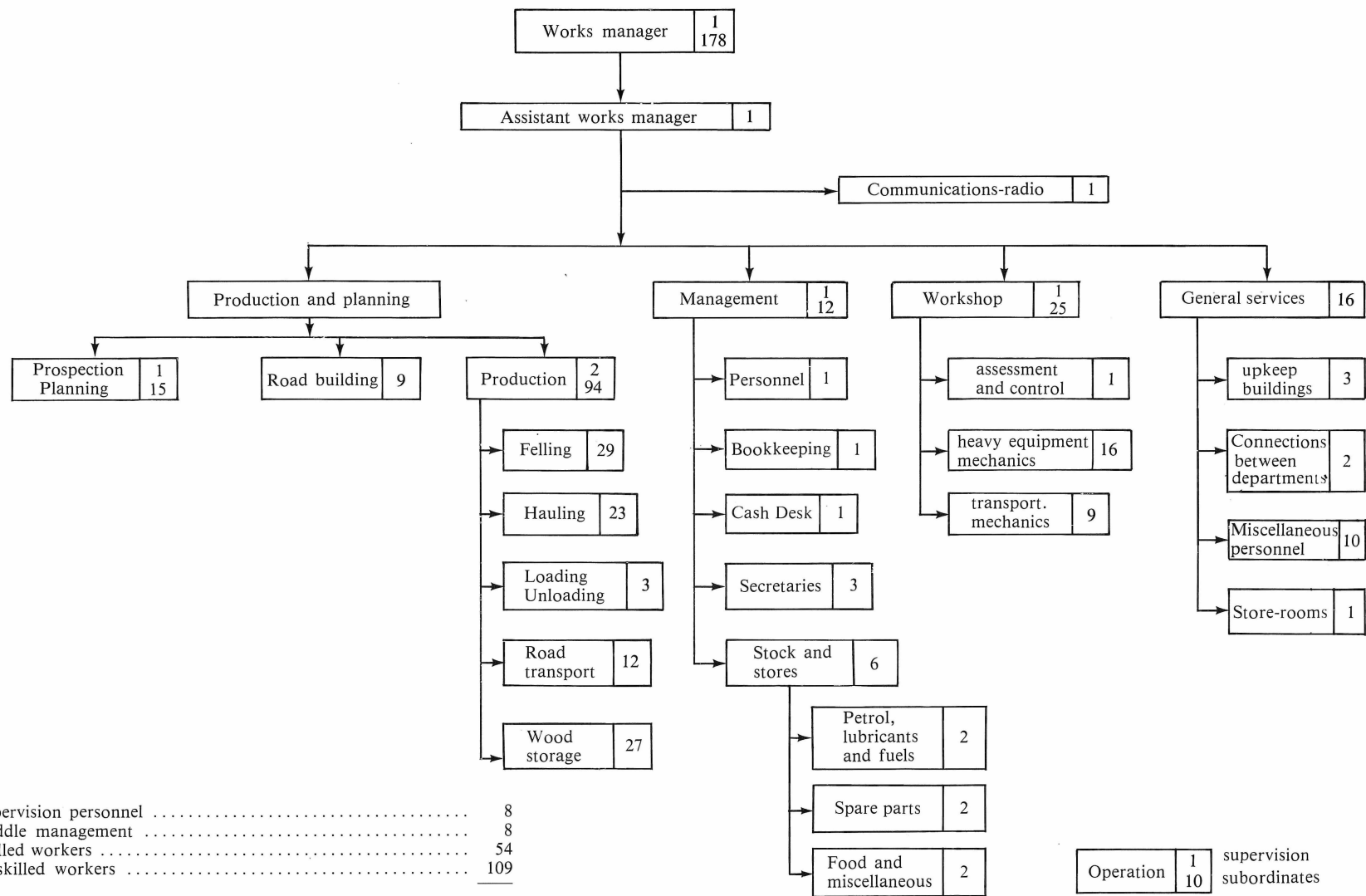
### The exploitation itself

#### FELLING AND BUCKING

*The felling teams are not only responsible for felling the trees, but also for pollarding, trimming the base and crosscutting the logs in the roadside processing yards. Felling foremen can only be found on large-scale concessions (those with more than 15 felling teams).*

(1) Production depends on the changing weather conditions throughout the year. A humid monsoon cuts production by 75 %.

(2) Institute of Forest Product Research. Bogor - Indonesia, 1976.





## HAULING

The most frequent way to haul trees is to use 200 HP crawler tractors for a distance of a few hundred meters. Some companies have started hauling in two phases :

- first, hauling with a track log skidder for a distance less than 300 meters, collecting all the logs in a forest processing yard ;

- second, hauling and employing faster vehicles to pull marketable logs from the forest yard to a roadside yard on hastily built skidding tracks. In the second case, distance often exceed one kilometer. The machines used are either the same as those used in Africa (Cat 518, Cat 528, Clark 666), or fast track log skidders (type FMC 200 or FMC 220). These vehicles are operated from 150 to 190 horometer hours a month, for all tasks (hauling, organizing the yard and helping the trucks that are bogged down).

## Processing and loading

Logs are often stripped by hand.

As pieceworkers'salaries and subcontractors'fees are calculated in relation to the m<sup>3</sup> or ton cleared, wood measurement is an important operation that requires a rather large number of staff as compared to those on other continents. Wood is measured at the forest processing yard before it is transported by road, then again at the roadside processing yard before it is floated. Grading is also made in the processing yards, then confirmed or rectified before putting the wood into the water.

In the roadside yard, the logs which have previously been processed are sorted out in order to be loaded on the trucks. Curiously enough, Caterpillar 966C, 170 HP wheel loaders, are not used very often. The most frequently used are Caterpillar 977 L, 175-190 HP front

loaders, crawler loaders, or Komatsu D755, or, depending on the size of the logs and the condition of the terrain, 260-280 HP wheelloaders Caterpillar 980 B or Clark 175 B.

## Road transportation

As is often the case in other countries, on the roads, wood is transported by 5-axle 260-280 HP log trailers. Taking all the companies I visited as a whole, 2/3 of the log trailers were three axles drive and one third two axle drive tractors.

It should be noted that Renaults's Industrial Vehicles and its partners (Mack), are, by far, the main purveyors of that type of equipment (GBH 280). Some companies are equipped with American vehicles whose horse power is greater than 300 HP and whose functional capacity is 60 m<sup>3</sup>, but these vehicles are not often used, probably because they both need a good road system and the distances are rather short (15 to 35 km). The distances are only longer than 50 km on concessions located in the center of the island where navigable rivers are further apart.

## Wood handling on the banks of a river

Depending on the nature of the load (whether the wood can or cannot be floated), log trailers arriving at the riverside yard are unloaded either on a platform using 270 HP front wheel loaders such as those used in the forest, or directly into the floating yard, by semi-mobile cranes. In these parks which are better organized than those in the forest, one machine is sufficient for the task.

## RIVER TRANSPORTATION

For foresters, this means of transportation, very common in Borneo, is limited only during the dry season and upriver (often more than 300 km away from the mouth).

In addition, canals, which are sometimes several dozen km long and 25-30 m wide, enable wood to be floated between rivers. This is, for instance, the case in Banjarmasin, a center for industrial processing and the loading of sea-going ships which collects the production of 4 to 5 watersheds (Barito, Kapuas, Kahayan, Rungan, Mentawai, Sampit).

Merantis, which constitute the bulk of the production, float very well.

Once the logs have been floated, they are assembled in fish bones shaped rafts so they can be transported on the river.

The size of convoys depends on the rivers. Where possible, rafts can be 2,000 to 2,500 m<sup>3</sup>, occasionally bigger, in one or two units. They are mainly transported by the current, but tug-boats (10 to 45 HP with wooden hulls, or 45 to 150 HP with steel hulls, depending on the size of the rafts) are used to manoeuvre the convoys and keep them from becoming stranded on the river banks or sand shoals.

As a result, the speed of the turnover depends much more on the season than on the nature of the convoy. During the dry season, convoys take 20 to 40 % longer than in the rainy season.

At certain strategic points along the rivers (junctions with other rivers, with canals, ...), companies have floating wood yards where modifications to the convoys can be made in order to make the most of the navigational possibilities downstream.

## YIELD AND COST

### Yield

The following chart gives a few ideas as to the average yield per year depending on exploitation operations and the means of transportation.

All things considered and contrary to what is usually believed, the individual yield in Indonesia is not much higher than in other tropical zones. On the other hand, and despite recent slight variations in economic patterns, the means of payment and the operating costs are very favorable for Indonesia in relation to its competitors.

### Costs

We do not know the present production cost of dryland forest logs in Kalimantan.

The only figures we can give are the 1981 costs of production and the manner in which they were distributed to take the wood to the stage where it was loaded onto the trucks. This does not include the financial costs and the specific forest product taxes for export.

Those costs were between 25,000 and 30,000 rupees/m<sup>3</sup> logs, i.e. 40 to 48 US \$/m<sup>3</sup> (1 US \$ = 625 rupees in 1981).

Operation	Yield capacity	Observation
Prospecting and planning	• 1,500 ha/year/team	• 1 team = 12 people
Felling-crosscutting	• 7,000 to 7,500 m <sup>3</sup> /year/team	• 1 team = 1 operator + 1 helper
One-phase skidding or first skidding operation	• 7,000 m <sup>3</sup> /year/vehicle • 9 to 10,000 m <sup>3</sup> /year/vehicle • 13 to 20,000 m <sup>3</sup> /year/vehicle	• Hauling distance more than 1,000 m on difficult terrain • Distance : 300-500 m, sandy terrain • Distance : 200-300 m sandy terrain
Second skidding	• 23,000 m <sup>3</sup> /year/wheel skidder • 25,000 m <sup>3</sup> /year/crawler skidder	• Easy, sandy terrain • Difficult terrain
De-barking	• 6,000 to 8,000 m <sup>3</sup> /year/de-barker	• Work done by hand
Scaling	• 35,000 m <sup>3</sup> /g/year/scaling team	• 1 team = 1 scaler + 2 or 3 helpers
Grading	• 50,000 m <sup>3</sup> /year/classifier	
Wood handling in the forest wood yard	• 35,000 to 45,000 m <sup>3</sup> /year/machine	
Road transportation	• 9 to 10,000 m <sup>3</sup> /year/log-trailer • 16,000 m <sup>3</sup> /year/log-trailer	• Distance = 65 to 70 km • Distance = 20 to 30 km
Rafting	• 50 to 60 logs a day per team	• 3 workers by team
Floating wood yard	• 10 to 12 workers by 120,000 m <sup>3</sup> /year of wood going through the yard	
River transportation	on tug : 2 to 3 skilled workers + 1 to 3 unskilled (depending on HP) rafts : 0 to 2 workers for supervision, depending on size of raft and difficulty of navigation	

	Main roads	Secondary roads
	70-100 100 150-300	40-50 70 70-100
Heavy civil engineering equipment needed (hours)	Scraping and shaping 30-35	



Photo Laurent.

*Les barges acheminent les bois lourds, sciés sur la concession.*  
The barges carry the heavy timber, that is sawn on the concession.

*The costs were usually distributed as follows :*

— labour cost .....	16 %
— fuel, lubricants .....	5 %
— spare parts, equipment + consumable items .....	16 %
— insurance and taxes .....	30 %
— overhead expenses .....	15 %
— depreciation .....	18 %

Once the costs of transportation within the concession, river transportation and the transbordments are included, the price of wood delivered to the floating

yard of the river harbor, waiting to be processed locally or loaded on board ship to be exported, came to : 44 to 57 US \$/m<sup>3</sup> of logs.

In addition, the various taxes and duties levied on exported meranti logs were, at the time, around 38.5 US \$/m<sup>3</sup>, two thirds of which were export duties.

In 1982, the European price of merantis coming from Indonesia was between 180 and 220 US \$/m<sup>3</sup> c.i.f.

Since then, the Indonesian rupee has lost nearly 75 % of its value in relation to the US dollar and, in spite of rising costs (production and transportation), in the spring of 1986, meranti logs were sold for between 165 and 170 US \$/m<sup>3</sup> c.i.f. in Europe.

## CONCLUSION AND FORECAST FOR THE FUTURE

*Let us now regard the whole primary processing.*

The prospects for sales after the first processing can be analysed keeping in mind the objectives of the fourth five-year plan (April 1984 to March 1989) :

logs : average annual growth rate of the output :  
13.89 % ;  
average annual growth rate of the local  
market : 13.6 % ;



average annual growth rate of exports by volume : 10.8 %;

average annual growth rate of exports by value : 12.95 % ;

lumber : average annual growth rate of the output : 8.98 %;

average annual growth rate of national consumption : 7.0 % ;

average annual growth rate of exports, by volume : 12,3 % ;

average annual growth rate of exports, by value : 5.12 %.

The conditions which enable the Indonesian authorities to establish these objectives are as follows.

Indonesia's forest products must be able to enter new markets (the People's Republic of China, the United Arab Emirates, Japan) as well as strengthen their position by obtaining a larger share of the market with their present trading partners (by improving quality, being competitive, ensuring a safe and steady supply and respecting the dates of delivery).

The high domestic demand for forest products, particularly from the building and construction sectors, and Indonesia's forest and human potential makes it possible to reach these objectives.

To compensate for the disadvantage of fluctuating prices, at home and abroad, Indonesia is encouraging dialogue between producer associations and the government in order to implement joint programs of commercial development and avoid suicidal competition between producers in the same country.

Moreover, the output of a number of rival countries is dropping steadily (South Korea, Taiwan, Japan, Singapore : 184 of the 506 plywood mills in those four countries will very likely have produced as early as 1986).

This article essentially tries to call the readers's attention to the present and foreseeable future developments of Indonesia's forest production. It also attempts to point out the reality, if necessary, behind the myth of dryland forest exploitation.

Forest harvesting, like the knowledge and the reproduction of existing resources, are, of course, important, but they are only part of the elements of forest valorization.

In general terms, the future seems headed in a few major directions :

— reinforcement and strengthening of the industrial and commercial structure of companies (based in part on an acceptance of foreign industrial partners),

Traditional pit sawyers.  
Scieurs de long traditionnels.

Photo Laurent.



- rationalization of output and processing,
- gradual development of forest activity in Irian Jaya which still contains large untapped resources,
- the will to limit exports of raw materials,
- development of the export of forest products with increasing added value.

The achievement of the above mentioned objectives will require certain steps. Some of these steps have already been taken :

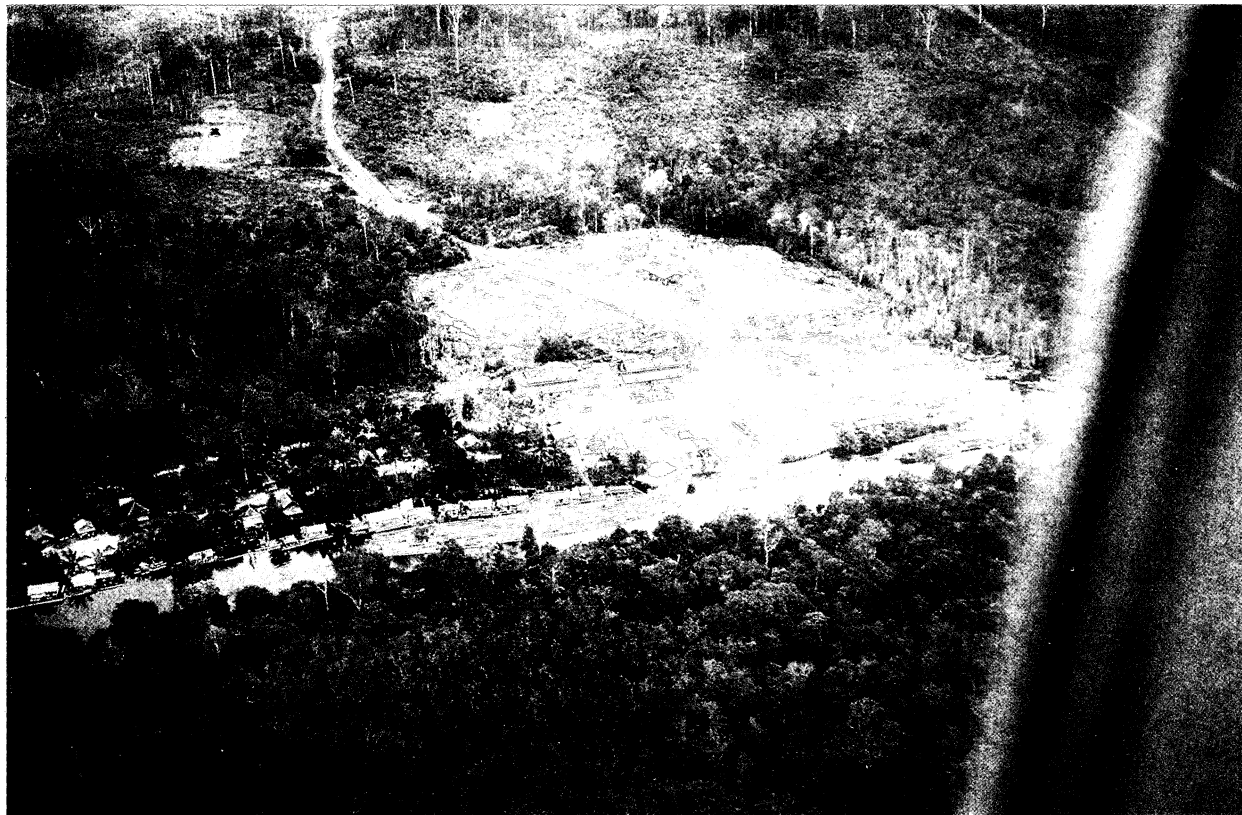
- training of forest production and industry executives,
- acceptance of foreign industrial partners (technology and capital),
- research :
  - on the improvement of production conditions (logging and transportation),
  - on under utilized species,
  - on the analysis of the technical and economic conditions for commercialisation,
  - on the definition of new products,
  - on industrial processing devices (in particular, lumber, plywood and furniture),

- technical assistance :
  - modernization and rationalization of production (forest harvesting and industrial processing units),
  - quality control,
  - development of the organization of commercial networks (particularly for export), thanks to :
    - market studies and attempts to identify Indonesia's handicap for trade,
    - a certain re-organization of Indonesia's domestic network (creation of wood processing industrial zones near the harbors, creation of centers responsible for packaging and controlling quality before export),
    - a possible re-organization of the network in importing countries (centers in Europe where Indonesia's forest products could be received and approved...).

Indonesia is one of the Asian trading partners that, sooner or later, will have to be taken into account and with whom it is high time to prepare the future. Each of us has to play his own role. C.T.F.T., as far as it is concerned, is ready to be a kind of catalyst, and a privileged place for exchange between our « historic » African partners, interested European industrialists, and the Asian partners with whom we already operate.

Traditional processing unit in Benjamarsin neighborhood.  
Unité de transformation traditionnelle dans les environs de Benjamarsin.

Photo Laurent.



# ENCLOSURES

## PERSONNEL EXPENSES — DRYLAND FOREST

The figures below are monthly average payments (salaries + bonuses + perks) for the main jobs in a forest exploitation company.

Job category	Job	Salaries + perks + bonuses K rupees/month
SUPERVISION	• Works manager .....	650 to 750
	• Assistant .....	500 to 600
	• Liaison officer .....	175 to 225
	• Assistant radio officer .....	85 to 175
	• Planning and prospection .....	150
	• Production and road building .....	350
	• Store-room supplies (spares, fuel, lubricants, miscell.) .....	75 to 100
	• Supervisors (wood yard, hauling, felling) .....	100
	• Supervisor .....	350
	• Equipment maintenance .....	300 to 550
MANAGEMENT	• Management director .....	200 to 220
	• Staff manager .....	100 to 215
	• Accountant .....	60 to 120
	• Cashier .....	60 to 90
	• Secretary .....	50 to 70
	• Clerk .....	30 to 45
	• Security .....	85
EXECUTION	• Feller (day-laborer) .....	60 to 90
	• Feller ass. (day-lab.) .....	50 to 60
	• Crawler driver (road) .....	85 to 195 (1)
	• Crawler driver assistant .....	50 to 55
	• Motor-grader driver .....	80 to 145 (2)
	• Motor-grader driver assistant .....	50 to 55
	• Truck driver .....	80 to 100 (3)
	• Loader driver (road) .....	60 to 105 (4)
	• Log-trailer driver .....	65 to 160
Workshop	• Highly-skilled mechanic .....	200 to 300
	• Mechanic (depending on skill) .....	80 to 190
	• Assistant mechanic .....	30 to 65
Rafting	• Skilled worker .....	55
Wood measurement	• Measurer (depending on skill) .....	70 to 100
	• Measurer assistant .....	50 to 65
	• Classifier .....	70
Loading on trucks	• Loader driver .....	105
Survey	• Foreman .....	105
	• Assistant .....	80 to 85
	• Compass bearer, prospector, record keeper .....	75 to 80
	• Tracker .....	50 to 55
Miscellaneous	• Domestic .....	20 to 35

## COST OF STAFF PAID BY PIECEWORK (Rupees/m<sup>3</sup>)

Operation	Examples of observed payments	Average
Felling team .....	315 to 500	330-350
Hauling (operator + assistant) .....	260 to 565	330
de-Barking .....	50 to 125	90
Road transportation (driver + assistant) .....	114 to 440	250-300
Rafting .....		20-25

(1) Average 150  
(2) Average 125

(3) Average 90  
(4) Average 80



LIST OF INDONESIAN EXPORTING HARBOURS

Province	Exporting Harbour	
1. D.I. Aceh	Kuala Langsa Singkil Belawan Kuala Tugha Sigli	Kampung Baru Balik Papan Kota Baru Ma Satui/K Baru Gn Batu/Bt Lian Gn Batu/P Laut
2. North Sumatera	Sibolga <i>Belawan</i> labuhan Bilik	17. East Kalimantan <i>Samarinda</i> Teluk Adang Muara Jawa Muara Berau Tlk <i>Balikpapan</i> Sangkulirang Tlk Sulaeman Tlk Apas Sei Buta Batu Putih Da Bengalar Ls Naga/berau Mangkupadi/tek Pulau Sadau Lok Tuan
3. West Sumatera	Teluk Bayur	18. North Sulawesi Bitung
4. Riau	Pekanbaru Selat Panjang Sei Pakning Siak Tembulahan <i>Bengkalis</i> Tg Peranap Perawang <i>Dumai</i> Sinaboi	19. Central Sulawesi Sidoan/Donggala Sibualong Perigi Sel Tambu/Banggai Bentang Teluk Lemala Torokondo/Poso
5. Jambi	<i>Jambi</i> Kuala Tungkal Muara Sabah	20. South Sulawesi <i>Ujung Pandang</i>
6. South Sumatera	<i>Palembang</i> Lobok Besar/ Pkl Balam Jebus/Muntok	21. South East Sulawesi Laburino Laenti/Kendari Simpolawa Ujung Pandang Latawa/Raha
7. Bengkulu	Sei Ketamun	22. Bali —
8. Lamoung	Panjang Lebar Besar Karang Baruk K. Way Semangka	23. West Nusa Tenggara Calabai
9. Jakarta	Tanjung Priok	24. East Nusa Tenggara Tenau/Kupang
10. West Java	Cirebon	25. Maluku Ambon Teluk Dadinga Kapan samana Air pote Wailoba Tg Loloo Sikotame Ternate Mangga/Taliabu Pulau Obi
11. Central Java	<i>Semarang</i>	26. Irian Jaya Jayapura Atay/Merauke Tg Denba (Waropan bawah) Tlk Sebakau/P. Adi P Asep-Babo/Manokwari
12. Yogyakarta	—	
13. East Java	<i>Surabaya</i>	
14. West Kalimantan	Teluk Aer Sei Raya Teluk Aer/ Ketapang	
15. Central Kalimantan	Taboneo Ma Kahayan/Sei Barito Pulang Pisau <i>Sampit</i> Kumai Pkl Bun Teluk Sebangau Kuala Kapuas Kuala Pembuang Bahaur	
16. South Kalimantan	Taboneo Gn Batu/Stagen <i>Banjarmasin</i>	